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(54) Title: NUCLEIC ACID MOLECULES AND USES THEREOF

(57) Abstract: The present invention is directed to an artificial nucleic acid and to polypeptides suitable for use in treatment or prophylaxis of an infection with Norovirus or a disorder related to such an infection. In particular, the present invention concerns a Norovirus vaccine. The present invention is directed to an artificial nucleic acid, polypeptides, compositions and vaccines comprising the artificial nucleic acid or the polypeptides. The invention further concerns a method of treating or preventing a disorder or a disease, first and second medical uses of the artificial nucleic acid, polypeptides, compositions and vaccines. Further, the invention is directed to a kit, particularly to a kit of parts, comprising the artificial nucleic acid, polypeptides, compositions and vaccines.

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Nucleic acid molecules and uses thereof

Introduction:

The present invention is directed to an artificial nucleic acid and to polypeptides suitable for use in treatment or prophylaxis of an infection with Norovirus or a disorder related to such an infection. In particular, the present invention concerns a Norovirus vaccine. The present invention is directed to an artificial nucleic acid, polypeptides, compositions and vaccines comprising the artificial nucleic acid or the polypeptides. The invention further concerns a method of treating or preventing a disorder or a disease, first and second medical uses of the artificial nucleic acid, polypeptides, compositions and vaccines. Further, the invention is directed to a kit, particularly to a kit of parts, comprising the artificial nucleic acid, polypeptides, compositions and vaccines.

Noroviruses (also known as Norwalk-like viruses or Norwalk viruses) are positive sense, single-stranded RNA Calciviruses (Sarvestani, Soroush T., et al. "Norovirus Infection: Replication, Manipulation of Host, and Interaction with the Host Immune Response." Journal of Interferon & Cytokine Research 36.4 (2016):215-225), containing a non-segmented RNA genome. The virus genome is organized in three open reading frames, of which the 5' proximal ORF encodes a large polyprotein that is cleaved into non-structural proteins; the minor capsid protein VP2 is encoded by ORF3 and the major capsid protein VP1 is encoded by ORF2 (Karst et al., Cell Host Microbe 11; 15(6):668-80, 2014; Robilotti E, Deresinski S, Pinsky BA. 2015. Norovirus. Clin Microbiol Rev 28:134–164).

Noroviruses are classified into five genogroups (GI - GV), and are further subdivided into genotypes based on the capsid sequence (Zheng, Du-Ping, et al. "Norovirus classification and proposed strain nomenclature." Virology 346.2 (2006):312-323; Kroneman, A., et al. "An automated genotyping tool for enteroviruses and noroviruses." Journal of Clinical Virology 51.2 (2011):121-125). Mostly viruses of genogroups I, II are known to infect humans (Ramani, Sasirekha, Robert L. Atmar, and Mary K. Estes. "Epidemiology of human noroviruses and updates on vaccine development.", Current opinion in gastroenterology 30.1 (2014):25). Norwalk viruses (NV) genotype GI.1 was the first isolated Norovirus, however genotype GII.4 Noroviruses are currently the most frequently detected in humans (Glass, Roger I., Umesh D. Parashar, and Mary K. Estes. "Norovirus gastroenteritis." New England Journal of Medicine 361.18 (2009):1776-1785).

Infections with Noroviruses are generally self-limiting in healthy adults, displaying typical symptoms including non-bloody diarrhea, vomiting, nausea and abdominal cramps. However, in individuals with weakened immune system, including young children and elderly, infection can be severe and even fatal (Glass, Roger I., Umesh D. Parashar, and Mary K. Estes. "Norovirus

gastroenteritis." New England Journal of Medicine 361.18 (2009):1776-1785). Nongastrointestinal- related illness, including neurodevelopmental disorders have also been reported after Norovirus infection. (Sarvestani, Soroush T., et al. "Norovirus Infection: Replication, Manipulation of Host, and Interaction with the Host Immune Response." Journal of Interferon & Cytokine Research 36.4 (2016):215-225).

Due to the low infectious dose, resistance to many common sterilization procedures, and ease of transmission, epidemic outbreaks are common and difficult to control (Glass, Roger I., Umesh D. Parashar, and Mary K. Estes. "Norovirus gastroenteritis." New England Journal of Medicine 361.18 (2009):1776-1785; Hutson et al., 2004). NoV has been shown to be the cause of the majority of nonbacterial gastroenteritis epidemics, resulting in a huge economic burden. In the US, the cost of NoV-associated hospitalizations has been estimated at approximately $500 million, while foodborne NoV cost due to healthcare and lost productivity has been estimated at $2 billion (Batz, Michael B., Sandra Hoffmann, and J. Glenn Morris Jr. "Ranking the disease burden of 14 pathogens in food sources in the United States using attribution data from outbreak investigations and expert elicitation." Journal of Food Protection 75.7 (2012):1278-1291). The rapid evolution of Norovirus genotypes through antigenic drift and changing glycan specificities still provide challenges in the development of potent vaccines (Ramani, Sasirekha, Robert L. Atmar, and Mary K. Estes. "Epidemiology of human noroviruses and updates on vaccine development." Current opinion in gastroenterology 30.1 (2014):25).

At present, there is no specific treatment of Norovirus infections. Therapy is limited to curing the symptoms caused by the infection. In addition, there is currently no vaccine available against Norovirus infections. There is therefore a strong need for a vaccine against Norovirus infection.

The underlying object of the present invention is therefore to provide a Norovirus vaccine. It is a further preferred object of the invention to provide a Norovirus vaccine, which may be produced at an industrial scale. A further object of the present invention is the provision of a storage-stable Norovirus vaccine. Further object of the underlying invention is to provide mRNA sequences coding for antigenic peptides or proteins derived from a protein of a Norovirus or a fragment or variant thereof for the use as a vaccine for prophylaxis or treatment of Norovirus infections. Furthermore, it is the object of the present invention to provide an effective Norovirus vaccine which can be stored without cold chain and which enables rapid and scalable vaccine production.

The object underlying the present invention is solved by the claimed subject-matter. Particularly, the objects underlying the present invention are solved according to a first aspect by an inventive by providing an artificial nucleic acid comprising at least one coding region encoding at least one polypeptide derived from a Norovirus, and/or a fragment or variant thereof.

Definitions:

For the sake of clarity and readability the following definitions are provided. Any technical feature mentioned for these definitions may be read on each and every embodiment of the invention. Additional definitions and explanations may be specifically provided in the context of these embodiments.

Adaptive immune response: The adaptive immune response is typically understood to be an antigen-specific response of the immune system. Antigen specificity allows for the generation of responses that are tailored to specific pathogens or pathogen-infected cells. The ability to mount these tailored responses is usually maintained in the body by "memory cells". Should a pathogen infect the body more than once, these specific memory cells are used to quickly eliminate it. In this context, the first step of an adaptive immune response is the activation of naïve antigen-specific T cells or different immune cells able to induce an antigen-specific immune response by antigen-presenting cells. This occurs in the lymphoid tissues and organs through which naïve T cells are constantly passing. The three cell types that may serve as antigen-presenting cells are dendritic cells, macrophages, and B cells. Each of these cells has a distinct function in eliciting immune responses. Dendritic cells may take up antigens by phagocytosis and macropinocytosis and may become stimulated by contact with e.g. a foreign antigen to migrate to the local lymphoid tissue, where they differentiate into mature dendritic cells. Macrophages ingest particulate antigens such as bacteria and are induced by infectious agents or other appropriate stimuli to express MHC molecules. The unique ability of B cells to bind and internalize soluble protein antigens via their receptors may also be important to induce T cells. MHC-molecules are, typically, responsible for presentation of an antigen to T-cells. Therein, presenting the antigen on MHC molecules leads to activation of T cells which induces their proliferation and differentiation into armed effector T cells. The most important function of effector T cells is the killing of infected cells by CD8+ cytotoxic T cells and the activation of macrophages by Th1 cells which together make up cell-mediated immunity, and the activation of B cells by both Th2 and Th1 cells to produce different classes of antibody, thus driving the humoral immune response. T cells recognize an antigen by their T cell receptors which do not recognize and bind the antigen directly, but instead recognize short peptide fragments e.g. of pathogen-derived protein antigens, e.g. so-called epitopes, which are bound to MHC molecules on the surfaces of other cells.

Adaptive immune system: The adaptive immune system is essentially dedicated to eliminate or prevent pathogenic growth. It typically regulates the adaptive immune response by providing the vertebrate immune system with the ability to recognize and remember specific pathogens (to generate immunity), and to mount stronger attacks each time the pathogen is encountered. The system is highly adaptable because of somatic hypermutation (a process of accelerated somatic mutations), and V(D)J recombination (an irreversible genetic recombination of antigen receptor gene segments). This mechanism allows a small number of genes to generate a vast number of different antigen receptors, which are then uniquely expressed on each individual lymphocyte. Because the gene rearrangement leads to an irreversible change in the DNA of each cell, all of the progeny (offspring) of such a cell will then inherit genes encoding the same receptor specificity, including the Memory B cells and Memory T cells that are the keys to long-lived specific immunity.

Adjuvant/adjuvant component: An adjuvant or an adjuvant component in the broadest sense is typically a pharmacological and/or immunological agent that may modify, e.g. enhance, the effect of other agents, such as a drug or vaccine. It is to be interpreted in a broad sense and refers to a broad spectrum of substances. Typically, these substances are able to increase the immunogenicity of antigens. For example, adjuvants may be recognized by the innate immune systems and, e.g., may elicit an innate immune response. "Adjuvants" typically do not elicit an adaptive immune response. Insofar, "adjuvants" do not qualify as antigens. Their mode of action is distinct from the effects triggered by antigens resulting in an adaptive immune response.

Antigen: In the context of the present invention "antigen" refers typically to a substance which may be recognized by the immune system, preferably by the adaptive immune system, and is capable of triggering an antigen-specific immune response, e.g. by formation of antibodies and/or antigen-specific T cells as part of an adaptive immune response. Typically, an antigen may be or may comprise a peptide or protein which may be presented by the MHC to T-cells. In the sense of the present invention an antigen may be the product of translation of a provided nucleic acid molecule, preferably an mRNA as defined herein. In this context, also fragments, variants and derivatives of peptides and proteins comprising at least one epitope are understood as antigens. In the context of the present invention, tumour antigens and pathogenic antigens as defined herein are particularly preferred.

Artificial nucleic acid molecule: An "artificial nucleic acid molecule" or "artificial nucleic acid" may typically be understood to be a nucleic acid molecule, e.g. a DNA or an RNA that does not occur naturally. In other words, an artificial nucleic acid molecule may be understood as a non-natural nucleic acid molecule. Such nucleic acid molecule may be non-natural due to its individual sequence (which does not occur naturally) and/or due to other modifications, e.g. structural modifications of nucleotides which do not occur naturally. An artificial nucleic acid molecule may be a DNA molecule, an RNA molecule or a hybrid-molecule comprising DNA and RNA portions. Typically, artificial nucleic acid molecules may be designed and/or generated by genetic engineering methods to correspond to a desired artificial sequence of nucleotides (heterologous sequence). In this context an artificial sequence is usually a sequence that may not occur naturally, i.e. it differs from the wild type sequence by at least one nucleotide. The term "wild type" may be understood as a sequence occurring in nature. Further, the term "artificial nucleic acid molecule" is not restricted to mean "one single molecule" but is, typically, understood to comprise an ensemble of identical molecules. Accordingly, it may relate to a plurality of identical molecules contained in an aliquot.

Bicistronic nucleic acid or RNA and multicistronic nucleic acid or RNA: A bicistronic or multicistronic nucleic acid or RNA is typically a nucleic acid or an RNA, preferably an mRNA, that typically may have two (bicistronic) or more (multicistronic) coding regions. A coding region in this context is a sequence of codons that is translatable into a peptide or protein.

Carrier/polymeric carrier: A carrier in the context of the invention may typically be a compound that facilitates transport and/or complexation of another compound (cargo). A polymeric carrier is typically a carrier that is formed of a polymer. A carrier may be associated to its cargo by covalent or non-covalent interaction. A carrier may transport nucleic acids, e.g. RNA or DNA, to the target cells. The carrier may – for some embodiments – be a cationic component.

Complexation and Formulation: According to a preferred embodiment, the at least one mRNA of the inventive composition may be complexed with lipids to form one or more liposomes, lipoplexes, or lipid nanoparticles. Therefore, in one embodiment, the inventive composition comprises liposomes, lipoplexes, and/or lipid nanoparticles comprising the at least one mRNA.

Lipid-based formulations have been increasingly recognized as one of the most promising delivery systems for RNA due to their biocompatibility and their ease of large-scale production. Cationic lipids have been widely studied as synthetic materials for delivery of RNA. After mixing together, nucleic acids are condensed by cationic lipids to form lipid/nucleic acid complexes known as lipoplexes. These lipid complexes are able to protect genetic material from the action of nucleases and deliver it into cells by interacting with the negatively charged cell membrane. Lipoplexes can be prepared by directly mixing positively charged lipids at physiological pH with negatively charged nucleic acids. Conventional liposomes consist of a lipid bilayer that can be composed of cationic, anionic, or neutral (phospho)lipids and cholesterol, which encloses an aqueous core. Both the lipid bilayer and the aqueous space can incorporate hydrophobic or hydrophilic compounds, respectively. Liposome characteristics and behaviour in vivo can be modified by addition of a hydrophilic polymer coating, e.g. polyethylene glycol (PEG), to the liposome surface to confer steric stabilization. Furthermore, liposomes can be used for specific targeting by attaching ligands (e.g., antibodies, peptides, and carbohydrates) to its surface or to the terminal end of the attached PEG chains (Front Pharmacol. 2015 Dec 1;6:286).Liposomes are colloidal lipid-based and surfactant-based delivery systems composed of a phospholipid bilayer surrounding an aqueous compartment. They may present as spherical vesicles and can range in size from 20 nm to a few microns. Cationic lipid-based liposomes are able to complex with negatively charged nucleic acids via electrostatic interactions, resulting in complexes that offer biocompatibility, low toxicity, and the possibility of the large-scale production required for in vivo clinical applications. Liposomes can fuse with the plasma membrane for uptake; once inside the cell, the liposomes are processed via the endocytic pathway and the genetic material is then released from the endosome/carrier into the cytoplasm. Liposomes have long been perceived as drug delivery vehicles because of their superior biocompatibility, given that liposomes are basically analogs of biological membranes, and can be prepared from both natural and synthetic phospholipids (Int J Nanomedicine. 2014; 9:1833–1843).

Cationic liposomes have been traditionally the most commonly used non-viral delivery systems for oligonucleotides, including plasmid DNA, antisense oligos, and siRNA/small hairpin RNA-shRNA). Cationic lipids, such as DOTAP, (1,2-dioleoyl-3-trimethylammonium-propane) and DOTMA (N-[1-(2,3-dioleoyloxy)propyl]-N,N,N-trimethyl-ammonium methyl sulfate) can form complexes or lipoplexes with negatively charged nucleic acids to form nanoparticles by electrostatic interaction, providing high in vitro transfection efficiency . Furthermore, neutral lipid-based nanoliposomes for RNA delivery as e.g. neutral 1,2-dioleoyl-sn-glycero-3-phosphatidylcholine (DOPC)-based nanoliposomes were developed. (Adv Drug Deliv Rev. 2014 Feb; 66:110–116).

Therefore, in one embodiment the at least one mRNA of the inventive composition is complexed with cationic lipids and/or neutral lipids and thereby forms liposomes, lipid nanoparticles, lipoplexes or neutral lipid-based nanoliposomes.

Cationic component or cationic compound: The term "cationic component" or "cationic compound" typically refers to a charged molecule, which is positively charged (cation) at a pH value typically from 1 to 9, preferably at a pH value of or below 9 (e.g. from 5 to 9), of or below 8 (e.g. from 5 to 8), of or below 7 (e.g. from 5 to 7), most preferably at a physiological pH, e.g. from 7.3 to 7.4. Accordingly, a cationic component may be any positively charged compound or polymer, preferably a cationic peptide or protein which is positively charged under physiological conditions, particularly under physiological conditions in vivo. Further accordingly, a cationic peptide, protein, polysaccharide, lipid or polymer according to the present invention is positively charged under physiological conditions, particularly under physiological salt conditions of the cell in vivo. A "cationic peptide or protein" may contain at least one positively charged amino acid, or more than one positively charged amino acid, e.g. selected from Arg, His, Lys or Orn. Accordingly, "polycationic" components or compounds are also within the scope exhibiting more than one positive charge under the conditions given.

5'-cap: A 5'-cap is an entity, typically a modified nucleotide entity, which generally "caps" the 5'-end of a mature mRNA. A 5'-cap may typically be formed by a modified nucleotide, particularly by a derivative of a guanine nucleotide. Preferably, the 5'-cap is linked to the 5'-terminus via a 5'-5'-triphosphate linkage. A 5'-cap may be methylated, e.g. m7GpppN, wherein N is the terminal 5' nucleotide of the nucleic acid carrying the 5'-cap, typically the 5'-end of an RNA. Further examples of 5'cap structures include glyceryl, inverted deoxy abasic residue (moiety), 4',5' methylene nucleotide, 1-(beta-D-erythrofuranosyl) nucleotide, 4'-thio nucleotide, carbocyclic nucleotide, 1,5-anhydrohexitol nucleotide, L-nucleotides, alpha-nucleotide, modified base nucleotide, threo-pentofuranosyl nucleotide, acyclic 3',4'-seco nucleotide, acyclic 3,4-dihydroxybutyl nucleotide, acyclic 3,5 dihydroxypentyl nucleotide, 3'-3'-inverted nucleotide moiety, 3'-3'-inverted abasic moiety, 3'-2'-inverted nucleotide moiety, 3'-2'-inverted abasic moiety, 1,4-butanediol phosphate, 3'-phosphoramidate, hexylphosphate, aminohexyl phosphate, 3'-phosphate, 3'phosphorothioate, phosphorodithioate, or bridging or non-bridging methylphosphonate moiety.

Cap analogue: A cap analogue refers to a non-polymerizable di-nucleotide that has cap functionality in that it facilitates translation or localization, and/or prevents degradation of a nucleic acid molecule, particularly of an RNA molecule, when incorporated at the 5' end of the nucleic acid molecule. Non-polymerizable means that the cap analogue will be incorporated only at the 5'-terminus because it does not have a 5' triphosphate and therefore cannot be extended in the 3' direction by a template-dependent polymerase, particularly, by template-dependent RNA polymerase.

Cap analogues include, but are not limited to, a chemical structure selected from the group consisting of m7GpppG, m7GpppA, m7GpppC; unmethylated cap analogues (e.g., GpppG); dimethylated cap analogue (e.g., m2,7GpppG), trimethylated cap analogue (e.g., m2,2,7GpppG), dimethylated symmetrical cap analogues (e.g., m7Gpppm7G), or anti reverse cap analogues (e.g., ARCA; m7,2'OmeGpppG, m7,2'dGpppG, m7,3'OmeGpppG, m7,3'dGpppG and their tetraphosphate derivatives) (Stepinski et al., 2001. RNA 7(10):1486-95).

Further cap analogues have been described previously (US 7,074,596, WO 2008/016473, WO 2008/157688, WO 2009/149253, WO 2011/015347, and WO 2013/059475). The synthesis of N7-(4-chlorophenoxyethyl) substituted dinucleotide cap analogues has been described recently (Kore et al. (2013) Bioorg. Med. Chem. 21(15):4570-4).

5'-cap-Structure: A 5'-cap is typicallyα a modified nucleotide (cap analogue), particularly a guanine nucleotide, added to the 5' end of a nucleic acid molecule, particularly of an RNA molecule, e.g. an mRNA molecule. Preferably, the 5'- cap is added using a 5'-5'-triphosphate linkage (also named m7GpppN). Further examples of 5'- cap structures include glyceryl, inverted deoxy abasic residue (moiety), 4',5' methylene nucleotide, 1-(beta-D-erythrofuranosyl) nucleotide, 4'-thio nucleotide, carbocyclic nucleotide, 1,5-anhydrohexitol nucleotide, L-nucleotides, alpha-nucleotide, modified base nucleotide, threo-pentofuranosyl nucleotide, acyclic 3',4'-seco nucleotide, acyclic 3,4-dihydroxybutyl nucleotide, acyclic 3,5 dihydroxypentyl nucleotide, 3'-3'-inverted nucleotide moiety, 3'-3'-inverted abasic moiety, 3'-2'-inverted nucleotide moiety, 3'-2'-inverted abasic moiety, 1,4-butanediol phosphate, 3'-phosphoramidate, hexylphosphate, aminohexyl phosphate, 3'-phosphate, 3'phosphorothioate, phosphorodithioate, or bridging or non-bridging methylphosphonate moiety. These modified 5'-cap structures may be used in the context of the present invention to modify the mRNA sequence of the inventive composition. Further modified 5'-cap structures which may be used in the context of the present invention are cap 1 (additional methylation of the ribose of the adjacent nucleotide of m7GpppN), cap2 (additional methylation of the ribose of the 2nd nucleotide downstream of the m7GpppN), cap3 (additional methylation of the ribose of the 3rd nucleotide downstream of the m7GpppN), cap4 (additional methylation of the ribose of the 4th nucleotide downstream of the m7GpppN), ARCA (anti-reverse cap analogue), modified ARCA (e.g. phosphothioate modified ARCA), inosine, N1-methyl-guanosine, 2'-fluoro-guanosine, 7-deaza-guanosine, 8-oxo-guanosine, 2-amino-guanosine, LNA-guanosine, and 2-azido-guanosine.

In the context of the present invention, a 5' cap structure (cap0 or cap1) may also be formed in chemical RNA synthesis or RNA in vitro transcription (co-transcriptional capping) using cap analogues, or a cap structure may be formed in vitro using capping enzymes (e.g., commercially available capping kits). A cap structure (e.g., cap0 or cap1) may also be formed in vitro using immobilized capping enzymes, e.g. in a capping reactor as described in WO 2016/193226.

Chemical synthesis of nucleic acids: Chemical synthesis of relatively short fragments of oligonucleotides with defined chemical structure provides a rapid and inexpensive access to custom-made oligonucleotides of any desired sequence. Whereas enzymes synthesize DNA and RNA only in the 5' to 3' direction, chemical oligonucleotide synthesis does not have this limitation, although it is most often carried out in the opposite, i.e. the 3' to 5' direction. Currently, the process is implemented as solid-phase synthesis using the phosphoramidite method and phosphoramidite building blocks derived from protected nucleosides (A, C, G, and U), or chemically modified nucleosides.

To obtain the desired oligonucleotide, the building blocks are sequentially coupled to the growing oligonucleotide chain on a solid phase in the order required by the sequence of the product in a fully automated process. Upon the completion of the chain assembly, the product is released from the solid phase to the solution, deprotected, and collected. The occurrence of side reactions sets practical limits for the length of synthetic oligonucleotides (up to about 200 nucleotide residues), because the

number of errors increases with the length of the oligonucleotide being synthesized. Products are often isolated by HPLC to obtain the desired oligonucleotides in high purity.

Chemically synthesized oligonucleotides find a variety of applications in molecular biology and medicine. They are most commonly used as antisense oligonucleotides, small interfering RNA, primers for DNA sequencing and amplification, probes for detecting complementary DNA or RNA via molecular hybridization, tools for the targeted introduction of mutations and restriction sites, and for the synthesis of artificial genes. Moreover, long-chain DNA molecules and long-chain RNA molecules may be chemically synthetized and used in the context of the present invention.

Cellular immunity/cellular immune response: Cellular immunity relates typically to the activation of macrophages, natural killer cells (NK), antigen-specific cytotoxic T-lymphocytes, and the release of various cytokines in response to an antigen. In more general terms, cellular immunity is not based on antibodies, but on the activation of cells of the immune system. Typically, a cellular immune response may be characterized e.g. by activating antigen-specific cytotoxic T-lymphocytes that are able to induce apoptosis in cells, e.g. specific immune cells like dendritic cells or other cells, displaying epitopes of foreign antigens on their surface. Such cells may be virus-infected or infected with intracellular bacteria, or cancer cells displaying tumor antigens. Further characteristics may be activation of macrophages and natural killer cells, enabling them to destroy pathogens and stimulation of cells to secrete a variety of cytokines that influence the function of other cells involved in adaptive immune responses and innate immune responses.

Cloning site: A cloning site is typically understood to be a segment of a nucleic acid molecule, which is suitable for insertion of a nucleic acid sequence, e.g., a nucleic acid sequence comprising a coding region. Insertion may be performed by any molecular biological method known to the one skilled in the art, e.g. by restriction and ligation. A cloning site typically comprises one or more restriction enzyme recognition sites (restriction sites). These one or more restrictions sites may be recognized by restriction enzymes which cleave the DNA at these sites. A cloning site which comprises more than one restriction site may also be termed a multiple cloning site (MCS) or a polylinker.

Coding region, coding sequence: A coding region, in the context of the invention, is typically a sequence of several nucleotide triplets, which may be translated into a peptide or protein. A coding region preferably contains a start codon, i.e. a combination of three subsequent nucleotides coding usually for the amino acid methionine (ATG), at its 5'-end and a subsequent region which usually exhibits a length which is a multiple of 3 nucleotides. A coding region is preferably terminated by a stop-codon (e.g., TAA, TAG, TGA). Typically, this is the only stop-codon of the coding region. Thus, a coding region in the context of the present invention is preferably a nucleotide sequence, consisting of a number of nucleotides that may be divided by three, which starts with a start codon (e.g. ATG) and which preferably terminates with a stop codon (e.g., TAA, TGA, or TAG). The coding region may be isolated or it may be incorporated in a longer nucleic acid sequence, for example in a vector or an mRNA. In the context of the present invention, a coding region may also be termed "protein coding region", "coding sequence", "CDS", "open reading frame" or "ORF".

Derived from: The phrase "derived from" as used throughout the present specification in the context of a nucleic acid, i.e. for a nucleic acid "derived from" (another) nucleic acid, means that the nucleic acid, which is derived from (another) nucleic acid, shares at least 50%, preferably at least 60%, preferably at least 70%, more preferably at least 75%, more preferably at least 80%, more preferably at least 85%, even more preferably at least 90%, even more preferably at least 95%, and particularly preferably at least 98% sequence identity with the nucleic acid from which it is derived. In one embodiment, "derived from" means having in increasing order of preference at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% or more sequence identity to the sequences as represented by SEQ ID NOs: 1-39690, 39713-39746. The skilled person is aware that sequence identity is typically calculated for the same types of nucleic acids, i.e. for DNA sequences or for RNA sequences. Thus, it is understood, if a DNA is "derived from" an RNA or if an RNA is "derived from" a DNA, in a first step the RNA sequence is converted into the corresponding DNA sequence (in particular by replacing the uracils (U) by thymidines (T) throughout the sequence) or, vice versa, the DNA sequence is converted into the corresponding RNA sequence (in particular by replacing the thymidines (T) by uracils (U) throughout the sequence). Thereafter, the sequence identity of the DNA sequences or the sequence identity of the RNA sequences is determined. Preferably, a nucleic acid "derived from" a nucleic acid also refers to nucleic acid, which is modified in comparison to the nucleic acid from which it is derived, e.g. in order to increase RNA stability even further and/or to prolong and/or increase protein production. It goes without saying that such modifications are preferred, which do not impair RNA stability, e.g. in comparison to the nucleic acid from which it is derived.

Different Noro virus: The term "different Noro virus" in the context of the invention has to be understood as the difference between at least two respective Noroviruses, wherein the difference is manifested on the RNA genome of the respective different virus. In the broadest sense, "different Norovirus" has to be understood as genetically "different Norovirus". Particularly, said (genetically) different Noroviruses express at least one different protein or peptide, wherein the at least one different protein or peptide preferably differs in at least one amino acid.

Same Norovirus: In the broadest sense, "same Norovirus" has to be understood as genetically the same. Particularly, said (genetically) same virus expresses the same proteins or peptides (e.g., at least one structural and/or non-structural protein), wherein all proteins or peptides have the same amino acid sequence.

DNA: DNA is the usual abbreviation for deoxy-ribonucleic acid. It is a nucleic acid molecule, i.e. a polymer consisting of nucleotides. These nucleotides are usually deoxy-adenosine-monophosphate, deoxy-thymidine-monophosphate, deoxy-guanosine-monophosphate and deoxy-cytidine-monophosphate monomers which are – by themselves – composed of a sugar moiety (deoxyribose), a base moiety and a phosphate moiety, and polymerize by a characteristic backbone structure. The backbone structure is, typically, formed by phosphodiester bonds between the sugar moiety of the nucleotide, i.e. deoxyribose, of a first and a phosphate moiety of a second, adjacent monomer. The specific order of the monomers, i.e. the order of the bases linked to the sugar/phosphate-backbone, is called the DNA sequence. DNA may be single stranded or double stranded. In the double

stranded form, the nucleotides of the first strand typically hybridize with the nucleotides of the second strand, e.g. by A/T-base-pairing and G/C-base-pairing.

Mono-, bi- and multicistronic and multi-antigen nucleic acids: A monocistronic nucleic acid may typically be a DNA or RNA, particularly an mRNA that comprises only one coding sequences. A coding sequence in this context is a sequence of several nucleotide triplets (codons) that can be translated into a peptide or protein

According to a further embodiment the coding region of the at least one mRNA of the composition may encode at least two, three, four, five, six, seven, eight and more antigens (or fragments and derivatives thereof) linked with or without an amino acid linker sequence, wherein said linker sequence can comprise rigid linkers, flexible linkers, cleavable linkers (e.g., self-cleaving peptides) or a combination thereof. Therein, the antigens may be identical or different or a combination thereof. According to the present invention, specific antigen and/or epitope combinations according to the paragraph "specific antigen combinations" disclosed above are particularly envisioned. Particular antigen/epitope combinations can be encoded by said mRNA encoding at least two antigens as explained above (herein referred to as "multi-antigen-constructs/mRNA").

According to a further embodiment the composition of the present invention, may comprise a mixture of at least one monocistronic mRNA, as defined above, and/or at least one bicistronic mRNA as defined above, and/or at least one multicistronic mRNA, as defined above, and/or at least one multi-antigen-constructs as defined above, and any combinations thereof. According to the present invention, specific antigen combinations according to the paragraph "specific antigen combinations" disclosed above are particularly envisioned and may be generated using a combination of mono-, bi-, multicistronic mRNA and multi-antigen-constructs.

According to certain embodiments of the present invention, the mRNA sequence is mono-, bi-, or multicistronic, preferably as defined herein. The coding sequences in a bi- or multicistronic mRNA preferably encode distinct peptides or proteins as defined herein or a fragment or variant thereof. Preferably, the coding sequences encoding two or more peptides or proteins may be separated in the bi- or multicistronic mRNA by at least one IRES (internal ribosomal entry site) sequence, as defined below. Thus, the term "encoding two or more peptides or proteins" may mean, without being limited thereto, that the bi- or even multicistronic mRNA, may encode e.g. at least two, three, four, five, six or more (preferably different) peptides or proteins or their fragments or variants within the definitions provided herein. More preferably, without being limited thereto, the bi- or even multicistronic mRNA, may encode, for example, at least two, three, four, five, six or more (preferably different) peptides or proteins as defined herein or their fragments or variants as defined herein. In this context, a so-called IRES (internal ribosomal entry site) sequence as defined above can function as a sole ribosome binding site, but it can also serve to provide a bi- or even multicistronic mRNA as defined above, which encodes several peptides or proteins which are to be translated by the ribosomes independently of one another. Examples of IRES sequences, which can be used according to the invention, are those from picornaviruses (e.g. FMDV), pestiviruses (CFFV), polioviruses (PV), encephalomyocarditis viruses (ECMV), foot and mouth disease viruses (FMDV), hepatitis C

viruses (HCV), classical swine fever viruses (CSFV), mouse leukoma virus (MLV), simian immunodeficiency viruses (SIV) or cricket paralysis viruses (CrPV).

According to a further embodiment the at least one coding region of the mRNA sequence according to the invention may encode at least two, three, four, five, six, seven, eight and more peptides or proteins (or fragments and derivatives thereof) as defined herein linked with or without an amino acid linker sequence, wherein said linker sequence can comprise rigid linkers, flexible linkers, cleavable linkers (e.g., self-cleaving peptides) or a combination thereof. Therein, the peptides or proteins may be identical or different or a combination thereof. Particular peptide or protein combinations can be encoded by said mRNA encoding at least two peptides or proteins as explained herein (also referred to herein as "multi-antigen-constructs/mRNA").

Epitope: (also called "antigen determinant") can be distinguished in T cell epitopes and B cell epitopes. T cell epitopes or parts of the proteins in the context of the present invention may comprise fragments preferably having a length of about 6 to about 20 or even more amino acids, e.g. fragments as processed and presented by MHC class I molecules, preferably having a length of about 8 to about 10 amino acids, e.g. 8, 9, or 10, (or even 11, or 12 amino acids), or fragments as processed and presented by MHC class II molecules, preferably having a length of about 13 or more amino acids, e.g. 13, 14, 15, 16, 17, 18, 19, 20 or even more amino acids, wherein these fragments may be selected from any part of the amino acid sequence. These fragments are typically recognized by T cells in form of a complex consisting of the peptide fragment and an MHC molecule, i.e. the fragments are typically not recognized in their native form. B cell epitopes are typically fragments located on the outer surface of (native) protein or peptide antigens as defined herein, preferably having 5 to 15 amino acids, more preferably having 5 to 12 amino acids, even more preferably having 6 to 9 amino acids, which may be recognized by antibodies, i.e. in their native form. Such epitopes of proteins or peptides may furthermore be selected from any of the herein mentioned variants of such proteins or peptides. In this context antigenic determinants can be conformational or discontinuous epitopes which are composed of segments of the proteins or peptides as defined herein that are discontinuous in the amino acid sequence of the proteins or peptides as defined herein but are brought together in the three-dimensional structure or continuous or linear epitopes which are composed of a single polypeptide chain.

Fragment of a sequence: A fragment of a sequence may typically be a shorter portion of a full-length sequence of e.g. a nucleic acid molecule or an amino acid sequence. Accordingly, a fragment, typically, consists of a sequence that is identical to the corresponding stretch within the full-length sequence. A preferred fragment of a sequence in the context of the present invention, consists of a continuous stretch of entities, such as nucleotides or amino acids corresponding to a continuous stretch of entities in the molecule the fragment is derived from, which represents at least 5%, 10%, 20%, preferably at least 30%, more preferably at least 40%, more preferably at least 50%, even more preferably at least 60%, even more preferably at least 70%, and most preferably at least 80% of the total (i.e. full-length) molecule from which the fragment is derived.

G/C modified: A G/C-modified nucleic acid may typically be a nucleic acid, preferably an artificial nucleic acid molecule as defined herein, based on a modified wild type sequence comprising a preferably increased number of guanosine and/or cytosine

nucleotides as compared to the wild type sequence. Such an increased number may be generated by substitution of codons containing adenosine or thymidine nucleotides by codons containing guanosine or cytosine nucleotides. If the enriched G/C content occurs in a coding region of DNA or RNA, it makes use of the degeneracy of the genetic code. Accordingly, the codon substitutions preferably do not alter the encoded amino acid residues, but exclusively increase the G/C content of the nucleic acid molecule.

Gene therapy: Gene therapy may typically be understood to mean a treatment of a patient's body or isolated elements of a patient's body, for example isolated tissues/cells, by nucleic acids encoding a peptide or protein. It typically may comprise at least one of the steps of a) administration of a nucleic acid, preferably an artificial nucleic acid molecule as defined herein, directly to the patient – by whatever administration route – or in vitro to isolated cells/tissues of the patient, which results in transfection of the patient's cells either in vivo/ex vivo or in vitro; b) transcription and/or translation of the introduced nucleic acid molecule; and optionally c) re-administration of isolated, transfected cells to the patient, if the nucleic acid has not been administered directly to the patient.

Genetic vaccination: Genetic vaccination may typically be understood to be vaccination by administration of a nucleic acid molecule encoding an antigen or an immunogen or fragments thereof. The nucleic acid molecule may be administered to a subject's body or to isolated cells of a subject. Upon transfection of certain cells of the body or upon transfection of the isolated cells, the antigen or immunogen may be expressed by those cells and subsequently presented to the immune system, eliciting an adaptive, i.e. antigen-specific immune response. Accordingly, genetic vaccination typically comprises at least one of the steps of a) administration of a nucleic acid, preferably an artificial nucleic acid molecule as defined herein, to a subject, preferably a patient, or to isolated cells of a subject, preferably a patient, which usually results in transfection of the subject's cells either in vivo or in vitro; b) transcription and/or translation of the introduced nucleic acid molecule; and optionally c) re-administration of isolated, transfected cells to the subject, preferably the patient, if the nucleic acid has not been administered directly to the patient.

Genotype, genotype of a virus: The terms "genotype" or "genotype of a virus" have to be understood as the genetic constitution of an individual or a group or class of organisms having the same genetically consistent structure. Genotyping means determining differences in the genetic of an individual. In the context of the invention, Norovirus genotype has to be understood as a Noro virus having the same genetically consistent structure.

Heterologous sequence: Two sequences are typically understood to be "heterologous" if they are not derivable from the same gene or in the same allele. I.e., although heterologous sequences may be derivable from the same organism, they naturally (in nature) do not occur in the same nucleic acid molecule, such as in the same mRNA.

Homolog of a nucleic acid sequence: The term "homolog" of a nucleic acid sequence refers to sequences of other species than the particular sequence. It is particularly preferred that the nucleic acid sequence is of human origin and therefore it is preferred that the homolog is a homolog of a human nucleic acid sequence.

Humoral immunity/humoral immune response: Humoral immunity refers typically to antibody production and optionally to accessory processes accompanying antibody production. A humoral immune response may be typically characterized, e.g., by Th2 activation and cytokine production, germinal center formation and isotype switching, affinity maturation and memory cell generation. Humoral immunity also typically may refer to the effector functions of antibodies, which include pathogen and toxin neutralization, classical complement activation, and opsonin promotion of phagocytosis and pathogen elimination.

Immunogen: In the context of the present invention an immunogen may be typically understood to be a compound that is able to stimulate an immune response. Preferably, an immunogen is a peptide, polypeptide, or protein. In a particularly preferred embodiment, an immunogen in the sense of the present invention is the product of translation of a provided nucleic acid molecule, preferably an artificial nucleic acid molecule as defined herein. Typically, an immunogen elicits at least an adaptive immune response.

Immunostimulatory composition: In the context of the invention, an immunostimulatory composition may be typically understood to be a composition containing at least one component which is able to induce an immune response or from which a component which is able to induce an immune response is derivable. Such immune response may be preferably an innate immune response or a combination of an adaptive and an innate immune response. Preferably, an immunostimulatory composition in the context of the invention contains at least one artificial nucleic acid molecule, more preferably an RNA, for example an mRNA molecule. The immunostimulatory component, such as the mRNA may be complexed with a suitable carrier. Thus, the immunostimulatory composition may comprise an mRNA/carrier-complex. Furthermore, the immunostimulatory composition may comprise an adjuvant and/or a suitable vehicle for the immunostimulatory component, such as the mRNA.

Immune response: An immune response may typically be a specific reaction of the adaptive immune system to a particular antigen (so called specific or adaptive immune response) or an unspecific reaction of the innate immune system (so called unspecific or innate immune response), or a combination thereof.

Immune system: The immune system may protect organisms from infection. If a pathogen succeeds in passing a physical barrier of an organism and enters this organism, the innate immune system provides an immediate, but non-specific response. If pathogens evade this innate response, vertebrates possess a second layer of protection, the adaptive immune system. Here, the immune system adapts its response during an infection to improve its recognition of the pathogen. This improved response is then retained after the pathogen has been eliminated, in the form of an immunological memory, and allows the adaptive immune system to mount faster and stronger attacks each time this pathogen is encountered. According to this, the immune system

comprises the innate and the adaptive immune system. Each of these two parts typically contains so called humoral and cellular components.

Immunostimulatory RNA: An immunostimulatory RNA (isRNA) in the context of the invention may typically be an RNA that is able to induce an innate immune response. It usually does not have a coding region and thus does not provide a peptide-antigen or immunogen but elicits an immune response e.g. by binding to a specific kind of Toll-like-receptor (TLR) or other suitable receptors. However, of course also mRNAs having a coding region and coding for a peptide/protein may induce an innate immune response and, thus, may be immunostimulatory RNAs.

Innate immune system: The innate immune system, also known as non-specific (or unspecific) immune system, typically comprises the cells and mechanisms that defend the host from infection by other organisms in a non-specific manner. This means that the cells of the innate system may recognize and respond to pathogens in a generic way, but unlike the adaptive immune system, it does not confer long-lasting or protective immunity to the host. The innate immune system may be, e.g., activated by ligands of Toll-like receptors (TLRs) or other auxiliary substances such as lipopolysaccharides, TNF-alpha, CD40 ligand, or cytokines, monokines, lymphokines, interleukins or chemokines, IL-1, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12, IL-13, IL-14, IL-15, IL-16, IL-17, IL-18, IL-19, IL-20, IL-21, IL-22, IL-23, IL-24, IL-25, IL-26, IL-27, IL-28, IL-29, IL-30, IL-31, IL-32, IL-33, IFN-alpha, IFN-beta, IFN-gamma, GM-CSF, G-CSF, M-CSF, LT-beta, TNF-alpha, growth factors, and hGH, a ligand of human Toll-like receptor TLR1, TLR2, TLR3, TLR4, TLR5, TLR6, TLR7, TLR8, TLR9, TLR10, a ligand of murine Toll-like receptor TLR1, TLR2, TLR3, TLR4, TLR5, TLR6, TLR7, TLR8, TLR9, TLR10, TLR11, TLR12 or TLR13, a ligand of a NOD-like receptor, a ligand of a RIG-I like receptor, an immunostimulatory nucleic acid, an immunostimulatory RNA (isRNA), a CpG-DNA, an antibacterial agent, or an anti-viral agent. The pharmaceutical composition according to the present invention may comprise one or more such substances. Typically, a response of the innate immune system includes recruiting immune cells to sites of infection, through the production of chemical factors, including specialized chemical mediators, called cytokines; activation of the complement cascade; identification and removal of foreign substances present in organs, tissues, the blood and lymph, by specialized white blood cells; activation of the adaptive immune system; and/or acting as a physical and chemical barrier to infectious agents.

Jet injection: The term "jet injection", as used herein, refers to a needle-free injection method, wherein a fluid containing at least one inventive nucleic acid sequence (e.g., RNA, DNA, mRNA) and, optionally, further suitable excipients is forced through an orifice, thus generating an ultra-fine liquid stream of high pressure that is capable of penetrating mammalian skin and, depending on the injection settings, subcutaneous tissue or muscle tissue. In principle, the liquid stream forms a hole in the skin, through which the liquid stream is pushed into the target tissue. Preferably, jet injection is used for intradermal, subcutaneous or intramuscular injection of the mRNA sequence according to the invention. In a preferred embodiment, jet injection is used for intramuscular injection of the mRNA sequence according to the invention. In a further preferred embodiment, jet injection is used for intradermal injection of the mRNA sequence according to the invention.

Monovalent/monovalent vaccine: A monovalent vaccine, also called univalent vaccine, is designed against a single antigen for a single organism. The term "monovalent vaccine" includes the immunization against a single valence. In the context of the invention, a monovalent Norovirus vaccine would comprise a vaccine comprising an artificial nucleic acid encoding one single antigenic peptide or protein derived from one specific Norovirus strain.

Nucleic acid molecule: A nucleic acid molecule, an artificial nucleic acid, or nucleic acid is a molecule comprising, preferably consisting of nucleic acid components. The terms nucleic acid molecule, artificial nucleic acid, or nucleic acid preferably refer to DNA or RNA molecules and vice versa. It is preferably used synonymous with the term "polynucleotide". Preferably, a nucleic acid molecule is a polymer comprising or consisting of nucleotide monomers, which are covalently linked to each other by phosphodiester-bonds of a sugar/phosphate-backbone. The terms "nucleic acid molecule", "artificial nucleic acid" or "nucleic acid" also encompasses modified nucleic acid molecules, such as base-modified, sugar-modified or backbone-modified etc. It encompasses any type of DNA or RNA molecules.

Nucleic acid sequence/amino acid: The sequence of a nucleic acid molecule is typically understood to be the particular and individual order, i.e. the succession of its nucleotides. The sequence of a protein or peptide is typically understood to be the order, i.e. the succession of its amino acids.

Peptide: A peptide or polypeptide is typically a polymer of amino acid monomers, linked by peptide bonds. It typically contains less than 50 monomer units. Nevertheless, the term peptide is not a disclaimer for molecules having more than 50 monomer units. Long peptides are also called polypeptides, typically having between 50 and 600 monomeric units. The term "polypeptide" as used herein, however, is typically not limited by the length of the molecule it refers to. In the context of the present invention, the term "polypeptide" may also be used with respect to peptides comprising less than 50 (e.g. 10) amino acids or peptides comprising even more than 600 amino acids. Also, the terms "polypeptide", "peptide", and "protein" are used interchangeably herein to refer to polymers of amino acids of any length.

Pharmaceutically effective amount: A pharmaceutically effective amount in the context of the invention is typically understood to be an amount that is sufficient to induce a pharmaceutical effect, such as an immune response, altering a pathological level of an expressed peptide or protein, or substituting a lacking gene product, e.g., in case of a pathological situation.

Protein: A protein typically comprises one or more peptides or polypeptides. A protein is typically folded into 3-dimensional form, which may be required for the protein to exert its biological function.

Poly(A) sequence: A poly(A) sequence, also called poly(A) tail or 3'-poly(A) tail, is typically understood to be a sequence of adenosine nucleotides, e.g., of up to about 400 adenosine nucleotides, e.g. from about 20 to about 400, preferably from about 50 to about 400, more preferably from about 50 to about 300, even more preferably from about 50 to about 250, most preferably from about 60 to about 250 adenosine nucleotides. A poly(A) sequence is typically located at the 3'-end of an mRNA. In the context

of the present invention, a poly(A) sequence may be located within an mRNA or any other nucleic acid molecule, such as, e.g., in a vector, for example, in a vector serving as template for the generation of an RNA, preferably an mRNA, e.g., by transcription of the vector. Moreover, poly(A) sequences, or poly(A) tails may be generated in vitro by enzymatic polyadenylation of the RNA, e.g. using Poly(A)polymerases (PAP) derived from E.coli or yeast. In addition, polyadenylation of RNA can be achieved by using immobilized PAP enzymes e.g. in a polyadenylation reactor (WO 2016/174271).

Poly(C) sequence: A poly(C) sequence is typically a long sequence of cytosine nucleotides, typically about 10 to about 200 cytosine nucleotides, preferably about 10 to about 100 cytosine nucleotides, more preferably about 10 to about 70 cytosine nucleotides or even more, preferably about 20 to about 50, or even about 20 to about 30 cytosine nucleotides. A poly(C) sequence may preferably be located 3' of the coding sequence comprised by a nucleic acid.

Polyadenylation: Polyadenylation is typically understood to be the addition of a poly(A) sequence to a nucleic acid molecule, such as an RNA molecule, e.g. to a premature mRNA. Polyadenylation may be induced by a so called polyadenylation signal. This signal is preferably located within a stretch of nucleotides at the 3'-end of a nucleic acid molecule, such as an RNA molecule, to be polyadenylated. A polyadenylation signal typically comprises a hexamer consisting of adenine and uracil/thymine nucleotides, preferably the hexamer sequence AAUAAA. Other sequences, preferably hexamer sequences, are also conceivable. Polyadenylation typically occurs during processing of a pre-mRNA (also called premature-mRNA). Typically, RNA maturation (from pre-mRNA to mature mRNA) comprises the step of polyadenylation.

Polyvalent/polyvalent vaccine: A polyvalent vaccine, called also multivalent vaccine, containing antigens from more than one strain of a virus, or different antigens of the same virus, or any combination thereof. The term "polyvalent vaccine" describes that this vaccine has more than one valence. In the context of the invention, a polyvalent Norovirus vaccine would comprise a vaccine comprising an artificial nucleic acid encoding antigenic peptides or proteins derived from several different Norovirus strains or comprising artificial nucleic acid encoding different antigens from the same Norovirus strain, or a combination thereof. In preferred embodiment, a polyvalent Norovirus vaccine comprises 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or even more different artificial nucleic acids each encoding at least one different antigenic peptide or protein. Methods to produce polyvalent mRNA vaccines are disclosed in the PCT application PCT/EP2016/082487.

Restriction site: A restriction site, also termed restriction enzyme recognition site, is a nucleotide sequence recognized by a restriction enzyme. A restriction site is typically a short, preferably palindromic nucleotide sequence, e.g. a sequence comprising 4 to 8 nucleotides. A restriction site is preferably specifically recognized by a restriction enzyme. The restriction enzyme typically cleaves a nucleotide sequence comprising a restriction site at this site. In a double-stranded nucleotide sequence, such as a double-stranded DNA sequence, the restriction enzyme typically cuts both strands of the nucleotide sequence.

RNA, mRNA: RNA is the usual abbreviation for ribonucleic-acid. It is a nucleic acid molecule, i.e. a polymer consisting of nucleotides. These nucleotides are usually adenosine-monophosphate, uridine-monophosphate, guanosine-monophosphate and cytidine-monophosphate monomers which are connected to each other along a so-called backbone. The backbone is formed by phosphodiester bonds between the sugar, i.e. ribose, of a first and a phosphate moiety of a second, adjacent monomer. The specific succession of the monomers is called the RNA-sequence. Usually RNA may be obtainable by transcription of a DNA-sequence, e.g., inside a cell. In eukaryotic cells, transcription is typically performed inside the nucleus or the mitochondria. Typically, transcription of DNA usually results in the so-called premature RNA which has to be processed into so-called messenger-RNA, usually abbreviated as mRNA. Processing of the premature RNA, e.g. in eukaryotic organisms, comprises a variety of different posttranscriptional-modifications such as splicing, 5'-capping, polyadenylation, export from the nucleus or the mitochondria and the like. The sum of these processes is also called maturation of RNA. The mature messenger RNA usually provides the nucleotide sequence that may be translated into an amino-acid sequence of a particular peptide or protein. Typically, a mature mRNA comprises a 5'-cap, a 5'-UTR, a coding region, a 3'-UTR and a poly(A) sequence. Aside from messenger RNA, several non-coding types of RNA exist which may be involved in regulation of transcription and/or translation.

Stabilized nucleic acid, preferably mRNA: A stabilized nucleic acid, preferably mRNA typically, exhibits a modification increasing resistance to in vivo degradation (e.g. degradation by an exo- or endo-nuclease) and/or ex vivo degradation (e.g. by the manufacturing process prior to vaccine administration, e.g. in the course of the preparation of the vaccine solution to be administered). Stabilization of RNA can, e.g., be achieved by providing a 5'-cap-Structure, a Poly-A-Tail, or any other UTR-modification. It can also be achieved by chemical modification or modification of the G/C content of the nucleic acid or other types of sequence optimization. Various other methods are known in the art and conceivable in the context of the invention.

Sequence identity: Two or more sequences are identical if they exhibit the same length and order of nucleotides or amino acids. The percentage of identity typically describes the extent, to which two sequences are identical, i.e. it typically describes the percentage of nucleotides that correspond in their sequence position with identical nucleotides of a reference sequence. In order to determine the degree of identity, the sequences to be compared are considered to exhibit the same length, i.e. the length of the longest sequence of the sequences to be compared. This means that a first sequence consisting of 8 nucleotides is 80% identical to a second sequence consisting of 10 nucleotides comprising the first sequence. Hence, in the context of the present invention, identity of sequences preferably relates to the percentage of nucleotides of a sequence which have the same position in two or more sequences having the same length. Therefore, e.g. a position of a first sequence may be compared with the corresponding position of the second sequence. If a position in the first sequence is occupied by the same component (residue) as is the case at a position in the second sequence, the two sequences are identical at this position. If this is not the case, the sequences differ at this position. If insertions occur in the second sequence in comparison to the first sequence, gaps can be inserted into the first sequence to allow a further alignment. If deletions occur in the second sequence in comparison to the first sequence, gaps can be inserted into the second sequence to allow a further alignment. The percentage to which two sequences are identical is then a function of the number of identical positions divided by the total number of positions including those positions which are only occupied in one sequence. The percentage to which two sequences are identical can be determined using

a mathematical algorithm. A preferred, but not limiting, example of a mathematical algorithm which can be used is the algorithm of Karlin et al. (1993), PNAS USA, 90:5873-5877 or Altschul et al. (1997), Nucleic Acids Res., 25:3389-3402. Such an algorithm is integrated in the BLAST program. Sequences which are identical to the sequences of the present invention to a certain extent can be identified by this program.

Serotype, serotype of a virus: A serotype or a serotype of a virus is a group of viruses classified together based on their antigens on the surface of the virus, allowing the epidemiologic classification of organisms to the sub-species level.

Strain, strain of a virus: A strain or a strain of a virus is a group of viruses that are genetically distinct from other groups of the same species. The strain that is defined by a genetic variant is also defined as a "subtype".

Transfection: The term "transfection" refers to the introduction of nucleic acid molecules, such as DNA or RNA (e.g. mRNA) molecules, into cells, preferably into eukaryotic cells. In the context of the present invention, the term "transfection" encompasses any method known to the skilled person for introducing nucleic acid molecules into cells, preferably into eukaryotic cells, such as into mammalian cells. Such methods encompass, for example, electroporation, lipofection, e.g. based on cationic lipids and/or liposomes, calcium phosphate precipitation, nanoparticle based transfection, virus based transfection, or transfection based on cationic polymers, such as DEAE-dextran or polyethylenimine etc. Preferably, the introduction of the nucleic acid, preferably the mRNA is non-viral.

Vaccine: A vaccine is typically understood to be a prophylactic or therapeutic material providing at least one antigen, preferably an immunogen. The antigen or immunogen may be derived from any material that is suitable for vaccination. For example, the antigen or immunogen may be derived from a pathogen, such as from bacteria or virus particles etc., or from a tumor or cancerous tissue. The antigen or immunogen stimulates the body's adaptive immune system to provide an adaptive immune response.

Vector: The term "vector" refers to a nucleic acid molecule, preferably to an artificial nucleic acid molecule. A vector in the context of the present invention is suitable for incorporating or harboring a desired nucleic acid sequence, such as a nucleic acid sequence comprising a coding region. Such vectors may be storage vectors, expression vectors, cloning vectors, transfer vectors etc. A storage vector is a vector which allows the convenient storage of a nucleic acid molecule, for example, of an mRNA molecule. Thus, the vector may comprise a sequence corresponding, e.g., to a desired mRNA sequence or a part thereof, such as a sequence corresponding to the coding region and the 3'-UTR and/or the 5'-UTR of an mRNA. An expression vector may be used for production of expression products such as RNA, e.g. mRNA, or peptides, polypeptides or proteins. For example, an expression vector may comprise sequences needed for transcription of a sequence stretch of the vector, such as a promoter sequence, e.g. an RNA polymerase promoter sequence. A cloning vector is typically a vector that contains a cloning site, which may be used to incorporate nucleic acid sequences into the vector. A cloning vector may be, e.g., a plasmid vector or a bacteriophage vector. A transfer vector may be a vector which is suitable for transferring nucleic acid molecules into cells or organisms, for example,

viral vectors. A vector in the context of the present invention may be, e.g., an RNA vector or a DNA vector. Preferably, a vector is a DNA molecule. Preferably, a vector in the sense of the present application comprises a cloning site, a selection marker, such as an antibiotic resistance factor, and a sequence suitable for multiplication of the vector, such as an origin of replication. Preferably, a vector in the context of the present application is a plasmid vector.

RNA in vitro transcription: The terms "RNA in vitro transcription" or "in vitro transcription" relate to a process wherein RNA is synthesized in a cell-free system (in vitro). DNA, particularly plasmid DNA, is used as template for the generation of RNA transcripts. RNA may be obtained by DNA-dependent in vitro transcription of an appropriate DNA template, which according to the present invention is preferably a linearized plasmid DNA template. The promoter for controlling in vitro transcription can be any promoter for any DNA-dependent RNA polymerase. Particular examples of DNA-dependent RNA polymerases are the T7, T3, and SP6 RNA polymerases. A DNA template for in vitro RNA transcription may be obtained by cloning of a nucleic acid, in particular cDNA corresponding to the respective RNA to be in vitro transcribed, and introducing it into an appropriate vector for in vitro transcription, for example into plasmid DNA. In a preferred embodiment of the present invention the DNA template is linearized with a suitable restriction enzyme, before it is transcribed in vitro. The cDNA may be obtained by reverse transcription of mRNA or chemical synthesis. Moreover, the DNA template for in vitro RNA synthesis may also be obtained by gene synthesis.
Methods for in vitro transcription are known in the art (see, e.g., Geall et al. (2013) Semin. Immunol. 25(2):152–159; Brunelle et al. (2013) Methods Enzymol. 530:101-14). Reagents used in said method typically include:

1) a linearized DNA template with a promoter sequence that has a high binding affinity for its respective RNA polymerase such as bacteriophage-encoded RNA polymerases;
2) ribonucleoside triphosphates (NTPs) for the four bases (adenine, cytosine, guanine and uracil);
3) optionally a cap analogue as defined above (e.g. m7G(5')ppp(5')G (m7G)), optionally, fraction of NTPs optimized to the RNA sequence (according to WO/2015/188933);
4) a DNA-dependent RNA polymerase capable of binding to the promoter sequence within the linearized DNA template (e.g. T7, T3 or SP6 RNA polymerase);
5) optionally a ribonuclease (RNase) inhibitor to inactivate any contaminating RNase;
6) optionally a pyrophosphatase to degrade pyrophosphate, which may inhibit transcription;
7) MgCl2, which supplies Mg2+ ions as a co-factor for the polymerase;
8) a buffer to maintain a suitable pH value, which can also contain antioxidants (e.g. DTT), and/or polyamines such as spermidine at optimal concentrations.

Vehicle: A vehicle is typically understood to be a material that is suitable for storing, transporting, and/or administering a compound, such as a pharmaceutically active compound. For example, it may be a physiologically acceptable liquid which is suitable for storing, transporting, and/or administering a pharmaceutically active compound.

Different species/species: The term "species" defines a monophyletic group of viruses whose properties can be distinguished from those of other species by multiple criteria (Adams et al., 2013, Arch Virol 158: 2633–9). The reference to a "different" or

"2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different" GI, GII, GIII, GIV or GV, GI.1 or GII.4 Norovirus or Noroviruses as used in the present invention means that a Norovirus from another species, strain or serotype is used or that the properties of the Noroviruses which are used or utilized can be distinguished from those of the other Norovirus by multiple criteria.

3'-untranslated region (3'-UTR): Generally, the term "3'-UTR" refers to a part of the artificial nucleic acid molecule, which is located 3' (i.e. "downstream") of a coding region and which is not translated into protein. Typically, a 3'-UTR is the part of an mRNA which is located between the protein coding region (coding region or coding sequence (CDS)) and the poly(A) sequence of the mRNA. In the context of the invention, the term 3'-UTR may also comprise elements, which are not encoded in the template, from which an RNA is transcribed, but which are added after transcription during maturation, e.g. a poly(A) sequence. A 3'-UTR of the mRNA is not translated into an amino acid sequence. The 3'-UTR sequence is generally encoded by the gene which is transcribed into the respective mRNA during the gene expression process. The genomic sequence is first transcribed into pre-mature mRNA, which comprises optional introns. The pre-mature mRNA is then further processed into mature mRNA in a maturation process. This maturation process comprises the steps of 5'capping, splicing the pre-mature mRNA to excize optional introns and modifications of the 3'-end, such as polyadenylation of the 3'-end of the pre-mature mRNA and optional endo-/ or exonuclease cleavages etc. In the context of the present invention, a 3'-UTR corresponds to the sequence of a mature mRNA which is located between the stop codon of the protein coding region, preferably immediately 3' to the stop codon of the protein coding region, and the poly(A) sequence of the mRNA. The term "corresponds to" means that the 3'-UTR sequence may be an RNA sequence, such as in the mRNA sequence used for defining the 3'-UTR sequence, or a DNA sequence which corresponds to such RNA sequence. In the context of the present invention, the term "a 3'-UTR of a gene", is the sequence which corresponds to the 3'-UTR of the mature mRNA derived from this gene, i.e. the mRNA obtained by transcription of the gene and maturation of the pre-mature mRNA. The term "3'-UTR of a gene" encompasses the DNA sequence and the RNA sequence (both sense and antisense strand and both mature and immature) of the 3'-UTR. Preferably, the 3'-UTRs have a length of more than 20, 30, 40 or 50 nucleotides.

5'-untranslated region (5'-UTR): Generally, the term "5'-UTR" refers to a part of the artificial nucleic acid molecule, which is located 5' (i.e. "upstream") of a coding region and which is not translated into protein. A 5'-UTR is typically understood to be a particular section of messenger RNA (mRNA), which is located 5' of the coding region of the mRNA. Typically, the 5'-UTR starts with the transcriptional start site and ends one nucleotide before the start codon of the coding region. Preferably, the 5'-UTRs have a length of more than 20, 30, 40 or 50 nucleotides. The 5'-UTR may comprise elements for controlling gene expression, also called regulatory elements. Such regulatory elements may be, for example, ribosomal binding sites. The 5'-UTR may be post transcriptionally modified, for example by addition of a 5'-CAP. A 5'-UTR of the mRNA is not translated into an amino acid sequence. The 5'-UTR sequence is generally encoded by the gene which is transcribed into the respective mRNA during the gene expression process. The genomic sequence is first transcribed into pre-mature mRNA, which comprises optional introns. The

pre-mature mRNA is then further processed into mature mRNA in a maturation process. This maturation process comprises the steps of 5'capping, splicing the pre-mature mRNA to excize optional introns and modifications of the 3'-end, such as polyadenylation of the 3'-end of the pre-mature mRNA and optional endo-/ or exonuclease cleavages etc.. In the context of the present invention, a 5'-UTR corresponds to the sequence of a mature mRNA which is located between the start codon and, for example, the 5'-cap. Preferably, the 5'-UTR corresponds to the sequence which extends from a nucleotide located 3' to the 5'-cap, more preferably from the nucleotide located immediately 3' to the 5'-cap, to a nucleotide located 5' to the start codon of the protein coding region, preferably to the nucleotide located immediately 5' to the start codon of the protein coding region. The nucleotide located immediately 3' to the 5'-cap of a mature mRNA typically corresponds to the transcriptional start site. The term "corresponds to" means that the 5'-UTR sequence may be an RNA sequence, such as in the mRNA sequence used for defining the 5'-UTR sequence, or a DNA sequence which corresponds to such RNA sequence. In the context of the present invention, the term "a 5'-UTR of a gene" is the sequence which corresponds to the 5'-UTR of the mature mRNA derived from this gene, i.e. the mRNA obtained by transcription of the gene and maturation of the pre-mature mRNA. The term "5'-UTR of a gene" encompasses the DNA sequence and the RNA sequence (both sense and antisense strand and both mature and immature) of the 5'-UTR.

5'-Terminal Oligopyrimidine Tract (TOP): The 5'-terminal oligopyrimidine tract (TOP) is typically a stretch of pyrimidine nucleotides located in the 5'-terminal region of a nucleic acid molecule, such as the 5'-terminal region of certain mRNA molecules or the 5'-terminal region of a functional entity, e.g. the transcribed region, of certain genes. The sequence starts with a cytidine, which usually corresponds to the transcriptional start site, and is followed by a stretch of usually about 3 to 30 pyrimidine nucleotides. For example, the TOP may comprise 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30 or even more nucleotides. The pyrimidine stretch and thus the 5' TOP ends one nucleotide 5' to the first purine nucleotide located downstream of the TOP. Messenger RNA that contains a 5'-terminal oligopyrimidine tract is often referred to as TOP mRNA. Accordingly, genes that provide such messenger RNAs are referred to as TOP genes. TOP sequences have, for example, been found in genes and mRNAs encoding peptide elongation factors and ribosomal proteins.

TOP motif: In the context of the present invention, a TOP motif is a nucleic acid sequence which corresponds to a 5'TOP as defined above. Thus, a TOP motif in the context of the present invention is preferably a stretch of pyrimidine nucleotides having a length of 3-30 nucleotides. Preferably, the TOP-motif consists of at least 3 pyrimidine nucleotides, preferably at least 4 pyrimidine nucleotides, preferably at least 5 pyrimidine nucleotides, more preferably at least 6 nucleotides, more preferably at least 7 nucleotides, most preferably at least 8 pyrimidine nucleotides, wherein the stretch of pyrimidine nucleotides preferably starts at its 5'-end with a cytosine nucleotide. In TOP genes and TOP mRNAs, the TOP-motif preferably starts at its 5'-end with the transcriptional start site and ends one nucleotide 5' to the first purin residue in said gene or mRNA. A TOP motif in the sense of the present invention is preferably located at the 5'-end of a sequence which represents a 5'-UTR or at the 5'-end of a sequence which codes for a 5'-UTR. Thus, preferably, a stretch of 3 or more pyrimidine nucleotides is called "TOP motif" in the sense of the present invention if this stretch is located at the 5'-end of a respective sequence, such as the artificial nucleic acid molecule, the 5'-UTR element of the artificial nucleic acid molecule, or the nucleic acid sequence which is derived from the 5'-UTR of a TOP

gene as described herein. In other words, a stretch of 3 or more pyrimidine nucleotides, which is not located at the 5'-end of a 5'-UTR or a 5'-UTR element but anywhere within a 5'-UTR or a 5'-UTR element, is preferably not referred to as "TOP motif".

TOP gene: TOP genes are typically characterised by the presence of a 5'-terminal oligopyrimidine tract. Furthermore, most TOP genes are characterized by a growth-associated translational regulation. However, also TOP genes with a tissue specific translational regulation are known. As defined above, the 5'-UTR of a TOP gene corresponds to the sequence of a 5'-UTR of a mature mRNA derived from a TOP gene, which preferably extends from the nucleotide located 3' to the 5'-cap to the nucleotide located 5' to the start codon. A 5'-UTR of a TOP gene typically does not comprise any start codons, preferably no upstream AUGs (uAUGs) or upstream coding regions (uORFs). Therein, upstream AUGs and upstream coding regions are typically understood to be AUGs and coding regions that occur 5' of the start codon (AUG) of the coding region that should be translated. The 5'-UTRs of TOP genes are generally rather short. The lengths of 5'-UTRs of TOP genes may vary between 20 nucleotides up to 500 nucleotides, and are typically less than about 200 nucleotides, preferably less than about 150 nucleotides, more preferably less than about 100 nucleotides. Exemplary 5'-UTRs of TOP genes in the sense of the present invention are the nucleic acid sequences extending from the nucleotide at position 5 to the nucleotide located immediately 5' to the start codon (e.g. the ATG) in the sequences according to SEQ ID NOs: 1-1363 of the patent application WO 2013/143700, whose disclosure is incorporated herewith by reference. In this context a particularly preferred fragment of a 5'-UTR of a TOP gene is a 5'-UTR of a TOP gene lacking the 5'TOP motif. The terms "5'-UTR of a TOP gene" or "5'-TOP UTR" preferably refer to the 5'-UTR of a naturally occurring TOP gene.

Orthologues and paralogues: Orthologues and paralogues encompass evolutionary concepts used to describe the ancestral relationships of genes. Paralogues are genes within the same species that have originated through duplication of an ancestral gene; orthologues are genes from different organisms that have originated through speciation, and are also derived from a common ancestral gene. In the context of the invention, an orthologue and/or a paralogue of a Norovirus nucleic acid sequence of the invention preferably refers to a sequence having in increasing order of preference at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% or more sequence identity to the sequence as represented by SEQ ID NOs: 4411–39690, 39713-39746. In the context of the invention, an orthologue and/or a paralogue of a Norovirus amino acid sequence of the invention refers preferably to a sequence having in increasing order of preference at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% or more sequence identity to the sequence as represented by SEQ ID NOs: 1-4410.

Hybridization/Homology: Nucleic acid molecules which are advantageously for the process according to the invention can be isolated based on their homology to the nucleic acid molecules or a complement sequence of the nucleic acid molecules disclosed herein using the sequences or part thereof as hybridization probe and following standard hybridization techniques under stringent hybridization conditions. In this context, it is possible to use, for example, isolated nucleic acid molecules of at least 15,

20, 25, 30, 35, 40, 50, 60 or more nucleotides, preferably of at least 15, 20 or 25 nucleotides in length which hybridize under stringent conditions with the above-described nucleic acid molecules, in particular with those which encompass a nucleotide sequence of the nucleic acid molecule used in the invention or encoding a protein used in the invention or of the nucleic acid molecule of the invention. Nucleic acid molecules with 30, 50, 100, 250 or more nucleotides may also be used.

The term "homology" means that the respective nucleic acid molecules or encoded proteins are functionally and/or structurally equivalent. The nucleic acid molecules that are homologous to the nucleic acid molecules described above and that are derivatives of said nucleic acid molecules are, for example, variations of said nucleic acid molecules which represent modifications having the same biological function, in particular encoding proteins with the same or substantially the same biological function. They may be naturally occurring variations, such as sequences from other species, strains, or mutations. These mutations may occur naturally or may be obtained by mutagenesis techniques. The allelic variations may be naturally occurring allelic variants as well as synthetically produced or genetically engineered variants. Structurally equivalents can, for example, be identified by testing the binding of said polypeptide to antibodies or computer based predictions.

By "hybridizing" it is meant that such nucleic acid molecules hybridize under conventional hybridization conditions, preferably under stringent conditions such as described by, e.g., Sambrook (Molecular Cloning; A Laboratory Manual, 2nd Edition, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY (1989)) or in Current Protocols in Molecular Biology, John Wiley & Sons, N. Y. (1989), 6.3.1-6.3.6.

According to the invention, DNA as well as RNA molecules of the nucleic acid of the invention can be used as probes. Further, as template for the identification of functional homologues Northern blot assays as well as Southern blot assays can be performed. The Northern blot assay advantageously provides further information about the expressed gene product: e.g. expression pattern, occurrence of processing steps, like splicing and capping, etc. The Southern blot assay provides additional information about the chromosomal localization and organization of the gene encoding the nucleic acid molecule of the invention.

A preferred, no limiting example of stringent hydridization conditions are hybridizations in 6 x sodium chloride/sodium citrate (= SSC) at approximately 45°C, followed by one or more wash steps in 0.2 x SSC, 0.1% SDS at 50 to 65°C, for example at 50°C, 55°C or 60°C. The skilled worker knows that these hybridization conditions differ as a function of the type of the nucleic acid and, for example when organic solvents are present, with regard to the temperature and concentration of the buffer. The temperature under "standard hybridization conditions" differs for example as a function of the type of the nucleic acid between 42°C and 58°C, preferably between 45°C and 50°C in an aqueous buffer with a concentration of 0.1 x 0.5 x, 1 x, 2x, 3x, 4x or 5 x SSC (pH 7.2). If organic solvent(s) is/are present in the abovementioned buffer, for example 50% formamide, the temperature under standard conditions is approximately 40°C, 42°C or 45°C. The hybridization conditions for DNA:DNA hybrids are preferably for example 0.1 x SSC and 20°C, 25°C, 30°C, 35°C, 40°C or 45°C, preferably between 30°C and 45°C. The hybridization conditions for DNA:RNA hybrids are preferably for example 0.1 x SSC and 30°C, 35°C, 40°C, 45°C, 50°C or 55°C, preferably between 45°C and 55°C. The abovementioned hybridization temperatures are determined for example for a nucleic acid approximately 100 bp (= base pairs) in length and a G + C content of 50% in the absence of formamide. The skilled worker knows to determine the hybridization conditions required with the aid of textbooks, for example the ones mentioned above, or from the following textbooks: Sambrook et al., "Molecular Cloning", Cold Spring Harbor Laboratory, 1989 ; Hames and Higgins (Ed.) 1985, "Nucleic

Acids Hybridization: A Practical Approach", IRL Press at Oxford University Press, Oxford ; Brown (Ed.) 1991, "Essential Molecular Biology: A Practical Approach", IRL Press at Oxford University Press, Oxford .

A further example of one such stringent hybridization condition is hybridization at 4XSSC at 65°C, followed by a washing in 0.1XSSC at 65°C for one hour. Alternatively, an exemplary stringent hybridization condition is in 50% formamide, 4XSSC at 42°C.

Further, the conditions during the wash step can be selected from the range of conditions delimited by low-stringency conditions (approximately 2X SSC at 50°C) and high-stringency conditions (approximately 0.2X SSC at 50°C, preferably at 65°C) (20X SSC: 0.3M sodium citrate, 3M NaCl, pH 7.0). In addition, the temperature during the wash step can be raised from low-stringency conditions at room temperature, approximately 22°C, to higher-stringency conditions at approximately 65°C. Both of the parameters salt concentration and temperature can be varied simultaneously, or else one of the two parameters can be kept constant while only the other is varied. Denaturants, for example formamide or SDS, may also be employed during the hybridization. In the presence of 50% formamide, hybridization is preferably effected at 42°C. Relevant factors like i) length of treatment, ii) salt conditions, iii) detergent conditions, iv) competitor DNAs, v) temperature and vi) probe selection can be combined case by case so that not all possibilities can be mentioned herein.

Some examples of conditions for DNA hybridization (Southern blot assays) and wash step are shown herein below:

(1) Hybridization conditions can be selected, for example, from the following conditions:

a) 4X SSC at 65°C,

b) 6X SSC at 45°C,

c) 6X SSC, 100 mg/ml denatured fragmented fish sperm DNA at 68°C,

d) 6X SSC, 0.5% SDS, 100 mg/ml denatured salmon sperm DNA at 68°C,

e) 6X SSC, 0.5% SDS, 100 mg/ml denatured fragmented salmon sperm DNA, 50% formamide at 42°C,

f) 50% formamide, 4X SSC at 42°C,

g) 50% (vol/vol) formamide, 0.1% bovine serum albumin, 0.1% Ficoll, 0.1% polyvinylpyrrolidone, 50 mM sodium phosphate buffer pH 6.5, 750 mM NaCl, 75 mM sodium citrate at 42°C,

h) 2X or 4X SSC at 50°C (low-stringency condition), or

i) 30 to 40% formamide, 2X or 4X SSC at 42°C (low-stringency condition).

(2) Wash steps can be selected, for example, from the following conditions:

a) 0.015 M NaCl/0.0015 M sodium citrate/0.1% SDS at 50°C.

b) 0.1X SSC at 65°C.

c) 0.1XSSC, 0.5% SDS at 68°C.

d) 0.1X SSC, 0.5% SDS, 50% formamide at 42°C.

e) 0.2X SSC, 0.1% SDS at 42°C.

f) 2X SSC at 65°C (low-stringency condition).

Further, some applications have to be performed at low stringency hybridisation conditions, without any consequences for the specificity of the hybridisation. For example, a Southern blot analysis of total DNA could be probed with a nucleic acid molecule

of the present invention and washed at low stringency (55°C in 2xSSPE, 0,1% SDS). A further example of such low-stringent hybridization conditions is 4XSSC at 50°C or hybridization with 30 to 40% formamide at 42°C. Such molecules comprise those which are fragments, analogues or derivatives of the polypeptide of the invention or used in the methods of the invention and differ, for example, by way of amino acid and/or nucleotide deletion(s), insertion(s), substitution (s), addition(s) and/or recombination (s) or any other modification(s) known in the art either alone or in combination from the above-described amino acid sequences or their underlying nucleotide sequence(s). However, it is preferred to use high stringency hybridisation conditions.

Hybridization should advantageously be carried out with fragments of at least 5, 10, 15, 20, 25, 30, 35 or 40 bp, advantageously at least 50, 60, 70 or 80 bp, preferably at least 90, 100 or 110 bp. Most preferably are fragments of at least 15, 20, 25 or 30 bp. Preferably are also hybridizations with at least 100 bp or 200, very especially preferably at least 400 bp in length. In an especially preferred embodiment, the hybridization should be carried out with the entire nucleic acid sequence with conditions described above.

The term "hybridizes under stringent conditions" is defined above. In one embodiment, the term "hybridizes under stringent conditions" is intended to describe conditions for hybridization and washing under which nucleotide sequences at least 30%, 40%, 50% or 65% identical to each other typically remain hybridized to each other. Preferably, the conditions are such that sequences at least about 70%, more preferably at least about 75% or 80%, and even more preferably at least about 85%, 90% or 95% or more identical to each other typically remain hybridized to each other.

To determine the percentage homology (= identity, herein used interchangeably) of two amino acid sequences or of two nucleic acid molecules, the sequences are written one underneath the other for an optimal comparison (for example gaps may be inserted into the sequence of a protein or of a nucleic acid in order to generate an optimal alignment with the other protein or the other nucleic acid).

The amino acid residues or nucleic acid molecules at the corresponding amino acid positions or nucleotide positions are then compared. If a position in one sequence is occupied by the same amino acid residue or the same nucleic acid molecule as the corresponding position in the other sequence, the molecules are homologous at this position (i.e. amino acid or nucleic acid "homology" as used in the present context corresponds to amino acid or nucleic acid "identity". The percentage homology between the two sequences is a function of the number of identical positions shared by the sequences (i.e. % homology = number of identical positions/total number of positions x 100). The terms "homology" and "identity" are thus to be considered as synonyms.

For the determination of the percentage homology (= identity) of two or more amino acids or of two or more nucleotide sequences several computer software programs have been developed. The homology of two or more sequences can be calculated with for example the software fasta, which presently has been used in the version fasta 3 (W. R. Pearson and D. J. Lipman (1988), Improved Tools for Biological Sequence Comparison. PNAS 85:2444-2448; W. R. Pearson (1990) Rapid and Sensitive Sequence Comparison with FASTP and FASTA. Methods in Enzymology 183:63-98; W. R. Pearson and D. J. Lipman (1988) Improved Tools for Biological Sequence Comparison. PNAS 85:2444-2448; W. R. Pearson (1990); Rapid and Sensitive Sequence Comparison with FASTP and FASTAMethods in Enzymology 183:63-98). Another useful program for the calculation of homologies of different sequences is the standard blast program, which is included in the Biomax pedant software (Biomax, Munich, Federal Republic of

Germany). This leads unfortunately sometimes to suboptimal results since blast does not always include complete sequences of the subject and the query. Nevertheless as this program is very efficient it can be used for the comparison of a huge number of sequences. The following settings are typically used for such a comparisons of sequences: -p Program Name [String]; -d Database [String]; default = nr; -i Query File [File In]; default = stdin; -e Expectation value (E) [Real]; default = 10.0; -m alignment view options: 0 = pairwise; 1 = query-anchored showing identities; 2 = query-anchored no identities; 3 = flat query-anchored, show identities; 4 = flat query-anchored, no identities; 5 = query-anchored no identities and blunt ends; 6 = flat query-anchored, no identities and blunt ends; 7 = XML Blast output; 8 = tabular; 9 tabular with comment lines [Integer]; default = 0; -o BLAST report Output File [File Out] Optional; default = stdout; -F Filter query sequence (DUST with blastn, SEG with others) [String]; default = T; -G Cost to open a gap (zero invokes default behavior) [Integer]; default = 0; -E Cost to extend a gap (zero invokes default behavior) [Integer]; default = 0; -X X drop-off value for gapped alignment (in bits) (zero invokes default behavior); blastn 30, mega blast 20, tblastx 0, all others 15 [Integer]; default = 0; -I Show GI's in deflines [T/F]; default = F; - q Penalty for a nucleotide mismatch (blastn only) [Integer]; default = -3; -r Reward for a nucleotide match (blastn only) [Integer]; default = 1; -v Number of database sequences to show one-line descriptions for (V) [Integer]; default = 500; -b Number of database sequence to show alignments for (B) [Integer]; default = 250; -f Threshold for extending hits, default if zero; blastp 11, blastn 0, blastx 12, tblastn 13; tblastx 13, mega blast 0 [Integer]; default = 0; -g Perfom gapped alignment (not available with tblastx) [T/F]; default = T; -Q Query Genetic code to use [Integer]; default = 1; -D DB Genetic code (for tblast[nx] only) [Integer]; default = 1; -a Number of processors to use [Integer]; default = 1; -O SeqAlign file [File Out] Optional; -J Believe the query defline [T/F]; default = F; -M Matrix [String]; default = BLOSUM62; -W Word size, default if zero (blastn 11, megablast 28, all others 3) [Integer]; default = 0; -z Effective length of the database (use zero for the real size) [Real]; default = 0; -K Number of best hits from a region to keep (off by default, if used a value of 100 is recommended) [Integer]; default = 0; -P 0 for multiple hit, 1 for single hit [Integer]; default = 0; -Y Effective length of the search space (use zero for the real size) [Real]; default = 0; -S Query strands to search against database (for blast[nx], and tblastx); 3 is both, 1 is top, 2 is bottom [Integer]; default = 3; -T Produce HTML output [T/F]; default = F; -I Restrict search of database to list of GI's [String] Optional; -U Use lower case filtering of FASTA sequence [T/F] Optional; default = F; -y X dropoff value for ungapped extensions in bits (0.0 invokes default behavior); blastn 20, megablast 10, all others 7 [Real]; default = 0.0; -Z X dropoff value for final gapped alignment in bits (0.0 invokes default behavior); blastn/megablast 50, tblastx 0, all others 25 [Integer]; default = 0; -R PSI-TBLASTN checkpoint file [File In] Optional; -n MegaBlast search [T/F]; default = F; -L Location on query sequence [String] Optional; -A Multiple Hits window size, default if zero (blastn/megablast 0, all others 40 [Integer]; default = 0; -w Frame shift penalty (OOF algorithm for blastx) [Integer]; default = 0; -t Length of the largest intron allowed in tblastn for linking HSPs (0 disables linking) [Integer]; default = 0.

Results of high quality are reached by using the algorithm of Needleman and Wunsch or Smith and Waterman. Therefore programs based on said algorithms are preferred. Advantageously the comparisons of sequences can be done with the program PileUp (J. Mol. Evolution., 25, 351 (1987), Higgins et al., CABIOS 5, 151 (1989)) or preferably with the programs "Gap" and "Needle", which are both based on the algorithms of Needleman and Wunsch (J. Mol. Biol. 48; 443 (1970)), and "BestFit", which is based on the algorithm of Smith and Waterman (Adv. Appl. Math. 2; 482 (1981)). "Gap" and "BestFit" are part of the GCG software-package (Genetics Computer Group, 575 Science Drive, Madison, Wisconsin, USA 53711 (1991); Altschul et al., (Nucleic Acids Res. 25, 3389

(1997)), "Needle" is part of the European Molecular Biology Open Software Suite (EMBOSS) (Trends in Genetics 16 (6), 276 (2000)). Therefore preferably the calculations to determine the percentages of sequence homology are done with the programs "Gap" or "Needle" over the whole range of the sequences. The following standard adjustments for the comparison of nucleic acid sequences were used for "Needle": matrix: EDNAFULL, Gap_penalty: 10.0, Extend_penalty: 0.5. The following standard adjustments for the comparison of nucleic acid sequences were used for "Gap": gap weight: 50, length weight: 3, average match: 10.000, average mismatch: 0.000.

For example a sequence, which has 80% homology with sequence SEQ ID NO: 4411 at the nucleic acid level is understood as meaning a sequence which, upon comparison with the sequence SEQ ID NO: 4411 by the above program "Needle" with the above parameter set, has a 80% identity.

Homology between two polypeptides is understood as meaning the identity of the amino acid sequence over in each case the entire sequence length which is calculated by comparison with the aid of the above program "Needle" using Matrix: EBLOSUM62, Gap_penalty: 8.0, Extend_penalty: 2.0.

For example a sequence which has a 80% homology with sequence SEQ ID NO: 1 at the protein level is understood as meaning a sequence which, upon comparison with the sequence SEQ ID NO: 1 by the above program "Needle" with the above parameter set, has a 80% identity.

Detailed Description:

In a first aspect, the invention relates to an artificial nucleic acid comprising or consisting of at least one coding region encoding at least one polypeptide derived from a Norovirus, and/or a fragment or variant thereof. In another embodiment, the artificial nucleic acid comprises at least one coding region encoding at least one polypeptide comprising or consisting of at least one Norovirus capsid protein, and/or a fragment or variant thereof.

In one embodiment, the artificial nucleic acid molecule according to the invention comprises at least one coding region encoding the Norovirus capsid protein VP1 or VP2. In another embodiment, the artificial nucleic acid encodes Norovirus capsid protein VP1. In this context, a reference to a Norovirus capsid protein VP1 equals a reference to a VP1 capsid protein derived from a Norovirus, a Norovirus VP1, capsid protein, capsid protein VP1, major capsid protein, major capsid protein VP1, major capsid region, major viral capsid protein, or VP1 capsid protein.

In particular, the invention relates to an artificial nucleic acid comprising or consisting of at least one coding region encoding at least one polypeptide selected from the group consisting of Norovirus capsid protein VP1 (also termed "Major capsid protein" or "capsidprotein"), Norovirus capsid protein VP2 (also termed "Minor capsid protein") and/or a Norovirus non-structural protein, such as NS1/NS2 (also termed p48 or Nterm (amino terminal protein)), NS3 (also termed NTPase or Nucleoside triphosphatase),

NS4 (also termed p22 or 3A-like protein), NS5 (also termed VPg or Genome-linked viral protein), NS6 (also termed Pro or Proteinase), or NS7 (also termed Pol or RNA-dependent RNA polymerase), and/or a fragment or variant of any of these proteins.

In one embodiment of the invention, vaccines and/or compositions contain VP1 proteins and/or VP2 proteins. Preferably each vaccine and/or composition contains VP1 and/or VP2 proteins from only one Norovirus genogroup giving rise to a monovalent vaccine. As used herein, the term "monovalent" means the antigenic proteins are derived from a single Norovirus genogroup. For example, the vaccines and/or compositions contain VP1 and/or VP2 from a virus strain of genogroup I (e.g. VP1 and VP2 from Norwalk virus).

Preferably the vaccines and/or compositions are comprised of predominantly VP1 proteins. In one embodiment of the invention, the antigen is a mixture of monovalent vaccines and/or compositions wherein the composition includes vaccines and/or compositions comprised of VP1 and/or VP2 from a single Norovirus genogroup mixed with vaccines and/or compositions comprised of VP1 and/or VP2 from a different Norovirus genogroup taken from multiple viral strains (e.g. a Norovirus from Genogroup IV.2 and a Norovirus from Genogroup I.1). Purely by way of example the composition can contain monovalent vaccines and/or compositions from one or more strains of Norovirus genogroup I together with monovalent vaccines and/or compositions from one or more strains of Norovirus genogroup II. Preferably, the Norovirus vaccines and/or composition mixture is composed of the Norovirus from Genogroup IV.2 and Norovirus from Genogroup I.1 or from different genus or species of a Norovirus from Genogroup IV.2.

Preferably the vaccines and/or compositions are comprised of predominantly VP1 proteins. In one embodiment of the invention, the antigen is a mixture of monovalent vaccines and/or compositions wherein the composition includes vaccines and/or compositions comprised of VP1 and/or VP2 from a single Norovirus genogroup mixed with vaccines and/or compositions comprised of VP1 and/or VP2 from a different Norovirus genogroup taken from multiple viral strains (e.g. a Norovirus from Genogroup II.4 and a Norovirus from Genogroup I.1). Purely by way of example the composition can contain monovalent vaccines and/or compositions from one or more strains of Norovirus genogroup I together with monovalent vaccines and/or compositions from one or more strains of Norovirus genogroup II. Preferably, the Norovirus vaccines and/or composition mixture is composed of the Norovirus from Genogroup II.4 and Norovirus from Genogroup I.1 or from different genus or species of a Norovirus from Genogroup II.4.

In this context, the amino acid sequence of the at least one antigenic peptide or protein may be selected from any peptide or protein derived from a capsid protein VP1, capsid protein VP2, NS1/NS2, NS3, NS4, NS5, NS6, or NS7 of a Norovirus or a fragment or variant thereof.

Further, in an alternative embodiment of the invention, the vaccines and/or compositions may be multivalent vaccines and/or compositions that comprise, for example, VP1 and/or VP2 proteins from one Norovirus genogroup intermixed with VP1 and/or VP2 proteins from a second Norovirus genogroup, wherein the different VP1 and VP2 proteins are not chimeric VP1 and VP2

proteins, but associate together within the same capsid structure to form immunogenic Vaccines and/or compositions. As used herein, the term "multivalent" means that the antigenic proteins are derived from two or more Norovirus genogroups. Multivalent vaccines and/or compositions may contain vaccines and/or composition antigens taken from two or more viral strains. Purely by way of example the composition can contain multivalent vaccines and/or compositions comprised of capsid monomers or multimers from one or more strains of Norovirus genogroup I together with capsid monomers or multimers from one or more strains of Norovirus genogroup II. Preferably, the Norovirus vaccines and/or composition mixture is composed of the Norovirus from Genogroup IV.2 and Norovirus from Genogroup I.1 or from different genus or species of a Norovirus from Genogroup IV.2.

Further, in an alternative embodiment of the invention, the vaccines and/or compositions may be multivalent vaccines and/or compositions that comprise, for example, VP1 and/or VP2 proteins from one Norovirus genogroup intermixed with VP1 and/or VP2 proteins from a second Norovirus genogroup, wherein the different VP1 and VP2 proteins are not chimeric VP1 and VP2 proteins, but associate together within the same capsid structure to form immunogenic Vaccines and/or compositions. As used herein, the term "multivalent" means that the antigenic proteins are derived from two or more Norovirus genogroups. Multivalent vaccines and/or compositions may contain vaccines and/or composition antigens taken from two or more viral strains. Purely by way of example the composition can contain multivalent vaccines and/or compositions comprised of capsid monomers or multimers from one or more strains of Norovirus genogroup I together with capsid monomers or multimers from one or more strains of Norovirus genogroup II. Preferably, the Norovirus vaccines and/or composition mixture is composed of the Norovirus from Genogroup II.4 and Norovirus from Genogroup I.1 or from different genus or species of a Norovirus from Genogroup II.4.

In another embodiment, the artificial nucleic acid may comprise 2, 3, 4, 5, 6, 7, 8, 9, 10 or more coding regions encoding at least one polypeptide selected from the group consisting of Norovirus capsid protein VP1, Norovirus capsid protein VP2, NS1/NS2, NS3, NS4, NS5, NS6, or NS7, and/or a fragment or variant of any of these proteins.

In a preferred embodiment, the compositions or vaccines of the present invention comprise a multivalent vaccine, e.g., comprising a polynucleotide which encodes at least two different VP1, for example a Norovirus capsid protein VP1 from a GII.4 strain and a Norovirus capsid protein VP1 from a GI.1 strain. In another embodiment, the compositions or vaccines comprises a multivalent vaccine, e.g., comprising two different polynucleotides, whereby one polynucleotide encodes for example a Norovirus capsid protein VP1 from a GII.4 strain and the other polynucleotide encodes a Norovirus capsid protein VP1 from a GI.1 strain.

In a further embodiment, the compositions or vaccines of the present invention may comprise a multivalent vaccine, e.g., comprising a polynucleotide which encodes at least two different VP1, for example a Norovirus capsid protein VP1 from two different GII.4 strains. In another embodiment, the compositions or vaccines comprise a multivalent vaccine, e.g., comprising two different polynucleotides, whereby one polynucleotide encodes for example a Norovirus capsid protein VP1 from two different GII.4 strains.

In some embodiments, as defined above, the composition or the vaccine is multivalent, i.e. compositions or vaccines of the present invention may vary in their valency. Valency refers to the number of antigenic components in the composition or vaccine. In some embodiments, the compositions or vaccines are monovalent. In some embodiments, the compositions or vaccines are divalent or bivalent. In some embodiments the compositions or vaccines are trivalent. In some embodiments the compositions or vaccines are teravalent. In some embodiments the compositions or vaccines are multi-valent. Multivalent vaccines may comprise at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more antigens or antigenic moieties (e.g., antigenic peptides, etc.). The antigenic components of the compositions or vaccines may be on a single polynucleotide or on separate polynucleotides. In another embodiment, multivalent vaccines may comprise or at least 10, 15, 20, 30, 40 or 50 or 100 or more antigens or antigenic moieties (e.g., antigenic peptides, etc.). In another embodiment, multivalent vaccines may comprise 2-10, 10-15, 15-20, 20-50, 50-100 or 100-200 or more antigens or antigenic moieties (e.g., antigenic peptides, etc.).

In a preferred embodiment, the multivalent composition or vaccine comprises about 30 to about 50 antigens or antigenic moieties.

In some embodiments, the open reading frame of the one or more RNA polynucleotides encodes at least 2, 3, 4, 5, 6, 7, 8, 9 or 10 or at least 10, 15, 20 or 50 or 2-10, 10-15, 15-20, 20-50, 50-100 or 100-200 antigenic polypeptides.

In this context it is particularly preferred that the composition comprises at least two mRNA sequences, wherein at least one mRNA sequence encodes at least one antigenic peptide or protein, i.e. VP1, is derived from a GII.4 Norovirus and at least one mRNA sequence encodes at least one antigenic peptide or protein, derived from Norovirus VP1, is derived from another GII.4 Norovirus.

In another preferred embodiment each mRNA sequence encodes at least one different antigenic peptide or protein derived from proteins of different Noroviruses. Preferably each mRNA sequence encodes at least one antigenic peptide or protein, derived from Norovirus VP1, of different GII.4 Noroviruses or different GI.1 Noroviruses, or a combination thereof.

In a further embodiment, the invention relates to a composition comprising or consisting of 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more separate artificial nucleic acids selected from the group of SEQ ID NOs: 4411–39690, 39713-39746 comprising at least one coding region encoding at least one polypeptide derived from a Norovirus selected from the group SEQ ID NOs: 1-4410 or a fragment or variant of any of these proteins.

In some embodiments, the open reading frame of the one or more RNA polynucleotides encode at least 10, 15, 20, 30, 40 or 50 or 100 antigenic polypeptides. In some embodiments, the open reading frame of the one or more RNA polynucleotides encode 2-10, 10-15, 15-20, 20-50, 50-100 or 100-200 antigenic polypeptides.

The present invention is based on the surprising finding that the at least one Norovirus protein comprised in the at least one polypeptide encoded by the artificial nucleic acid as described herein can efficiently be expressed in a mammalian cell. It was further unexpectedly found that the artificial nucleic acid is suitable for eliciting an immune response against Norovirus in a subject.

Furthermore, the present invention is based on the surprising finding that mRNA-based or artificial nucleic acid vaccines comprising mRNA or artificial nucleic acid sequences encoding different antigens of a Norovirus (particularly Norovirus capsid protein VP1) were extremely effective in inducing an antigen-specific immune response against Norovirus. Furthermore, the inventors surprisingly found that many mRNA sequences encoding different antigens of different Noroviruses can be effectively combined in one mRNA-based vaccine.

In one embodiment, the artificial nucleic acid of the invention comprises at least one coding region encoding at least one polypeptide derived from a Norovirus and/or a fragment or variant thereof.

In a further embodiment, the artificial nucleic acid of the invention comprises at least one coding region encoding at least one polypeptide selected from the group consisting of a non-structural protein derived from a Norovirus and/or a capsid protein derived from a Norovirus, and/or a fragment or variant thereof.

In a further embodiment, the artificial nucleic acid of the invention comprises at least one coding region encoding at least one polypeptide selected from the group consisting of Norovirus non-structural proteins NS1/NS2, NS3, NS4, NS5, NS6, NS7, Norovirus capsid protein VP1 and Norovirus capsid protein VP2, and/or a fragment or variant thereof.

Norovirus:

In the context of the present invention, the term "Norovirus" comprises any Norovirus, irrespective of strain or origin. Preferably, the term "Norovirus" comprises a Norovirus strain selected from the group consisting of Genogroup I, Genogroup II, Genogroup III, Genogroup IV, or Genogroup V (abbreviated as GI, GII, GIII, GIV or GV, respectively).

In a further embodiment, the term "Norovirus" comprises a Norovirus strain selected from the group consisting of

(i) Genogroup I genotype 1 (abbreviated as GI.1), GI.2, GI.3, GI.4, GI.5, GI.6, GI.7, GI.8, GI.9, GI.10, GI.11, GI.12, GI.13, GI.14, GI.15, GI.16 and/or GI.17;

(ii) Genogroup II genotype 1 (abbreviated as GII.1), GII.2, GII.3, GII.4, GII.5, GII.6, GII.7, GII.8, GII.9, GII.10, GII.11, GII.12, GII.13, GII.14, GII.15, GII.16, GII.17, GII.18, GII.19, GII.20, GII.21, GII.22, GII.23, and/or GII.24;

(iii) Genogroup III genotype I (abbreviated as GIII.1), GIII.2, GIII.3, and/or GIII.4;

(iv) Genogroup IV genotype I (abbreviated as GIV.1), GIV.2, GIV.3, and/or GIV.4;

(v) Genogroup V genotype I (abbreviated as GV.1), GV.2, GV.3, and/or GV.4;

and/or combinations of 2, 3, 4, 5, 6, 7, 8, 9, or 10, or more of any of the above Noroviruses from different Genogroups and/or different Genotypes.

In a further embodiment, the nucleic acid of the invention, preferably a VP1 nucleic acid derived from a Norovirus, is derived from a Norovirus selected from the group consisting of

(i) Genogroup I genotype I (abbreviated as GI.1), GI.2, GI.3, GI.4, GI.5, GI.6, GI.7, GI.8, GI.9, GI.10, GI.11, GI.12, GI.13, GI.14, GI.15, GI.16 and/or GI.17;

(ii) Genogroup II genotype I (abbreviated as GII.1), GII.2, GII.3, GII.4, GII.5, GII.6, GII.7, GII.8, GII.9, GII.10, GII.11, GII.12, GII.13, GII.14, GII.15, GII.16, GII.17, GII.18, GII.19, GII.20, GII.21, GII.22, GII.23, and/or GII.24;

(iii) Genogroup III genotype I (abbreviated as GIII.1), GIII.2, GIII.3, and/or GIII.4;

(iv) Genogroup IV genotype I (abbreviated as GIV.1), GIV.2, GIV.3, and/or GIV.4; and

(v) Genogroup V genotype I (abbreviated as GV.1), GV.2, GV.3, and/or GV.4.

In the case, 2, 3, 4, 5, 6, 7, 8, 9, 10 or more different VP1 nucleic acids are utilized or employed, for example in a composition of the invention or a vaccine of the invention, the VP1 nucleic acids can be derived from 2, 3, 4, 5, 6, 7, 8, 9, or 10, or more of any of the above Noroviruses from different Genogroups and/or different Genotypes.

In the context of the invention, a reference to GI.1 to GI.17 means a reference to GI.1, GI.2, GI.3, GI.4, GI.5, GI.6, GI.7, GI.8, GI.9, GI.10, GI.11, GI.12, GI.13, GI.14, GI.15, GI.16 and/or GI.17; a reference to GII.1 to GII.24 means a reference to GII.1, GII.2, GII.3, GII.4, GII.5, GII.6, GII.7, GII.8, GII.9, GII.10, GII.11, GII.12, GII.13, GII.14, GII.15, GII.16, GII.17, GII.18, GII.19, GII.20, GII.21, GII.22, GII.23, and/or GII.24; a reference to GIII.1 to GIII.4 means to a reference to GIII.1, GIII.2, GIII.3, and/or GIII.4; a reference to GIV.1 to GIV.4 means to a reference to GIV.1, GIV.2, GIV.3, and/or GIV.4; a reference to GV.1 to GV.4 means to a reference to GV.1, GV.2, GV.3, and/or GV.4.

In other embodiments, the term "Norovirus" comprises a Norovirus strain selected from the group consisting of a GII.4 Norovirus and/or a GI.1 Norovirus. In a further embodiment, the term "Norovirus" as used herein refers to Norovirus GII.4 CIN-1 (also termed Norovirus Hu/GII.4/031693/USA/2003 or having Accession No. JQ965810.1), GII.4 (Accession No: AY502023.1), GII.4 CIN-002 and/or GII.4 Sydney. In another embodiment, the Norovirus is a GII.4 Sydney Norovirus or a GII.4 Sydney 2012 Norovirus.

In other embodiments, the term "Norovirus" comprises a Norovirus strain selected from the group consisting of a GII.4 Norovirus and/or a GI.1 Norovirus. In a further embodiment, the term "Norovirus" as used herein refers to Norovirus GII.4-031693-USA-2003, Norovirus GII.4/Farmington Hills/2002/USA, Norovirus GII.4-2006b 092895-USA-2008, Norovirus GII.4-GZ2010-L87-Guangzhou-2011, Norovirus GII.4-USA-1997, Norovirus GI.1-USA-1968-Capsidprotein.

In another embodiment, the term "Norovirus" comprises a Norovirus strain selected from the group consisting of Norovirus Hu/GII.4/Dijon/E872/2002/FRA, Norovirus Hu/GII.4/MD120-12/1987/USA, Norovirus Hu/GII.1/7EK/Hawaii/1971/USA, Norovirus Hu/GII.6/CHDC4073/1984/USA, Norovirus Hu/GII.4/Hiroshima/19/2001/JPN, Norovirus Hu/GII.4/Hiroshima/67/2006/JPN, Norovirus Hu/GII/JP/2015/GII.Pe_GII.4/Osaka/OSF78, Norovirus GII/Hu/NL/2012/GII.4/Groningen, Norovirus GII/Hu/NL/2014/GII.2/Groningen, Norovirus Hu/GII.4/New Orleans1500/2008/USA, Norovirus Hu/GII.6/Ohio/490/2012/USA, Norovirus Hu/GII.3/Jingzhou/2013402/CHN, Norovirus Hu/GII.4/Jingzhou/2013403/CHN, Norovirus Hu/GII.17/Gaithersburg/2014/US, Norovirus Hu/GII.4/C127/GF/1978, Norovirus Hu/GII.4/CHDC3967/1988/US, Norovirus Hu/GII.4/CHDC4108/1987/US, Norovirus Hu/GII.4/CHDC4871/1977/US, Norovirus Hu/GII.3/CHDC5261/1990/US, Norovirus Hu/GII.3/Milwaukee009/2010/USA, Norovirus Hu/GII.4/Miranda/NSW817L/2010/AU, Norovirus Hu/GII.2/KL109/MY/1978, Norovirus Hu/GII.14/HK74/CN/1978, Norovirus Hu/GII.7/HK4/CN/1976, Norovirus Hu/GII.17/C142/GF/1978, Norovirus Hu/GII.5/C15/GF/1978, Norovirus Hu/GI.5/E57/UG/1975, Norovirus Hu/GII.4/Randwick/NSW882J/2011/AU, Norovirus Hu/GII.4/Berowra/NSW767L/2012/AU, Norovirus Hu/GII.4/Sydney/NSW0514/2012/AU, Norovirus Hu/GII.4/Hong Kong/CUHK3630/2012/CHN, Norovirus Hu/GII.4/VP1172/Shanghai/2012/CHN, Norovirus Hu/GII-4/New Taipei/CGMH61/2012/TW, Norovirus GII/Hu/HKG/2013/GII.4/CUHK-NS-141, Norovirus GII/Hu/JP/2002/GII.P12_GII.13/Saitama/T80, Norovirus GII/Hu/JP/2001/GII.P12_GII.12/Saitama/T15, Norovirus GII/Hu/JP/2007/GII.P21_GII.21/, Kawasaki/Y0284, Norovirus GII/Hu/JP/2007/GII.P15_GII.15/ Sapporo/HK299, Norovirus GI/Hu/JP/2007/GI.P3_GI.3/Shimizu/KK2866, Norovirus GII/Hu/JP/2007/GII.P7_GII.14/Fukuoka/KK282, Norovirus GI/Hu/JP/2007/GI.P8_GI.8/Nagoya/KY531, Norovirus Hu/GII.4/SJTUH1/CHN/2014, Norovirus Hu/GII.4/variant Sydney 2012/FRA, Norovirus Hu/GII-4/Hokkaido4/2006/JP, Norovirus GIV/Hu/Jp/2001/GIV.1/OC01017023, Norovirus Hu/GII.4/Beijing/53671/2007/CHN, Norovirus Hu/11.4/2200661/HK/2010, Norovirus Hu/GII.4/Aichi368-14/2014, Norovirus Hu/GII.4/Hunter 284E/040/AU, Norovirus Hu/GII-4/Osaka/1998/JPN, Norovirus Hu/GI.1/P774.Delsjo2004/Gothenburg/Sweden, Norovirus pig/GII.11/F18-10/2005/CAN, Norovirus Hu/GII.4/Wellington/1995/USA, Norovirus Hu/GII.4/Henry/2000/USA, Norovirus Hu/GII.4/SSCS/2005/USA, Norovirus GII/Hu/IN/2006/GII.P4_GII.4_ Yerseke2006a/Pune-PC21, Norovirus Hu/GI.1/P7-587/2007/Stromstad/Sweden, Norovirus Hu/GI.2/Leuven/2003/BEL, Norovirus Hu/GII.7/NSW743L/2008/AUS, Norovirus Hu/GII.2/NF2002/USA/2002, Norovirus Hu/GII.4/NF2003/USA/2003, Norovirus Hu/GII.3/1999, Norovirus Hu/GIV.1/Ahrenshoop246/DEU/2012, Norovirus Hu/GII.4/Xi'an/P19/2010/CHN, Norovirus Hu/GII.4/PA363/2011/ITA, Norovirus Hu/GII.4/P3/2012/Gothenburg/Sweden, Norovirus Hu/GII.4/Tanger/TM687/2011/MAR, Norovirus 12-X-2/2012/GII.P22/GII.5, Norovirus Hu/GII.4/Kobe034/2006/JP, Norovirus Hu/GGII.4/Tiel001/1995/NL, Norovirus Hu/GGII.4/DenHaag015/2000/NL, Norovirus Hu/GGII.4/Schiedam018/2001/NL, Norovirus Hu/GGII.4/Apeldoorn023/2003/NL, Norovirus Hu/GGII.4/Middelburg007/2004/NL, Norovirus Hu/GII-4/Matsudo/021071/2002/JP, Norovirus Hu/GII-4/Kaiso/030556/2003/JP, Norovirus Hu/GII-4/Awa/040354/2004/JP, Norovirus Hu/GII.4/Apeldoorn317/2007/NL, Norovirus Hu/GII.2/Rotterdam39E/2002/NL, Norovirus Hu/GII.4/RotterdamP200/2005/NL, Norovirus Hu/GII.4/Stockholm/19865/2008/SE, Norovirus Hu/GII.6/OC04062VLP/2004/JP, Norovirus Hu/GII.4/HS194/2009/US, Norovirus Hu/GII.12/HS210/2010/USA, Norovirus Hu/GI.1/8FIIa/1968/USA, Norovirus Hu/GII.4/CHDC5191/1974/USA, Norovirus Hu/GII.4/N76/2010/HuZhou, Norovirus Hu/GII.6/S9c/1976/SEN, Norovirus Hu/GII.4/KL45/1978/MYS, Norovirus

Hu/GII.4/NIHIC17.5/2012/USA, Norovirus Hu/GII.4/NIHIC9/2011/USA, Norovirus Hu/GII.4/C110/1978/GUF, Norovirus Hu/GII.4/HS66/2001/USA, Norovirus Hu/GII/JP/2015/GII.P17_GII.17/Kawasaki308, Norovirus Hu/GII/JP/2014/GII.P17_GII.17/Nagano8-1, Norovirus Hu/GII/JP/2015/GII.Pe_GII.4/Osaka/OSF78, Norovirus GI/Hu/NL/2011/GI.4/Groningen, Norovirus GII/Hu/NL/2014/GII.4/Groningen01, Norovirus Hu/GII.4/Kenepuru/NZ327/2006/NZL, Norovirus Hu/GII.4/Rathmines/NSW287R/2007/AUS, Norovirus Hu/GII.4/Turramurra/NSW892U/2009/AUS, Norovirus Hu/GII.4/Seoul/0389/2009/KOR, Norovirus Hu/GII.4/Seoul/0945/2009/KOR, Norovirus Hu/GII.12/Shelby/2009/USA, Norovirus Hu/GI.7/TCH-060/USA/2003, Norovirus Hu/GII.1/Ascension208/2010/USA, Norovirus Hu/GII.13/VA173/2010/USA, Norovirus Hu/GII.21/Salisbury150/2011/USA, Norovirus Hu/GII.4/1997/USA, Norovirus Hu/GII.4/Farmington Hills/2004/USA, Norovirus Hu/GII.4/Minerva/2006/USA, Norovirus Hu/GII.4/Ohio/71/2012/USA, Norovirus Hu/GII.4/AlbertaE1065/2011/CA, Norovirus Hu/GII.4/SG4051-09/2009/SG, Norovirus Hu/GII.3/TCH-104/USA/2002, Norovirus Hu/GI.6/TCH-099/USA/2003, Norovirus 06-AM-11/2006/GII.4/Yerseke/2006a, Norovirus 09-BI-2/2009/GII.4/NewOrleans/2009, Norovirus Hu/GII.4/PR328/2013/ITA, Norovirus Hu/GII.P17_GII.17/PR668/2015/ITA, Norovirus Hu/GII.4/AlbertaSPI/2013/CA, Norovirus Hu/GII.4/C00007892/2011/UK, Norovirus Hu/GII.6/GZ2010-L96/Guangzhou/CHN/2011, Norovirus Bo/GIII.1/Aba-Z5/2002/HUN, Norovirus GI.9, Norovirus Hu/GII.17/CUHK-NS-670/HKG/2015, Norovirus GII/Hu/SI/2015/GII.17/Ljubljana1662, Norovirus Hu/GII.17/CUHK-NS-647/HKG/2015, Norovirus Hu/GII.21/CUHK-NS-609/HKG/2015, Norovirus Hu/GII.4/Melbourne6623/2016/AUS, Norovirus GII/Hu/JP/2016/GII.P16_GII.4_ Sydney2012/OH16002, Norovirus Hu/GII/JP/2016/GII.P16_GII.4_ Sydney2012/Kawasaki194, Norovirus 16F2149_GII.2_Guangdong_CHN_2016, Norovirus Hu/GII.17/CUHK-NS-864/HKG/2016, Norovirus GII/Hu/ZAF/2012/GII.P4_GII.4/ CapeTown/9772, Norovirus GII.12, Snow Mountain virus, Human calicivirus strain Melksham.

In one embodiment, the artificial nucleic acid is derived from a Norovirus selected from the group consisting of genogroup I Norovirus, genogroup II Norovirus, genogroup III Norovirus, genogroup IV Norovirus, and genogroup V Norovirus; preferably the artificial nucleic acid is derived from a Norovirus selected from the group consisting of a GI.1 to GI.17 Norovirus, GII.1 to GII.24 Norovirus, GIII.1 to GIII.4 Norovirus, GIV.1 to GIV.4 Norovirus and GV.1 to GV.4 Norovirus; more preferably, the artificial nucleic acid is derived from a Norovirus selected from the group consisting of GI.1 Norovirus and GII.4 Norovirus, even more preferably, the artificial nucleic acid is derived from a GII.4 Norovirus, still more preferably, the artificial nucleic acid is derived from a GII.4 CIN-1 Norovirus or a GII.4 Sydney Norovirus or a GII.4 Sydney 2012 Norovirus.

In preferred embodiments, the artificial nucleic acid is derived from a Norovirus selected from the group consisting of Norovirus GII.4-031693-USA-2003, Norovirus GII.4/Farmington Hills/2002/USA, Norovirus GII.4-2006b 092895-USA-2008, Norovirus GII.4-GZ2010-L87-Guangzhou-2011, Norovirus GII.4-USA-1997, Norovirus GI.1-USA-1968-Capsidprotein.

Norovirus peptides or proteins:

The at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises at least one Norovirus protein. The RNA genome of Norovirus typically encodes a plurality of structural and non-structural proteins.

Translation of Norovirus RNA typically leads to a precursor protein comprising a plurality of individual viral (structural and non-structural) proteins (or precursor of these proteins) in one polypeptide chain, which is typically referred to as "polyprotein" or "precursor protein".

In the context of the present invention, a Norovirus polyprotein typically comprises amino acid sequences that are target sites for enzymes that specifically cleave the polyprotein in order to yield fragments of the polyprotein, wherein the fragments preferably comprise an individual Norovirus protein or two or more Norovirus proteins, or a fragment or variant thereof. In the context of the present invention, the term "polyprotein" may also refer to a polypeptide chain comprising the amino acid sequences of at least two individual Norovirus proteins, or a fragment or variant thereof. Cleavage of a Norovirus polyprotein preferably occurs between individual Norovirus proteins (e.g. between the capsid protein VP1 and the capsid protein VP2, or fragments or variants thereof. An individual Norovirus protein, or a fragment or variant thereof, e.g. as obtained from a polyprotein by cleavage, is preferably referred to as "mature Norovirus protein". In the context of the present invention, the term "mature Norovirus protein" is not limited to an individual Norovirus protein, or a fragment or variant thereof, which was generated by cleavage of a polyprotein, but also comprises an individual Norovirus protein of another origin, such as an individual Norovirus protein expressed recombinantly from an artificial nucleic acid. Preferably, a mature Norovirus protein lacks an amino acid sequence that is typically present in a corresponding amino acid sequence encoding said Norovirus protein in a Norovirus polyprotein (precursor protein) and wherein said amino acid sequence lacking in the mature Norovirus protein preferably corresponds to an amino acid sequence, which is usually removed by cleavage during processing of a Norovirus polyprotein. For example, an amino acid sequence, which is a target site for a protease, may be present in a Norovirus polyprotein, but may be absent from a mature Norovirus protein derived from said Norovirus polyprotein.

In one embodiment, the artificial nucleic acid comprising at least one coding region encoding at least one polypeptide comprises at least one Norovirus capsid protein VP1 or Norovirus capsid protein VP2 and/or a fragment or a variant thereof.

In another embodiment, the artificial nucleic acid comprising at least one coding region encoding at least one polypeptide comprises at least one Norovirus capsid protein VP1 and/or a fragment or variant thereof. In a further embodiment, the artificial nucleic acid comprises a Norovirus capsid protein VP1 and/or a fragment or variant thereof.

In the context of the present invention, the term "Norovirus protein" may refer to any amino acid encoded by a Norovirus nucleic acid. In the context of the invention, a Norovirus capsid protein VP1 or VP1 protein is preferred. For example, a "Norovirus protein" may be any polypeptide comprising or consisting of an amino acid sequence according to any one of the following amino acid sequences from Genbank, or a fragment or variant of any of these sequences as provided in Table 1 (Column 2; "NCBI or Genbank Accession No.") and Table 3 (Column 2; "NCBI or Genbank Accession No.").

In particular, the term "Norovirus protein" as used herein comprises an individual structural or non-structural Norovirus protein. For example, a Norovirus protein in the meaning of the present invention may be a protein selected from the group consisting of

Norovirus capsid protein VP1, Norovirus capsid protein VP2, and a Norovirus non-structural protein (NS), such as NS1/NS2, NS3, NS4, NS5, NS6, or NS7.

In particular, the term "Norovirus protein" as used herein is a Norovirus capsid protein VP1. Further, in particular, the term "Norovirus protein" as used herein is a Norovirus capsid protein derived from a GII.4 Norovirus.

As used herein, the term "Norovirus protein" may also refer to an amino acid sequence corresponding to an individual Norovirus protein as present in a Norovirus polyprotein (precursor protein). Said amino acid sequence in the polyprotein may differ from the amino acid sequence of the corresponding amino acid sequence of the respective mature Norovirus protein (i.e. after cleavage/processing the polyprotein). For example, the corresponding amino acid sequence comprised in the polyprotein may comprise amino acid residues that are removed during cleavage/processing of the polyprotein (such as a signal sequence or a target site for a protease) and that are no longer present in the respective mature Norovirus protein. In the context of the present invention, the term "Norovirus protein" comprises both, the precursor amino acid sequence comprised in a Norovirus polyprotein (i.e. as part of a polypeptide chain optionally further comprising other viral proteins) as well as the respective mature individual Norovirus protein. For example, the term "Norovirus capsid protein VP1" as used herein may refer to an amino acid sequence in a Norovirus polyprotein corresponding to the precursor sequence of Norovirus capsid protein VP1 (comprising, for example, a (C-terminal) signal sequence) as present in a Norovirus polyprotein as well as to a mature (separate) Norovirus capsid protein VP1 (no longer comprising, for example, a (C-terminal) signal sequence).

Where reference is made to amino acid residues and their position in a Norovirus protein or in a Norovirus polyprotein, any numbering used herein – unless stated otherwise – relates to the position of the respective amino acid residue in a Norovirus polyprotein (precursor protein), wherein position "1" corresponds to the first amino acid residue, i.e. the amino acid residue at the N-terminus of a Norovirus polyprotein. More preferably, the numbering with regard to amino acid residues refers to the respective position of an amino acid residue in a Norovirus polyprotein, which is preferably derived from a Norovirus strain selected from the group consisting of Genogroup II or Genogroup I (abbreviated as GII, or GI, respectively), more preferably from the group consisting of Genogroup II genotype 4 (abbreviated as GII.4) or Genogroup I genotype 1 (abbreviated as GII.4 and GI.1), or even more preferably the strain is selected from strain Norovirus strain GII.4 CIN-1 or CIN-002.

Preferred Norovirus protein in the context of the invention may be any polypeptide comprising or consisting of an amino acid sequence according to any one of the following amino acid sequences from Genbank, or a fragment or variant of any of these sequences: ACO55068, AFS33552, AFS33555, AFX71665, BAI49904, BAI49914, BAS02083, CRL46958, CRL46973, ADB27027, AGI96397, AGX01095, AGX01098, AKI30060, AGL98413, ACT76145, ACT76148, ACT76151, AED02034, AEX10549, AFJ21448, AFN06726, AFN06727, AFN06731, AFN06732, AFN06733, AFN06735, AFV08771, AFV08777, AFV08795, AFX95940, AGI99552, AGK25912, AID68581, AII73717, AII73735, AII73741, AII73759, AII73765, AII73780, AII73783, AIS40019, AIY27747, BAG70437, BAU16306, ACY00615, ADK47170, BAQ20801, AAZ31376, ABI97981, ABW74128, ACC69023, ACL27297, ACL27298, ACL27299, ACL31322, ACN32270, ACU56258, ACX85810, AFB18010, AFB18013, AFK75854, AFN61315, AFQ00511, AHC12655, AHZ12912, AIC32559, AID51489,

BAF45861, BAF74508, BAF74509, BAF74512, BAF74517, BAF74521, BAF95499, BAF95501, BAF95505, BAG55289, BAG68713, BAG68801, BAH30707, BAL40873, ADB27914, ADT70684, AFJ38516, AFJ38519, AFW15943, AGE99599, AGE99612, AGT17839, AFX71669, AGE99607, AHI59166, BAR42290, BAR63722, BAS02084, CRL46953, CRL46962, ABQ63283, ACW19927, ADQ43783, ADV37805, ADV37919, AEI83469, AEQ77282, AFA55174, AFC89656, AFC89665, AFJ04707, AFJ04708, AFJ04709, AFP89593, AFU55731, AFU92710, AGO64038, AGT62521, AJZ77004, AJZ77015, AKE31861, ALD09618, ALT54494, CCX28619, AGC96535, ABY67257, AHA91656, KT315718, KT591501, KT315706, KR921940, KX767083, LC153121, LC175468, KY485125, KU555841, KP784696, KP064099, U70059, X81879.

Preferred examples of Noroviruses which may be used for providing the nucleic acid molecules of the invention may include Norovirus GII.4-031693-USA-2003, Norovirus GII.4/Farmington Hills/2002/USA, Norovirus GII.4-2006b 092895-USA-2008, Norovirus GII.4-GZ2010-L87-Guangzhou-2011, Norovirus GII.4-USA-1997, Norovirus GI.1-USA-1968.

Further Preferred examples of Noroviruses which may be used for providing the nucleic acid molecules of the invention may include Norovirus Hu/GII.4/Dijon/E872/2002/FRA, Norovirus Hu/GII.4/MD120-12/1987/USA, Norovirus Hu/GII.1/7EK/Hawaii/1971/USA, Norovirus Hu/GII.6/CHDC4073/1984/USA, Norovirus Hu/GII.4/Hiroshima/19/2001/JPN, Norovirus Hu/GII.4/Hiroshima/67/2006/JPN, Norovirus Hu/GII/JP/2015/GII.Pe_GII.4/Osaka/OSF78, Norovirus GII/Hu/NL/2012/GII.4/Groningen, Norovirus GII/Hu/NL/2014/GII.2/Groningen, Norovirus Hu/GII.4/New Orleans1500/2008/USA, Norovirus Hu/GII.6/Ohio/490/2012/USA, Norovirus Hu/GII.3/Jingzhou/2013402/CHN, Norovirus Hu/GII.4/Jingzhou/2013403/CHN, Norovirus Hu/GII.17/Gaithersburg/2014/US, Norovirus Hu/GII.4/C127/GF/1978, Norovirus Hu/GII.4/CHDC3967/1988/US, Norovirus Hu/GII.4/CHDC4108/1987/US, Norovirus Hu/GII.4/CHDC4871/1977/US, Norovirus Hu/GII.3/CHDC5261/1990/US, Norovirus Hu/GII.3/Milwaukee009/2010/USA, Norovirus Hu/GII.4/Miranda/NSW817L/2010/AU, Norovirus Hu/GII.2/KL109/MY/1978, Norovirus Hu/GII.14/HK74/CN/1978, Norovirus Hu/GII.7/HK4/CN/1976, Norovirus Hu/GII.17/C142/GF/1978, Norovirus Hu/GII.5/C15/GF/1978, Norovirus Hu/GI.5/E57/UG/1975, Norovirus Hu/GII.4/Randwick/NSW882J/2011/AU, Norovirus Hu/GII.4/Berowra/NSW767L/2012/AU, Norovirus Hu/GII.4/Sydney/NSW0514/2012/AU, Norovirus Hu/GII.4/Hong Kong/CUHK3630/2012/CHN, Norovirus Hu/GII.4/VP1172/Shanghai/2012/CHN, Norovirus Hu/GII-4/New Taipei/CGMH61/2012/TW, Norovirus GII/Hu/HKG/2013/GII.4/CUHK-NS-141, Norovirus GII/Hu/JP/2002/GII.P12_GII.13/Saitama/T80, Norovirus GII/Hu/JP/2001/GII.P12_GII.12/Saitama/T15, Norovirus GII/Hu/JP/2007/GII.P21_GII.21/, Kawasaki/Y0284, Norovirus GII/Hu/JP/2007/GII.P15_GII.15/ Sapporo/HK299, Norovirus GI/Hu/JP/2007/GI.P3_GI.3/Shimizu/KK2866, Norovirus GII/Hu/JP/2007/GII.P7_GII.14/Fukuoka/KK282, Norovirus GI/Hu/JP/2007/GI.P8_GI.8/Nagoya/KY531, Norovirus Hu/GII.4/SJTUH1/CHN/2014, Norovirus Hu/GII.4/variant Sydney 2012/FRA, Norovirus Hu/GII-4/Hokkaido4/2006/JP, Norovirus GIV/Hu/Jp/2001/GIV.1/OC01017023, Norovirus Hu/GII.4/Beijing/53671/2007/CHN, Norovirus Hu/II.4/2200661/HK/2010, Norovirus Hu/GII.4/Aichi368-14/2014, Norovirus Hu/GII.4/Hunter 284E/040/AU, Norovirus Hu/GII-4/Osaka/1998/JPN, Norovirus* Hu/GI.1/P774.Delsjo2004/Gothenburg/Sweden, Norovirus pig/GII.11/F18-10/2005/CAN, Norovirus Hu/GII.4/Wellington/1995/USA, Norovirus Hu/GII.4/Henry/2000/USA, Norovirus Hu/GII.4/SSCS/2005/USA, Norovirus GII/Hu/IN/2006/GII.P4_GII.4_ Yerseke2006a/Pune-PC21, Norovirus Hu/GI.1/P7-587/2007/Stromstad/Sweden, Norovirus

Hu/GI.2/Leuven/2003/BEL, Norovirus Hu/GII.7/NSW743L/2008/AUS, Norovirus Hu/GII.2/NF2002/USA/2002, Norovirus Hu/GII.4/NF2003/USA/2003, Norovirus Hu/GII.3/1999, Norovirus Hu/GIV.1/Ahrenshoop246/DEU/2012, Norovirus Hu/GII.4/Xi'an/P19/2010/CHN, Norovirus Hu/GII.4/PA363/2011/ITA, Norovirus Hu/GII.4/P3/2012/Gothenburg/Sweden, Norovirus Hu/GII.4/Tanger/TM687/2011/MAR, Norovirus 12-X-2/2012/GII.P22/GII.5, Norovirus Hu/GII.4/Kobe034/2006/JP, Norovirus Hu/GGII.4/Tiel001/1995/NL, Norovirus Hu/GGII.4/DenHaag015/2000/NL, Norovirus Hu/GGII.4/Schiedam018/2001/NL, Norovirus Hu/GGII.4/Apeldoorn023/2003/NL, Norovirus Hu/GGII.4/Middelburg007/2004/NL, Norovirus Hu/GII-4/Matsudo/021071/2002/JP, Norovirus Hu/GII-4/Kaiso/030556/2003/JP, Norovirus Hu/GII-4/Awa/040354/2004/JP, Norovirus Hu/GII.4/Apeldoorn317/2007/NL, Norovirus Hu/GII.2/Rotterdam39E/2002/NL, Norovirus Hu/GII.4/RotterdamP200/2005/NL, Norovirus Hu/GII.4/Stockholm/19865/2008/SE, Norovirus Hu/GII.6/OC04062VLP/2004/JP, Norovirus Hu/GII.4/HS194/2009/US, Norovirus Hu/GII.12/HS210/2010/USA, Norovirus Hu/GI.1/8FIIa/1968/USA, Norovirus Hu/GII.4/CHDC5191/1974/USA, Norovirus Hu/GII.4/N76/2010/HuZhou, Norovirus Hu/GII.6/S9c/1976/SEN, Norovirus Hu/GII.4/KL45/1978/MYS, Norovirus Hu/GII.4/NIHIC17.5/2012/USA, Norovirus Hu/GII.4/NIHIC9/2011/USA, Norovirus Hu/GII.4/C110/1978/GUF, Norovirus Hu/GII.4/HS66/2001/USA, Norovirus Hu/GII/JP/2015/GII.P17_GII.17/Kawasaki308, Norovirus Hu/GII/JP/2014/GII.P17_GII.17/Nagano8-1, Norovirus Hu/GII/JP/2015/GII.Pe_GII.4/Osaka/OSF78, Norovirus GI/Hu/NL/2011/GI.4/Groningen, Norovirus GII/Hu/NL/2014/GII.4/Groningen01, Norovirus Hu/GII.4/Kenepuru/NZ327/2006/NZL, Norovirus Hu/GII.4/Rathmines/NSW287R/2007/AUS, Norovirus Hu/GII.4/Turramurra/NSW892U/2009/AUS, Norovirus Hu/GII.4/Seoul/0389/2009/KOR, Norovirus Hu/GII.4/Seoul/0945/2009/KOR, Norovirus Hu/GII.12/Shelby/2009/USA, Norovirus Hu/GI.7/TCH-060/USA/2003, Norovirus Hu/GII.1/Ascension208/2010/USA, Norovirus Hu/GII.13/VA173/2010/USA, Norovirus Hu/GII.21/Salisbury150/2011/USA, Norovirus Hu/GII.4/1997/USA, Norovirus Hu/GII.4/Farmington Hills/2004/USA, Norovirus Hu/GII.4/Minerva/2006/USA, Norovirus Hu/GII.4/Ohio/71/2012/USA, Norovirus Hu/GII.4/AlbertaE1065/2011/CA, Norovirus Hu/GII.4/SG4051-09/2009/SG, Norovirus Hu/GII.3/TCH-104/USA/2002, Norovirus Hu/GI.6/TCH-099/USA/2003, Norovirus 06-AM-11/2006/GII.4/Yerseke/2006a, Norovirus 09-BI-2/2009/GII.4/NewOrleans/2009, Norovirus Hu/GII.4/PR328/2013/ITA, Norovirus Hu/GII.P17_GII.17/PR668/2015/ITA, Norovirus Hu/GII.4/AlbertaSP1/2013/CA, Norovirus Hu/GII.4/C00007892/2011/UK, Norovirus Hu/GII.6/GZ2010-L96/Guangzhou/CHN/2011, Norovirus Bo/GIII.1/Aba-Z5/2002/HUN, Norovirus GI.9, Norovirus Hu/GII.17/CUHK-NS-670/HKG/2015, Norovirus GII/Hu/SI/2015/GII.17/Ljubljana1662, Norovirus Hu/GII.17/CUHK-NS-647/HKG/2015, Norovirus Hu/GII.21/CUHK-NS-609/HKG/2015, Norovirus Hu/GII.4/Melbourne6623/2016/AUS, Norovirus GII/Hu/JP/2016/GII.P16_GII.4_ Sydney2012/OH16002, Norovirus Hu/GII/JP/2016/GII.P16_GII.4_ Sydney2012/Kawasaki194, Norovirus 16F2149_GII.2_Guangdong_CHN_2016, Norovirus Hu/GII.17/CUHK-NS-864/HKG/2016, Norovirus GII/Hu/ZAF/2012/GII.P4_GII.4/ CapeTown/9772, Norovirus GII.12, Snow Mountain virus, Human calicivirus strain Melksham.

Preferred examples of Noroviruses which may be used for providing the nucleic acid molecules of the invention are provided in Table 1 (Column 6 "Strain/Isolate"). Even more preferred examples of Noroviruses which may be used for providing the nucleic acid molecules of the invention are provided in Table 3 (Column 1 "Strain/Isolate").

The nucleic acid and corresponding amino acid sequences of each are all incorporated by reference in their entirety. In some embodiments, a cryptogram can be used for identification purposes and is organized: host species from which the virus was isolated/genus abbreviation/species abbreviation/strain name/year of occurrence/country of origin. (Green et al., Human Caliciviruses, in Fields Virology Vol. I 841-874 (Knipe and Howley, editors-in-chief, 4th ed., Lippincott Williams & Wilkins 2001)). Use of a combination of Norovirus genogroups such as a genogroup I.1 (Norwalk virus) and II.4 (f.e. Houston virus) or other commonly circulating strains, or synthetic constructs representing combinations or portions thereof are preferred in some embodiments. New strains of Noroviruses are routinely identified (Centers for Disease Control, Morbidity and Mortality Weekly Report, 56(33):842-846 (2007)) and consensus sequences of two or more viral strains may also be used to express Norovirus antigens.

In some embodiments described herein, the at least one polypeptide encoded by the at least one coding region of the artificial nucleic acid may consist of an individual Norovirus protein, the amino acid sequence of which does typically not comprise an N-terminal methionine residue. It is thus understood that the phrase "polypeptide consisting of Norovirus protein ..." relates to a polypeptide comprising the amino acid sequence of said Norovirus protein and – if the amino acid sequence of the respective Norovirus protein does not comprise such an N-terminal methionine residue – an N-terminal methionine residue.

Norovirus sequences:

According to a preferred embodiment, the inventive artificial nucleic acid comprises at least one coding region encoding at least one polypeptide comprising or consisting of at least one Norovirus protein as described herein, wherein the at least one Norovirus protein comprises an amino acid sequence according to any one of SEQ ID NOs: 1-4410, or a fragment or variant of any of these sequences.

In one embodiment, the term "sequence", "sequence of the invention", "artificial nucleic acid" or "artificial nucleic acid of the invention" refers to any one of SEQ ID NOs: 1–39690, 39713-39746.

In a further embodiment, the artificial nucleic acid of the invention comprises at least one encoded polypeptide comprising

(i) at least one of the amino acid sequences according to any one of SEQ ID NOs: 1–4410; and/or

(ii) at least one of the amino acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% sequence identity to the amino acid sequence represented by any one of SEQ ID NOs: 1-4410; and/or

(iii) an orthologue or a paralogue of any one of SEQ ID NOs: 1-39690, 39713-39746; and/or a fragment or variant of any of these sequences.

In another embodiment the artificial nucleic acid of the invention comprises at least one coding region comprising

(i) at least one of the nucleic acid sequences according to any one of SEQ ID NOs: 4411-39690, 39713-39746; and/or

(ii) at least one of the nucleic acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% sequence identity to the nucleic acid sequence represented by any one of SEQ ID NOs: 4411-39690, 39713-39746; and/or

(iii) at least one complement of the nucleic acid sequences which are capable of hybridizing with a nucleic acid sequence comprising a sequence as shown in SEQ ID NOs: 4411-39690, 39713-39746, and/or to a nucleic acid encoding a polypeptide having a sequence as shown in SEQ ID NOs: 1-4410, and/or

(iv) an orthologue or a paralogue of any one of SEQ ID NOs: 1-39690, 39713-39746; and/or a fragment or variant of any of these sequences.

In the context of the present invention a fragment of a protein or a variant thereof encoded by the at least one coding sequence of the artificial nucleic acid according to the invention may typically comprise an amino acid sequence having a sequence identity of at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99%, preferably of at least 70%, more preferably of at least 80%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with an amino acid sequence of the respective naturally occurring full-length protein or a variant thereof, preferably as disclosed in Table 1, column 1, column 2 or column 3, more preferably as disclosed in Table 3, column 1, column 2, column 3.

In a preferred embodiment, the at least one coding sequence of the artificial nucleic acid sequence according to the invention preferably encodes Norovirus proteins selected from the proteins provided in Table 1, or a fragment or variant thereof. Any Norovirus protein provided in Table 1, or any a fragment or variant thereof, can cause an immune response when administered to an individual. Therefore, all Norovirus proteins provided in Table 1 and Table 3 can be considered as preferred Norovirus antigens in the context of the present invention.

It is further preferred that the at least one coding sequence of the artificial nucleic acid sequence of the present invention encodes a Norovirus protein or peptide, or a fragment or variant thereof, wherein the Norovirus protein or peptide is an antigen selected from the antigens listed in Table 1. Therein, each row (row 1 – row 4410) corresponds to a Norovirus protein or antigen as identified by the respective gene name (first column, column 1 "Name") and the database accession number of the corresponding protein (second column, column 2 "NCBI or Genbank Accession No."). The third column, column 3 ("A") in Table 1 indicates the SEQ ID NOs corresponding to the respective amino acid sequence as provided herein. The SEQ ID NOs corresponding to the nucleic acid sequence of the wild type nucleic acid sequence encoding the Norovirus protein or peptide is indicated in the fourth column, column 4 ("B"). The fifth column, column 5 ("C") provides the SEQ ID NOs corresponding to modified nucleic acid sequences of the nucleic acid sequences as described herein that encode the Norovirus protein or peptide preferably having the

amino acid sequence as defined by the SEQ ID NOs indicated in the third column ("A") or by the database entry indicated in the second column ("NCBI or Genbank Accession No.").

In this context it is further preferred that the at least one coding sequence of the artificial nucleic acid sequence of the present invention encodes at least one Norovirus protein or peptide which is derived from Norovirus polyprotein, or a fragment or variant thereof, wherein the Norovirus polyprotein is selected from the Norovirus polyprotein amino acid sequences listed in Table 1. Therein, each row corresponds to a Norovirus polyprotein as identified by the respective gene name (first column "Name", derived from NCBI or Genbank) and the database accession number of the corresponding protein (second column "NCBI or Genbank Accession No."). The third column ("A") in Table 1 indicates the SEQ ID NOs corresponding to the respective amino acid sequence as provided herein. The SEQ ID NOs corresponding to the nucleic acid sequence of the wild type nucleic acid encoding the Norovirus protein or peptide is indicated in the fourth column ("B"). The fifth column ("C") provides the SEQ ID NOs corresponding to modified nucleic acid sequences of the nucleic acids as described herein that encode the Norovirus protein or peptide preferably having the amino acid sequence as defined by the SEQ ID NOs indicated in the third column ("A") or by the database entry indicated in the second column ("NCBI or Genbank Accession No.").

Particularly preferred in this context are the Norovirus polyprotein and nucleic acid sequences according to SEQ ID NOs: 39713-39746.

In specific embodiments the Norovirus protein or peptide is derived from a Norovirus capsid protein VP1 according to SEQ ID NOs: 1-4410.

In this context it is further preferred that the at least one coding sequence of the artificial nucleic acid sequence of the present invention encodes at least one Norovirus protein or peptide which is derived from Norovirus capsid protein VP1, or a fragment or variant thereof, wherein the Norovirus capsid protein VP1 is selected from the Norovirus capsid protein VP1 amino acid sequences listed in Table 1. Therein, each row corresponds to a Norovirus capsid protein VP1 as identified by the respective gene name (first column "Name") and the database accession number of the corresponding protein (second column "NCBI or Genbank Accession No"). The third column ("A") in Table 1 indicates the SEQ ID NOs corresponding to the respective amino acid sequence as provided herein. The SEQ ID NOs corresponding to the nucleic acid sequence of the wild type RNA encoding the Norovirus antigen is indicated in the fourth column ("B"). The fifth column ("C") provides the SEQ ID NOs corresponding to modified nucleic acid sequences of the RNAs as described herein that encode the Norovirus antigen preferably having the amino acid sequence as defined by the SEQ ID NOs indicated in the third column ("A") or by the database entry indicated in the second column ("NCBI or Genbank Accession No").

According to a preferred embodiment, the inventive artificial nucleic acid comprises or consists of at least one coding sequence encoding at least one Norovirus protein or peptide as described herein. Preferably, the inventive artificial nucleic acid comprises

or consists of a coding sequence according to any one of SEQ ID NOs: 4411-39690, 39713-39746, or a homolog, fragment or variant of any of these sequences (see Table 1, column "B" and "C").

Accordingly, in another embodiment, a nucleic acid molecule of the invention is at least 15, 20, 25 or 30 nucleotides in length. Preferably, it hybridizes under stringent conditions to a nucleic acid molecule comprising a nucleotide sequence of the nucleic acid molecule of the present invention or used in the methods of the present invention. The nucleic acid molecule is preferably at least 20, 30, 50, 100, 250 or more nucleotides in length.

In a preferred embodiment, the present invention thus provides artificial nucleic acid sequences comprising at least one coding sequence, wherein the coding sequence encoding Norovirus capsid protein VP1 comprises or consists any one of the nucleic acid sequences defined in Table 1, preferably in the fourth or fifth column (column "B" or "C", respectively) of Table 1, or a fragment or variant of any one of these sequences.

In particularly preferred embodiments the nucleic acid sequence comprises or consists of at least one coding sequence encoding Norovirus capsid protein VP1 according to SEQ ID NOs: 4411-39690, 39713-39746.

In these context it is particularly preferred that the nucleic acid sequence according to the invention comprises at least one coding sequence encoding Norovirus capsid protein VP1 comprising a nucleic acid sequence selected from sequences being identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to the nucleic acid sequences as disclosed in Table 1, preferably in the fourth or fifth column (column "B" or "C", respectively) of Table 1 or a fragment or variant thereof.

According to a particularly preferred embodiment, the present invention provides an nucleic acid sequence as defined herein comprising at least one coding sequence encoding at least one Norovirus peptide or protein derived from Norovirus capsid protein VP1, wherein the coding sequence comprises or consists of any one of the (modified) nucleic acid sequences defined in the Column "C" of Table 1, or of a fragment or variant of any one of these sequences.

According to a preferred embodiment, the inventive artificial nucleic acid comprises or consists of at least one coding sequence encoding at least one Norovirus protein or peptide as described herein, wherein the at least one Norovirus protein comprises an amino acid sequence according to any one of SEQ ID NOs: 1-4410, or a homolog, fragment or variant of any of these sequences (see Table 1, third column, column "A"). According to a preferred embodiment, the inventive artificial nucleic acid comprises at least one coding sequence encoding at least one protein or peptide derived from a Norovirus, or a fragment or variant thereof, wherein the Norovirus protein or peptide preferably comprises or consists of any one of the amino acid sequences defined in the third column (column "A") of Table 1, or a fragment or variant of any one of these sequences. In other words, the at least one coding sequence preferably encodes a Norovirus protein comprising or consisting of an amino acid sequence selected from the group consisting of SEQ ID NOs: 1-4410.

In a further preferred embodiment, the at least one coding sequence of the nucleic acid sequence according to the invention comprises or consists of an nucleic acid sequence identical to or having a sequence identity of at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99%, preferably of at least 70%, more preferably of at least 80%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with any one of the (G/C modified) RNA sequences defined in the fifth column (column "C") of Table 1, or of a fragment or variant of any one of these sequences.

In a further preferred embodiment, the at least one coding sequence of the nucleic acid sequence according to the invention comprises or consists of an nucleic acid sequence identical to or having a sequence identity of at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99%, preferably of at least 70%, more preferably of at least 80%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with any one of the (human codon usage adapted) RNA sequences defined in the fifth column (column "C") of Table 1, or of a fragment or variant of any one of these sequences.

According to a particularly preferred embodiment, the at least one coding sequence of the RNA sequence according to the invention comprises or consists of an nucleic acid sequence having a sequence identity of at least 80% with any one of the (human codon usage adapted) RNA sequences defined in the fifth column (column "C") of Tables 1, or of a fragment or variant of any one of these sequences.

According to a particularly preferred embodiment, the present invention provides an nucleic acid sequence as defined herein comprising at least one coding sequence encoding at least one Norovirus peptide or protein derived from Norovirus capsid protein VP1, wherein the coding sequence comprises or consists of any one of the (human codon usage adapted) RNA sequences defined in the fifth column (column "C") of Table 1, or of a fragment or variant of any one of these sequences.

Norovirus peptide or protein derived from Norovirus capsid protein VP1, wherein the coding sequence comprises or consists of any one of the (codon optimized) RNA sequences defined in the fifth column (column "C") of Table 1, or of a fragment or variant of any one of these sequences.

Accordingly, in another embodiment, a nucleic acid molecule of the invention is at least 15, 20, 25 or 30 nucleotides in length. Preferably, it hybridizes under stringent conditions to a nucleic acid molecule comprising a nucleotide sequence of the nucleic acid molecule of the present invention or used in the methods of the present invention, e.g. comprising the sequence shown in SEQ ID NOs: 4411-39690, 39713-39746. The nucleic acid molecule is preferably at least 20, 30, 50, 100, 250 or more nucleotides in length.

In one embodiment of the invention, a complement sequence derived from SEQ ID NOs: 4411-39690, 39713-39746, or a fragment or variant thereof is used in the hybridization. Preferably, a complement of a nucleic acid molecule of the invention that hybridizes under stringent conditions to a sequence shown in SEQ ID NOs: 4411-39690, 39713-39746 correspond to a naturally-occurring nucleic acid molecule of the invention. As used herein, a "naturally-occurring" nucleic acid molecule refers to an RNA or DNA molecule having a nucleotide sequence that occurs in nature (e.g., encodes a natural protein).

In a further preferred embodiment, the at least one coding sequence of the nucleic acid sequence according to the invention comprises or consists of an nucleic acid sequence identical to or having a sequence identity of at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99%, preferably of at least 70%, more preferably of at least 80%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with any one of the (codon optimized) RNA sequences defined in the fifth column 5 (column "C") of Table 1, or of a fragment or variant of any one of these sequences.

In the context of the present invention, a "fragment" of an amino acid sequence, such as a polypeptide or a protein, e.g. the at least one Norovirus protein as described herein, may typically comprise a sequence of a protein or peptide as defined herein, which is, with regard to its amino acid sequence (or the respective coding nucleic acid molecule), N-terminally and/or C-terminally truncated compared to the amino acid sequence of the original (native) protein (or respective coding nucleic acid molecule). Such truncation may thus occur either on the amino acid level or correspondingly on the nucleic acid level. A sequence identity with respect to such a fragment as defined herein may therefore preferably refer to the entire protein or peptide as defined herein or to the entire (coding) nucleic acid molecule of such a protein or peptide.

Preferably, a fragment of an amino acid sequence comprises or consists of a continuous stretch of amino acid residues corresponding to a continuous stretch of amino acid residues in the protein the fragment is derived from, which represents at least 5%, 10%, 20%, preferably at least 30%, more preferably at least 40%, more preferably at least 50%, even more preferably at least 60%, even more preferably at least 70%, and most preferably at least 80% of the total (i.e. full-length) protein, from which the fragment is derived.

In the context of the present invention, a fragment of a protein or of a peptide may furthermore comprise a sequence of a protein or peptide as defined herein, which has a length of for example at least 5 amino acids, preferably a length of at least 6 amino acids, preferably at least 7 amino acids, more preferably at least 8 amino acids, even more preferably at least 9 amino acids; even more preferably at least 10 amino acids; even more preferably at least 11 amino acids; even more preferably at least 12 amino acids; even more preferably at least 13 amino acids; even more preferably at least 14 amino acids; even more preferably at least 15 amino acids; even more preferably at least 16 amino acids; even more preferably at least 17 amino acids; even more preferably at least 18 amino acids; even more preferably at least 19 amino acids; even more preferably at least 20 amino acids; even more preferably at least 25 amino acids; even more preferably at least 30 amino acids; even more preferably at least 35 amino acids; even more preferably at least 50 amino acids; or most preferably at least 100 amino acids. For example such

fragment may have a length of about 6 to about 20 or even more amino acids, e.g. fragments as processed and presented by MHC class I molecules, preferably having a length of about 8 to about 10 amino acids, e.g. 8, 9, or 10, (or even 6, 7, 11, or 12 amino acids), or fragments as processed and presented by MHC class II molecules, preferably having a length of about 13 or more amino acids, e.g. 13, 14, 15, 16, 17, 18, 19, 20 or even more amino acids, wherein these fragments may be selected from any part of the amino acid sequence. These fragments are typically recognized by T-cells in form of a complex consisting of the peptide fragment and an MHC molecule, i.e. the fragments are typically not recognized in their native form. Fragments of proteins or peptides may comprise at least one epitope of those proteins or peptides. Furthermore also domains of a protein, like the extracellular domain, the intracellular domain or the transmembrane domain and shortened or truncated versions of a protein may be understood to comprise a fragment of a protein.

As used herein, a "variant" of a protein or a peptide may be generated, having an amino acid sequence, which differs from the original sequence in one or more mutation(s), such as one or more substituted, inserted and/or deleted amino acid(s). Preferably, these fragments and/or variants have the same biological function or specific activity compared to the full-length native protein, e.g. its specific antigenic property. "Variants" of proteins or peptides as defined in the context of the present invention may comprise conservative amino acid substitution(s) compared to their native, i.e. non-mutated physiological, sequence. Those amino acid sequences as well as their encoding nucleotide sequences in particular fall under the term variants as defined herein. Substitutions in which amino acids, which originate from the same class, are exchanged for one another are called conservative substitutions. In particular, these are amino acids having aliphatic side chains, positively or negatively charged side chains, aromatic groups in the side chains or amino acids, the side chains of which can enter into hydrogen bridges, e.g. side chains which have a hydroxyl function. This means that e.g. an amino acid having a polar side chain is replaced by another amino acid having a likewise polar side chain, or, for example, an amino acid characterized by a hydrophobic side chain is substituted by another amino acid having a likewise hydrophobic side chain (e.g. serine (threonine) by threonine (serine) or leucine (isoleucine) by isoleucine (leucine)). Insertions and substitutions are possible, in particular, at those sequence positions which cause no modification to the three-dimensional structure or do not affect the binding region. Modifications to a three-dimensional structure by insertion(s) or deletion(s) can easily be determined e.g. using CD spectra (circular dichroism spectra) (Urry, 1985, Absorption, Circular Dichroism and ORD of Polypeptides, in: Modern Physical Methods in Biochemistry, Neuberger et al. (ed.), Elsevier, Amsterdam).

In the context of the present invention, a "variant" of a protein or peptide may have at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% amino acid identity over a stretch of at least 10, at least 20, at least 30, at least 50, at least 75 or at least 100 amino acids of such protein or peptide. More preferably, a "variant" of a protein or peptide as used herein is at least 40%, preferably at least 50%, more preferably at least 60%, more preferably at least 70%, even more preferably at least 80%, even more preferably at least 90%, most preferably at least 95% identical to the protein or peptide, from which the variant is derived.

Alternatively or additionally, a protein of the invention, a capsid protein, a Norovirus capsid protein VP1 or a Norovirus capsid protein VP2 as defined herein refers to any polypeptide being identical or having in increasing order of preference at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% or more amino acid sequence identity to the protein of the invention, a capsid protein, a Norovirus capsid protein VP1 or a Norovirus capsid protein VP2 as represented by SEQ ID NOs: 1-4410, or to any of the full length polypeptide sequences given in SEQ ID NOs: 1-4410.

Furthermore, variants of proteins or peptides as defined herein, which may be encoded by a nucleic acid, may also comprise those sequences, wherein nucleotides of the encoding nucleic acid sequence are exchanged according to the degeneration of the genetic code, without leading to an alteration of the respective amino acid sequence of the protein or peptide, i.e. the amino acid sequence or at least part thereof may not differ from the original sequence in one or more mutation(s) within the above meaning.

According to a preferred embodiment, the at least one coding region of the inventive artificial nucleic acid comprises or consists of at least one nucleic acid sequence according to any one of SEQ ID NOs: 4411-39690, 39713-39746, or a fragment or variant of any of these sequences.

As used herein, a "fragment" of a nucleic acid sequence comprises or consists of a continuous stretch of nucleotides corresponding to a continuous stretch of nucleotides in the full-length nucleic acid sequence which is the basis for the nucleic acid sequence of the fragment, which represents at least 20%, preferably at least 30%, more preferably at least 40%, more preferably at least 50%, even more preferably at least 60%, even more preferably at least 70%, even more preferably at least 80%, and most preferably at least 90% of the full-length nucleic acid sequence. Such a fragment, in the sense of the present invention, is preferably a functional fragment of the full-length nucleic acid sequence.

In the context of the present invention, the phrase "variant of a nucleic acid sequence" typically relates to a variant of a nucleic acid sequence, which forms the basis of a nucleic acid sequence. For example, a variant nucleic acid sequence may exhibit one or more nucleotide deletions, insertions, additions and/or substitutions compared to the nucleic acid sequence, from which the variant is derived. Preferably, a variant of a nucleic acid sequence is at least 40%, preferably at least 50%, more preferably at least 60%, more preferably at least 70%, even more preferably at least 80%, even more preferably at least 90%, most preferably at least 95% identical to the nucleic acid sequence the variant is derived from. Preferably, the variant is a functional variant. A "variant" of a nucleic acid sequence may have at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% nucleotide identity over a stretch of at least 10, at least 20, at least 30, at least 50, at least 75 or at least 100 nucleotides of such nucleic acid sequence.

Alternatively or additionally, a nucleic acid sequence encoding a protein of the invention, a capsid protein, a Norovirus capsid protein VP1 or a Norovirus capsid protein VP2 as defined herein refers to any nucleic acid sequence having in increasing order of preference at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% or more sequence identity to the nucleic acid sequence as represented by SEQ ID NOs: 4411-39690, 39713-39746, or to any of the full length polypeptide sequences given in SEQ ID NOs: 1-4410.

Preferably, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of Norovirus capsid protein VP1, or a fragment or variant thereof. More preferably, the at least one encoded polypeptide comprises or consists of an amino acid sequence according to any one of SEQ ID NOs: 1-4410, or a fragment or variant of any of these sequences.

Alternatively or additionally, a nucleic acid sequence encoding a Norovirus capsid protein VP1 as defined herein refers to any nucleic acid sequence being identical or having in increasing order of preference at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% or more sequence identity to the full-length nucleic acid sequence as represented by SEQ ID NOs: 4411-39690, 39713-39746.

In certain embodiments, the at least one encoded polypeptide comprises or consists of a fragment of Norovirus capsid protein VP1 or a variant of such a fragment. Preferably, the at least one encoded polypeptide comprises or consists of a C-terminal fragment of Norovirus capsid protein VP1, or a variant of such a fragment. In another embodiment, the at least one encoded polypeptide comprises or consists of an N-terminal fragment of Norovirus capsid protein VP1, or a variant of such a fragment.

Preferably, the at least one encoded polypeptide comprises or consists of a fragment, preferably a C-terminal fragment, or a variant of such a fragment, of a Norovirus capsid protein VP1 as present in a Norovirus polyprotein (precursor protein) before cleavage. In the context of the present invention, the phrase "Norovirus capsid protein VP1 as present in a Norovirus polyprotein before cleavage" typically refers to a continuous amino acid sequence beginning at the N-terminus of a Norovirus polyprotein (before cleavage) and comprising the amino acid residue immediately N-terminal of the first amino acid residue of a precursor of Norovirus pr protein as present in the Norovirus polyprotein. In other words, the phrase "Norovirus capsid protein VP1 as present in a Norovirus polyprotein before cleavage" may refer to a part of a Norovirus polyprotein corresponding to Norovirus capsid protein VP1 comprising a C-terminal fragment, preferably a C-terminal signal sequence, which is typically not present in mature Norovirus protein VP1. For example, a 'Norovirus capsid protein VP1 as present in a Norovirus polyprotein before cleavage' as used herein may comprise an amino acid sequence derived from an amino acid sequence corresponding to amino acid residues 1 to 122 of a Norovirus polyprotein before cleavage. According to a preferred embodiment, a Norovirus capsid protein VP1 as

present in a Norovirus polyprotein before cleavage comprises an amino acid sequence according to any one of SEQ ID NOs: 1-4410, or a fragment or variant of any of these sequences.

Hence, a "C-terminal fragment, or a variant of such a fragment, of Norovirus capsid protein VP1 as present in a Norovirus polyprotein (precursor protein) before cleavage" preferably comprises an amino acid sequence corresponding to a continuous amino acid sequence, which is located immediately N-terminal of Norovirus pr protein in a Norovirus polyprotein before cleavage, or to a fragment or variant of said amino acid sequence. Preferably, the C-terminal fragment, or a variant of such a fragment, of Norovirus capsid protein VP1 as present in a Norovirus polyprotein (precursor protein) before cleavage comprises or consists of at least 3, 4, 5, 6, 7, 8, 9, or, most preferably, at least 10 amino acid residues. Alternatively, the C-terminal fragment, or a variant of such a fragment, of Norovirus capsid protein VP1 as present in a Norovirus polyprotein (precursor protein) before cleavage may consist of 3 to 40, 3 to 30, 3 to 20, 5 to 20 or 10 to 20 amino acid residues.

According to a preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of at least one amino acid sequence derived from a signal sequence, or a fragment or variant thereof.

As used herein, the term "signal sequence" preferably refers to an amino acid sequence, which is involved in the targeting of a protein, e.g. a Norovirus protein, to a cellular compartment, preferably a membrane, more preferably a membrane of the endoplasmic reticulum (ER). A signal sequence in the context of the present invention preferably comprises from 3 to 40, 3 to 30, 3 to 20, 5 to 20 or 10 to 20 amino acid residues. Such a signal sequence may be present, for example, in a Norovirus polyprotein and may be removed during processing of said polyprotein. A signal sequence is preferably no longer present in a mature Norovirus protein. For example, Norovirus capsid protein VP1 as present in a Norovirus polyprotein typically comprises a C-terminal signal sequence, corresponding to the amino acid sequence immediately N-terminal of Norovirus pr protein (e.g. amino acid residues 105 to 122 in a Norovirus polyprotein before cleavage). That signal sequence is involved in targeting Norovirus capsid protein VP1 to the ER membrane and is typically removed in order to yield mature Norovirus capsid protein VP1, which no longer comprises said C-terminal fragment comprising a signal sequence.

Preferably, the amino acid sequence derived from a signal sequence, or a fragment or variant thereof, comprises at least 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 or at least 20 amino acid residues. Alternatively, the amino acid sequence derived from a signal sequence, or a fragment or variant thereof may consist of 3 to 40, 3 to 30, 3 to 20, 5 to 20 or 10 to 20 amino acid residues. Most preferably, the amino acid sequence derived from a signal sequence, or a fragment or variant thereof consists of from 3 to 20 amino acid residues.

In a preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of at least one amino acid sequence derived from a signal sequence, which comprises or consists of an amino acid sequence that is bound by signal recognition particle (SRP). More preferably, the at least one amino

acid sequence derived from a signal sequence comprises or consists of an amino acid sequence that is recognized by signal peptide peptidase (SPP), by a viral protease and/or by furin or a furin-like protease. Most preferably, the at least one amino acid sequence derived from a signal sequence comprises an amino acid sequence that is recognized by a viral protease comprising one or more of a Norovirus non-structural protein selected from the group consisting of NS1/NS2, NS3, NS4, NS5, NS6, and NS7.

In a preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of at least one amino acid sequence derived from a signal sequence of a secretory protein or from a signal sequence of a membrane protein. More preferably, the at least one amino acid sequence derived from a signal sequence, preferably derived from a signal sequence of a membrane protein, targets the at least one encoded protein to a cellular compartment, preferably to the endoplasmic reticulum (ER), more preferably to the ER membrane.

It is further preferred that the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of an amino acid sequence corresponding to a signal sequence from a Norovirus protein, preferably from Norovirus capsid protein VP1, more preferably from Norovirus capsid protein VP1 as present in a Norovirus polyprotein before cleavage, or a fragment or variant of any of these.

According to a preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of an amino acid sequence corresponding to a signal sequence from Norovirus capsid protein VP1 as present in a Norovirus polyprotein before cleavage, or a fragment or variant thereof, wherein the signal sequence is preferably derived from a C-terminal fragment of Norovirus capsid protein VP1 as present in a Norovirus polyprotein before cleavage, preferably as described herein.

According to another preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of a fragment, preferably a C-terminal fragment, or a variant of such a fragment, of a mature Norovirus protein, preferably of a mature Norovirus capsid protein VP1. In this context, it is preferred that the mature Norovirus protein is a mature Norovirus protein as defined herein.

According to a preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of a fragment, preferably a C-terminal fragment, or a variant of such a fragment, of mature Norovirus capsid protein VP1, wherein the mature Norovirus capsid protein VP1 does preferably not comprise a C-terminal signal sequence as described herein with respect to a Norovirus capsid protein VP1 as present in a Norovirus polyprotein (before cleavage). More preferably, the mature Norovirus capsid protein VP1 comprises or consists of an amino acid sequence according to any one of SEQ ID NOs: 1-4410, or a fragment or variant thereof.

Preferably, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of a C-terminal fragment, preferably as defined herein, or a variant of such a fragment, of mature Norovirus capsid protein VP1.

Preferably, the C-terminal fragment, or a variant of such a fragment, of mature Norovirus capsid protein VP1 comprises or consists of at least 3, 4, 5, 6, 7, 8, 9, or, most preferably, at least 10 amino acid residues. Alternatively, the C-terminal fragment, or a variant of such a fragment, of mature Norovirus capsid protein VP1 may comprise or consist of 3 to 40, 3 to 30, 3 to 20, 3 to 10, 5 to 20 or 10 to 20 amino acid residues.

According to another embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of an amino acid sequence derived from a

a) a C-terminal fragment, or a variant of such a fragment, of a mature Norovirus capsid protein VP1, preferably as defined herein

and

b) a C-terminal fragment, or a variant of such a fragment, of Norovirus capsid protein VP1 as present in a Norovirus polyprotein (precursor protein) before cleavage, preferably as defined herein; or
a signal sequence, or a fragment or variant thereof, preferably as defined herein.

Therein, the amino acid sequence according to a) may be in continuation with the amino acid sequence according to b), wherein the sequences may be positioned relative to each other in any manner. Alternatively, the amino acid sequences according to a) and b) may be separated in the at least one encoded protein by another amino acid sequence. Most preferably, the amino acid sequence according to a) is located N-terminally with respect to b).

According to a preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of at least one amino acid sequence corresponding to a fragment of Norovirus non-structural protein 1 (NS1/2), or a variant of such a fragment.

As used herein, the term "fragment of Norovirus non-structural protein 1 (NS1/2)" preferably relates to a continuous amino acid sequence derived from Norovirus non-structural protein 1 (NS1/2), or to a fragment or variant of said continuous amino acid sequence.

Preferably, the fragment, or variant thereof, of Norovirus non-structural protein 1 (NS1/2) comprises or consists of at least 3, 4, 5, 6, 7, 8, 9, or, most preferably, at least 10 amino acid residues. Alternatively, the fragment, or variant thereof, of Norovirus non-structural protein 1 (NS1/2) may comprise or consist of 3 to 40, 3 to 30, 3 to 20, 3 to 10, 5 to 20 or 10 to 20 amino acid residues. Most preferably, the fragment, or variant thereof, of Norovirus non-structural protein 1 (NS1/2) comprises or consists of from 3 to 20 amino acid residues.

In a preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of at least one amino acid sequence corresponding to an N-terminal fragment of Norovirus non-structural protein 1 (NS1/2), or a variant of said fragment.

In the context of the present invention, the term "N-terminal fragment of Norovirus non-structural protein 1 (NS1/2)" relates to a continuous amino acid sequence derived from the N-terminus of Norovirus non-structural protein 1 (NS1/2). More preferably, the N-terminal fragment of Norovirus non-structural protein 1 (NS1/2) comprises or consists of from 3 to 20 amino acid residues. In a preferred embodiment, the at least one encoded polypeptide comprises an N-terminal fragment of Norovirus non-structural protein 1 (NS1/2), wherein the N-terminal fragment of Norovirus non-structural protein 1 (NS1/2) is a continuous amino acid sequence comprising or consisting of 3 to 20 amino acid residues corresponding to a continuous amino acid sequence of 3 to 20 amino acid residues in the first 20 amino acid residues (counting from the N-terminus) of Norovirus non-structural protein 1 (NS1/2), or a variant thereof.

In one embodiment, the at least one encoded polypeptide comprises or consists of an N-terminal fragment of Norovirus non-structural protein 1 (NS1/2), wherein the N-terminal fragment of Norovirus non-structural protein 1 (NS1/2) is a continuous amino acid sequence comprising or consisting of 3 to 20 amino acid residues corresponding to a continuous amino acid sequence of 3 to 20 amino acid residues in the first 20 amino acid residues (counting from the N-terminus) of a mature Norovirus non-structural protein 1 (NS1/2), or a variant thereof. Therein, the first 20 amino acid residues of a mature Norovirus non-structural protein 1 (NS1/2) preferably comprise or consist of the N-terminus itself (i.e. the amino acid residue at the N-terminus) and the 19 following amino acid residues.

In a preferred embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises a first Norovirus protein, which is preferably a Norovirus protein as described herein, or a fragment or variant thereof, and further comprises at least one second or further Norovirus protein, or a fragment or variant thereof, wherein the at least one second or further Norovirus protein, or the fragment or variant thereof, is distinct from the first Norovirus protein, or the fragment or variant thereof.

In that embodiment, the first Norovirus protein is preferably selected from the group consisting of Norovirus NS1/NS2, NS32A, NS42B, NS53, NS64A, NS4B or NS75, or a fragment or variant thereof. Preferably, the second or further Norovirus protein is selected from the group consisting of Norovirus capsid protein VP1, Norovirus capsid protein VP2 and a Norovirus non-structural protein, preferably Norovirus NS1/NS2, NS3, NS4, NS5, NS6, or NS7, or a fragment or variant thereof.

More preferably, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises Norovirus capsid protein VP1 and/or VP2, or a fragment or variant thereof, and further comprises at least one of the following:

a) an amino acid sequence corresponding to a C-terminal fragment, or a variant thereof, of mature Norovirus capsid protein VP1, preferably as described herein;

b) an amino acid sequence corresponding to a C-terminal fragment, or a variant thereof, of Norovirus capsid protein VP1 as present in Norovirus polyprotein before cleavage, preferably as described herein;

c) an amino acid sequence corresponding to an N-terminal fragment, or a variant thereof, of Norovirus non-structural protein 1 (NS1/NS2), preferably as described herein; and/or

d) an amino acid corresponding to a fragment of Norovirus NS1/NS2, NS3, NS4, NS5, NS6, or NS7.

In a further embodiment, the at least one polypeptide encoded by the at least one coding region of the inventive artificial nucleic acid comprises or consists of, preferably in this order from N-terminus to C-terminus, Norovirus capsid protein VP1, or a fragment or variant thereof,
and Norovirus non-structural protein 1 (NS1/NS2), or a fragment or variant thereof.

According to a preferred embodiment, the inventive artificial nucleic acid is monocistronic, bicistronic or multicistronic.

Preferably, the inventive artificial nucleic acid is monocistronic. In that embodiment, the inventive artificial nucleic acid comprises one coding region, wherein the coding region encodes a polypeptide comprising at least two different Norovirus proteins, preferably as defined herein, or a fragment or variant thereof.

Alternatively, the inventive artificial nucleic acid can be bi- or multicistronic and comprises at least two coding regions, wherein the at least two coding regions encode at least two polypeptides, wherein each of the at least two polypeptides comprises at least one different Norovirus protein, preferably as described herein, or a fragment or variant of any one of these proteins. For example, the inventive artificial nucleic acid may comprise two coding regions, wherein the first coding region encodes a first polypeptide comprising a first Norovirus protein, or a fragment or variant thereof, and wherein the second coding region encodes a second polypeptide comprising a second Norovirus protein, or a fragment or variant thereof, wherein the first and second Norovirus proteins or a fragment or variant thereof are distinct from each other.

The inventive artificial nucleic acid may be provided as DNA or as RNA, preferably an RNA as defined herein. More preferably, the inventive artificial nucleic acid is an artificial mRNA.

The inventive artificial nucleic acid may further be single stranded or double stranded. When provided as a double stranded nucleic acid, the inventive artificial nucleic acid preferably comprises a sense and a corresponding antisense strand.

Preferably, the inventive artificial nucleic acid as defined herein typically comprises a length of about 50 to about 20000, or 100 to about 20000 nucleotides, preferably of about 250 to about 20000 nucleotides, more preferably of about 500 to about 10000, even more preferably of about 500 to about 5000.

Nucleic acid modifications:

According to one embodiment, the inventive artificial nucleic acid as defined herein, may be in the form of a modified nucleic acid, preferably a modified mRNA, wherein any modification, as defined herein, may be introduced into the inventive artificial nucleic acid. Modifications as defined herein preferably lead to a stabilized artificial nucleic acid, preferably a stabilized artificial RNA, of the present invention.

According to one embodiment, the inventive artificial nucleic acid, preferably an mRNA, may thus be provided as a "stabilized nucleic acid", preferably as a "stabilized mRNA", that is to say as a nucleic acid, preferably an mRNA, that is essentially resistant to in vivo degradation (e.g. by an exo- or endo-nuclease). Such stabilization can be effected, for example, by a modified phosphate backbone of an artificial mRNA of the present invention. A backbone modification in connection with the present invention is a modification in which phosphates of the backbone of the nucleotides contained in the mRNA are chemically modified. Nucleotides that may be preferably used in this connection contain e.g. a phosphorothioate-modified phosphate backbone, preferably at least one of the phosphate oxygens contained in the phosphate backbone being replaced by a sulfur atom. Stabilized artificial nucleic acids, preferably mRNAs, may further include, for example: non-ionic phosphate analogues, such as, for example, alkyl and aryl phosphonates, in which the charged phosphonate oxygen is replaced by an alkyl or aryl group, or phosphodiesters and alkylphosphotriesters, in which the charged oxygen residue is present in alkylated form. Such backbone modifications typically include, without implying any limitation, modifications from the group consisting of methylphosphonates, phosphoramidates and phosphorothioates (e.g. cytidine-5'-O-(1-thiophosphate)).

In the following, specific modifications are described, which are preferably capable of "stabilizing" the inventive artificial nucleic acid, preferably an mRNA, as defined herein.

Chemical modifications:

The terms "nucleic acid modification" as used herein may refer to chemical modifications comprising backbone modifications as well as sugar modifications or base modifications.

In this context, a modified artificial nucleic acid, preferably an mRNA, as defined herein may contain nucleotide analogues/modifications, e.g. backbone modifications, sugar modifications or base modifications. A backbone modification in connection with the present invention is a modification, in which phosphates of the backbone of the nucleotides contained in an artificial nucleic acid, preferably an mRNA, as defined herein are chemically modified. A sugar modification in connection with the present invention is a chemical modification of the sugar of the nucleotides of the artificial nucleic acid, preferably an mRNA, as defined herein. Furthermore, a base modification in connection with the present invention is a chemical modification of the base moiety of the nucleotides of the artificial nucleic acid, preferably an mRNA. In this context, nucleotide analogues or modifications are preferably selected from nucleotide analogues, which are applicable for transcription and/or translation.

Sugar Modifications:

The modified nucleosides and nucleotides, which may be incorporated into a modified artificial nucleic acid, preferably an mRNA, as described herein, can be modified in the sugar moiety. For example, the 2' hydroxyl group (OH) can be modified or replaced with a number of different "oxy" or "deoxy" substituents. Examples of "oxy" -2' hydroxyl group modifications include, but are not limited to, alkoxy or aryloxy (-OR, e.g., R = H, alkyl, cycloalkyl, aryl, aralkyl, heteroaryl or sugar); polyethyleneglycols (PEG), -O(CH_2CH_2O)nCH_2CH_2OR; "locked" nucleic acids (LNA) in which the 2' hydroxyl is connected, e.g., by a methylene bridge, to the 4' carbon of the same ribose sugar; and amino groups (-O-amino, wherein the amino group, e.g., NRR, can be alkylamino, dialkylamino, heterocyclyl, arylamino, diarylamino, heteroarylamino, or diheteroaryl amino, ethylene diamine, polyamino) or aminoalkoxy.

"Deoxy" modifications include hydrogen, amino (e.g. NH_2; alkylamino, dialkylamino, heterocyclyl, arylamino, diaryl amino, heteroaryl amino, diheteroaryl amino, or amino acid); or the amino group can be attached to the sugar through a linker, wherein the linker comprises one or more of the atoms C, N, and O.

The sugar group can also contain one or more carbons that possess the opposite stereochemical configuration than that of the corresponding carbon in ribose. Thus, an artificial nucleic acid, preferably an mRNA, can include nucleotides containing, for instance, arabinose as the sugar.

Backbone Modifications:

The phosphate backbone may further be modified in the modified nucleosides and nucleotides, which may be incorporated into a modified artificial nucleic acid, preferably an mRNA, as described herein. The phosphate groups of the backbone can be modified by replacing one or more of the oxygen atoms with a different substituent. Further, the modified nucleosides and nucleotides can include the full replacement of an unmodified phosphate moiety with a modified phosphate as described herein. Examples of modified phosphate groups include, but are not limited to, phosphorothioate, phosphoroselenates, borano phosphates, borano phosphate esters, hydrogen phosphonates, phosphoroamidates, alkyl or aryl phosphonates and phosphotriesters. Phosphorodithioates have both non-linking oxygens replaced by sulfur. The phosphate linker can also be modified by the replacement of a linking oxygen with nitrogen (bridged phosphoroamidates), sulfur (bridged phosphorothioates) and carbon (bridged methylene-phosphonates).

Base Modifications:

The modified nucleosides and nucleotides, which may be incorporated into a modified nucleic acid, preferably an mRNA, as described herein can further be modified in the nucleobase moiety. Examples of nucleobases found in a nucleic acid such as RNA include, but are not limited to, adenine, guanine, cytosine and uracil. For example, the nucleosides and nucleotides described herein can be chemically modified on the major groove face. In some embodiments, the major groove chemical modifications can include an amino group, a thiol group, an alkyl group, or a halo group.

In particularly preferred embodiments of the present invention, the nucleotide analogues/modifications are selected from base modifications, which are preferably selected from 2-amino-6-chloropurineriboside-5'-triphosphate, 2-Aminopurine-riboside-5'-

triphosphate; 2-aminoadenosine-5'-triphosphate, 2'-Amino-2'-deoxycytidine-triphosphate, 2-thiocytidine-5'-triphosphate, 2-thiouridine-5'-triphosphate, 2'-Fluorothymidine-5'-triphosphate, 2'-O-Methyl inosine-5'-triphosphate 4-thiouridine-5'-triphosphate, 5-aminoallylcytidine-5'-triphosphate, 5-aminoallyluridine-5'-triphosphate, 5-bromocytidine-5'-triphosphate, 5-bromouridine-5'-triphosphate, 5-Bromo-2'-deoxycytidine-5'-triphosphate, 5-Bromo-2'-deoxyuridine-5'-triphosphate, 5-iodocytidine-5'-triphosphate, 5-Iodo-2'-deoxycytidine-5'-triphosphate, 5-iodouridine-5'-triphosphate, 5-Iodo-2'-deoxyuridine-5'-triphosphate, 5-methylcytidine-5'-triphosphate, 5-methyluridine-5'-triphosphate, 5-Propynyl-2'-deoxycytidine-5'-triphosphate, 5-Propynyl-2'-deoxyuridine-5'-triphosphate, 6-azacytidine-5'-triphosphate, 6-azauridine-5'-triphosphate, 6-chloropurineriboside-5'-triphosphate, 7-deazaadenosine-5'-triphosphate, 7-deazaguanosine-5'-triphosphate, 8-azaadenosine-5'-triphosphate, 8-azidoadenosine-5'-triphosphate, benzimidazole-riboside-5'-triphosphate, N1-methyladenosine-5'-triphosphate, N1-methylguanosine-5'-triphosphate, N6-methyladenosine-5'-triphosphate, O6-methylguanosine-5'-triphosphate, pseudouridine-5'-triphosphate, or puromycin-5'-triphosphate, xanthosine-5'-triphosphate. Particular preference is given to nucleotides for base modifications selected from the group of base-modified nucleotides consisting of 5-methylcytidine-5'-triphosphate, 7-deazaguanosine-5'-triphosphate, 5-bromocytidine-5'-triphosphate, and pseudouridine-5'-triphosphate.

In some embodiments, modified nucleosides include pyridin-4-one ribonucleoside, 5-aza-uridine, 2-thio-5-aza-uridine, 2-thiouridine, 4-thio-pseudouridine, 2-thio-pseudouridine, 5-hydroxyuridine, 3-methyluridine, 5-carboxymethyl-uridine, 1-carboxymethyl-pseudouridine, 5-propynyl-uridine, 1-propynyl-pseudouridine, 5-taurinomethyluridine, 1-taurinomethyl-pseudouridine, 5-taurinomethyl-2-thio-uridine, 1-taurinomethyl-4-thio-uridine, 5-methyl-uridine, 1-methyl-pseudouridine, 4-thio-1-methyl-pseudouridine, 2-thio-1-methyl-pseudouridine, 1-methyl-1-deaza-pseudouridine, 2-thio-1-methyl-1-deaza-pseudouridine, dihydrouridine, dihydropseudouridine, 2-thio-dihydrouridine, 2-thio-dihydropseudouridine, 2-methoxyuridine, 2-methoxy-4-thio-uridine, 4-methoxy-pseudouridine, and 4-methoxy-2-thio-pseudouridine.

In some embodiments, modified nucleosides include 5-aza-cytidine, pseudoisocytidine, 3-methyl-cytidine, N4-acetylcytidine, 5-formylcytidine, N4-methylcytidine, 5-hydroxymethylcytidine, 1-methyl-pseudoisocytidine, pyrrolo-cytidine, pyrrolo-pseudoisocytidine, 2-thio-cytidine, 2-thio-5-methyl-cytidine, 4-thio-pseudoisocytidine, 4-thio-1-methyl-pseudoisocytidine, 4-thio-1-methyl-1-deaza-pseudoisocytidine, 1-methyl-1-deaza-pseudoisocytidine, zebularine, 5-aza-zebularine, 5-methyl-zebularine, 5-aza-2-thio-zebularine, 2-thio-zebularine, 2-methoxy-cytidine, 2-methoxy-5-methyl-cytidine, 4-methoxy-pseudoisocytidine, and 4-methoxy-1-methyl-pseudoisocytidine. In other embodiments, modified nucleosides include 2-aminopurine, 2, 6-diaminopurine, 7-deaza-adenine, 7-deaza-8-aza-adenine, 7-deaza-2-aminopurine, 7-deaza-8-aza-2-aminopurine, 7-deaza-2,6-diaminopurine, 7-deaza-8-aza-2,6-diaminopurine, 1-methyladenosine, N6-methyladenosine, N6-isopentenyladenosine, N6-(cis-hydroxyisopentenyl)adenosine, 2-methylthio-N6-(cis-hydroxyisopentenyl) adenosine, N6-glycinylcarbamoyladenosine, N6-threonylcarbamoyladenosine, 2-methylthio-N6-threonyl carbamoyladenosine, N6,N6-dimethyladenosine, 7-methyladenine, 2-methylthio-adenine, and 2-methoxy-adenine.

In other embodiments, modified nucleosides include inosine, 1-methyl-inosine, wyosine, wybutosine, 7-deaza-guanosine, 7-deaza-8-aza-guanosine, 6-thio-guanosine, 6-thio-7-deaza-guanosine, 6-thio-7-deaza-8-aza-guanosine, 7-methyl-guanosine, 6-thio-7-methyl-guanosine, 7-methylinosine, 6-methoxy-guanosine, 1-methylguanosine, N2-methylguanosine, N2,N2-dimethylguanosine, 8-oxo-guanosine, 7-methyl-8-oxo-guanosine, 1-methyl-6-thio-guanosine, N2-methyl-6-thio-guanosine, and N2,N2-dimethyl-6-thio-guanosine.

In some embodiments, the nucleotide can be modified on the major groove face and can include replacing hydrogen on C-5 of uracil with a methyl group or a halo group. In specific embodiments, a modified nucleoside is 5'-O-(1-thiophosphate)-adenosine, 5'-O-(1-thiophosphate)-cytidine, 5'-O-(1-thiophosphate)-guanosine, 5'-O-(1-thiophosphate)-uridine or 5'-O-(1-thiophosphate)-pseudouridine.

In further specific embodiments, a modified artificial nucleic acid, preferably an mRNA, may comprise nucleoside modifications selected from 6-aza-cytidine, 2-thio-cytidine, α-thio-cytidine, Pseudo-iso-cytidine, 5-aminoallyl-uridine, 5-iodo-uridine, N1-methyl-pseudouridine, 5,6-dihydrouridine, α-thio-uridine, 4-thio-uridine, 6-aza-uridine, 5-hydroxy-uridine, deoxy-thymidine, 5-methyl-uridine, Pyrrolo-cytidine, inosine, α-thio-guanosine, 6-methyl-guanosine, 5-methyl-cytdine, 8-oxo-guanosine, 7-deaza-guanosine, N1-methyl-adenosine, 2-amino-6-Chloro-purine, N6-methyl-2-amino-purine, Pseudo-iso-cytidine, 6-Chloro-purine, N6-methyl-adenosine, α-thio-adenosine, 8-azido-adenosine, 7-deaza-adenosine.

Lipid modification:

According to a further embodiment, a modified artificial nucleic acid, preferably an mRNA, as defined herein can contain a lipid modification. Such a lipid-modified artificial nucleic acid as defined herein typically further comprises at least one linker covalently linked with that artificial nucleic acid, and at least one lipid covalently linked with the respective linker. Alternatively, the lipid-modified artificial nucleic acid comprises at least one artificial nucleic acid as defined herein and at least one (bifunctional) lipid covalently linked (without a linker) with that artificial nucleic acid. According to a third alternative, the lipid-modified artificial nucleic acid comprises an artificial nucleic acid molecule as defined herein, at least one linker covalently linked with that artificial nucleic acid, and at least one lipid covalently linked with the respective linker, and also at least one (bifunctional) lipid covalently linked (without a linker) with that artificial nucleic acid. In this context, it is particularly preferred that the lipid modification is present at the terminal ends of a linear artificial nucleic acid.

Coding sequence modifications:

G/C content modification:

According to another embodiment, the artificial nucleic acid of the present invention may be modified, and thus stabilized, by modifying the G/C content of the artificial nucleic acid, preferably an mRNA, preferably of the coding region of the inventive artificial nucleic acid.

Preferably, the G/C content of the at least one coding region of the artificial nucleic acid, preferably an mRNA, is modified, preferably increased, compared to the G/C content of the corresponding coding sequence of the wild type nucleic acid, preferably an mRNA, wherein the encoded amino acid sequence is preferably not modified compared to the amino acid sequence encoded by the corresponding wild type nucleic acid (i.e. the non-modified nucleic acid), preferably an mRNA. This modification of the inventive artificial nucleic acid, preferably of an mRNA, as described herein is based on the fact that the sequence of any mRNA region to be translated is important for efficient translation of that mRNA. Thus, the composition and the sequence of various nucleotides are important. In particular, sequences having an increased G (guanosine)/C (cytosine) content are more stable than sequences having an increased A (adenosine)/U (uracil) content. According to the invention, the codons of the artificial

nucleic acid, preferably an mRNA, are therefore varied compared to the respective wild type mRNA, while retaining the translated amino acid sequence, such that they include an increased amount of G/C nucleotides. In respect to the fact that several codons encode one and the same amino acid (so-called degeneration of the genetic code), the most favorable codons for the stability can be determined (so-called alternative codon usage). Depending on the amino acid to be encoded by the artificial nucleic acid, preferably an mRNA, there are various possibilities for modification of its sequence, compared to its wild type sequence. In the case of amino acids which are encoded by codons, which contain exclusively G or C nucleotides, no modification of the codon is necessary. Thus, the codons for Pro (CCC or CCG), Arg (CGC or CGG), Ala (GCC or GCG) and Gly (GGC or GGG) require no modification, since no A or U is present. In contrast, codons which contain A and/or U nucleotides can be modified by substitution of other codons, which code for the same amino acids but contain no A and/or U. Examples of these are: the codons for Pro can be modified from CCU or CCA to CCC or CCG; the codons for Arg can be modified from CGU or CGA or AGA or AGG to CGC or CGG; the codons for Ala can be modified from GCU or GCA to GCC or GCG; the codons for Gly can be modified from GGU or GGA to GGC or GGG. In other cases, although A or U nucleotides cannot be eliminated from the codons, it is however possible to decrease the A and U content by using codons, which contain a lower content of A and/or U nucleotides. Examples of these are: the codons for Phe can be modified from UUU to UUC; the codons for Leu can be modified from UUA, UUG, CUU or CUA to CUC or CUG; the codons for Ser can be modified from UCU or UCA or AGU to UCC, UCG or AGC; the codon for Tyr can be modified from UAU to UAC; the codon for Cys can be modified from UGU to UGC; the codon for His can be modified from CAU to CAC; the codon for Gln can be modified from CAA to CAG; the codons for Ile can be modified from AUU or AUA to AUC; the codons for Thr can be modified from ACU or ACA to ACC or ACG; the codon for Asn can be modified from AAU to AAC; the codon for Lys can be modified from AAA to AAG; the codons for Val can be modified from GUU or GUA to GUC or GUG; the codon for Asp can be modified from GAU to GAC; the codon for Glu can be modified from GAA to GAG; the stop codon UAA can be modified to UAG or UGA. In the case of the codons for Met (AUG) and Trp (UGG), on the other hand, there is no possibility of sequence modification. The substitutions listed above can be used either individually or in all possible combinations to increase the G/C content of the inventive artificial nucleic acid, preferably an mRNA, compared to its corresponding wild type sequence, such as the corresponding wild type mRNA sequence. Thus, for example, all codons for Thr occurring in the wild type sequence can be modified to ACC (or ACG). Preferably, however, for example, combinations of the above substitution possibilities are used:

substitution of all codons coding for Thr in the original sequence (wild type mRNA) to ACC (or ACG) and

substitution of all codons originally coding for Ser to UCC (or UCG or AGC); substitution of all codons coding for Ile in the original sequence to AUC and substitution of all codons originally coding for Lys to AAG and substitution of all codons originally coding for Tyr to UAC; substitution of all codons coding for Val in the original sequence to GUC (or GUG) and substitution of all codons originally coding for Glu to GAG and substitution of all codons originally coding for Ala to GCC (or GCG) and substitution of all codons originally coding for Arg to CGC (or CGG); substitution of all codons coding for Val in the original sequence to GUC (or GUG) and substitution of all codons originally coding for Glu to GAG and substitution of all codons originally coding for Ala to GCC (or GCG) and substitution of all codons originally coding for Gly to GGC (or GGG) and substitution of all codons originally coding for Asn to AAC; substitution of all codons coding for Val in the original sequence to GUC (or GUG) and substitution of all codons originally coding for Phe to UUC and substitution of all codons originally coding for Cys to UGC and substitution of all codons originally coding for Leu to CUG (or CUC) and substitution of all codons originally coding for Gln to CAG and substitution of all

codons originally coding for Pro to CCC (or CCG); etc. Preferably, the G/C content of the coding region of the inventive artificial nucleic acid, preferably an mRNA, is increased by at least 7%, more preferably by at least 15%, particularly preferably by at least 20%, compared to the G/C content of the coding region of the wild type nucleic acid. According to a specific embodiment at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, more preferably at least 70%, even more preferably at least 80% and most preferably at least 90%, 95% or even 100% of the substitutable codons in the coding region or the whole sequence of the wild type nucleic acid sequence, preferably an mRNA sequence, are substituted, thereby increasing the G/C content of said sequence. In this context, it is particularly preferable to increase the G/C content of the inventive artificial nucleic acid to the maximum (i.e. 100% of the substitutable codons), in particular in the region coding for the at least one protein, compared to the wild type sequence.

In one embodiment of the invention, the G/C content of the artificial nucleic acid of the invention is increased compared to the G/C content of the corresponding coding sequence of the wild type mRNA, or wherein the C content of the coding region of the mRNA sequence is increased compared to the C content of the corresponding coding sequence of the wild type mRNA, or wherein the codon usage in the coding region of the mRNA sequence is adapted to the human codon usage, or wherein the codon adaptation index (CAI) is increased or maximised in the coding region of the mRNA sequence, wherein the encoded amino acid sequence of the mRNA sequence is preferably not being modified compared to the encoded amino acid sequence of the wild type mRNA.

In a further embodiment, the artificial nucleic acid according to the invention is codon optimized,
wherein

(i) the at least one coding region comprises a nucleic acid sequence, which is codon-optimized; and/or

(ii) the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 8821-13230, 26461-39690, 39715, 39716, 39717, 39720, 39721, 39724, 39725, 39728, 39729, 39730, 39733, 39734, 39737, 39738, 39741, 39742, 39745 and 39746, or a fragment or variant of any of these sequences; and/or

(iii) the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 13231-17640, or a fragment or variant of any of these sequences; and/or

(iv) the artificial nucleic acid of the invention, wherein the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 17641-22050, or a fragment or variant of any of these sequences; and/or

(v) the artificial nucleic acid of the invention, wherein the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 22051-26460, or a fragment or variant of any of these sequences.

According to the invention, a further preferred modification of the artificial nucleic acid of the present invention is based on the finding that the translation efficiency is also determined by a different frequency in the occurrence of tRNAs in cells. It is thus preferred that the at least one coding region of the artificial nucleic acid according to the invention comprises a nucleic acid sequence, which is codon-optimized. The term "codon-optimized" as used herein typically refers to an artificial nucleic acid, preferably to a nucleic acid sequence in the at least one coding region therein, wherein at least one codon of the wild type sequence, which codes for a tRNA which is relatively rare in the cell, is exchanged for a codon, which codes for a tRNA which is relatively frequent in the cell and carries the same amino acid as the relatively rare tRNA. Most preferably, that modification also increases the G/C content of the at least one coding region of the artificial nucleic acid.

Thus, if so-called "rare codons" are present in the artificial nucleic acid of the present invention to an increased extent, the corresponding modified nucleic acid sequence, preferably an mRNA sequence, is translated to a significantly poorer degree than in the case where codons coding for relatively "frequent" tRNAs are present. According to the invention, in the modified artificial nucleic acid of the present invention, the region which encodes the at least one protein as defined herein is modified compared to the corresponding region of the wild type nucleic acid, preferably an mRNA, such that at least one codon of the wild type sequence, which codes for a tRNA which is relatively rare in the cell, is exchanged for a codon, which codes for a tRNA which is relatively frequent in the cell and carries the same amino acid as the relatively rare tRNA. By this modification, the sequences of the artificial nucleic acid of the present invention is modified such that codons for which frequently occurring tRNAs are available are inserted. In other words, according to the invention, by this modification all codons of the wild type sequence which code for a tRNA which is relatively rare in the cell can in each case be exchanged for a codon which codes for a tRNA which is relatively frequent in the cell and which, in each case, carries the same amino acid as the relatively rare tRNA. Which tRNAs occur relatively frequently in the cell and which, in contrast, occur relatively rarely is known to a person skilled in the art; cf. e.g. Akashi, Curr. Opin. Genet. Dev. 2001, 11(6): 660-666. The codons which use for the particular amino acid the tRNA which occurs the most frequently, e.g. the Gly codon, which uses the tRNA, which occurs the most frequently in the (human) cell, are particularly preferred. According to the invention, it is particularly preferable to link the sequential G/C content which is increased, in particular maximized, in the modified artificial nucleic acid of the present invention, with the "frequent" codons without modifying the amino acid sequence of the protein encoded by the coding region of the corresponding wild type nucleic acid, preferably an mRNA. This preferred embodiment allows provision of a particularly efficiently translated and stabilized (modified) artificial nucleic acid of the present invention. The determination of an artificial nucleic acid of the present invention as described above (increased G/C content; exchange of tRNAs) can be carried out using the computer program explained in WO 02/098443 – the disclosure content of which is included in its full scope in the present invention. Using this computer program, the nucleotide sequence of any desired mRNA can be modified with the aid of the genetic code or the degenerative nature thereof such that a maximum G/C content results, in combination with the use of codons which code for tRNAs occurring as frequently as possible in the cell, the amino acid sequence encoded by the artificial nucleic acid preferably not being modified compared to the non-modified sequence. Alternatively, it is also possible to modify only the G/C content or only the codon usage compared to the original sequence. The source code in Visual Basic 6.0 (development environment used: Microsoft Visual Studio Enterprise 6.0

with Servicepack 3) is also described in WO 02/098443. In a further preferred embodiment of the present invention, the A/U content in the environment of the ribosome binding site of the artificial nucleic acid of the present invention is increased compared to the A/U content in the environment of the ribosome binding site of its particular wild type nucleic acid, preferably an mRNA. This modification (an increased A/U content around the ribosome binding site) increases the efficiency of ribosome binding to the artificial nucleic acid. An effective binding of the ribosomes to the ribosome binding site (e.g. a Kozak sequence as known in the art) in turn has the effect of an efficient translation of the artificial nucleic acid. According to a further embodiment of the present invention, the artificial nucleic acid of the present invention may be modified with respect to potentially destabilizing sequence elements. Particularly, the coding region and/or the 5' and/or 3' untranslated region of the artificial nucleic acid may be modified compared to the particular wild type nucleic acid such that it contains no destabilizing sequence elements, the amino acid sequence encoded by the modified artificial nucleic acid preferably not being modified compared to its particular wild type nucleic acid. It is known that, for example, in sequences of eukaryotic RNAs destabilizing sequence elements (DSE) occur, to which signal proteins bind and regulate enzymatic degradation of RNA in vivo. For further stabilization of the modified artificial nucleic acid, optionally in the region which encodes the at least one protein as defined herein, one or more such modifications compared to the corresponding region of the wild type nucleic acid, preferably an mRNA, can therefore be carried out, so that no or substantially no destabilizing sequence elements are contained there. According to the invention, DSE present in the untranslated regions (3'- and/or 5'-UTR) can also be eliminated from the artificial nucleic acid of the present invention by such modifications. Such destabilizing sequences are e.g. AU-rich sequences (AURES), which occur in 3'-UTR sections of numerous unstable RNAs (Caput et al., Proc. Natl. Acad. Sci. USA 1986, 83: 1670 to 1674). The artificial nucleic acid of the present invention is therefore preferably modified compared to the wild type nucleic acid such that the artificial nucleic acid contains no such destabilizing sequences. This also applies to those sequence motifs which are recognized by possible endonucleases, e.g. the sequence GAACAAG, which is contained in the 3'-UTR segment of the gene which codes for the transferrin receptor (Binder et al., EMBO J. 1994, 13: 1969 to 1980). These sequence motifs are also preferably removed in the artificial nucleic acid of the present invention. It is further preferred that the artificial nucleic acid of the present invention has, in a modified form, at least one IRES as defined above and/or at least one 5' and/or 3' stabilizing sequence, in a modified form, e.g. to enhance ribosome binding or to allow expression of different encoded polypeptides located on an artificial nucleic acid of the present invention. This particularly applies to embodiments, wherein the artificial nucleic acid is bi- or multicistronic and wherein an IRES is preferably located between individual coding regions.

According to a preferred embodiment, the at least one coding region of the artificial nucleic acid or artificial nucleic acid molecule comprises or consists of at least one nucleic acid sequence according to any one of SEQ ID NOs: 8821-39690, 39715, 39716, 39717, 39720, 39721, 39724, 39725, 39728, 39729, 39730, 39733, 39734, 39737, 39738, 39741, 39742, 39745 and 39746, or a fragment or variant of any of these sequences. More preferably, the at least one coding region of the artificial nucleic comprises or consists of an RNA sequence, which is at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to any one of SEQ ID NOs:

8821-39690, 39715, 39716, 39717, 39720, 39721, 39724, 39725, 39728, 39729, 39730, 39733, 39734, 39737, 39738, 39741, 39742, 39745 and 39746.

G/C content modification:

According to another embodiment, the RNA of the present invention, preferably an mRNA, may be modified, and thus stabilized, by modifying the guanosine/cytosine (G/C) content of the RNA, preferably of the at least one coding sequence of the RNA of the present invention.

In a particularly preferred embodiment of the present invention, the G/C content of the coding region of the RNA of the present invention is modified, particularly increased, compared to the G/C content of the coding region of the respective wild type RNA, i.e. the unmodified RNA. The amino acid sequence encoded by the RNA is preferably not modified as compared to the amino acid sequence encoded by the respective wild type RNA. This modification of the RNA of the present invention is based on the fact that the sequence of any RNA region to be translated is important for efficient translation of that RNA. Thus, the composition of the RNA and the sequence of various nucleotides are important. In particular, sequences having an increased G (guanosine)/C (cytosine) content are more stable than sequences having an increased A (adenosine)/U (uracil) content. According to the invention, the codons of the RNA are therefore varied compared to the respective wild type RNA, while retaining the translated amino acid sequence, such that they include an increased amount of G/C nucleotides. In respect to the fact that several codons code for one and the same amino acid (so-called degeneration of the genetic code), the most favourable codons for the stability can be determined (so-called alternative codon usage). Depending on the amino acid to be encoded by the RNA, there are various possibilities for modification of the RNA sequence, compared to its wild type sequence. In the case of amino acids, which are encoded by codons, which contain exclusively G or C nucleotides, no modification of the codon is necessary. Thus, the codons for Pro (CCC or CCG), Arg (CGC or CGG), Ala (GCC or GCG) and Gly (GGC or GGG) require no modification, since no A or U is present. In contrast, codons which contain A and/or U nucleotides can be modified by substitution of other codons, which code for the same amino acids but contain no A and/or U. Examples of these are: the codons for Pro can be modified from CCU or CCA to CCC or CCG; the codons for Arg can be modified from CGU or CGA or AGA or AGG to CGC or CGG; the codons for Ala can be modified from GCU or GCA to GCC or GCG; the codons for Gly can be modified from GGU or GGA to GGC or GGG. In other cases, although A or U nucleotides cannot be eliminated from the codons, it is however possible to decrease the A and U content by using codons which contain a lower content of A and/or U nucleotides. Examples of these are: the codons for Phe can be modified from UUU to UUC; the codons for Leu can be modified from UUA, UUG, CUU or CUA to CUC or CUG; the codons for Ser can be modified from UCU or UCA or AGU to UCC, UCG or AGC; the codon for Tyr can be modified from UAU to UAC; the codon for Cys can be modified from UGU to UGC; the codon for His can be modified from CAU to CAC; the codon for Gln can be modified from CAA to CAG; the codons for Ile can be modified from AUU or AUA to AUC; the codons for Thr can be modified from ACU or ACA to ACC or ACG; the codon for Asn can be modified from AAU to AAC; the codon for Lys can be modified from AAA to AAG; the codons for Val can be modified from GUU or GUA to GUC or GUG; the codon for Asp can be modified from GAU to GAC; the codon for Glu can be modified from GAA to GAG; the stop codon UAA can be modified to UAG or UGA. In the case of the codons for Met (AUG) and Trp (UGG), on the other hand, there is no possibility of sequence modification. The substitutions listed above can be used either individually or

in all possible combinations to increase the G/C content of the at least one mRNA of the composition of the present invention compared to its particular wild type mRNA (i.e. the original sequence). Thus, for example, all codons for Thr occurring in the wild type sequence can be modified to ACC (or ACG). Preferably, however, for example, combinations of the above substitution possibilities are used:

substitution of all codons coding for Thr in the original sequence (wild type mRNA) to ACC (or ACG) and substitution of all codons originally coding for Ser to UCC (or UCG or AGC); substitution of all codons coding for Ile in the original sequence to AUC and substitution of all codons originally coding for Lys to AAG and substitution of all codons originally coding for Tyr to UAC; substitution of all codons coding for Val in the original sequence to GUC (or GUG) and substitution of all codons originally coding for Glu to GAG and

substitution of all codons originally coding for Ala to GCC (or GCG) and substitution of all codons originally coding for Arg to CGC (or CGG); substitution of all codons coding for Val in the original sequence to GUC (or GUG) and substitution of all codons originally coding for Glu to GAG and substitution of all codons originally coding for Ala to GCC (or GCG) and substitution of all codons originally coding for Gly to GGC (or GGG) and substitution of all codons originally coding for Asn to AAC; substitution of all codons coding for Val in the original sequence to GUC (or GUG) and substitution of all codons originally coding for Phe to UUC and

substitution of all codons originally coding for Cys to UGC and substitution of all codons originally coding for Leu to CUG (or CUC) and substitution of all codons originally coding for Gln to CAG and substitution of all codons originally coding for Pro to CCC (or CCG); etc.

Preferably, the G/C content of the coding region of the RNA of the present invention is increased by at least 7%, more preferably by at least 15%, particularly preferably by at least 20%, compared to the G/C content of the coding region of the wild type RNA, which codes for an antigen as defined herein or a fragment or variant thereof. According to a specific embodiment at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, more preferably at least 70%, even more preferably at least 80% and most preferably at least 90%, 95% or even 100% of the substitutable codons in the region coding for an antigen as defined herein or a fragment or variant thereof or the whole sequence of the wild type RNA sequence are substituted, thereby increasing the GC/content of said sequence. In this context, it is particularly preferable to increase the G/C content of the RNA of the present invention, preferably of the at least one coding region of the RNA according to the invention, to the maximum (i.e. 100% of the substitutable codons) as compared to the wild type sequence. According to the invention, a further preferred modification of the RNA of the present invention is based on the finding that the translation efficiency is also determined by a different frequency in the occurrence of tRNAs in cells. Thus, if so-called "rare codons" are present in the RNA of the present invention to an increased extent, the corresponding modified RNA sequence is translated to a significantly poorer degree than in the case where codons coding for relatively "frequent" tRNAs are present. According to the invention, in the modified RNA of the present invention, the region which codes for an antigen as defined herein or a fragment or variant thereof is modified compared to the corresponding region of the wild type RNA such that at least one codon of the wild type sequence, which codes for a tRNA which is relatively rare in the cell, is exchanged for a codon, which codes for a tRNA which is relatively frequent in the cell and carries the same amino acid as the relatively rare tRNA. By this modification, the sequences of the RNA of the present invention are modified such that codons for which frequently occurring tRNAs are available are inserted. In other words, according to the invention, by this

modification all codons of the wild type sequence, which code for a tRNA which is relatively rare in the cell, can in each case be exchanged for a codon, which codes for a tRNA which is relatively frequent in the cell and which, in each case, carries the same amino acid as the relatively rare tRNA. Which tRNAs occur relatively frequently in the cell and which, in contrast, occur relatively rarely is known to a person skilled in the art; cf. e.g. Akashi, Curr. Opin. Genet. Dev. 2001, 11(6): 660-666. The codons, which use for the particular amino acid the tRNA which occurs the most frequently, e.g. the Gly codon, which uses the tRNA, which occurs the most frequently in the (human) cell, are particularly preferred. According to the invention, it is particularly preferable to link the sequential G/C content which is increased, in particular maximized, in the modified RNA of the present invention, with the "frequent" codons without modifying the amino acid sequence of the protein encoded by the coding region of the RNA. This preferred embodiment allows provision of a particularly efficiently translated and stabilized (modified) RNA of the present invention. The determination of a modified RNA of the present invention as described above (increased G/C content; exchange of tRNAs) can be carried out using the computer program explained in WO 02/098443 – the disclosure content of which is included in its full scope in the present invention. Using this computer program, the nucleotide sequence of any desired RNA can be modified with the aid of the genetic code or the degenerative nature thereof such that a maximum G/C content results, in combination with the use of codons which code for tRNAs occurring as frequently as possible in the cell, the amino acid sequence coded by the modified RNA preferably not being modified compared to the non-modified sequence. Alternatively, it is also possible to modify only the G/C content or only the codon usage compared to the original sequence. The source code in Visual Basic 6.0 (development environment used: Microsoft Visual Studio Enterprise 6.0 with Servicepack 3) is also described in WO 02/098443. In a further preferred embodiment of the present invention, the A/U content in the environment of the ribosome binding site of the RNA of the present invention is increased compared to the A/U content in the environment of the ribosome binding site of its respective wild type mRNA. This modification (an increased A/U content around the ribosome binding site) increases the efficiency of ribosome binding to the RNA. An effective binding of the ribosomes to the ribosome binding site (Kozak sequence: SEQ ID NOs: 39711, 39712; the AUG forms the start codon) in turn has the effect of an efficient translation of the RNA. According to a further embodiment of the present invention, the RNA of the present invention may be modified with respect to potentially destabilizing sequence elements. Particularly, the coding region and/or the 5' and/or 3' untranslated region of this RNA may be modified compared to the respective wild type RNA such that it contains no destabilizing sequence elements, the encoded amino acid sequence of the modified RNA preferably not being modified compared to its respective wild type RNA. It is known that, for example in sequences of eukaryotic RNAs, destabilizing sequence elements (DSE) occur, to which signal proteins bind and regulate enzymatic degradation of RNA in vivo. For further stabilization of the modified RNA, optionally in the region which encodes an antigen as defined herein or a fragment or variant thereof, one or more such modifications compared to the corresponding region of the wild type RNA can therefore be carried out, so that no or substantially no destabilizing sequence elements are contained there. According to the invention, DSE present in the untranslated regions (3'- and/or 5'-UTR) can also be eliminated from the RNA of the present invention by such modifications. Such destabilizing sequences are e.g. AU-rich sequences (AURES), which occur in 3'-UTR sections of numerous unstable RNAs (Caput et al., Proc. Natl. Acad. Sci. USA 1986, 83: 1670 to 1674). The RNA of the present invention is therefore preferably modified compared to the respective wild type RNA such that the RNA of the present invention contains no such destabilizing sequences. This also applies to those sequence motifs which are recognized by possible endonucleases, e.g. the sequence GAACAAG, which is contained in the 3'-UTR segment of the gene encoding the

transferrin receptor (Binder et al., EMBO J. 1994, 13: 1969 to 1980). These sequence motifs are also preferably removed in the RNA of the present invention.

According to a preferred embodiment, the present invention provides an RNA as defined herein comprising at least one coding sequence, wherein the coding sequence comprises or consists of any one of the (modified) nucleic acid sequences defined in SEQ ID NOs: 8821-13230, 39715, 39716, 39717, 39720, 39721, 39724, 39725, 39728, 39729, 39730, 39733, 39734, 39737, 39738, 39741, 39742, 39745, 39746, and/or SEQ ID NOs: 26461-30870, and/or SEQ ID NOs: 30871-35280, and/or SEQ ID NOs: 35281–39690, and/or SEQ ID NO: 39713 to SEQ ID NO:39746, and/or SEQ ID NO: 39714, 39716, 39729, 39734, 39738, 39725, or of a fragment or variant of any one of these sequences. In other words, the at least one coding sequence preferably comprises or consists of a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 8821-13230, 39715, 39716, 39717, 39720, 39721, 39724, 39725, 39728, 39729, 39730, 39733, 39734, 39737, 39738, 39741, 39742, 39745, 39746, and/or SEQ ID NOs: 26461-30870, and/or SEQ ID NOs: 30871-35280, and/or SEQ ID NOs: 35281–39690, and/or SEQ ID NO: 39713 to SEQ ID NO: 39746, and/or SEQ ID NO: 39714, 39716, 39729, 39734, 39738, 39725, or a fragment or variant of any one of these nucleic acid sequences.

In a further preferred embodiment, the at least one coding sequence of the RNA according to the invention comprises or consists of a nucleic acid sequence identical to or having a sequence identity of at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99%, preferably of at least 70%, more preferably of at least 80%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with any one of the (modified) nucleic acid sequences defined in SEQ ID NOs: 8821-13230, 39715, 39716, 39717, 39720, 39721, 39724, 39725, 39728, 39729, 39730, 39733, 39734, 39737, 39738, 39741, 39742, 39745, 39746, and/or SEQ ID NOs: 26461-30870, and/or SEQ ID NOs: 30871-35280, and/or SEQ ID NOs: 35281–39690, and/or SEQ ID NO: 39713 to SEQ ID NO: 39746, and/or SEQ ID NOs: 39714, 39716, 39729, 39734, 39738, 39725, or of a fragment or variant of any one of these sequences.

According to a particularly preferred embodiment, the at least one coding sequence of the RNA according to the invention comprises or consists of a nucleic acid sequence having a sequence identity of at least 80% with any one of the (modified) nucleic acid sequences defined in SEQ ID NOs: 8821-13230, 39715, 39716, 39717, 39720, 39721, 39724, 39725, 39728, 39729, 39730, 39733, 39734, 39737, 39738, 39741, 39742, 39745, 39746, and/or SEQ ID NOs: 26461-30870, and/or SEQ ID NOs: 30871-35280, and/or SEQ ID NOs: 35281–39690, and/or SEQ ID NO: 39713 to SEQ ID NO: 39746, and/or SEQ ID NOs: 39714, 39716, 39729, 39734, 39738, 39725, or of a fragment or variant of any one of these sequences.

GC optimized sequences:

In a preferred embodiment, the present invention provides an RNA comprising at least one coding sequence, wherein the coding sequence comprises or consists of a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 39714, 39716, 39729, 39734, 39738, 39725, or a fragment or variant of any one of these nucleic acid sequences.

According to a further embodiment, the at least one coding sequence of the RNA according to the invention comprises or consists of a nucleic acid sequence having a sequence identity of at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99%, preferably of at least 70%, more preferably of at least 80%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 39714, 39716, 39729, 39734, 39738, 39725, or a fragment or variant of any one of these nucleic acid sequences.

Sequences adapted to human codon usage:

According to the invention, a further preferred modification of the RNA of the present invention is based on the finding that codons encoding the same amino acid typically occur at different frequencies. According to the invention, in the modified RNA of the present invention, the coding sequence (coding region) as defined herein is preferably modified compared to the corresponding region of the respective wild type RNA such that the frequency of the codons encoding the same amino acid corresponds to the naturally occurring frequency of that codon according to the human codon usage as e.g. shown in Table 2.

For example, in the case of the amino acid alanine (Ala) present in an amino acid sequence encoded by the at least one coding sequence of the RNA according to the invention, the wild type coding sequence is preferably adapted in a way that the codon "GCC" is used with a frequency of 0.40, the codon "GCT" is used with a frequency of 0.28, the codon "GCA" is used with a frequency of 0.22 and the codon "GCG" is used with a frequency of 0.10 etc. (see Table 2).

Table 2: Human codon usage table

Amino acid	codon	fraction	/1000	Amino acid	codon	fraction	/1000
Ala	GCG	0.10	7.4	Pro	CCG	0.11	6.9
Ala	GCA	0.22	15.8	Pro	CCA	0.27	16.9
Ala	GCT	0.28	18.5	Pro	CCT	0.29	17.5
Ala	GCC*	0.40	27.7	Pro	CCC*	0.33	19.8
Cys	TGT	0.42	10.6	Gln	CAG*	0.73	34.2
Cys	TGC*	0.58	12.6	Gln	CAA	0.27	12.3
Asp	GAT	0.44	21.8	Arg	AGG	0.22	12.0
Asp	GAC*	0.56	25.1	Arg	AGA*	0.21	12.1
Glu	GAG*	0.59	39.6	Arg	CGG	0.19	11.4
Glu	GAA	0.41	29.0	Arg	CGA	0.10	6.2
Phe	TTT	0.43	17.6	Arg	CGT	0.09	4.5
Phe	TTC*	0.57	20.3	Arg	CGC	0.19	10.4
Gly	GGG	0.23	16.5	Ser	AGT	0.14	12.1

Amino acid	codon	fraction	/1000	Amino acid	codon	fraction	/1000
Gly	GGA	0.26	16.5	Ser	AGC*	0.25	19.5
Gly	GGT	0.18	10.8	Ser	TCG	0.06	4.4
Gly	GGC*	0.33	22.2	Ser	TCA	0.15	12.2
His	CAT	0.41	10.9	Ser	TCT	0.18	15.2
His	CAC*	0.59	15.1	Ser	TCC	0.23	17.7
Ile	ATA	0.14	7.5	Thr	ACG	0.12	6.1
Ile	ATT	0.35	16.0	Thr	ACA	0.27	15.1
Ile	ATC*	0.52	20.8	Thr	ACT	0.23	13.1
Lys	AAG*	0.60	31.9	Thr	ACC*	0.38	18.9
Lys	AAA	0.40	24.4	Val	GTG*	0.48	28.1
Leu	TTG	0.12	12.9	Val	GTA	0.10	7.1
Leu	TTA	0.06	7.7	Val	GTT	0.17	11.0
Leu	CTG*	0.43	39.6	Val	GTC	0.25	14.5
Leu	CTA	0.07	7.2	Trp	TGG*	1	13.2
Leu	CTT	0.12	13.2	Tyr	TAT	0.42	12.2
Leu	CTC	0.20	19.6	Tyr	TAC*	0.58	15.3
Met	ATG*	1	22.0	Stop	TGA*	0.61	1.6
Asn	AAT	0.44	17.0	Stop	TAG	0.17	0.8
Asn	AAC*	0.56	19.1	Stop	TAA	0.22	1.0

*: most frequent codon

In a preferred embodiment, the present invention provides an RNA comprising at least one coding sequence, wherein the coding sequence comprises a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 17641-22050, or a fragment or variant of any one of said nucleic acid sequences.

According to a further embodiment, the at least one coding sequence of the RNA according to the invention comprises or consists of a nucleic acid sequence having a sequence identity of at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99%, preferably of at least 70%, more preferably of at least 80%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 17641-22050, or a fragment or variant of any one of said nucleic acid sequences.

Codon-optimized sequences:

As described above it is preferred according to the invention, that all codons of the wild type sequence which code for a tRNA, which is relatively rare in the cell, are exchanged for a codon which codes for a tRNA, which is relatively frequent in the cell and which, in each case, carries the same amino acid as the relatively rare tRNA. Therefore it is particularly preferred that the most frequent codons are used for each encoded amino acid (see Table 2, most frequent codons are marked with asterisks). Such an optimization procedure increases the codon adaptation index (CAI) and ultimately maximises the CAI. In the context of the invention, sequences with increased or maximized CAI are typically referred to as "codon-optimized" sequences and/or CAI increased and/or maximized sequences. According to a preferred embodiment, the RNA of the present invention comprises at least one coding sequence, wherein the coding sequence is codon-optimized as described herein. More preferably, the codon adaptation index (CAI) of the at least one coding sequence is at least 0.5, at least 0.8, at least 0.9 or at least 0.95. Most preferably, the codon adaptation index (CAI) of the at least one coding sequence is 1.

For example, in the case of the amino acid alanine (Ala) present in the amino acid sequence encoded by the at least one coding sequence of the RNA according to the invention, the wild type coding sequence is adapted in a way that the most frequent human codon "GCC" is always used for said amino acid, or for the amino acid Cysteine (Cys), the wild type sequence is adapted in a way that the most frequent human codon "TGC" is always used for said amino acid etc.

In a preferred embodiment, the present invention provides an RNA comprising at least one coding sequence, wherein the coding sequence comprises a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 22051-26460, or a fragment or variant of any one of said nucleic acid sequences.

According to a further embodiment, the at least one coding sequence of the RNA according to the invention comprises or consists of a nucleic acid sequence having a sequence identity of at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99%, preferably of at least 70%, more preferably of at least 80%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 22051-26460, or a fragment or variant of any one of said nucleic acid sequences.

C-optimized sequences:

According to another embodiment, the RNA of the composition of the present invention may be modified by modifying, preferably increasing, the cytosine (C) content of the RNA, preferably of the coding region of the RNA.

In a particularly preferred embodiment of the present invention, the C content of the coding region of the RNA of the present invention is modified, preferably increased, compared to the C content of the coding region of the respective wild type RNA, i.e. the unmodified RNA. The amino acid sequence encoded by the at least one coding sequence of the RNA of the present invention is preferably not modified as compared to the amino acid sequence encoded by the respective wild type mRNA.

In a preferred embodiment of the present invention, the modified RNA is modified such that at least 10%, 20%, 30%, 40%, 50%, 60%, 70% or 80%, or at least 90% of the theoretically possible maximum cytosine-content or even a maximum cytosine-content is achieved.

In further preferred embodiments, at least 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% or even 100% of the codons of the target RNA wild type sequence, which are "cytosine content optimizable" are replaced by codons having a higher cytosine-content than the ones present in the wild type sequence.

In a further preferred embodiment, some of the codons of the wild type coding sequence may additionally be modified such that a codon for a relatively rare tRNA in the cell is exchanged by a codon for a relatively frequent tRNA in the cell, provided that the substituted codon for a relatively frequent tRNA carries the same amino acid as the relatively rare tRNA of the original wild type codon. Preferably, all of the codons for a relatively rare tRNA are replaced by a codon for a relatively frequent tRNA in the cell, except codons encoding amino acids, which are exclusively encoded by codons not containing any cytosine, or except for glutamine (Gln), which is encoded by two codons each containing the same number of cytosines.

In a further preferred embodiment of the present invention, the modified target RNA is modified such that at least 80%, or at least 90% of the theoretically possible maximum cytosine-content or even a maximum cytosine-content is achieved by means of codons, which code for relatively frequent tRNAs in the cell, wherein the amino acid sequence remains unchanged.

Due to the naturally occurring degeneracy of the genetic code, more than one codon may encode a particular amino acid. Accordingly, 18 out of 20 naturally occurring amino acids are encoded by more than one codon (with Tryp and Met being an exception), e.g. by 2 codons (e.g. Cys, Asp, Glu), by three codons (e.g. Ile), by 4 codons (e.g. Al, Gly, Pro) or by 6 codons (e.g. Leu, Arg, Ser). However, not all codons encoding the same amino acid are utilized with the same frequency under in vivo conditions. Depending on each single organism, a typical codon usage profile is established.

The term "cytosine content-optimizable codon" as used within the context of the present invention refers to codons, which exhibit a lower content of cytosines than other codons encoding the same amino acid. Accordingly, any wild type codon, which may be replaced by another codon encoding the same amino acid and exhibiting a higher number of cytosines within that codon, is considered to be cytosine-optimizable (C-optimizable). Any such substitution of a C-optimizable wild type codon by the specific C-optimized codon within a wild type coding region increases its overall C content and reflects a C-enriched modified mRNA sequence. According to a preferred embodiment, the RNA of the present invention, preferably the at least one coding sequence of the RNA of the present invention comprises or consists of a C-maximized RNA sequence containing C-optimized codons for all potentially C-optimizable codons. Accordingly, 100% or all of the theoretically replaceable C-optimizable codons are preferably replaced by C-optimized codons over the entire length of the coding region.

In this context, cytosine-content optimizable codons are codons, which contain a lower number of cytosines than other codons coding for the same amino acid. Any of the codons GCG, GCA, GCU codes for the amino acid Ala, which may be exchanged by the codon GCC encoding the same amino acid, and/or the codon UGU that codes for Cys may be exchanged by the codon UGC encoding the same amino acid, and/or the codon GAU which codes for Asp may be exchanged by the codon GAC encoding the same amino acid, and/or the codon that UUU that codes for Phe may be exchanged for the codon UUC encoding the same amino acid, and/or any of the codons GGG, GGA, GGU that code Gly may be exchanged by the codon GGC encoding the same amino acid, and/or the codon CAU that codes for His may be exchanged by the codon CAC encoding the same amino acid, and/or any of the codons AUA, AUU that code for Ile may be exchanged by the codon AUC, and/or any of the codons UUG, UUA, CUG, CUA, CUU coding for Leu may be exchanged by the codon CUC encoding the same amino acid, and/or the codon AAU that codes for Asn may be exchanged by the codon AAC encoding the same amino acid, and/or any of the codons CCG, CCA, CCU coding for Pro may be exchanged by the codon CCC encoding the same amino acid, and/or any of the codons AGG, AGA, CGG, CGA, CGU coding for Arg may be exchanged by the codon CGC encoding the same amino acid, and/or any of the codons AGU, AGC, UCG, UCA, UCU coding for Ser may be exchanged by the codon UCC encoding the same amino acid, and/or any of the codons ACG, ACA, ACU coding for Thr may be exchanged by the codon ACC encoding the same amino acid, and/or any of the codons GUG, GUA, GUU coding for Val may be exchanged by the codon GUC encoding the same amino acid, and/or the codon UAU coding for Tyr may be exchanged by the codon UAC encoding the same amino acid.

In any of the above instances, the number of cytosines is increased by 1 per exchanged codon. Exchange of all non C-optimized codons (corresponding to C-optimizable codons) of the coding region results in a C-maximized coding sequence. In the context of the invention, at least 70%, preferably at least 80%, more preferably at least 90%, of the non C-optimized codons within the at least one coding region of the RNA according to the invention are replaced by C-optimized codons.

It may be preferred that for some amino acids the percentage of C-optimizable codons replaced by C-optimized codons is less than 70%, while for other amino acids the percentage of replaced codons is higher than 70% to meet the overall percentage of C-optimization of at least 70% of all C-optimizable wild type codons of the coding region.

Preferably, in a C-optimized RNA of the invention, at least 50% of the C-optimizable wild type codons for any given amino acid are replaced by C-optimized codons, e.g. any modified C-enriched RNA preferably contains at least 50% C-optimized codons at C-optimizable wild type codon positions encoding any one of the above mentioned amino acids Ala, Cys, Asp, Phe, Gly, His, Ile, Leu, Asn, Pro, Arg, Ser, Thr, Val and Tyr, preferably at least 60%.

In this context codons encoding amino acids, which are not cytosine content-optimizable and which are, however, encoded by at least two codons, may be used without any further selection process. However, the codon of the wild type sequence that codes for a relatively rare tRNA in the cell, e.g. a human cell, may be exchanged for a codon that codes for a relatively frequent tRNA in the cell, wherein both code for the same amino acid. Accordingly, the relatively rare codon GAA coding for Glu may be exchanged by the relative frequent codon GAG coding for the same amino acid, and/or

the relatively rare codon AAA coding for Lys may be exchanged by the relative frequent codon AAG coding for the same amino acid, and/or
the relatively rare codon CAA coding for Gln may be exchanged for the relative frequent codon CAG encoding the same amino acid.

In this context, the amino acids Met (AUG) and Trp (UGG), which are encoded by only one codon each, remain unchanged. Stop codons are not cytosine-content optimized; however, the relatively rare stop codons amber, ochre (UAA, UAG) may be exchanged by the relatively frequent stop codon opal (UGA).

The single substitutions listed above may be used individually as well as in all possible combinations in order to optimize the cytosine-content of the modified RNA compared to the wild type mRNA sequence.

Accordingly, the at least one coding sequence as defined herein may be changed compared to the coding region of the respective wild type RNA in such a way that an amino acid encoded by at least two or more codons, of which one comprises one additional cytosine, such a codon may be exchanged by the C-optimized codon comprising one additional cytosine, wherein the amino acid is preferably unaltered compared to the wild type sequence.

In a preferred embodiment, the present invention provides an RNA comprising at least one coding sequence, wherein the coding sequence comprises a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 13231-17640, or a fragment or variant of any one of said nucleic acid sequences.

According to a further embodiment, the at least one coding sequence of the RNA according to the invention comprises or consists of a nucleic acid sequence having a sequence identity of at least 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99%, preferably of at least 70%, more preferably of at least 80%, even more preferably at least 85%, even more preferably of at least 90% and most preferably of at least 95% or even 97%, with a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 13231-17640, or a fragment or variant of any one of said nucleic acid sequences.

According to a particularly preferred embodiment, the invention provides an RNA, preferably an mRNA, comprising at least one coding sequence as defined herein, wherein the G/C content of the at least one coding sequence of the RNA is increased compared to the G/C content of the corresponding coding sequence of the corresponding wild type RNA, and/or wherein the C content of the at least one coding sequence of the RNA is increased compared to the C content of the corresponding coding sequence of the corresponding wild type RNA, and/or wherein the codons in the at least one coding sequence of the RNA are adapted to human codon usage, wherein the codon adaptation index (CAI) is preferably increased or maximised in the at least one coding sequence of the RNA, and wherein the amino acid sequence encoded by the RNA is preferably not being modified compared to the amino acid sequence encoded by the corresponding wild type RNA.

5'-cap structure:

Modification of the 5'-end of a modified artificial nucleic acid:

According to another preferred embodiment of the invention, the artificial nucleic acid, preferably an mRNA, as defined herein, can be modified by the addition of a so-called "5'-cap" structure, which preferably stabilizes the nucleic acid, preferably an mRNA, as described herein.

In a particularly preferred embodiment, the artificial nucleic acid according to the invention, preferably an mRNA, comprises a 5'-cap structure.

A 5'-cap is an entity, typically a modified nucleotide entity, which generally "caps" the 5'-end of a nucleic acid, for example of a mature mRNA. A 5'-cap may typically be formed by a modified nucleotide, particularly by a derivative of a guanine nucleotide. Preferably, the 5'-cap is linked to the 5'-terminus via a 5'-5'-triphosphate linkage. A 5'-cap may be methylated, e.g. m7GpppN, wherein N is the terminal 5' nucleotide of the nucleic acid carrying the 5'-cap, typically the 5'-end of an mRNA. m7GpppN is the 5'-cap structure, which naturally occurs in mRNA transcribed by polymerase II and is therefore preferably not considered as modification comprised in an artificial nucleic acid in this context. Accordingly, a modified artificial nucleic acid, preferably an mRNA, of the present invention may comprise an m7GpppN as 5'-cap, but additionally the modified artificial nucleic acid, preferably an mRNA, typically comprises at least one further modification as defined herein.

Further examples of 5'cap structures include glyceryl, inverted deoxy abasic residue (moiety), 4',5' methylene nucleotide, 1-(beta-D-erythrofuranosyl) nucleotide, 4'-thio nucleotide, carbocyclic nucleotide, 1,5-anhydrohexitol nucleotide, L-nucleotides, alpha-nucleotide, modified base nucleotide, threo-pentofuranosyl nucleotide, acyclic 3',4'-seco nucleotide, acyclic 3,4-dihydroxybutyl nucleotide, acyclic 3,5 dihydroxypentyl nucleotide, 3'-3'-inverted nucleotide moiety, 3'-3'-inverted abasic moiety, 3'-2'-inverted nucleotide moiety, 3'-2'-inverted abasic moiety, 1,4-butanediol phosphate, 3'-phosphoramidate, hexylphosphate, aminohexyl phosphate, 3'-phosphate, 3'phosphorothioate, phosphorodithioate, or bridging or non-bridging methylphosphonate moiety. These modified 5'-cap structures are regarded as at least one modification in this context.

Particularly preferred modified 5'-cap structures are cap1 (methylation of the ribose of the adjacent nucleotide of m7G), cap2 (additional methylation of the ribose of the 2nd nucleotide downstream of the m7G), cap3 (additional methylation of the ribose of the 3rd nucleotide downstream of the m7G), cap4 (additional methylation of the ribose of the 4th nucleotide downstream of the m7G), ARCA (anti-reverse cap analogue, modified ARCA (e.g. phosphothioate modified ARCA), inosine, N1-methyl-guanosine, 2'-fluoro-guanosine, 7-deaza-guanosine, 8-oxo-guanosine, 2-amino-guanosine, LNA-guanosine, and 2-azido-guanosine.

5'-UTRs:

According to a further embodiment, the artificial nucleic acid comprises an untranslated region (UTR). More preferably, the artificial nucleic acid according to the invention, preferably an mRNA, comprises at least one of the following structural elements:

a 5'- and/or 3'- untranslated region element (UTR element), particularly a 5'-UTR element, which comprises or consists of a nucleic acid sequence which is derived from the 5'-UTR of a TOP gene or from a fragment, homolog or a variant thereof, or a 5'- and/or 3'-UTR element which may be derivable from a gene that provides a stable mRNA or from a homolog, fragment or variant thereof; a histone-stem-loop structure, preferably a histone-stem-loop in its 3' untranslated region; a 5'-cap structure; a poly-A tail; or a poly(C) sequence.

In a preferred embodiment, the artificial nucleic acid, preferably an mRNA, comprises at least one 5'- or 3'-UTR element. In this context, an UTR element comprises or consists of a nucleic acid sequence, which is derived from the 5'- or 3'-UTR of any naturally occurring gene or which is derived from a fragment, a homolog or a variant of the 5'- or 3'-UTR of a gene. Preferably the 5'- or 3'-UTR element used according to the present invention is heterologous to the coding region of the inventive artificial nucleic acid. Even if 5'- or 3'-UTR elements derived from naturally occurring genes are preferred, also synthetically engineered UTR elements may be used in the context of the present invention.

According to a preferred embodiment, the artificial nucleic acid according to the invention comprises a 5'-UTR. More preferably, the artificial nucleic acid comprises a 5'-UTR comprising at least one heterologous 5'-UTR element.

In a particularly preferred embodiment, the artificial nucleic acid comprises at least one 5'-untranslated region element (5'-UTR element), preferably a heterologous 5'-UTR element, which comprises or consists of a nucleic acid sequence, which is derived from the 5'-UTR of a TOP gene or which is derived from a fragment, homolog or variant of the 5'-UTR of a TOP gene.

It is particularly preferred that the 5'-UTR element does not comprise a TOP-motif or a 5'TOP, as defined above.

In some embodiments, the nucleic acid sequence of the 5'-UTR element, which is derived from a 5'-UTR of a TOP gene, terminates at its 3'-end with a nucleotide located at position 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10 upstream of the start codon (e.g. A(U/T)G) of the gene or mRNA it is derived from. Thus, the 5'-UTR element does not comprise any part of the protein coding region. Thus, preferably, the only protein coding part of the artificial nucleic acid is provided by the at least one coding region.

The nucleic acid sequence, which is derived from the 5'-UTR of a TOP gene, is typically derived from a eukaryotic TOP gene, preferably a plant or animal TOP gene, more preferably a chordate TOP gene, even more preferably a vertebrate TOP gene, most preferably a mammalian TOP gene, such as a human TOP gene.

For example, the 5'-UTR element is preferably selected from 5'-UTR elements comprising or consisting of a nucleic acid sequence, which is derived from a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-1363, SEQ ID NO: 1395, SEQ ID NO: 1421 and SEQ ID NO: 1422 of the patent application WO 2013/143700, whose disclosure is incorporated herein by reference, from the homologs of SEQ ID NOs: 1-1363, SEQ ID NO: 1395, SEQ ID NO: 1421 and SEQ ID NO: 1422 of the patent application WO 2013/143700, from a variant thereof, or preferably from a corresponding RNA sequence. The term "homologs of SEQ ID NOs: 1-

1363, SEQ ID NO: 1395, SEQ ID NO: 1421 and SEQ ID NO: 1422 of the patent application WO 2013/143700" refers to sequences of other species than homo sapiens, which are homologous to the sequences according to SEQ ID NOs: 1-1363, SEQ ID NO: 1395, SEQ ID NO: 1421 and SEQ ID NO: 1422 of the patent application WO 2013/143700.

In a preferred embodiment, the 5'-UTR element of the artificial nucleic acid, preferably an mRNA, comprises or consists of a nucleic acid sequence, which is derived from a nucleic acid sequence extending from nucleotide position 5 (i.e. the nucleotide that is located at position 5 in the sequence) to the nucleotide position immediately 5' to the start codon (located at the 3' end of the sequences), e.g. the nucleotide position immediately 5' to the ATG sequence, of a nucleic acid sequence selected from SEQ ID NOs: 1-1363, SEQ ID NO: 1395, SEQ ID NO: 1421 and SEQ ID NO: 1422 of the patent application WO 2013/143700, from the homologs of SEQ ID NOs: 1-1363, SEQ ID NO: 1395, SEQ ID NO: 1421 and SEQ ID NO: 1422 of the patent application WO 2013/143700 from a variant thereof, or a corresponding RNA sequence. It is particularly preferred that the 5'-UTR element is derived from a nucleic acid sequence extending from the nucleotide position immediately 3' to the 5'TOP to the nucleotide position immediately 5' to the start codon (located at the 3'-end of the sequences), e.g. the nucleotide position immediately 5' to the ATG sequence, of a nucleic acid sequence selected from SEQ ID NOs: 1-1363, SEQ ID NO: 1395, SEQ ID NO: 1421 and SEQ ID NO: 1422 of the patent application WO 2013/143700, from the homologs of SEQ ID NOs: 1-1363, SEQ ID NO: 1395, SEQ ID NO: 1421 and SEQ ID NO: 1422 of the patent application WO 2013/143700, from a variant thereof, or a corresponding RNA sequence.

In a particularly preferred embodiment, the 5'-UTR element comprises or consists of a nucleic acid sequence, which is derived from a 5'-UTR of a TOP gene encoding a ribosomal protein or from a variant of a 5'-UTR of a TOP gene encoding a ribosomal protein. For example, the 5'-UTR element comprises or consists of a nucleic acid sequence, which is derived from a 5'-UTR of a nucleic acid sequence according to any of SEQ ID NO: 67, 170, 193, 244, 259, 554, 650, 675, 700, 721, 913, 1016, 1063, 1120, 1138, and 1284-1360 of the patent application WO 2013/143700, a corresponding RNA sequence, a homolog thereof, or a variant thereof as described herein, preferably lacking the 5'TOP motif. As described above, the sequence extending from position 5 to the nucleotide immediately 5' to the ATG (which is located at the 3'-end of the sequences) corresponds to the 5'-UTR of said sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NOs: 1-4410, or a fragment or variant of any of these sequences, wherein these sequences resemble VP1 protein sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NOs: 4411-8820, 39713, 39714, 39718, 39719, 39722, 39723, 39726, 39727, 39731, 39732, 39735, 39736, 39739, 39740, 39743 and 39744, or a fragment or variant of any of these sequences, wherein these sequences resemble VP1 nucleotide wild type sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NOs: 8821-13230, 39715, 39716, 39717, 39720, 39721, 39724, 39725, 39728, 39729, 39730, 39733, 39734, 39737, 39738, 39741, 39742, 39745, 39746, and/or SEQ ID NOs: 26461-30870, and/or SEQ ID NOs: 30871-35280, and/or SEQ ID NOs: 35281-39690, and/or SEQ ID NO:39713 to SEQ

ID NO:39746, and/or SEQ ID NO: 39714, 39716, 39729, 39734, 39738, 39725, or a fragment or variant of any of these sequences, wherein these sequences resemble optimized VP1 nucleotide wild type sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NOs: 13231-17640, or a fragment or variant of any of these sequences, wherein these sequences resemble optimized VP1 nucleotide wild type sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NOs: 17641-22050, or a fragment or variant of any of these sequences, wherein these sequences resemble optimized VP1 nucleotide wild type sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NOs: 22051-26460, or a fragment or variant of any of these sequences, wherein these sequences resemble optimized VP1 nucleotide wild type sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NOs: 26461-30870, or a fragment or variant of any of these sequences, wherein these sequences resemble optimized VP1 nucleotide wild type sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NOs: 30871-35280, or a fragment or variant of any of these sequences, wherein these sequences resemble optimized VP1 nucleotide wild type sequences.

In one embodiment, the sequences of the invention are selected from the group of any of SEQ ID NOs: 35281-39690, or a fragment or variant of any of these sequences, wherein these sequences resemble optimized VP1 nucleotide wild type sequences.

Preferably, the artificial nucleic acid according to the invention comprises a 5'-UTR comprising at least one heterologous 5'-UTR sequence, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence, which is derived from a 5'-UTR of a TOP gene encoding a ribosomal protein, preferably from a corresponding RNA sequence, or from a homolog, a fragment or a variant thereof, preferably lacking the 5'TOP motif.

Preferably, the 5'-UTR element comprises or consists of a nucleic acid sequence, which is derived from a 5'-UTR of a TOP gene encoding a ribosomal Large protein (RPL) or from a homolog or variant of a 5'-UTR of a TOP gene encoding a ribosomal Large protein (RPL). For example, the 5'-UTR element comprises or consists of a nucleic acid sequence, which is derived from a 5'-UTR of a nucleic acid sequence according to any of SEQ ID NOs: 67, 259, 1284-1318, 1344, 1346, 1348-1354, 1357, 1358, 1421 and 1422 of the patent application WO 2013/143700, a corresponding RNA sequence, a homolog thereof, or a variant thereof as described herein, preferably lacking the 5'TOP motif.

In a particularly preferred embodiment, the 5'-UTR element comprises or consists of a nucleic acid sequence, which is derived from the 5'-UTR of a ribosomal protein Large 32 gene, preferably from a vertebrate ribosomal protein Large 32 (L32) gene, more preferably from a mammalian ribosomal protein Large 32 (L32) gene, most preferably from a human ribosomal protein Large

32 (L32) gene, or from a variant of the 5'-UTR of a ribosomal protein Large 32 gene, preferably from a vertebrate ribosomal protein Large 32 (L32) gene, more preferably from a mammalian ribosomal protein Large 32 (L32) gene, most preferably from a human ribosomal protein Large 32 (L32) gene, wherein preferably the 5'-UTR element does not comprise the 5'TOP of said gene.

Accordingly, in a particularly preferred embodiment, the 5'-UTR element comprises or consists of a nucleic acid sequence which has an identity of at least about 40%, preferably of at least about 50%, preferably of at least about 60%, preferably of at least about 70%, more preferably of at least about 80%, more preferably of at least about 90%, even more preferably of at least about 95%, even more preferably of at least about 99% to the nucleic acid sequence according to SEQ ID NO: 20649 (5'-UTR of human ribosomal protein Large 32 lacking the 5'-terminal oligopyrimidine tract; corresponding to SEQ ID NO: 1368 of the patent application WO 2013/143700) or preferably to a corresponding RNA sequence, such as SEQ ID NO: 39692, or wherein the at least one 5'-UTR element comprises or consists of a fragment of a nucleic acid sequence which has an identity of at least about 40%, preferably of at least about 50%, preferably of at least about 60%, preferably of at least about 70%, more preferably of at least about 80%, more preferably of at least about 90%, even more preferably of at least about 95%, even more preferably of at least about 99% to the nucleic acid sequence according to SEQ ID NO: 39691, or more preferably to a corresponding RNA sequence, such as SEQ ID NO: 39692, wherein, preferably, the fragment is as described above, i.e. being a continuous stretch of nucleotides representing at least 20% etc. of the full-length 5'-UTR. Preferably, the fragment exhibits a length of at least about 20 nucleotides or more, preferably of at least about 30 nucleotides or more, more preferably of at least about 40 nucleotides or more. Preferably, the fragment is a functional fragment as described herein.

In some embodiments, the artificial nucleic acid according to the invention comprises a 5'-UTR element, which comprises or consists of a nucleic acid sequence, which is derived from the 5'-UTR of a vertebrate TOP gene, such as a mammalian, e.g. a human TOP gene, selected from RPSA, RPS2, RPS3, RPS3A, RPS4, RPS5, RPS6, RPS7, RPS8, RPS9, RPS10, RPS11, RPS12, RPS13, RPS14, RPS15, RPS15A, RPS16, RPS17, RPS18, RPS19, RPS20, RPS21, RPS23, RPS24, RPS25, RPS26, RPS27, RPS27A, RPS28, RPS29, RPS30, RPL3, RPL4, RPL5, RPL6, RPL7, RPL7A, RPL8, RPL9, RPL10, RPL10A, RPL11, RPL12, RPL13, RPL13A, RPL14, RPL15, RPL17, RPL18, RPL18A, RPL19, RPL21, RPL22, RPL23, RPL23A, RPL24, RPL26, RPL27, RPL27A, RPL28, RPL29, RPL30, RPL31, RPL32, RPL34, RPL35, RPL35A, RPL36, RPL36A, RPL37, RPL37A, RPL38, RPL39, RPL40, RPL41, RPLP0, RPLP1, RPLP2, RPLP3, RPLP0, RPLP1, RPLP2, EEF1A1, EEF1B2, EEF1D, EEF1G, EEF2, EIF3E, EIF3F, EIF3H, EIF2S3, EIF3C, EIF3K, EIF3EIP, EIF4A2, PABPC1, HNRNPA1, TPT1, TUBB1, UBA52, NPM1, ATP5G2, GNB2L1, NME2, UQCRB, or from a homolog or variant thereof, wherein preferably the 5'-UTR element does not comprise a TOP-motif or the 5'TOP of said genes, and wherein optionally the 5'-UTR element starts at its 5'-end with a nucleotide located at position 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10 downstream of the 5'-terminal oligopyrimidine tract (TOP) and wherein further optionally the 5'-UTR element which is derived from a 5'-UTR of a TOP gene terminates at its 3'-end with a nucleotide located at position 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10 upstream of the start codon (A(U/T)G) of the gene it is derived from.

According to a preferred embodiment, the artificial nucleic acid comprises at least one heterologous 5'-UTR element comprising a nucleic acid sequence, which is derived from a 5'-UTR of a TOP gene encoding a ribosomal Large protein (RPL), preferably

RPL32 or RPL35A, or from a gene selected from the group consisting of HSD17B4, ATP5A1, AIG1, ASAH1, COX6C or ABCB7 (also referred to herein as MDR), or from a homolog, a fragment or variant of any one of these genes, preferably lacking the 5'TOP motif.

In further particularly preferred embodiments, the 5'-UTR element comprises or consists of a nucleic acid sequence, which is derived from the 5'-UTR of a ribosomal protein Large 32 gene (RPL32), a ribosomal protein Large 35 gene (RPL35), a ribosomal protein Large 21 gene (RPL21), an ATP synthase, H+ transporting, mitochondrial F1 complex, alpha subunit 1, cardiac muscle (ATP5A1) gene, an hydroxysteroid (17-beta) dehydrogenase 4 gene (HSD17B4), an androgen-induced 1 gene (AIG1), cytochrome c oxidase subunit VIc gene (COX6C), a N-acylsphingosine amidohydrolase (acid ceramidase) 1 gene (ASAH1), or an ATP-Binding Cassette, Sub-Family B (MDR/TAP), Member 7 gene (ABCB7), or from a variant thereof, preferably from a vertebrate ribosomal protein Large 32 gene (RPL32), a vertebrate ribosomal protein Large 35 gene (RPL35), a vertebrate ribosomal protein Large 21 gene (RPL21), a vertebrate ATP synthase, H+ transporting, mitochondrial F1 complex, alpha subunit 1, cardiac muscle (ATP5A1) gene, a vertebrate hydroxysteroid (17-beta) dehydrogenase 4 gene (HSD17B4), a vertebrate androgen-induced 1 gene (AIG1), a vertebrate cytochrome c oxidase subunit VIc gene (COX6C), a vertebrate N-acylsphingosine amidohydrolase (acid ceramidase) 1 gene (ASAH1), or a vertebrate ATP-Binding Cassette, Sub-Family B (MDR/TAP), Member 7 gene (ABCB7), or from a variant thereof, more preferably from a mammalian ribosomal protein Large 32 gene (RPL32), a ribosomal protein Large 35 gene (RPL35), a ribosomal protein Large 21 gene (RPL21), a mammalian ATP synthase, H+ transporting, mitochondrial F1 complex, alpha subunit 1, cardiac muscle (ATP5A1) gene, a mammalian hydroxysteroid (17-beta) dehydrogenase 4 gene (HSD17B4), a mammalian androgen-induced 1 gene (AIG1), a mammalian cyto-chrome c oxidase subunit VIc gene (COX6C), a mammalian N-acylsphingosine ami-dohydrolase (acid ceramidase) 1 gene (ASAH1), or a mammalian ATP-Binding Cassette, Sub-Family B (MDR/TAP), Member 7 gene (ABCB7), or from a variant thereof, most preferably from a human ribosomal protein Large 32 gene (RPL32), a human ribosomal protein Large 35 gene (RPL35), a human ribosomal protein Large 21 gene (RPL21), a human ATP synthase, H+ transporting, mitochondrial F1 complex, alpha subunit 1, cardiac muscle (ATP5A1) gene, a human hydroxysteroid (17-beta) dehydrogenase 4 gene (HSD17B4), a human androgen-induced 1 gene (AIG1), a human cytochrome c oxidase subunit VIc gene (COX6C), a human N-acylsphingosine amidohydrolase (acid ceramidase) 1 gene (ASAH1), or a human ATP-Binding Cassette, Sub-Family B (MDR/TAP), Member 7 gene (ABCB7), or from a variant thereof, wherein preferably the 5'-UTR element does not comprise the 5'TOP of said gene.

Accordingly, in a particularly preferred embodiment, the 5'-UTR element comprises or consists of a nucleic acid sequence, which has an identity of at least about 40%, preferably of at least about 50%, preferably of at least about 60%, preferably of at least about 70%, more preferably of at least about 80%, more preferably of at least about 90%, even more preferably of at least about 95%, even more preferably of at least about 99% to the nucleic acid sequence according to SEQ ID NO: 1368, or SEQ ID NOs: 1412-1420 of the patent application WO 2013/143700, or a corresponding RNA sequence, or wherein the at least one 5'-UTR element comprises or consists of a fragment of a nucleic acid sequence which has an identity of at least about 40%, preferably of at least about 50%, preferably of at least about 60%, preferably of at least about 70%, more preferably of at least about 80%, more preferably of at least about 90%, even more preferably of at least about 95%, even more preferably of at least about

99% to the nucleic acid sequence according to SEQ ID NO: 1368, or SEQ ID NOs: 1412-1420 of the patent application WO 2013/143700, wherein, preferably, the fragment is as described above, i.e. being a continuous stretch of nucleotides representing at least 20% etc. of the full-length 5'-UTR. Preferably, the fragment exhibits a length of at least about 20 nucleotides or more, preferably of at least about 30 nucleotides or more, more preferably of at least about 40 nucleotides or more. Preferably, the fragment is a functional fragment as described herein.

According to a particularly preferred embodiment, the artificial nucleic acid comprises a 5'-UTR comprising at least one heterologous 5'-UTR element, wherein the heterologous 5'-UTR element comprises a nucleic acid sequence according to SEQ ID NO: 39691 to SEQ ID NO: 39694, or a homolog, a fragment or a variant thereof. Preferably, the at least one heterologous 5'-UTR element comprises or consists of a nucleic acid sequence, which has an identity of at least about 40%, preferably of at least about 50%, preferably of at least about 60%, preferably of at least about 70%, more preferably of at least about 80%, more preferably of at least about 90%, even more preferably of at least about 95%, even more preferably of at least about 99% to a nucleic acid sequence according to any one of SEQ ID NO: 39691 to SEQ ID NO: 39694.

According to a preferred embodiment, the artificial nucleic acid according to the invention comprises a 3'-untranslated region (3'-UTR). More preferably, the artificial nucleic acid according to the invention comprises a 3'-UTR comprising or consisting of at least one heterologous 3'-UTR element, preferably as defined herein.

Poly(A) sequence and Poly(C) sequence:

According to a further preferred embodiment, the artificial nucleic acid, preferably the 3'-UTR, may contain a poly-A tail of typically about 10 to 200 adenosine nucleotides, preferably about 10 to 100 adenosine nucleotides, more preferably about 40 to 80 adenosine nucleotides or even more preferably about 50 to 70 adenosine nucleotides.

Preferably, the poly(A) sequence in the artificial nucleic acid, preferably an mRNA, is derived from a DNA template by in vitro transcription. Alternatively, the poly(A) sequence may also be obtained in vitro by common methods of chemical-synthesis without being necessarily transcribed from a DNA progenitor. Moreover, poly(A) sequences, or poly(A) tails may be generated by enzymatic polyadenylation of the RNA according to the present invention using commercially available polyadenylation kits and corresponding protocols known in the art, or using immobilized poly(A)polymerases e.g. in a polyadenylation reactor (WO 2016/174271).

Alternatively, the artificial nucleic acid, preferably an mRNA, optionally comprises a polyadenylation signal, which is defined herein as a signal, which conveys polyadenylation to a (transcribed) mRNA by specific protein factors (e.g. cleavage and polyadenylation specificity factor (CPSF), cleavage stimulation factor (CstF), cleavage factors I and II (CF I and CF II), poly(A) polymerase (PAP)). In this context, a consensus polyadenylation signal is preferred comprising the NN(U/T)ANA consensus sequence. In a particularly preferred aspect, the polyadenylation signal comprises one of the following sequences: AA(U/T)AAA or A(U/T)(U/T)AAA (wherein uridine is usually present in RNA and thymidine is usually present in DNA).

According to a further preferred embodiment, the artificial nucleic acid of the present invention, preferably the 3'-UTR of the artificial nucleic acid, may contain a poly-C tail of typically about 10 to 200 cytosine nucleotides, preferably about 10 to 100 cytosine nucleotides, more preferably about 20 to 70 cytosine nucleotides or even more preferably about 20 to 60 or even 10 to 40 cytosine nucleotides.

3'-UTRs:

In a further preferred embodiment, the artificial nucleic acid according to the invention further comprises at least one 3'-UTR element, which comprises or consists of a nucleic acid sequence derived from the 3'-UTR of a chordate gene, preferably a vertebrate gene, more preferably a mammalian gene, most preferably a human gene, or from a variant of the 3'-UTR of a chordate gene, preferably a vertebrate gene, more preferably a mammalian gene, most preferably a human gene.

The term "3'-UTR element" refers to a nucleic acid sequence, which comprises or consists of a nucleic acid sequence that is derived from a 3'-UTR or from a variant of a 3'-UTR. A 3'-UTR element in the sense of the present invention may represent the 3'-UTR on a DNA or on an RNA level. Thus, in the sense of the present invention, preferably, a 3'-UTR element may be the 3'-UTR of an mRNA, preferably of an artificial mRNA, or it may be the transcription template for a 3'-UTR of an mRNA. Thus, a 3'-UTR element preferably is a nucleic acid sequence, which corresponds to the 3'-UTR of an mRNA, preferably to the 3'-UTR of an artificial mRNA, such as an mRNA obtained by transcription of a genetically engineered vector construct. Preferably, the 3'-UTR element fulfils the function of a 3'-UTR or encodes a sequence, which fulfils the function of a 3'-UTR.

Preferably, the artificial nucleic acid comprises a 3'-UTR element comprising or consisting of a nucleic acid sequence derived from a 3'-UTR of a gene, which preferably encodes a stable mRNA, or from a homolog, a fragment or a variant of said gene. In particular, the 3'-UTR element may be derivable from a gene that relates to an mRNA with an enhanced half-life (that provides a stable mRNA), for example a 3'-UTR element as defined and described below.

In a particularly preferred embodiment, the 3'-UTR element comprises or consists of a nucleic acid sequence which is derived from a 3'-UTR of a gene selected from the group consisting of an albumin gene, an α-globin gene, a β-globin gene, a tyrosine hydroxylase gene, a lipoxygenase gene, and a collagen alpha gene, such as a collagen alpha 1(I) gene, or from a homolog, a fragment or a variant of a 3'-UTR of a gene selected from the group consisting of an albumin gene, an α-globin gene, a β-globin gene, a tyrosine hydroxylase gene, a lipoxygenase gene, and a collagen alpha gene, such as a collagen alpha 1(I) gene. More preferably, the 3'-UTR element comprises or consists of a nucleic acid sequence which is derived from a 3'-UTR of a gene selected from the group consisting of an albumin gene, an α-globin gene, a β-globin gene, a tyrosine hydroxylase gene, a lipoxygenase gene, and a collagen alpha gene, such as a collagen alpha 1(I) gene, or from a homolog, a fragment or a variant of a 3'-UTR of a gene selected from the group consisting of an albumin gene, an α-globin gene, a β-globin gene, a tyrosine hydroxylase gene, a lipoxygenase gene, and a collagen alpha gene, such as a collagen alpha 1(I) gene according to SEQ ID NOs: 1369-1390 of

the patent application WO 2013/143700, whose disclosure is incorporated herein by reference, or from a homolog, a fragment or a variant thereof.

In a particularly preferred embodiment, the 3'-UTR element comprises or consists of a nucleic acid sequence, which is derived from the 3'-UTR of a vertebrate albumin gene or from a variant thereof, preferably from the 3'-UTR of a mammalian albumin gene or from a variant thereof, more preferably from the 3'-UTR of a human albumin gene or from a variant thereof, even more preferably from the 3'-UTR of the human albumin gene according to Genbank Accession number NM_000477.5, or from a fragment or variant thereof. More preferably, the 3'-UTR element comprises or consists of a nucleic acid according to SEQ ID NO: 39703, or SEQ ID NO: 39704 (corresponding to SEQ ID NO: 1369 of the patent application WO 2013/143700), or a fragment, homolog or variant thereof.

Most preferably the 3'-UTR element comprises or consists of the nucleic acid sequence derived from a fragment of the human albumin gene according to SEQ ID NO: 39705, or SEQ ID NO: 39706 (corresponding to SEQ ID NO: 1376 of the patent application WO 2013/143700), or a fragment, homolog or variant thereof. Further preferably, the 3'-UTR element comprises or consists of a nucleic acid according to SEQ ID NO: 39707, or SEQ ID NO: 39708, (Albumin 7), or a fragment, homolog or variant thereof.

In another particularly preferred embodiment, the at least one heterologous 3'-UTR element comprises or consists of a nucleic acid sequence derived from a 3'-UTR of an α-globin gene, preferably a vertebrate α-or β-globin gene, more preferably a mammalian α-or β-globin gene, most preferably a human α-or β-globin gene.

More preferably, the 3'-UTR element comprises or consists of a nucleic acid according to SEQ ID NO: 39695, or SEQ ID NO: 39696 (corresponding to SEQ ID NO: 1370 of the patent application WO 2013/143700), or a homolog, a fragment, or a variant thereof

Preferably, the at least one heterologous 3'-UTR element comprises or consists of a nucleic acid sequence derived from a 3'-UTR of Homo sapiens hemoglobin, alpha 1 (HBA1). More preferably, the 3'-UTR element comprises or consists of a nucleic acid according to SEQ ID NO: 39695, or SEQ ID NO: 39696 (corresponding to SEQ ID NO: 1370 of the patent application WO 2013/143700), or a homolog, a fragment, or a variant thereof.

In another embodiment, the at least one heterologous 3'-UTR element comprises or consists of a nucleic acid sequence derived from a 3'-UTR of Homo sapiens hemoglobin, alpha 2 (HBA2). More preferably, the 3'-UTR element comprises or consists of a nucleic acid according to SEQ ID NO: 39697 or SEQ ID NO: 39698 (corresponding to SEQ ID NO: 1371 of the patent application WO 2013/143700), or a homolog, a fragment, or a variant thereof.

According to another embodiment, the at least one heterologous 3'-UTR element comprises or consists of a nucleic acid sequence derived from a 3'-UTR of Homo sapiens hemoglobin, beta (HBB). More preferably, the 3'-UTR element comprises or consists of a

nucleic acid according to SEQ ID NO: 39699, or SEQ ID NO: 39700 (corresponding to SEQ ID NO: 1372 of the patent application WO 2013/143700), or a homolog, a fragment, or a variant thereof.

The at least one heterologous 3'-UTR element may further comprise or consist of the center, α-complex-binding portion of the 3'-UTR of an α-globin gene, such as of a human α-globin gene, or a homolog, a fragment, or a variant of an α-globin gene, preferably according to SEQ ID NO: 39701 or SEQ ID NO: 39702 (also referred to herein as "muag") (corresponding to SEQ ID NO: 1393 of the patent application WO 2013/143700), or a homolog, a fragment, or a variant thereof.

The term "a nucleic acid sequence which is derived from the 3'-UTR of a [...] gene" preferably refers to a nucleic acid sequence which is based on the 3'-UTR sequence of a [...] gene or on a part thereof, such as on the 3'-UTR of an albumin gene, an α-globin gene, a β-globin gene, a tyrosine hydroxylase gene, a lipoxygenase gene, or a collagen alpha gene, such as a collagen alpha 1(I) gene, preferably of an albumin gene or on a part thereof. This term includes sequences corresponding to the entire 3'-UTR sequence, i.e. the full length 3'-UTR sequence of a gene, and sequences corresponding to a fragment of the 3'-UTR sequence of a gene, such as an albumin gene, α-globin gene, β-globin gene, tyrosine hydroxylase gene, lipoxygenase gene, or collagen alpha gene, such as a collagen alpha 1(I) gene, preferably of an albumin gene.

The term "a nucleic acid sequence which is derived from a variant of the 3'-UTR of a [...] gene" preferably refers to a nucleic acid sequence, which is based on a variant of the 3'-UTR sequence of a gene, such as on a variant of the 3'-UTR of an albumin gene, an α-globin gene, a β-globin gene, a tyrosine hydroxylase gene, a lipoxygenase gene, or a collagen alpha gene, such as a collagen alpha 1(I) gene, or on a part thereof as described above. This term includes sequences corresponding to the entire sequence of the variant of the 3'-UTR of a gene, i.e. the full length variant 3'-UTR sequence of a gene, and sequences corresponding to a fragment of the variant 3'-UTR sequence of a gene. A fragment in this context preferably consists of a continuous stretch of nucleotides corresponding to a continuous stretch of nucleotides in the full-length variant 3'-UTR, which represents at least 20%, preferably at least 30%, more preferably at least 40%, more preferably at least 50%, even more preferably at least 60%, even more preferably at least 70%, even more preferably at least 80%, and most preferably at least 90% of the full-length variant 3'-UTR. Such a fragment of a variant, in the sense of the present invention, is preferably a functional fragment of a variant as described herein.

Preferably, the at least one 5'-UTR element and the at least one 3'-UTR element act synergistically to increase protein production from the inventive artificial nucleic acid as described above.

Histone-stem-loop:

In a particularly preferred embodiment, the inventive artificial nucleic acid as described herein comprises a histone stem-loop sequence/structure (histone stem-loop). Such histone stem-loop sequences are preferably selected from histone stem-loop sequences as disclosed in WO 2012/019780, whose disclosure is incorporated herewith by reference.

A histone stem-loop sequence, suitable to be used within the present invention, is preferably selected from at least one of the following formulae (I) or (II):

formula (I) (stem-loop sequence without stem bordering elements):

$$\underbrace{[N_{0-2}GN_{3-5}]}_{\text{stem1}}\ \underbrace{[N_{0-4}(U/T)N_{0-4}]}_{\text{loop}}\ \underbrace{[N_{3-5}CN_{0-2}]}_{\text{stem2}}$$

formula (II) (stem-loop sequence with stem bordering elements):

$$\underbrace{N_{1-6}}_{\text{stem1}}\ \underbrace{[N_{0-2}GN_{3-5}]}_{\text{stem1}}\ \underbrace{[N_{0-4}(U/T)N_{0-4}]}_{\text{loop}}\ \underbrace{[N_{3-5}CN_{0-2}]}_{\text{stem2}}\ \underbrace{N_{1-6}}_{\text{stem2}}$$

bordering element bordering element

wherein:

stem1 or stem2 bordering elements N_{1-6}	is a consecutive sequence of 1 to 6, preferably of 2 to 6, more preferably of 2 to 5, even more preferably of 3 to 5, most preferably of 4 to 5 or 5 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C, or a nucleotide analogue thereof;
stem1 $[N_{0-2}GN_{3-5}]$	is reverse complementary or partially reverse complementary with element stem2, and is a consecutive sequence between of 5 to 7 nucleotides;
	wherein N_{0-2} is a consecutive sequence of 0 to 2, preferably of 0 to 1, more preferably of 1 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof;
	wherein N_{3-5} is a consecutive sequence of 3 to 5, preferably of 4 to 5, more preferably of 4 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof, and

wherein G is guanosine or an analogue thereof, and may be optionally replaced by a cytidine or an analogue thereof, provided that its complementary nucleotide cytidine in stem2 is replaced by guanosine;

loop sequence [N_{0-4}(U/T)N_{0-4}] is located between elements stem1 and stem2, and is a consecutive sequence of 3 to 5 nucleotides, more preferably of 4 nucleotides;

wherein each N_{0-4} is independent from another a consecutive sequence of 0 to 4, preferably of 1 to 3, more preferably of 1 to 2 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof; and
wherein U/T represents uridine, or optionally thymidine;

stem2 [N_{3-5}CN_{0-2}] is reverse complementary or partially reverse complementary with element stem1, and is a consecutive sequence between of 5 to 7 nucleotides;

wherein N_{3-5} is a consecutive sequence of 3 to 5, preferably of 4 to 5, more preferably of 4 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof;

wherein N_{0-2} is a consecutive sequence of 0 to 2, preferably of 0 to 1, more preferably of 1 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G or C or a nucleotide analogue thereof; and

wherein C is cytidine or an analogue thereof, and may be optionally replaced by a guanosine or an analogue thereof provided that its complementary nucleoside guanosine in stem1 is replaced by cytidine;

wherein
stem1 and stem2 are capable of base pairing with each other forming a reverse complementary sequence, wherein base pairing may occur between stem1 and stem2, e.g. by Watson-Crick base pairing of nucleotides A and U/T or G and C or by non-Watson-Crick base pairing e.g. wobble base pairing, reverse Watson-Crick base pairing, Hoogsteen base pairing, reverse Hoogsteen base pairing or are capable of base pairing with each other forming a partially reverse complementary sequence, wherein an incomplete base pairing may occur between stem1 and stem2, on the basis that one ore more bases in one stem do not have a complementary base in the reverse complementary sequence of the other stem.

According to a further preferred embodiment of the first inventive aspect, the inventive artificial nucleic acid may comprise at least one histone stem-loop sequence according to at least one of the following specific formulae (Ia) or (IIa):

formula (Ia) (stem-loop sequence without stem bordering elements):

$$\underbrace{[N_{0-1}GN_{3-5}]}_{\text{stem1}}\ \underbrace{[N_{1-3}(U/T)N_{0-2}]}_{\text{loop}}\ \underbrace{[N_{3-5}CN_{0-1}]}_{\text{stem2}}$$

formula (IIa) (stem-loop sequence with stem bordering elements):

$$\underbrace{N_{2-5}}_{\substack{\text{stem1}\\ \text{bordering element}}}\ \underbrace{[N_{0-1}GN_{3-5}]}_{\text{stem1}}\ \underbrace{[N_{1-3}(U/T)N_{0-2}]}_{\text{loop}}\ \underbrace{[N_{3-5}CN_{0-1}]}_{\text{stem2}}\ \underbrace{N_{2-5}}_{\substack{\text{stem2}\\ \text{bordering element}}}$$

wherein: N, C, G, T and U are as defined above.

According to a further more particularly preferred embodiment of the first aspect, the inventive artificial nucleic acid may comprise at least one histone stem-loop sequence according to at least one of the following specific formulae (Ib) or (IIb):

formula (Ib) (stem-loop sequence without stem bordering elements):

$$\underbrace{[N_1GN_4]}_{\text{stem1}}\ \underbrace{[N_2(U/T)N_1]}_{\text{loop}}\ \underbrace{[N_4CN_1]}_{\text{stem2}}$$

formula (IIb) (stem-loop sequence with stem bordering elements):

$$\underbrace{N_{4-5}}_{\substack{\text{stem1}\\ \text{bordering element}}}\ \underbrace{[N_1GN_4]}_{\text{tem1}}\ \underbrace{[N_2(U/T)N_1]}_{\text{loop}}\ \underbrace{[N_4CN_1]}_{\text{stem2}}\ \underbrace{N_{4-5}}_{\substack{\text{stem2}\\ \text{bordering element}}}$$

wherein: N, C, G, T and U are as defined above.

A particular preferred histone stem-loop sequence is the nucleic acid sequence according to SEQ ID NO: 39709, or more preferably the corresponding RNA sequence according to SEQ ID NO: 39710.

Additional peptide or protein elements:

According to other preferred embodiments, the artificial nucleic acid sequence, particularly the RNA sequence according to the invention may additionally encode further peptide or protein elements that e.g., promote secretion of the protein (secretory signal peptides), promote anchoring of the encoded antigen in the plasma membrane (transmembrane domains), promote virus-like particle formation (VLP forming domains). In addition, the artificial nucleic acid sequence according to the present invention may additionally encode peptide linker elements, self-cleaving peptides or helper peptides.

According to another particularly preferred embodiment, the inventive artificial nucleic acid may additionally or alternatively encode a secretory signal peptide (signal sequence). Such signal peptides are sequences, which typically exhibit a length of about 10 to 30 amino acids and are preferably located at the N-terminus of the encoded peptide, without being limited thereto. Signal peptides as defined herein preferably allow the transport of the at least one protein encoded by the at least one coding region of the inventive artificial nucleic acid into a defined cellular compartment, preferably the cell surface, the endoplasmic reticulum (ER) or the endosomal-lysosomal compartment. Examples of secretory signal peptide sequences as defined herein include, without being limited thereto, signal sequences of classical or non-classical MHC-molecules (e.g. signal sequences of MHC I and II molecules, e.g. of the MHC class I molecule HLA-A*0201), signal sequences of cytokines or immunoglobulines as defined herein, signal sequences of the invariant chain of immunoglobulines or antibodies as defined herein, signal sequences of Lampl, Tapasin, Erp57, Calretikulin, Calnexin, and further membrane associated proteins or of proteins associated with the endoplasmic reticulum (ER) or the endosomal-lysosomal compartiment. More preferably, signal sequences of MHC class I molecule HLA-A*0201 may be used according to the present invention.

According to other embodiments, the artificial nucleic acid sequence, particularly the RNA sequence according to the invention may additionally encode at least one transmembrane domain element.

Transmembrane elements or membrane spanning polypeptide elements are present in proteins that are integrated or anchored in plasma membranes of cells. Typical transmembrane elements are alpha-helical transmembrane elements. Such transmembrane elements are composed essentially of amino acids with hydrophobic side chains, because the interior of a cell membrane (lipid bilayer) is also hydrophobic. From the structural perspective, transmembrane elements are commonly single hydrophobic alpha helices or beta barrel structures; whereas hydrophobic alpha helices are usually present in proteins that are present in membrane anchored proteins (e.g., seven transmembrane domain receptors), beta-barrel structures are often present in proteins that generate pores or channels.

For target proteins, such as antigenic peptides or proteins according to the present invention (derived from Norovirus) it may be beneficial to introduce a transmembrane element into the respective constructs. By addition of a transmembrane element to the target peptide/protein it may be possible to further enhance the immune response, wherein the translated target peptide/protein, e.g. a viral antigen, anchors to a target membrane, e.g. the plasma membrane of a cell, thereby increasing immune responses. This effect is also referred to as antigen clustering.

When used in combination with a polypeptide or protein of interest in the context of the present invention, such transmembrane element can be placed N-terminal or C-terminal to the Norovirus antigenic peptide or protein of interest. On nucleic acid level, the coding sequence for such transmembrane element is typically placed in frame (i.e. in the same reading frame), 5' or 3' to the coding sequence of the polypeptide as defined herein.

The transmembrane domain may be selected from the transmembrane domain of Hemagglutinin (HA) of Influenza virus, Env of HIV-1, EIAV (equine infectious anaemia virus), MLV (murine leukaemia virus), mouse mammary tumor virus, G protein of VSV (vesicular stomatitis virus), Rabies virus, or a transmembrane element of a seven transmembrane domain receptor.

According to other embodiments, the artificial nucleic acid sequence, particularly the RNA sequence according to the invention may additionally encode at least one VLP forming domain.

VLPs are self-assembled viral structural proteins (envelope proteins or capsid proteins) that structurally resemble viruses (without containing viral genetic material). VLPs contain repetitive high density displays of antigens which present conformational epitopes that can elicit strong T cell and B cell immune responses.

When used in combination with a Norovirus antigenic peptide or protein in the context of the present invention, such VLP forming element can be placed N-terminal or C-terminal to the polypeptide of interest. On nucleic acid level, the coding sequence for such VLP forming element is typically placed in frame (i.e. in the same reading frame), 5' or 3' to the coding sequence of the polypeptide as defined herein.

For nucleic acid (e.g. RNA) encoding a polypeptide or protein of interest, particularly Norovirus antigenic polypeptides or proteins, it may be beneficial to introduce a VLP forming element into the respective constructs. In addition to the "clustering" of epitopes, an improved secretion of the VLP particle may also increase the immunogenicity of the respective antigen.

VLP forming elements fused to an antigen may generate virus like particles containing repetitive high density displays of antigens. Essentially, such VLP forming elements can be chosen from any viral or phage capsid or envelope protein.

According to another embodiment, the artificial nucleic acid sequence, particularly the RNA sequence according to the invention may additionally encode at least one peptide linker element.

In protein constructs composed of several elements (e.g., Norovirus antigenic peptide or protein fused to a transmembrane domain), the protein elements may be separated by peptide linker elements. Such elements may be beneficial because they allow for a proper folding of the individual elements and thereby the proper functionality of each element. Alternatively, the term "spacer" or "peptide spacer" is used herein.

When used in the context of the present invention, such linkers or spacers are particularly useful when encoded by a nucleic acid encoding at least two functional protein elements, such as at least one polypeptide or protein of interest (Norovirus antigens) and at least one further protein or polypeptide element (e.g., VLP forming domain, transmembrane domain). In that case, the linker is typically located on the polypeptide chain in between the polypeptide of interest and the at least one further protein element. On nucleic acid level, the coding sequence for such linker is typically placed in the reading frame, 5' or 3' to the coding sequence for the polypeptide or protein of interest, or placed between coding regions for individual polypeptide domains of a given protein of interest.

Peptide linkers are preferably composed of small, non-polar (e.g. Gly) or polar (e.g. Ser or Thr) amino acids. The small size of these amino acids provides flexibility, and allows for mobility of the connecting functional domains. The incorporation of Ser or Thr can maintain the stability of the linker in aqueous solutions by forming hydrogen bonds with the water molecules, and therefore reduces an interaction between the linker and the protein moieties. Rigid linkers generally maintain the distance between the protein domains and they may be based on helical structures and/or they have a sequence that is rich in proline. Cleavable linkers (also termed "cleavage linkers") allow for in vivo separation of the protein domains. The mechanism of cleavage may be based e.g. on reduction of disulfide bonds within the linker sequence or proteolytic cleavage. The cleavage may be mediated by an enzyme (enzymatic cleavage), e.g. the cleavage linker may provide a protease sensitive sequence (e.g., furin cleavage).

A typical sequence of a flexible linker is composed of repeats of the amino acids Glycine (G) and Serine (S). For instance, the linker may have the following sequence: GS, GSG, SGG, SG, GGS, SGS, GSS, SSG. In some embodiments, the same sequence is repeated multiple times (e.g. two, three, four, five or six times) to create a longer linker. In other embodiments, a single amino acid residue such as S or G can be used as a linker.

Linkers or spacers may be used as additional elements to promote or improve the secretion of the target protein (Norovirus antigenic peptides or proteins).

According to other embodiments, the artificial nucleic acid sequence, particularly the RNA sequence according to the invention may additionally encode at least one self-cleaving peptide.

Viral self-cleaving peptides (2A peptides) allow the expression of multiple proteins from a single open reading frame. The terms 2A peptide and 2A element are used interchangeably herein. The mechanism by the 2A sequence for generating two proteins from one transcript is by ribosome skipping – a normal peptide bond is impaired at 2A, resulting in two discontinuous protein fragments from one translation event.

When used in the context of the present invention, such 2A peptides are particularly useful when encoded by a nucleic acid encoding at least two functional protein elements (e.g. two Norovirus antigenic peptides or proteins). In general, a 2A element is useful when the nucleic acid molecule encodes at least one polypeptide or protein of interest and at least one further protein element. In a preferred embodiment, a 2A element is present when the polynucleotide of the invention encodes two proteins or polypeptides of interest, e.g. two antigens.

The coding sequence for such 2A peptide is typically located in between the coding sequence of the polypeptide of interest and the coding sequence of the least one further protein element (which may also be a polypeptide of interest), so that cleavage of the 2A peptide leads to two separate polypeptide molecules, at least one of them being a polypeptide or protein of interest.

For example, for expressing target proteins (Norovirus antigenic peptides or proteins) that are composed of several polypeptide chains it may be beneficial to provide coding information for both polypeptide chains on a single nucleic acid molecule, separated by a nucleic acid sequence encoding a 2A peptide. 2A peptides may also be beneficial when cleavage of the protein of interest from another encoded polypeptide element is desired.

2A peptides may be derived from foot-and-mouth diseases virus, from equine rhinitis A virus, Thosea asigna virus, Porcine teschovirus-1.

According to other embodiments, the artificial nucleic acid sequence, particularly the RNA sequence according to the invention may additionally encode at least one helper peptide.

In essence, helper peptides binds to class II MHC molecules as a nonspecific vaccine helper epitope (adjuvant) and induces an increased (and long term) immune response by increasing the helper T-cell response. In an embodiment, such a helper peptide may be N-terminally and/or C-terminally fused to the antigenic peptide or protein derived from Norovirus.

<u>mRNA structures:</u>

Any of the above modifications may be applied to the artificial nucleic acid of the present invention, and further to any nucleic acid as used in the context of the present invention and may be, if suitable or necessary, be combined with each other in any combination, provided, these combinations of modifications do not interfere with each other in the artificial nucleic acid. A person skilled in the art will be able to take his choice accordingly.

The artificial nucleic acid as defined herein, may preferably comprise a 5'-UTR, a coding region encoding the at least one polypeptide comprising at least one Norovirus protein as described herein, or a fragment, variant or derivative thereof; and/or a 3'-UTR preferably containing at least one histone stem-loop. The 3'-UTR of the artificial nucleic acid preferably comprises also a poly(A) and/or a poly(C) sequence as defined herewithin. The single elements of the 3'-UTR may occur therein in any order from 5' to 3' along the sequence of the artificial nucleic acid. In addition, further elements as described herein, may also be

contained, such as a stabilizing sequence as defined herewithin (e.g. derived from the UTR of a globin gene), IRES sequences, etc. Each of the elements may also be repeated in the artificial nucleic acid according to the invention at least once (particularly in di- or multicistronic constructs), preferably twice or more. As an example, the single elements may be present in the artificial nucleic acid in the following order:

5'– coding region – histone stem-loop – poly(A)/(C) sequence – 3'; or
5'– coding region – poly(A)/(C) sequence – histone stem-loop – 3'; or
5'– coding region – histone stem-loop – polyadenylation signal – 3'; or
5'– coding region – polyadenylation signal– histone stem-loop – 3'; or
5'– coding region – histone stem-loop – histone stem-loop – poly(A)/(C) sequence – 3'; or
5'– coding region – histone stem-loop – histone stem-loop – polyadenylation signal– 3'; or
5'– coding region – stabilizing sequence – poly(A)/(C) sequence – histone stem-loop – 3'; or
5'– coding region – stabilizing sequence – poly(A)/(C) sequence – poly(A)/(C) sequence – histone stem-loop – 3'; etc.

In this context, it is particularly preferred that – if, in addition to the at least one encoded polypeptide defined herein, a further peptide or protein is encoded by the artificial nucleic acid – the encoded peptide or protein is preferably no histone protein, no reporter protein (e.g. Luciferase, GFP, EGFP, β-Galactosidase, particularly EGFP) and/or no marker or selection protein (e.g. alpha-Globin, Galactokinase and Xanthine:Guanine phosphoribosyl transferase (GPT)). In a preferred embodiment, the artificial nucleic acid according to the invention does not comprise a reporter gene or a marker gene. Preferably, the artificial nucleic acid according to the invention does not encode, for instance, luciferase; green fluorescent protein (GFP) and its variants (such as eGFP, RFP or BFP); α-globin; hypoxanthine-guanine phosphoribosyltransferase (HGPRT); β-galactosidase; galactokinase; alkaline phosphatase; secreted embryonic alkaline phosphatase (SEAP)) or a resistance gene (such as a resistance gene against neomycin, puromycin, hygromycin and zeocin). In a preferred embodiment, the artificial nucleic acid according to the invention does not encode luciferase. In another embodiment, the artificial nucleic acid according to the invention does not encode GFP or a variant thereof.

According to a preferred embodiment, the inventive artificial nucleic acid comprises or consists of, preferably in 5' to 3' direction, the following elements:

a) optionally, a 5'-cap structure (cap0, cap1, cap2), preferably m7GpppN,
b) a coding region encoding at least one protein comprising at least one Norovirus protein as described herein, or a fragment or variant thereof,
c) optionally a poly(A) tail, preferably consisting of 10 to 200, 10 to 100, 40 to 80 or 50 to 70 adenosine nucleotides,
d) optionally a poly(C) tail, preferably consisting of 10 to 200, 10 to 100, 20 to 70, 20 to 60 or 10 to 40 cytosine nucleotides, and
e) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEQ ID NO: 39709 to SEQ ID NO: 39710.

More preferably, the artificial nucleic acid according to the invention comprises or consists of, preferably in 5' to 3' direction, the following elements:

a) optionally, a 5'-cap structure (cap0, cap1, cap2), preferably m7GpppN,

b) a coding region encoding at least one protein comprising at least one Norovirus protein as described herein, or a fragment or variant thereof,

c) a 3'-UTR element comprising a nucleic acid sequence, which is derived from an α-globin gene, preferably comprising the corresponding RNA sequence of the nucleic acid sequence according to SEQ ID NO: 39701, or SEQ ID NO: 39702, or a homolog, a fragment or a variant thereof,

d) optionally a poly(A) tail, preferably consisting of 10 to 200, 10 to 100, 40 to 80 or 50 to 70 adenosine nucleotides,

e) optionally a poly(C) tail, preferably consisting of 10 to 200, 10 to 100, 20 to 70, 20 to 60 or 10 to 40 cytosine nucleotides, and

f) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEQ ID NO: 39709 to SEQ ID NO: 39710.

According to a particularly preferred embodiment the RNA sequence according to the invention comprises, preferably in 5'- to 3'-direction:

a) a 5'-cap structure (cap0, cap1, cap2), preferably m7GpppN;

b) a 5'-UTR element which comprises or consists of a nucleic acid sequence corresponding to a nucleic acid sequence according to SEQ ID NO: 39691, or SEQ ID NO: 39692, or SEQ ID NO: 39693, or SEQ ID NO: 39694, a homolog, a fragment or a variant thereof;

c) at least one coding sequence according to any one of SEQ ID NOs: 8821-39690, 39717, and/or 39730 or a variant or fragment thereof encoding at least one antigenic peptide or protein derived from a Norovirus protein or peptide or a fragment or variant thereof according to any one of SEQ ID NOs: 1-4410, preferably comprising or consisting of any one of the nucleic acid sequences according to, or a fragment or variant thereof,

d) a 3'-UTR element comprising or consisting of a nucleic acid sequence which is derived from a gene providing a stable RNA, preferably comprising or consisting of the corresponding to a nucleic acid sequence according to SEQ ID NO: 39707, or SEQ ID NO: 39708, or SEQ ID NO: 39703, or SEQ ID NO: 39704, a homolog, a fragment or a variant thereof;

e) optionally, a poly(A) sequence preferably comprising 64 adenosines; and

f) optionally, a poly(C) sequence, preferably comprising 30 cytosines.

More preferably, the artificial nucleic acid according to the invention comprises or consists of, preferably in 5' to 3' direction, the following elements:

a) optionally, a 5'-cap structure (cap0, cap1, cap2), preferably m7GpppN,

b) a 5'-UTR element, which comprises or consists of a nucleic acid sequence, which is derived from the 5'-UTR of a TOP gene, preferably comprising a nucleic acid sequence according to SEQ ID NO: 39691 to SEQ ID NO: 39694, or a homolog, a fragment or a variant thereof,

c) a coding sequence encoding at least one protein comprising at least one Norovirus protein as described herein, or a fragment or variant thereof,

d) a 3'-UTR element comprising a nucleic acid sequence, which is derived from an albumin gene, preferably comprising the corresponding RNA sequence of the nucleic acid sequence according to SEQ ID NO: 39705, or SEQ ID NO: 39706, or a homolog, a fragment or a variant thereof,

e) optionally a poly(A) tail, preferably consisting of 10 to 200, 10 to 100, 40 to 80 or 50 to 70 adenosine nucleotides,

f) optionally a poly(C) tail, preferably consisting of 10 to 200, 10 to 100, 20 to 70, 20 to 60 or 10 to 40 cytosine nucleotides, and

g) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEQ ID NO: 39709 to SEQ ID NO: 39710.

In some embodiments, the at least one coding region of the artificial nucleic acid according to the present invention comprises a nucleic acid sequence encoding a molecular tag. More preferably, the molecular tag is selected from the group consisting of a FLAG tag, a glutathione-S-transferase (GST) tag, a His tag, a Myc tag, an E tag, a Strep tag, a green fluorescent protein (GFP) tag and an HA tag.

In particularly preferred embodiments the mRNA sequence according to the invention comprises the following mRNA sequences (or RNA sequences being identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to the following RNA sequences):

- mRNA encoding VP1 protein of Norovirus GII.4-031693-USA-2003; SEQ ID NO: 39713.
- mRNA encoding VP1 protein of Norovirus GII.4-031693-USA-2003; SEQ ID NO: 39714.
- mRNA encoding VP1 protein of Norovirus GII.4-031693-USA-2003; SEQ ID NO: 39715.
- mRNA encoding VP1 protein of Norovirus GII.4-031693-USA-2003; SEQ ID NO: 39716.
- mRNA encoding VP1 protein of Norovirus GII.4-031693-USA-2003; SEQ ID NO: 39717.
- mRNA encoding VP1 protein of Norovirus GII.4 Farmington Hills-2002-USA; SEQ ID NO: 39718.
- mRNA encoding VP1 protein of Norovirus GII.4 Farmington Hills-2002-USA; SEQ ID NO: 39719.
- mRNA encoding VP1 protein of Norovirus GII.4 Farmington Hills-2002-USA; SEQ ID NO: 39720.
- mRNA encoding VP1 protein of Norovirus GII.4 Farmington Hills-2002-USA; SEQ ID NO: 39721.
- mRNA encoding VP1 protein of Norovirus GI.1-USA-1968; SEQ ID NO: 39722.
- mRNA encoding VP1 protein of Norovirus GI.1-USA-1968; SEQ ID NO: 39723.
- mRNA encoding VP1 protein of Norovirus GI.1-USA-1968; SEQ ID NO: 39724.
- mRNA encoding VP1 protein of Norovirus GI.1-USA-1968; SEQ ID NO: 39725.
- mRNA encoding VP1 protein of Norovirus GII.4 2006b 092895-USA-2008; SEQ ID NO: 39726.

- mRNA encoding VP1 protein of Norovirus GII.4 2006b 092895-USA-2008; SEQ ID NO: 39727.
- mRNA encoding VP1 protein of Norovirus GII.4 2006b 092895-USA-2008; SEQ ID NO: 39728.
- mRNA encoding VP1 protein of Norovirus GII.4 2006b 092895-USA-2008; SEQ ID NO: 39729.
- mRNA encoding VP1 protein of Norovirus GII.4 2006b 092895-USA-2008; SEQ ID NO: 39730.
- mRNA encoding VP1 protein of Norovirus GII.4 GZ2010-L87-Guangzhou-2011; SEQ ID NO: 39731.
- mRNA encoding VP1 protein of Norovirus GII.4 GZ2010-L87-Guangzhou-2011; SEQ ID NO: 39732.
- mRNA encoding VP1 protein of Norovirus GII.4 GZ2010-L87-Guangzhou-2011; SEQ ID NO: 39733.
- mRNA encoding VP1 protein of Norovirus GII.4 GZ2010-L87-Guangzhou-2011; SEQ ID NO: 39734.
- mRNA encoding VP1 protein of Norovirus GII.4 USA-1997; SEQ ID NO: 39735.
- mRNA encoding VP1 protein of Norovirus GII.4 USA-1997; SEQ ID NO: 39736.
- mRNA encoding VP1 protein of Norovirus GII.4 USA-1997; SEQ ID NO: 39737.
- mRNA encoding VP1 protein of Norovirus GII.4 USA-1997; SEQ ID NO: 39738.
- mRNA encoding VP1 protein of Norovirus Melksham; SEQ ID NO: 39739.
- mRNA encoding VP1 protein of Norovirus Melksham; SEQ ID NO: 39740.
- mRNA encoding VP1 protein of Norovirus Melksham; SEQ ID NO: 39741.
- mRNA encoding VP1 protein of Norovirus Melksham; SEQ ID NO: 39742.
- mRNA encoding VP1 protein of Norovirus GII.2-Vaals87-2005-NL; SEQ ID NO: 39743.
- mRNA encoding VP1 protein of Norovirus GII.2-Vaals87-2005-NL; SEQ ID NO: 39744.
- mRNA encoding VP1 protein of Norovirus GII.2-Vaals87-2005-NL; SEQ ID NO: 39745.
- mRNA encoding VP1 protein of Norovirus GII.2-Vaals87-2005-NL; SEQ ID NO: 39746.

RNA production:

The artificial nucleic acid according to the invention may be prepared by using any suitable method known in the art, including synthetic methods such as e.g. solid phase synthesis, as well as recombinant and in vitro methods, such as in vitro transcription reactions.

In a preferred embodiment, a linear DNA template is transcribed in vitro using DNA dependent T7 RNA polymerase in the presence of a nucleotide mixture and cap analog (m7GpppG) under suitable buffer conditions. In a particularly preferred embodiment, RNA production is performed under current good manufacturing practice, implementing various quality control steps, e.g. according to WO 2016/180430. The obtained RNAs are HPLC purified using PureMessenger® (CureVac, Tübingen, Germany; WO 2008/077592). In a preferred embodiment, purified RNA product is lyophilized according to WO 2016/165831 to yield a temperature stable Norovirus artificial nucleic acid. For the production of polyvalent Norovirus compositions, methods as disclosed in the PCT application PCT/EP2016/082487 are preferably used and adapted accordingly.

Composition:

In a further aspect, the present invention provides a composition comprising at least one artificial nucleic acid as described herein and a suitable carrier, preferably a pharmaceutically acceptable carrier. The inventive composition comprising the artificial nucleic acid as described herein is preferably a (pharmaceutical) composition or a vaccine as described herein.

The inventive composition may comprise either only one type of artificial nucleic acid or at least two different artificial nucleic acids. In particular, the inventive composition may comprise at least two artificial nucleic acids as described herein, wherein each of the at least two artificial nucleic acids comprises at least one coding region encoding at least one polypeptide comprising a different one of the Norovirus proteins as described herein, or a fragment or a variant of any one of these proteins. Alternatively, the composition may comprise at least two artificial nucleic acids as described herein, wherein each of the at least two artificial nucleic acids comprises at least one coding region encoding at least one polypeptide comprising at least two different Norovirus proteins as described herein, or a fragment or a variant of any one of these proteins. In another embodiment, the composition may also comprise at least two different artificial nucleic acids, which are bi- or multicistronic nucleic acids as described herein and wherein each of the artificial nucleic acids encodes at least two polypeptides, each comprising at least one Norovirus protein, or a fragment or variant thereof.

Preferably, the inventive composition comprises or consists of at least one artificial nucleic acid as described herein and a pharmaceutically acceptable carrier. The expression "pharmaceutically acceptable carrier" as used herein preferably includes the liquid or non-liquid basis of the inventive composition, which is preferably a pharmaceutical composition or a vaccine. If the inventive composition is provided in liquid form, the carrier will preferably be water, typically pyrogen-free water; isotonic saline or buffered (aqueous) solutions, e.g phosphate, citrate etc. buffered solutions. Water or preferably a buffer, more preferably an aqueous buffer, may be used, containing a sodium salt, preferably at least 50 mM of a sodium salt, a calcium salt, preferably at least 0,01 mM of a calcium salt, and optionally a potassium salt, preferably at least 3 mM of a potassium salt. According to a preferred embodiment, the sodium, calcium and, optionally, potassium salts may occur in the form of their halogenides, e.g. chlorides, iodides, or bromides, in the form of their hydroxides, carbonates, hydrogen carbonates, or sulfates, etc. Without being limited thereto, examples of sodium salts include e.g. NaCl, NaI, NaBr, Na_2CO_3, $NaHCO_3$, Na_2SO_4, examples of the optional potassium salts include e.g. KCl, KI, KBr, K_2CO_3, $KHCO_3$, K_2SO_4, and examples of calcium salts include e.g. $CaCl_2$, CaI_2, $CaBr_2$, $CaCO_3$, $CaSO_4$, $Ca(OH)_2$. Furthermore, organic anions of the aforementioned cations may be contained in the buffer.

Furthermore, one or more compatible solid or liquid fillers or diluents or encapsulating compounds may be used as well, which are suitable for administration to a person. The term "compatible" as used herein means that the constituents of the inventive composition are capable of being mixed with the at least one artificial nucleic acid of the composition, in such a manner that no interaction occurs, which would substantially reduce the biological activity or the pharmaceutical effectiveness of the inventive composition under typical use conditions. Pharmaceutically acceptable carriers, fillers and diluents must, of course, have sufficiently high purity and sufficiently low toxicity to make them suitable for administration to a person to be treated. Some examples of compounds which can be used as pharmaceutically acceptable carriers, fillers or constituents thereof are sugars,

such as, for example, lactose, glucose, trehalose and sucrose; starches, such as, for example, corn starch or potato starch; dextrose; cellulose and its derivatives, such as, for example, sodium carboxymethylcellulose, ethylcellulose, cellulose acetate; powdered tragacanth; malt; gelatin; tallow; solid gliddants, such as, for example, stearic acid, magnesium stearate; calcium sulfate; vegetable oils, such as, for example, groundnut oil, cottonseed oil, sesame oil, olive oil, corn oil and oil from theobroma; polyols, such as, for example, polypropylene glycol, glycerol, sorbitol, mannitol and polyethylene glycol; alginic acid.

Further additives which may be included in the inventive composition are emulsifiers, such as, for example, Tween; wetting agents, such as, for example, sodium lauryl sulfate; colouring agents; taste-imparting agents, pharmaceutical carriers; tablet-forming agents; stabilizers; antioxidants; preservatives.

In another embodiment, the composition of the invention comprises at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more artificial nucleic acids of the invention, wherein each of the at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more artificial nucleic acids of the invention comprises at least one coding region encoding at least one polypeptide comprising a Norovirus protein, and/or a fragment or a variant of any one of these proteins, wherein each coding region preferably encodes a different Norovirus protein, more preferably each coding region encodes a capsid protein, preferably VP1 of a different Norovirus.

In another embodiment, the composition of the invention comprises at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25,26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 5051, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more artificial nucleic acids of the invention, wherein each of the at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 5051, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more artificial nucleic acids of the invention comprises at least one coding region encoding at least one polypeptide comprising at least two different Norovirus proteins, preferably VP1 and VP2, and/or a fragment or a variant of any one of these proteins.

In a preferred embodiment, the inventive composition, which is preferably a pharmaceutical composition or a vaccine, comprises at least one artificial nucleic acid as described herein, wherein the at least one artificial nucleic acid is complexed at least partially with a cationic or polycationic compound and/or a polymeric carrier, preferably a cationic protein or peptide. Accordingly, in a further embodiment of the invention it is preferred that the at least one artificial nucleic acid as defined herein or any other nucleic acid comprised in the inventive (pharmaceutical) composition or vaccine is associated with or complexed

with a cationic or polycationic compound or a polymeric carrier, optionally in a weight ratio selected from a range of about 6:1 (w/w) to about 0.25:1 (w/w), more preferably from about 5:1 (w/w) to about 0.5:1 (w/w), even more preferably of about 4:1 (w/w) to about 1:1 (w/w) or of about 3:1 (w/w) to about 1:1 (w/w), and most preferably a ratio of about 3:1 (w/w) to about 2:1 (w/w) of the artificial nucleic acid or any other nucleic acid to cationic or polycationic compound and/or with a polymeric carrier; or optionally in a nitrogen/phosphate (N/P) ratio of the artificial nucleic acid or any other nucleic acid to cationic or polycationic compound and/or polymeric carrier in the range of about 0.1-10, preferably in a range of about 0.3-4 or 0.3-1, and most preferably in a range of about 0.5-1 or 0.7-1, and even most preferably in a range of about 0.3-0.9 or 0.5-0.9. More preferably, the N/P ratio of the at least one artificial nucleic acid to the one or more polycations is in the range of about 0.1 to 10, including a range of about 0.3 to 4, of about 0.5 to 2, of about 0.7 to 2 and of about 0.7 to 1.5.

In another embodiment, the composition comprising at least one artificial nucleic acid of the invention is defined as follows:

(i) the ratio of complexed nucleic acid to free nucleic acid is selected from a range of about 5:1 (w/w) to about 1:10 (w/w), more preferably from a range of about 4:1 (w/w) to about 1:8 (w/w), even more preferably from a range of about 3:1 (w/w) to about 1:5 (w/w) or 1:3 (w/w), wherein the ratio is most preferably about 1:1 (w/w); or

(ii) the mRNA is complexed with one or more cationic or polycationic compounds in a weight ratio selected from a range of about 6:1 (w/w) to about 0.25:1 (w/w), more preferably from about 5:1 (w/w) to about 0.5:1 (w/w), even more preferably of about 4:1 (w/w) to about 1:1 (w:w) or of about 3:1 (w/w) to about 1:1 (w/w), and most preferably a ratio of about 3:1 (w/w) to about 2:1 (w/w) of mRNA to cationic or polycationic compound and/or with a polymeric carrier; or optionally in a nitrogen/phosphate ratio of mRNA to cationic or polycationic compound and/or polymeric carrier in the range of about 0.1-10, preferably in a range of about 0.3-4 or 0.3-1, and most preferably in a range of about 0.5-1 or 0.7-1, and even most preferably in a range of about 0.3-0.9 or 0.5-0.9;

and/or wherein the at least one artificial nucleic acid or mRNA is complexed with one or more cationic or polycationic compounds, preferably with cationic or polycationic polymers, cationic or polycationic peptides or proteins, e.g. protamine, cationic or polycationic polysaccharides and/or cationic or polycationic lipids and/or wherein the at least one artificial nucleic acid or mRNA is complexed with one or more lipids and thereby forming liposomes, lipid nanoparticles and/or lipoplexes.

Preferably, the inventive composition comprises at least one artificial nucleic acid as described herein, which is complexed with one or more polycations and/or a polymeric carrier, and at least one free nucleic acid, wherein the at least one complexed nucleic acid is preferably identical to the at least one artificial nucleic acid according to the present invention. In this context it is particularly preferred that the at least one artificial nucleic acid of the inventive composition is complexed at least partially with a cationic or polycationic compound and/or a polymeric carrier, preferably cationic proteins or peptides. In this context, the disclosure of WO 2010/037539 and WO 2012/113513 is incorporated herewith by reference. Partially means that only a part of the inventive artificial nucleic acid is complexed with a cationic compound and that the rest of the inventive artificial nucleic acid is (comprised in the inventive pharmaceutical composition or vaccine) in uncomplexed form ("free").

In a further embodiment, the composition of the invention comprises

(i) at least 2, 3, 4, 5, 6, 7, 8, 9, 10 or more artificial nucleic acids as defined in the invention; or

(ii) at least 10, 15, 20 or 50 artificial nucleic acids as defined in the invention; or

(iii) 2-10, 10-15, 15-20, 20-50, 50-100 or 100-200 artificial nucleic acids as defined in the invention;

and a pharmaceutically acceptable carrier.

In one embodiment, the compositions and/or vaccines of the invention comprise artificial nucleic acids encoding one or more capsid proteins VP1 derived from one or more Noroviruses. In another embodiment, the compositions and/or vaccines of the invention comprise artificial nucleic acids encoding one or more capsid proteins VP2 derived from one or more Noroviruses.

In another embodiment, the composition of the invention is further defined as composition, wherein

(i) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GI Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GII Noroviruses; or

(iii) the artificial nucleic acids are derived from a single GIII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GIII Noroviruses; or

(iv) the artificial nucleic acids are derived from a single GIV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GIV Noroviruses; or

(v) the artificial nucleic acids are derived from a single GV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GV Noroviruses; or

(vi) the artificial nucleic acids are derived from a single GI Norovirus and additionally from a single GII Norovirus, GIII Norovirus, GIV Norovirus and/or GV Norovirus; or

(vii) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81,

82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GI Noroviruses and additionally from a single GII, GIII, GIV or GV Norovirus and/or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 and/or more GII, GIII, GIV or GV Noroviruses.

In a further embodiment, the composition of the invention further is defined as composition, wherein

(i) the artificial nucleic acids are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GI.1 Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GII.4 Noroviruses; or

(iii) the artificial nucleic acids are derived from a single GI.1 Norovirus and additionally from a single GII.4 Norovirus; or

(iv) the artificial nucleic acids are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GI.1 Noroviruses and additionally from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more GII.4 Noroviruses.

In a further embodiment, the composition of the invention further is defined as composition, wherein

(i) the artificial nucleic acids are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GI.1 Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GII.4 Noroviruses; or

(iii) the artificial nucleic acids are derived from a single GI.1 Norovirus and additionally from a single GII.4 Norovirus; or

(iv) the artificial nucleic acids are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GI.1 Noroviruses and additionally from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more GII.4 Noroviruses; and/or

wherein

(i) at least one of the nucleic acid sequences according to any one of SEQ ID NOs: 4411-39690, 39713-39746; and/or

(ii) at least one of the nucleic acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% sequence identity to the nucleic acid sequence represented by any one of SEQ ID NOs: 4411-39690, 39713-39746; and/or

(iii) at least one complement of the nucleic acid sequences which are capable of hybridizing with a nucleic acid sequence comprising a sequence as shown in SEQ ID NOs: 4411-39690, 39713-39746, and/or

(iv) an orthologue or a paralogue of any one of SEQ ID NOs: 4411-39690, 39713-39746; and/or a fragment or variant of any of these sequences.

and/or

wherein

(i) at least one of the nucleic acid sequences according to any one of SEQ ID NO: 39713 to SEQ ID NO: 39746; and/or

(ii) at least one of the nucleic acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% sequence identity to the nucleic acid sequence represented by any one of SEQ ID NO: 39713 to SEQ ID NO: 39746; and/or

(iii) at least one complement of the nucleic acid sequences which are capable of hybridizing with a nucleic acid sequence comprising a sequence as shown in SEQ ID NO: 39713 to SEQ ID NO: 39746; and/or

(iv) an orthologue or a paralogue of any one of SEQ ID NO: 39713 to SEQ ID NO: 39746; and/or a fragment or variant of any of these sequences.

In a preferred embodiment, the composition of the invention further is defined as a composition comprising two different nucleic acid sequences (bivalent, divalent composition), wherein one of the two different nucleic acid sequences is derived from Norovirus GII.4 and one of the two different nucleic acid sequence is derived from Norovirus GI.1, wherein the one nucleic acid sequence of Norovirus GII.4 may be any one of the nucleic acid sequences as defined herein and in Table 1, or fragment or variants

of these sequences, and wherein the one nucleic acid sequence of Norovirus GI.1 may be any one of the nucleic acid sequences as defined herein and in Table 1, or fragment or variants of these sequences. Preferably, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of one nucleic acid sequence derived from Norovirus GII.4 selected from SEQ ID NOs: 39713-39721, 39726-39742, and one nucleic acid sequence derived from Norovirus GI.1 selected from SEQ ID NOs: 39722-39725.

In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID NO: 39716 (Norovirus GII.4) and SEQ ID NO: 39725 (Norovirus GI.1). In a further specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID NO: 39721 (Norovirus GII.4) and SEQ ID NO: 39725 (Norovirus GI.1). In a further specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID NO: 39729 (Norovirus GII.4) and SEQ ID NO: 39725 (Norovirus GI.1). In a further specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID NO: 39734 (Norovirus GII.4) and SEQ ID NO: 39725 (Norovirus GI.1). In a further specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID NO: 39738 (Norovirus GII.4) and SEQ ID NO: 39725 (Norovirus GI.1).

In a preferred embodiment, the composition of the invention further is defined as a composition comprising two different nucleic acid sequences (bivalent, divalent composition) derived from Norovirus GII.4, wherein the two different nucleic acid sequences of Norovirus GII.4 may be any one of the nucleic acid sequences as defined herein and in Table 1, or fragment or variants of these sequences. Preferably, the composition comprising two different nucleic acid sequences derived from Norovirus GII.4 (bivalent, divalent composition) comprises or consists of one nucleic acid sequence selected from SEQ ID NOs: 39713-39721, 39726-39742.

In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID NO: 39716 (Norovirus GII.4) and SEQ ID NO: 39721 (Norovirus GII.4). In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID NO: 39729 (Norovirus GII.4) and SEQ ID NO: 39721 (Norovirus GII.4). In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID NO: 39734 (Norovirus GII.4) and SEQ ID NO: 39721 (Norovirus GII.4). In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID NO: 39738 (Norovirus GII.4) and SEQ ID NO: 39721 (Norovirus GII.4). In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID NO: 39716 (Norovirus GII.4) and SEQ ID NO: 39729 (Norovirus GII.4). In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID NO:

39734 (Norovirus GII.4) and SEQ ID NO: 39729 (Norovirus GII.4). In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID NO: 39738 (Norovirus GII.4) and SEQ ID NO: 39729 (Norovirus GII.4). In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID NO: 39716 (Norovirus GII.4) and SEQ ID NO: 39734 (Norovirus GII.4).In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID NO: 39738 (Norovirus GII.4) and SEQ ID NO: 39734 (Norovirus GII.4). In a specific preferred embodiment, the composition comprising two different nucleic acid sequences (bivalent, divalent composition) comprises or consists of the nucleic acid sequences SEQ ID NO: 39716 (Norovirus GII.4) and SEQ ID NO: 39738 (Norovirus GII.4).

In further a preferred embodiment, the composition of the invention further is defined as a composition comprising four different nucleic acid sequences (tetravalent composition), wherein each of the four different nucleic acid sequences is derived from Norovirus GII.4, wherein each of the four different nucleic of Norovirus GII.4 may be any one of the nucleic acid sequences as defined herein and in Table 1, or fragment or variants of these sequences. Preferably, the composition comprising four different nucleic acid sequences (tetravalent composition) comprises or consists of four nucleic acid sequence derived from Norovirus GII.4 selected from SEQ ID NOs: 39713-39721, 39726-39742.

In a specific preferred embodiment, the composition comprising four different nucleic acid sequences (tetravalent composition) comprises four of the nucleic acid sequences selected from SEQ ID NOs: 39716, 39721, 39729, 39734 or 39738.

In a further preferred embodiment, the composition of the invention is defined as a composition comprising four different nucleic acid sequences (tetravalent composition), wherein at least one of the four different nucleic acid sequences is derived from Norovirus GII.4 and at least one of the four different nucleic acid sequence is derived from Norovirus GI.1, wherein the at least one of the four different nucleic of Norovirus GII.4 may be any one of the nucleic acid sequences as defined herein and in Table 1, or fragment or variants of these sequences, and wherein the at least one of the four of nucleic acid sequence of Norovirus GI.1 may be any one of the nucleic acid sequences as defined herein and in Table 1, or fragment or variants of these sequences.

In a further preferred embodiment, the composition of the invention is defined as a composition comprising four different nucleic acid sequences (tetravalent composition), wherein three of the four different nucleic acid sequences are derived from Norovirus GII.4 and one of the four different nucleic acid sequence is derived from Norovirus GI.1, wherein the three of the four different nucleic of Norovirus GII.4 may be any one of the nucleic acid sequences as defined in Table 1, or fragment or variants of these sequences, and wherein the one of the four of nucleic acid sequence of Norovirus GI.1 may be any one of the nucleic acid sequences as defined in Table 1, or fragment or variants of these sequences. Preferably, the composition comprising four different nucleic acid sequences (tetravalent composition) comprises or consists of three nucleic acid sequence derived from Norovirus GII.4 selected from SEQ ID NOs: 39713-39721, 39726-39742 and one nucleic acid sequence derived from Norovirus GI.1 SEQ ID NOs: 39722-39725.

In a specific preferred embodiment, the composition comprising four different nucleic acid sequences (tetravalent composition) comprises three of the nucleic acid sequences derived from Norovirus GII.4 selected from SEQ ID NOs: 39716, 39721, 39729, 39734 or 39738 and one nucleic acid sequence derived from Norovirus GI.1 SEQ ID NO: 39725.

In further a preferred embodiments, the composition of the invention is defined as a composition comprising multiple different nucleic acid sequences (multivalent composition) defined as a composition comprising 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 different nucleic acid sequences derived from Norovirus GI.1, Norovirus GI.2, Norovirus GI.3, Norovirus GI.4, Norovirus GI.5, Norovirus GI.6, Norovirus GI.7, Norovirus GI.8, Norovirus GI.9, Norovirus GII.1, Norovirus GII.2, Norovirus GII.3, Norovirus GII.4, Norovirus GII.5, Norovirus GII.6, Norovirus GII.7, Norovirus GII.11, Norovirus GII.12, Norovirus GII.13, Norovirus GII.14, Norovirus GII.15, Norovirus GII.16, Norovirus GII.17, Norovirus GII.21, Norovirus GIII.1, Norovirus GV.1 or Norovirus GIV.1.

In further a preferred embodiments, the composition of the invention is defined as a composition comprising multiple different nucleic acid sequences (multivalent composition) defined as a composition comprising 5, 6, 7, 8, 9,10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 different nucleic acid sequences selected from Table 3 (column 4 and column 5). In Table 3, each row (row 1 - row 138) corresponds to selected Norovirus protein or antigen as identified by the respective name (first column, column 1 "Strain/Isolate") and the database accession number of the corresponding protein (second column, column 2 "NCBI or Genbank Accession No."). The third column, column 3 ("A") in Table 3 indicates the SEQ ID NOs corresponding to the respective amino acid sequence as provided herein. The SEQ ID NOs corresponding to the nucleic acid sequence of the wild type nucleic acid sequence encoding the Norovirus protein or peptide is indicated in the fourth column, column 4 ("B"). The fifth column, column 5 ("C") provides the SEQ ID NOs corresponding to modified nucleic acid sequences of the nucleic acid sequences as described herein that encode the Norovirus protein or peptide preferably having the amino acid sequence as defined by the SEQ ID NOs indicated in the third column ("A") or by the database entry indicated in the second column ("NCBI or Genbank Accession No.").

Table 3: Selected VP1 Norovirus sequences (row 1 – row 138)

	column 1	column 2	column 3	column 4	column 5
Row	**Strain/Isolate**	**NCBI or Genbank Accession No.**	**A**	**B**	**C**
1	Norovirus Hu/GII.4/Dijon/E872/2002/FRA	ACO55068	2	4412	8822, 13232, 17642, 22052, 26462, 30872, 35282
2	Norovirus Hu/GII.4/MD120-12/1987/USA	AFS33552	16	4426	8836, 13246, 17656, 22066, 26476, 30886, 35296
3	Norovirus Hu/GII.1/7EK/Hawaii/1971/USA	AFS33555	17	4427	8837, 13247, 17657, 22067, 26477, 30887, 35297
4	Norovirus Hu/GII.6/CHDC4073/1984/USA	AFX71665	27	4437	8847, 13257, 17667, 22077, 26487, 30897, 35307
5	Norovirus Hu/GII.4/Hiroshima/19/2001/JPN	BAI49904	327	4737	9147, 13557, 17967, 22377, 26787, 31197, 35607
6	Norovirus Hu/GII.4/Hiroshima/67/2006/JPN	BAI49914	335	4745	9155, 13565, 17975, 22385, 26795, 31205, 35615
7	Norovirus Hu/GII/JP/2015/GII.Pe_GII.4/Osaka/OSF78	BAS02083	364	4774	9184, 13594, 18004, 22414, 26824, 31234, 35644
8	Norovirus GII/Hu/NL/2012/GII.4/Groningen	CRL46958	367	4777	9187, 13597, 18007, 22417, 26827, 31237, 35647
9	Norovirus GII/Hu/NL/2014/GII.2/Groningen	CRL46973	372	4782	9192, 13602, 18012, 22422, 26832, 31242, 35652
10	Norovirus Hu/GII.4/New Orleans1500/2008/USA	ADB27027	376	4786	9196, 13606, 18016, 22426, 26836, 31246, 35656
11	Norovirus Hu/GII.6/Ohio/490/2012/USA	AGI96397	386	4796	9206, 13616, 18026, 22436, 26846, 31256, 35666
12	Norovirus Hu/GII.3/Jingzhou/2013402/CHN	AGX01095	391	4801	9211, 13621, 18031, 22441, 26851, 31261, 35671
13	Norovirus Hu/GII.4/Jingzhou/2013403/CHN	AGX01098	392	4802	9212, 13622, 18032, 22442, 26852, 31262, 35672
14	Norovirus Hu/GII.17/Gaithersburg/2014/US	AKI30060	393	4803	9213, 13623, 18033, 22443, 26853, 31263, 35673

15	Norovirus Hu/GII.4/C127/GF/1978	AGL98413	404	4814	9224, 13634, 18044, 22454, 26864, 31274, 35684
16	Norovirus Hu/GII.4/CHDC3967/1988/US	ACT76145	458	4868	9278, 13688, 18098, 22508, 26918, 31328, 35738
17	Norovirus Hu/GII.4/CHDC4108/1987/US	ACT76148	459	4869	9279, 13689, 18099, 22509, 26919, 31329, 35739
18	Norovirus Hu/GII.4/CHDC4871/1977/US	ACT76151	460	4870	9280, 13690, 18100, 22510, 26920, 31330, 35740
19	Norovirus Hu/GII.3/CHDC5261/1990/US	AED02034	501	4911	9321, 13731, 18141, 22551, 26961, 31371, 35781
20	Norovirus Hu/GII.3/Milwaukee009/2010/USA	AEX10549	534	4944	9354, 13764, 18174, 22584, 26994, 31404, 35814
21	Norovirus Hu/GII.4/Miranda/NSW817L/2010/AU	AFJ21448	597	5007	9417, 13827, 18237, 22647, 27057, 31467, 35877
22	Norovirus Hu/GII.2/KL109/MY/1978	AFN06726	603	5013	9423, 13833, 18243, 22653, 27063, 31473, 35883
23	Norovirus Hu/GII.14/HK74/CN/1978	AFN06727	604	5014	9424, 13834, 18244, 22654, 27064, 31474, 35884
24	Norovirus Hu/GII.7/HK4/CN/1976	AFN06731	608	5018	9428, 13838, 18248, 22658, 27068, 31478, 35888
25	Norovirus Hu/GII.17/C142/GF/1978	AFN06732	609	5019	9429, 13839, 18249, 22659, 27069, 31479, 35889
26	Norovirus Hu/GII.5/C15/GF/1978	AFN06733	610	5020	9430, 13840, 18250, 22660, 27070, 31480, 35890
27	Norovirus Hu/GI.5/E57/UG/1975	AFN06735	612	5022	9432, 13842, 18252, 22662, 27072, 31482, 35892
28	Norovirus Hu/GII.4/Randwick/NSW882J/2011/AU	AFV08771	616	5026	9436, 13846, 18256, 22666, 27076, 31486, 35896
29	Norovirus Hu/GII.4/Berowra/NSW767L/2012/AU	AFV08777	618	5028	9438, 13848, 18258, 22668, 27078, 31488, 35898
30	Norovirus Hu/GII.4/Sydney/NSW0514/2012/AU	AFV08795	624	5034	9444, 13854, 18264, 22674, 27084, 31494, 35904
31	Norovirus Hu/GII.4/Hong Kong/CUHK3630/2012/CHN	AFX95940	625	5035	9445, 13855, 18265, 22675, 27085, 31495, 35905

32	Norovirus Hu/GII.4/VP1172/Shanghai/2012/CHN	AGI99552	629	5039	9449, 13859, 18269, 22679, 27089, 31499, 35909
33	Norovirus Hu/GII-4/New Taipei/CGMH61/2012/TW	AGK25912	644	5054	9464, 13874, 18284, 22694, 27104, 31514, 35924
34	Norovirus GII/Hu/HKG/2013/GII.4/CUHK-NS-141	AID68581	859	5269	9679, 14089, 18499, 22909, 27319, 31729, 36139
35	Norovirus GII/Hu/JP/2002/GII.P12_GII.13/Saitama/T80	AII73717	877	5287	9697, 14107, 18517, 22927, 27337, 31747, 36157
36	Norovirus GII/Hu/JP/2001/GII.P12_GII.12/Saitama/T15	AII73735	883	5293	9703, 14113, 18523, 22933, 27343, 31753, 36163
37	Norovirus GII/Hu/JP/2007/GII.P21_GII.21/Kawasaki/Y0284	AII73741	885	5295	9705, 14115, 18525, 22935, 27345, 31755, 36165
38	Norovirus GII/Hu/JP/2007/GII.P15_GII.15/Sapporo/HK299	AII73759	891	5301	9711, 14121, 18531, 22941, 27351, 31761, 36171
39	Norovirus GI/Hu/JP/2007/GI.P3_GI.3/Shimizu/KK2866	AII73765	893	5303	9713, 14123, 18533, 22943, 27353, 31763, 36173
40	Norovirus GII/Hu/JP/2007/GII.P7_GII.14/Fukuoka/KK282	AII73780	898	5308	9718, 14128, 18538, 22948, 27358, 31768, 36178
41	Norovirus GI/Hu/JP/2007/GI.P8_GI.8/Nagoya/KY531	AII73783	899	5309	9719, 14129, 18539, 22949, 27359, 31769, 36179
42	Norovirus Hu/GII.4/SJTUHI/CHN/2014	AIS40019	901	5311	9721, 14131, 18541, 22951, 27361, 31771, 36181
43	Norovirus Hu/GII.4/variant Sydney 2012/FRA	AIY27747	930	5340	9750, 14160, 18570, 22980, 27390, 31800, 36210
44	Norovirus Hu/GII-4/Hokkaido4/2006/JP	BAG70437	1033	5443	9853, 14263, 18673, 23083, 27493, 31903, 36313
45	Norovirus GIV/Hu/Jp/2001/GIV.1/0C01017023	BAU16306	1345	5755	10165, 14575, 18985, 23395, 27805, 32215, 36625
46	Norovirus Hu/GII.4/Beijing/53671/2007/CHN	ACY00615	1454	5864	10274, 14684, 19094, 23504, 27914, 32324, 36734
47	Norovirus Hu/II.4/2200661/HK/2010	ADK47170	1467	5877	10287, 14697, 19107, 23517, 27927, 32337, 36747
48	Norovirus Hu/GII.4/Aichi368-14/2014	BAQ20801	1477	5887	10297, 14707, 19117, 23527, 27937, 32347, 36757

49	Norovirus Hu/GII.4/Hunter 284E/040/AU	AAZ31376	1552	5962	10372, 14782, 19192, 23602, 28012, 32422, 36832
50	Norovirus Hu/GII-4/Osaka/1998/JPN	ABI97981	1569	5979	10389, 14799, 19209, 23619, 28029, 32439, 36849
51	Norovirus Hu/GI.1/P774.Delsjo2004/Gothenburg/Sweden	ABW74128	1610	6020	10430, 14840, 19250, 23660, 28070, 32480, 36890
52	Norovirus pig/GII.11/FI8-10/2005/CAN	ACC69023	1629	6039	10449, 14859, 19269, 23679, 28089, 32499, 36909
53	Norovirus Hu/GII.4/Wellington/1995/USA	ACL27297	1670	6080	10490, 14900, 19310, 23720, 28130, 32540, 36950
54	Norovirus Hu/GII.4/Henry/2000/USA	ACL27298	1671	6081	10491, 14901, 19311, 23721, 28131, 32541, 36951
55	Norovirus Hu/GII.4/SSCS/2005/USA	ACL27299	1672	6082	10492, 14902, 19312, 23722, 28132, 32542, 36952
56	Norovirus GII/Hu/IN/2006/GII.P4_GII.4_ Yerseke2006a/Pune-PC21	ACL31322	1680	6090	10500, 14910, 19320, 23730, 28140, 32550, 36960
57	Norovirus Hu/GI.1/P7-587/2007/Stromstad/Sweden	ACN32270	1692	6102	10512, 14922, 19332, 23742, 28152, 32562, 36972
58	Norovirus Hu/GI.2/Leuven/2003/BEL	ACU56258	1698	6108	10518, 14928, 19338, 23748, 28158, 32568, 36978
59	Norovirus Hu/GII.7/NSW743L/2008/AUS	ACX85810	1712	6122	10532, 14942, 19352, 23762, 28172, 32582, 36992
60	Norovirus Hu/GII.2/NF2002/USA/2002	AFB18010	1731	6141	10551, 14961, 19371, 23781, 28191, 32601, 37011
61	Norovirus Hu/GII.4/NF2003/USA/2003	AFB18013	1732	6142	10552, 14962, 19372, 23782, 28192, 32602, 37012
62	Norovirus Hu/GII.3/1999	AFK75854	1739	6149	10559, 14969, 19379, 23789, 28199, 32609, 37019
63	Norovirus Hu/GIV.1/Ahrenshoop246/DEU/2012	AFN61315	1740	6150	10560, 14970, 19380, 23790, 28200, 32610, 37020
64	Norovirus Hu/GII.4/Xi'an/P19/2010/CHN	AFQ00511	1741	6151	10561, 14971, 19381, 23791, 28201, 32611, 37021
65	Norovirus Hu/GII.4/PA363/2011/ITA	AHC12655	1770	6180	10590, 15000, 19410, 23820, 28230, 32640, 37050

66	Norovirus Hu/GII.4/P3/2012/Gothenburg/Sweden	AHZ12912	1778	6188	10598, 15008, 19418, 23828, 28238, 32648, 37058
67	Norovirus Hu/GII.4/Tanger/TM687/2011/MAR	AIC32559	1787	6197	10607, 15017, 19427, 23837, 28247, 32657, 37067
68	Norovirus 12-X-2/2012/GII.P22/GII.5	AID51489	1793	6203	10613, 15023, 19433, 23843, 28253, 32663, 37073
69	Norovirus Hu/GII.4/Kobe034/2006/JP	BAF45861	1826	6236	10646, 15056, 19466, 23876, 28286, 32696, 37106
70	Norovirus Hu/GGII.4/Tiel001/1995/NL	BAF74508	1827	6237	10647, 15057, 19467, 23877, 28287, 32697, 37107
71	Norovirus Hu/GGII.4/DenHaag015/2000/NL	BAF74509	1828	6238	10648, 15058, 19468, 23878, 28288, 32698, 37108
72	Norovirus Hu/GGII.4/Schiedam018/2001/NL	BAF74512	1831	6241	10651, 15061, 19471, 23881, 28291, 32701, 37111
73	Norovirus Hu/GGII.4/Apeldoorn023/2003/NL	BAF74517	1836	6246	10656, 15066, 19476, 23886, 28296, 32706, 37116
74	Norovirus Hu/GGII.4/Middelburg007/2004/NL	BAF74521	1840	6250	10660, 15070, 19480, 23890, 28300, 32710, 37120
75	Norovirus Hu/GII-4/Matsudo/021071/2002/JP	BAF95499	1847	6257	10667, 15077, 19487, 23897, 28307, 32717, 37127
76	Norovirus Hu/GII-4/Kaiso/030556/2003/JP	BAF95501	1848	6258	10668, 15078, 19488, 23898, 28308, 32718, 37128
77	Norovirus Hu/GII-4/Awa/040354/2004/JP	BAF95505	1850	6260	10670, 15080, 19490, 23900, 28310, 32720, 37130
78	Norovirus Hu/GII.4/Apeldoorn317/2007/NL	BAG55289	1885	6295	10705, 15115, 19525, 23935, 28345, 32755, 37165
79	Norovirus Hu/GII.2/Rotterdam39E/2002/NL	BAG68713	1891	6301	10711, 15121, 19531, 23941, 28351, 32761, 37171
80	Norovirus Hu/GII.4/RotterdamP200/2005/NL	BAG68801	1897	6307	10717, 15127, 19537, 23947, 28357, 32767, 37177
81	Norovirus Hu/GII.4/Stockholm/19865/2008/SE	BAH30707	1916	6326	10736, 15146, 19556, 23966, 28376, 32786, 37196
82	Norovirus Hu/GII.6/OC04062VLP/2004/JP	BAL40873	1921	6331	10741, 15151, 19561, 23971, 28381, 32791, 37201

83	Norovirus Hu/GII.4/HS194/2009/US	ADB27914	1961	6371	10781, 15191, 19601, 24011, 28421, 32831, 37241
84	Norovirus Hu/GII.12/HS210/2010/USA	ADT70684	1965	6375	10785, 15195, 19605, 24015, 28425, 32835, 37245
85	Norovirus Hu/GI.1/8FIIa/1968/USA	AFJ38516	1970	6380	10790, 15200, 19610, 24020, 28430, 32840, 37250
86	Norovirus Hu/GII.4/CHDC5191/1974/USA	AFJ38519	1971	6381	10791, 15201, 19611, 24021, 28431, 32841, 37251
87	Norovirus Hu/GII.4/N76/2010/HuZhou	AFW15943	1975	6385	10795, 15205, 19615, 24025, 28435, 32845, 37255
88	Norovirus Hu/GII.6/S9c/1976/SEN	AGE99599	2000	6410	10820, 15230, 19640, 24050, 28460, 32870, 37280
89	Norovirus Hu/GII.4/KL45/1978/MYS	AGE99612	2001	6411	10821, 15231, 19641, 24051, 28461, 32871, 37281
90	Norovirus Hu/GII.4/NIHIC17.5/2012/USA	AGT17839	2005	6415	10825, 15235, 19645, 24055, 28465, 32875, 37285
91	Norovirus Hu/GII.4/NIHIC9/2011/USA	AFX71669	4198	8608	13018, 17428, 21838, 26248, 30658, 35068, 39478
92	Norovirus Hu/GII.4/C110/1978/GUF	AGE99607	4336	8746	13156, 17566, 21976, 26386, 30796, 35206, 39616
93	Norovirus Hu/GII.4/HS66/2001/USA	AHI59166	4379	8789	13199, 17609, 22019, 26429, 30839, 35249, 39659
94	Norovirus Hu/GII/JP/2015/GII.P17_GII.17/Kawasaki308	BAR42290	4395	8805	13215, 17625, 22035, 26445, 30855, 35265, 39675
95	Norovirus Hu/GII/JP/2014/GII.P17_GII.17/Nagano8-1	BAR63722	4399	8809	13219, 17629, 22039, 26449, 30859, 35269, 39679
96	Norovirus Hu/GII/JP/2015/GII.Pe_GII.4/Osaka/OSF78	BAS02084	4400	8810	13220, 17630, 22040, 26450, 30860, 35270, 39680
97	Norovirus GI/Hu/NL/2011/GI.4/Groningen	CRL46953	4401	8811	13221, 17631, 22041, 26451, 30861, 35271, 39681
98	Norovirus GII/Hu/NL/2014/GII.4/Groningen01	CRL46962	4404	8814	13224, 17634, 22044, 26454, 30864, 35274, 39684
99	Norovirus Hu/GII.4/Kenepuru/NZ327/2006/NZL	ABQ63283	2018	6428	10838, 15248, 19658, 24068, 28478, 32888, 37298

100	Norovirus Hu/GII.4/Rathmines/NSW287R/2007/AUS	ACW19927	2023	6433	10843, 15253, 19663, 24073, 28483, 32893, 37303
101	Norovirus Hu/GII.4/Turramurra/NSW892U/2009/AUS	ADQ43783	2032	6442	10852, 15262, 19672, 24082, 28492, 32902, 37312
102	Norovirus Hu/GII.4/Seoul/0389/2009/KOR	ADV37805	2033	6443	10853, 15263, 19673, 24083, 28493, 32903, 37313
103	Norovirus Hu/GII.4/Seoul/0945/2009/KOR	ADV37919	2038	6448	10858, 15268, 19678, 24088, 28498, 32908, 37318
104	Norovirus Hu/GII.12/Shelby/2009/USA	AEI83469	2039	6449	10859, 15269, 19679, 24089, 28499, 32909, 37319
105	Norovirus Hu/GI.7/TCH-060/USA/2003	AEQ77282	2041	6451	10861, 15271, 19681, 24091, 28501, 32911, 37321
106	Norovirus Hu/GII.1/Ascension208/2010/USA	AFA55174	2042	6452	10862, 15272, 19682, 24092, 28502, 32912, 37322
107	Norovirus Hu/GII.13/VA173/2010/USA	AFC89656	2043	6453	10863, 15273, 19683, 24093, 28503, 32913, 37323
108	Norovirus Hu/GII.21/Salisbury150/2011/USA	AFC89665	2046	6456	10866, 15276, 19686, 24096, 28506, 32916, 37326
109	Norovirus Hu/GII.4/1997/USA	AFJ04707	2049	6459	10869, 15279, 19689, 24099, 28509, 32919, 37329
110	Norovirus Hu/GII.4/Farmington Hills/2004/USA	AFJ04708	2050	6460	10870, 15280, 19690, 24100, 28510, 32920, 37330
111	Norovirus Hu/GII.4/Minerva/2006/USA	AFJ04709	2051	6461	10871, 15281, 19691, 24101, 28511, 32921, 37331
112	Norovirus Hu/GII.4/Ohio/71/2012/USA	AFP89593	2052	6462	10872, 15282, 19692, 24102, 28512, 32922, 37332
113	Norovirus Hu/GII.4/AlbertaE1065/2011/CA	AFU55731	2068	6478	10888, 15298, 19708, 24118, 28528, 32938, 37348
114	Norovirus Hu/GII.4/SG4051-09/2009/SG	AFU92710	2119	6529	10939, 15349, 19759, 24169, 28579, 32989, 37399
115	Norovirus Hu/GII.3/TCH-104/USA/2002	AGO64038	2170	6580	10990, 15400, 19810, 24220, 28630, 33040, 37450
116	Norovirus Hu/GI.6/TCH-099/USA/2003	AGT62521	2174	6584	10994, 15404, 19814, 24224, 28634, 33044, 37454

117	Norovirus 06-AM-11/2006/GII.4/Yerseke/2006a	AJZ77004	2228	6638	11048, 15458, 19868, 24278, 28688, 33098, 37508
118	Norovirus 09-BI-2/2009/GII.4/NewOrleans/2009	AJZ77015	2231	6641	11051, 15461, 19871, 24281, 28691, 33101, 37511
119	Norovirus Hu/GII.4/PR328/2013/ITA	AKE31861	2242	6652	11062, 15472, 19882, 24292, 28702, 33112, 37522
120	Norovirus Hu/GII.P17_GII.17/PR668/2015/ITA	ALD09618	2253	6663	11073, 15483, 19893, 24303, 28713, 33123, 37533
121	Norovirus Hu/GII.4/AlbertaSPI/2013/CA	ALT54494	2274	6684	11094, 15504, 19914, 24324, 28734, 33144, 37554
122	Norovirus Hu/GII.4/C00007892/2011/UK	CCX28619	2280	6690	11100, 15510, 19920, 24330, 28740, 33150, 37560
123	Norovirus Hu/GII.6/GZ2010-L96/Guangzhou/CHN/2011	AGC96535	2330	6740	11150, 15560, 19970, 24380, 28790, 33200, 37610
124	Norovirus Bo/GIII.1/Aba-Z5/2002/HUN	ABY67257	2341	6751	11161, 15571, 19981, 24391, 28801, 33211, 37621
125	Norovirus GI.9	AHA91656	2342	6752	11162, 15572, 19982, 24392, 28802, 33212, 37622
126	Norovirus Hu/GII.17/CUHK-NS-670/HKG/2015	KT315718	2488	6898	11308, 15718, 20128, 24538, 28948, 33358, 37768
127	Norovirus GII/Hu/SI/2015/GII.17/Ljubljana1662	KT591501	2509	6919	11329, 15739, 20149, 24559, 28969, 33379, 37789
128	Norovirus Hu/GII.17/CUHK-NS-647/HKG/2015	KT315706	2529	6939	11349, 15759, 20169, 24579, 28989, 33399, 37809
129	Norovirus Hu/GII.21/CUHK-NS-609/HKG/2015	KR921940	2540	6950	11360, 15770, 20180, 24590, 29000, 33410, 37820
130	Norovirus Hu/GII.4/Melbourne6623/2016/AUS	KX767083	2600	7010	11420, 15830, 20240, 24650, 29060, 33470, 37880
131	Norovirus GII/Hu/JP/2016/GII.P16_GII.4_Sydney2012/OH16002	LC153121	2664	7074	11484, 15894, 20304, 24714, 29124, 33534, 37944
132	Norovirus Hu/GII/JP/2016/GII.P16_GII.4_Sydney2012/Kawasaki194	LC175468	3556	7966	12376, 16786, 21196, 25606, 30016, 34426, 38836
133	Norovirus 16F2149_GII.2_Guangdong_CHN_2016	KY485125	2438	6848	11258, 15668, 20078, 24488, 28898, 33308, 37718

134	Norovirus Hu/GII.17/CUHK-NS-864/HKG/2016	KU555841	2594	7004	11414, 15824, 20234, 24644, 29054, 33464, 37874
135	Norovirus GII/Hu/ZAF/2012/GII.P4_GII.4/CapeTown/9772	KP784696	2613	7023	11433, 15843, 20253, 24663, 29073, 33483, 37893
136	Norovirus GII.12	KP064099	4036	8446	12856, 17266, 21676, 26086, 30496, 34906, 39316
137	Snow Mountain virus	U70059	2441	6851	11261, 15671, 20081, 24491, 28901, 33311, 37721
138	Human calicivirus strain Melksham	X81879	2359	6769	11179, 15589, 19999, 24409, 28819, 33229, 37639

Preferably, the molar ratio of the complexed nucleic acid to the free nucleic acid is selected from a molar ratio of about 0.001:1 to about 1:0.001, including a ratio of about 1:1. In a preferred embodiment, the invention provides a composition comprising at least one artificial nucleic acid as described herein, wherein the ratio of complexed nucleic acid to free nucleic acid is selected from a range of about 5:1 (w/w) to about 1:10 (w/w), more preferably from a range of about 4:1 (w/w) to about 1:8 (w/w), even more preferably from a range of about 3:1 (w/w) to about 1:5 (w/w) or 1:3 (w/w), wherein the ratio is most preferably about 1:1 (w/w).

In one embodiment, at least one artificial nucleic acid as defined herein or any other nucleic acid comprised in the inventive (pharmaceutical) composition or vaccine can also be associated with a vehicle, transfection or complexation agent for increasing the transfection efficiency and/or the immunostimulatory properties of the at least one artificial nucleic acid or of optionally comprised further included nucleic acids.

In the context of the present invention, a cationic or polycationic compound is preferably selected from any cationic or polycationic compound, suitable for complexing and thereby stabilizing a nucleic acid, particularly the at least one artificial nucleic acid of the inventive composition, e.g. by associating the at least one artificial nucleic acid with the cationic or polycationic compound. Such a cationic or polycationic compound per se does not need to exhibit any adjuvant properties, since an adjuvant property, particularly the capability of inducing an innate immune response, is preferably created upon complexing the at least one artificial nucleic acid with the cationic or polycationic compound. When complexing the at least one artificial nucleic acid with the cationic or polycationic compound, the adjuvant component is formed.

Particularly preferred, cationic or polycationic peptides or proteins (preferably also as component P^2 in a polymeric carrier according to formula IV herein) may be selected from protamine, nucleoline, spermine or spermidine, poly-L-lysine (PLL), basic polypeptides, poly-arginine, cell penetrating peptides (CPPs), chimeric CPPs, such as Transportan, or MPG peptides, HIV-binding peptides, Tat, HIV-1 Tat (HIV), Tat-derived peptides, oligoarginines, members of the penetratin family, e.g. Penetratin, Antennapedia-derived peptides (particularly from Drosophila antennapedia), pAntp, plsl, etc., antimicrobial-derived CPPs e.g.

Buforin-2, Bac715-24, SynB, SynB(1), pVEC, hCT-derived peptides, SAP, MAP, KALA, PpTG20, Proline-rich peptides, L-oligomers, Arginine-rich peptides, Calcitonin-peptides, FGF, Lactoferrin, poly-L-Lysine, poly-Arginine, histones, VP22 derived or analog peptides, HSV, VP22 (Herpes simplex), MAP, KALA or protein transduction domains (PTDs, PpTG20, prolin-rich peptides, arginine-rich peptides, lysine-rich peptides, Pep-1, Calcitonin peptide(s), etc.

According to a preferred embodiment, cationic or polycationic proteins or peptides are selected from the following proteins or peptides having the following total formula (III):

$$(Arg)_l;(Lys)_m;(His)_n;(Orn)_o;(Xaa)_x, \qquad \text{formula (III)}$$

wherein l + m + n +o + x = 8-15, and l, m, n or o independently of each other may be any number selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 or 15, provided that the overall content of Arg, Lys, His and Orn represents at least 50% of all amino acids of the oligopeptide; and Xaa may be any amino acid selected from native (= naturally occurring) or non-native amino acids except of Arg, Lys, His or Orn; and x may be any number selected from 0, 1, 2, 3, 4, 5, 6, 7, or 8, provided, that the overall content of Xaa does not exceed 50% of all amino acids of the oligopeptide. Preferred cationic peptides in this context are e.g. Arg_7, Arg_8, Arg_9, H_3R_9, R_9H_3, $H_3R_9H_3$, $YSSR_9SSY$, $(RKH)_4$, $Y(RKH)_2R$, etc. In this context the disclosure of WO 2009/030481 is incorporated herewith by reference.

Further preferred cationic or polycationic compounds, which can be used for complexing the at least one artificial nucleic acid according to the invention may include cationic polysaccharides, for example chitosan, polybrene, cationic polymers, e.g. polyethyleneimine (PEI), cationic lipids, e.g. DOTMA: [1-(2,3-sioleyloxy)propyl)]-N,N,N-trimethylammonium chloride, DMRIE, di-C14-amidine, DOTIM, SAINT, DC-Chol, BGTC, CTAP, DOPC, DODAP, DOPE: Dioleyl phosphatidylethanol-amine, DOSPA, DODAB, DOIC, DMEPC, DOGS: Dioctadecylamidoglicylspermin, DIMRI: Dimyristo-oxypropyl dimethyl hydroxyethyl ammonium bromide, DOTAP: dioleoyloxy-3-(trimethylammonio)propane, DC-6-14: O,O-ditetradecanoyl-N-(α-trimethylammonioacetyl)diethanolamine chloride, CLIP1: rac-[(2,3-dioctadecyloxypropyl)(2-hydroxyethyl)]-dimethylammonium chloride, CLIP6: rac-[2(2,3-dihexadecyloxypropyl-oxymethyloxy)ethyl]trimethylammonium, CLIP9: rac-[2(2,3-dihexadecyloxypropyl-oxysuccinyloxy)ethyl]-trimethylammonium, oligofectamine, or cationic or polycationic polymers, e.g. modified polyaminoacids, such as β-aminoacid-polymers or reversed polyamides, etc., modified polyethylenes, such as PVP (poly(N-ethyl-4-vinylpyridinium bromide)), etc., modified acrylates, such as pDMAEMA (poly(dimethylaminoethyl methylacrylate)), etc., modified amidoamines such as pAMAM (poly(amidoamine)), etc., modified polybetaaminoester (PBAE), such as diamine end modified 1,4 butanediol diacrylate-co-5-amino-1-pentanol polymers, etc., dendrimers, such as polypropylamine dendrimers or pAMAM based dendrimers, etc., polyimine(s), such as PEI: poly(ethyleneimine), poly(propyleneimine), etc., polyallylamine, sugar backbone based polymers, such as cyclodextrin based polymers, dextran based polymers, chitosan, etc., silan backbone based polymers, such as PMOXA-PDMS copolymers, etc., blockpolymers consisting of a combination of one or more cationic blocks (e.g. selected from a cationic polymer as mentioned above) and of one or more hydrophilic or hydrophobic blocks (e.g. polyethyleneglycole); etc. Association or

complexing the at least one artificial nucleic acid of the inventive composition with cationic or polycationic compounds preferably provides adjuvant properties to the at least one artificial nucleic acid and confers a stabilizing effect to the at least one artificial nucleic acid of the adjuvant component by complexation. The procedure for stabilizing the at least one artificial nucleic acid is in general described in EP-A-1083232, the disclosure of which is incorporated by reference into the present invention in its entirety. Particularly preferred as cationic or polycationic compounds are compounds selected from the group consisting of protamine, nucleoline, spermin, spermidine, oligoarginines as defined above, such as Arg_7, Arg_8, Arg_9, Arg_7, H_3R_9, R_9H_3, $H_3R_9H_3$, YSSR$_9$SSY, $(RKH)_4$, $Y(RKH)_2R$, etc.

According to a preferred embodiment, the inventive composition is formulated by using the at least one artificial nucleic acid according to the invention and one or more liposomes, lipoplexes, or lipid nanoparticles. In one embodiment, the inventive composition comprises liposomes. Liposomes are artificially-prepared vesicles, which may primarily be composed of a lipid bilayer and may be used as a delivery vehicle for the administration of nutrients and pharmaceutical formulations. Liposomes can be of different sizes such as, but not limited to, a multilamellar vesicle (MLV) which may be hundreds of nanometers in diameter and may contain a series of concentric bilayers separated by narrow aqueous compartments, a small unicellular vesicle (SUV) which may be smaller than 50 nm in diameter, and a large unilamellar vesicle (LUV) which may be between 50 and 500 nm in diameter. Liposome design may include, but is not limited to, opsonins or ligands in order to improve the attachment of liposomes to unhealthy tissue or to activate events such as, but not limited to, endocytosis. Liposomes may contain a low or a high pH in order to improve the delivery of the inventive composition, in particular when applied as a pharmaceutical composition or a vaccine as described herein.

According to a preferred embodiment, the inventive composition comprises the artificial nucleic acid as described herein and a polymeric carrier. A polymeric carrier used according to the invention might be a polymeric carrier formed by disulfide-crosslinked cationic components. The disulfide-crosslinked cationic components may be the same or different from each other. The polymeric carrier can also contain further components. It is also particularly preferred that the polymeric carrier used in the composition according to the present invention comprises mixtures of cationic peptides, proteins or polymers and optionally further components as defined herein, which are crosslinked by disulfide bonds as described herein. In this context, the disclosure of WO 2012/013326 is incorporated herewith by reference.

In this context, the cationic components, which form basis for the polymeric carrier by disulfide-crosslinkage, are typically selected from any suitable cationic or polycationic peptide, protein or polymer suitable for this purpose, particular any cationic or polycationic peptide, protein or polymer capable to complex the at least one artificial nucleic acid as defined herein or a further nucleic acid comprised in the composition, and thereby preferably condensing the mRNA or the nucleic acid. The cationic or polycationic peptide, protein or polymer, is preferably a linear molecule, however, branched cationic or polycationic peptides, proteins or polymers may also be used.

Every disulfide-crosslinking cationic or polycationic protein, peptide or polymer of the polymeric carrier, which may be used to complex the at least one artificial nucleic acid or any further nucleic acid comprised in the inventive (pharmaceutical) composition or vaccine contains at least one –SH moiety, most preferably at least one cysteine residue or any further chemical group exhibiting an –SH moiety, capable to form a disulfide linkage upon condensation with at least one further cationic or polycationic protein, peptide or polymer as cationic component of the polymeric carrier as mentioned herein.

As defined above, the polymeric carrier, which may be used to complex the at least one artificial nucleic acid or any further nucleic acid comprised in the inventive (pharmaceutical) composition or vaccine may be formed by disulfide-crosslinked cationic (or polycationic) components. Preferably, such cationic or polycationic peptides or proteins or polymers of the polymeric carrier, which comprise or are additionally modified to comprise at least one –SH moiety, are selected from, proteins, peptides and polymers as defined above for complexation agent.

In a further particular embodiment, the polymeric carrier which may be used to complex the at least one artificial nucleic acid or any further nucleic acid comprised in the inventive (pharmaceutical) composition or vaccine may be selected from a polymeric carrier molecule according to generic formula (IV):

$$L\text{-}P^1\text{-}S\text{-}[S\text{-}P^2\text{-}S]_n\text{-}S\text{-}P^3\text{-}L \qquad \text{formula (IV)}$$

wherein,

P^1 and P^3 are different or identical to each other and represent a linear or branched hydrophilic polymer chain, each P^1 and P^3 exhibiting at least one –SH-moiety, capable to form a disulfide linkage upon condensation with component P^2, or alternatively with (AA), $(AA)_x$, or $[(AA)_x]_z$ if such components are used as a linker between P^1 and P^2 or P^3 and P^2) and/or with further components (e.g. (AA), $(AA)_x$, $[(AA)_x]_z$ or L), the linear or branched hydrophilic polymer chain selected independent from each other from polyethylene glycol (PEG), poly-*N*-(2-hydroxypropyl)methacrylamide, poly-2-(methacryloyloxy)ethyl phosphorylcholines, poly(hydroxyalkyl L-asparagine), poly(2-(methacryloyloxy)ethyl phosphorylcholine), hydroxyethylstarch or poly(hydroxyalkyl L-glutamine), wherein the hydrophilic polymer chain exhibits a molecular weight of about 1 kDa to about 100 kDa, preferably of about 2 kDa to about 25 kDa; or more preferably of about 2 kDa to about 10 kDa, e.g. about 5 kDa to about 25 kDa or 5 kDa to about 10 kDa;

P^2 is a cationic or polycationic peptide or protein, e.g. as defined above for the polymeric carrier formed by disulfide-crosslinked cationic components, and preferably having a length of about 3 to about 100 amino acids, more preferably having a length of about 3 to about 50 amino acids, even more preferably having a length of about 3 to about 25 amino acids, e.g. a length of about 3 to 10, 5 to 15, 10 to 20 or 15 to 25 amino acids, more preferably a length of about 5 to about 20 and even more preferably a length of about 10 to about 20; or

is a cationic or polycationic polymer, e.g. as defined above for the polymeric carrier formed by disulfide-crosslinked cationic components, typically having a molecular weight of about 0.5 kDa to about 30 kDa, including a molecular weight of about 1 kDa to about 20 kDa, even more preferably of about 1.5 kDa to about 10 kDa, or having a molecular

weight of about 0.5 kDa to about 100 kDa, including a molecular weight of about 10 kDa to about 50 kDa, even more preferably of about 10 kDa to about 30 kDa;

each P^2 exhibiting at least two –SH-moieties, capable to form a disulfide linkage upon condensation with further components P^2 or component(s) P^1 and/or P^3 or alternatively with further components (e.g. (AA), $(AA)_x$, or $[(AA)_x]_z$);

-S-S- is a (reversible) disulfide bond (the brackets are omitted for better readability), wherein S preferably represents sulphur or a –SH carrying moiety, which has formed a (reversible) disulfide bond. The (reversible) disulfide bond is preferably formed by condensation of –SH-moieties of either components P^1 and P^2, P^2 and P^2, or P^2 and P^3, or optionally of further components as defined herein (e.g. L, (AA), $(AA)_x$, $[(AA)_x]_z$, etc); The –SH-moiety may be part of the structure of these components or added by a modification as defined below;

L is an optional ligand, which may be present or not, and may be selected independent from the other from RGD, Transferrin, Folate, a signal peptide or signal sequence, a localization signal or sequence, a nuclear localization signal or sequence (NLS), an antibody, a cell penetrating peptide, (e.g. TAT or KALA), a ligand of a receptor (e.g. cytokines, hormones, growth factors etc), small molecules (e.g. carbohydrates like mannose or galactose or synthetic ligands), small molecule agonists, inhibitors or antagonists of receptors (e.g. RGD peptidomimetic analogues), or any further protein as defined herein, etc.;

n is an integer, typically selected from a range of about 1 to 50, preferably from a range of about 1, 2 or 3 to 30, more preferably from a range of about 1, 2, 3, 4, or 5 to 25, or a range of about 1, 2, 3, 4, or 5 to 20, or a range of about 1, 2, 3, 4, or 5 to 15, or a range of about 1, 2, 3, 4, or 5 to 10, including e.g. a range of about 4 to 9, 4 to 10, 3 to 20, 4 to 20, 5 to 20, or 10 to 20, or a range of about 3 to 15, 4 to 15, 5 to 15, or 10 to 15, or a range of about 6 to 11 or 7 to 10. Most preferably, n is in a range of about 1, 2, 3, 4, or 5 to 10, more preferably in a range of about 1, 2, 3, or 4 to 9, in a range of about 1, 2, 3, or 4 to 8, or in a range of about 1, 2, or 3 to 7.

In this context, the disclosure of WO 2011/026641 is incorporated herewith by reference. Each of hydrophilic polymers P^1 and P^3 typically exhibits at least one –SH-moiety, wherein the at least one –SH-moiety is capable to form a disulfide linkage upon reaction with component P^2 or with component (AA) or $(AA)_x$, if used as linker between P^1 and P^2 or P^3 and P^2 as defined below and optionally with a further component, e.g. L and/or (AA) or $(AA)_x$, e.g. if two or more –SH-moieties are contained. The following subformulae "P^1-S-S-P^2" and "P^2-S-S-P^3" within generic formula (IV) above (the brackets are omitted for better readability), wherein any of S, P^1 and P^3 are as defined herein, typically represent a situation, wherein one–SH-moiety of hydrophilic polymers P^1 and P^3 was condensed with one –SH-moiety of component P^2 of generic formula (IV) above, wherein both sulphurs of these –SH-moieties form a disulfide bond –S-S- as defined herein in formula (IV). These –SH-moieties are typically provided by each of the hydrophilic polymers P^1 and P^3, e.g. via an internal cysteine or any further (modified) amino acid or compound which carries a –SH moiety. Accordingly, the subformulae "P^1-S-S-P^2" and "P^2-S-S-P^3" may also be written as "P^1-Cys-Cys-P^2" and "P^2-Cys-Cys-P^3", if the –SH- moiety is provided by a cysteine, wherein the term Cys-Cys represents two cysteines coupled via a disulfide bond, not via a peptide bond. In this case, the term "-S-S-" in these formulae may also be written as "-S-Cys", as "-Cys-S" or as "-Cys-Cys-". In this context, the term "-Cys-Cys-" does not represent a peptide bond but a linkage of two cysteines via their –SH-moieties to form a disulfide bond. Accordingly, the term "-Cys-Cys-" also may be understood generally as "-(Cys-S)-(S-Cys)-", wherein in

this specific case S indicates the sulphur of the –SH-moiety of cysteine. Likewise, the terms "-S-Cys" and "-Cys-S" indicate a disulfide bond between a –SH containing moiety and a cysteine, which may also be written as "-S-(S-Cys)" and "-(Cys-S)-S". Alternatively, the hydrophilic polymers P^1 and P^3 may be modified with a –SH moiety, preferably via a chemical reaction with a compound carrying a –SH moiety, such that each of the hydrophilic polymers P^1 and P^3 carries at least one such –SH moiety. Such a compound carrying a –SH moiety may be e.g. an (additional) cysteine or any further (modified) amino acid, which carries a –SH moiety. Such a compound may also be any non-amino compound or moiety, which contains or allows to introduce a –SH moiety into hydrophilic polymers P^1 and P^3 as defined herein. Such non-amino compounds may be attached to the hydrophilic polymers P^1 and P^3 of formula (IV) of the polymeric carrier according to the present invention via chemical reactions or binding of compounds, e.g. by binding of a 3-thio propionic acid or thioimolane, by amide formation (e.g. carboxylic acids, sulphonic acids, amines, etc), by Michael addition (e.g maleinimide moieties, α,β-unsatured carbonyls, etc), by click chemistry (e.g. azides or alkines), by alkene/alkine methatesis (e.g. alkenes or alkines), imine or hydrozone formation (aldehydes or ketons, hydrazins, hydroxylamins, amines), complexation reactions (avidin, biotin, protein G) or components which allow S_n-type substitution reactions (e.g halogenalkans, thiols, alcohols, amines, hydrazines, hydrazides, sulphonic acid esters, oxyphosphonium salts) or other chemical moieties which can be utilized in the attachment of further components. A particularly preferred PEG derivate in this context is alpha-methoxy-omega-mercapto poly(ethylene glycol). In each case, the SH-moiety, e.g. of a cysteine or of any further (modified) amino acid or compound, may be present at the terminal ends or internally at any position of hydrophilic polymers P^1 and P^3. As defined herein, each of hydrophilic polymers P^1 and P^3 typically exhibits at least one –SH-moiety preferably at one terminal end, but may also contain two or even more –SH-moieties, which may be used to additionally attach further components as defined herein, preferably further functional peptides or proteins e.g. a ligand, an amino acid component (AA) or $(AA)_x$, antibodies, cell penetrating peptides or enhancer peptides (e.g. TAT, KALA), etc.

The complexed artificial nucleic acid in the inventive (pharmaceutical) composition or vaccine, is preferably prepared according to a first step by complexing the at least one artificial with a cationic or polycationic compound and/or with a polymeric carrier, preferably as defined herein, in a specific ratio to form a stable complex. In this context, it is highly preferable, that no free cationic or polycationic compound or polymeric carrier or only a negligibly small amount thereof remains in the component of the complexed artificial nucleic acid after complexing the artificial nucleic acid. Accordingly, the ratio of the at least one artificial nucleic acid and the cationic or polycationic compound and/or the polymeric carrier in the component of the complexed at least one artificial nucleic acid is typically selected in a range that the at least one artificial nucleic acid is entirely complexed and no free cationic or polycationic compound or polymeric carrier or only a negligibly small amount thereof remains in the composition.

The inventive composition comprising at least one artificial nucleic acid according to the invention may be provided in liquid and or in dry (e.g. lyophylized) form. In a preferred embodiment, the inventive artificial nucleic acid or the inventive composition is provided in lyophilized form. The inventive artificial nucleic acid and the inventive composition thus provide a possibility to store (irrespective of the ambient temperature and also without cooling) an artificial nucleic acid and a composition suitable for vaccination against Norovirus and related diseases or disorders. Preferably, the at least one lyophilized artificial nucleic acid is

reconstituted in a suitable buffer, advantageously based on an aqueous carrier, e.g. Ringer-Lactate solution, prior to use, such as administration to a subject.

In one embodiment, the composition according to the invention

a) comprises a plurality or more than one of the mRNA sequences as defined in the invention;

or

b) comprises at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more artificial nucleic acids as defined in the invention, wherein each of the at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more artificial nucleic acids comprises at least one coding region encoding at least one polypeptide comprising a Norovirus protein as defined in the invention, and/or a fragment or a variant of any one of these proteins, wherein each coding region preferably encodes a different Norovirus protein, more preferably each coding region encodes a capsid protein, preferably VP1 of a different Norovirus.

In another embodiment, the composition according to the invention comprises at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more artificial nucleic acids of the invention, wherein each of the at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more artificial nucleic acids comprises at least one coding region encoding at least one polypeptide comprising at least two different Norovirus proteins, preferably VP1 and VP2, as defined in the invention, and/or a fragment or a variant of any one of these proteins, and/or wherein each of the mRNA sequences encodes at least one different antigenic peptide or protein derived from proteins of the same Norovirus.

In a further embodiment, the composition according to the invention comprises mRNA sequences, wherein each of the mRNA sequences encodes at least one different antigenic peptide or protein derived from different proteins of the same Norovirus.

In a further embodiment, the composition according to the invention comprises mRNA sequences, wherein each of the mRNA sequences encodes at least one different antigenic peptide or protein derived from different proteins of different Noroviruses.

In a further aspect, the invention concerns a vaccine comprising the artificial nucleic acid as described herein or the inventive composition comprising at least one artificial nucleic acid according to the invention. Therein, the at least one artificial nucleic acid preferably elicits an adaptive immune response upon administration to a subject.

In a preferred embodiment, the inventive vaccine comprises the artificial nucleic acid as described herein or the inventive composition comprising at least one artificial nucleic acid according to the invention and a pharmaceutically acceptable carrier. Accordingly, the inventive vaccine is based on the same components as the inventive composition comprising at least one artificial nucleic acid according to the invention as defined above. Insofar, it may be referred to the above disclosure defining the inventive composition.

In one embodiment, the composition of the invention comprises a plurality or more than one of the mRNA sequences of the invention.

In one embodiment, the composition of the invention comprises a plurality or more than one of the mRNA sequences of the invention, wherein each of the mRNA sequences encodes at least one different antigenic peptide or protein derived from proteins of the same Norovirus.

In one embodiment, the composition of the invention comprises a plurality or more than one of the mRNA sequences of the invention, wherein each of the mRNA sequences encodes at least one different antigenic peptide or protein derived from different proteins of the same Norovirus.

In another embodiment, the composition of the invention comprises a plurality or more than one of the mRNA sequences of the invention, wherein each of the mRNA sequences encodes at least one different antigenic peptide or protein derived from different proteins of different Noroviruses.

In one embodiment, the vaccine of the invention is multivalent and comprises

(i) at least 2, 3, 4, 5, 6, 7, 8, 9, 10 or more artificial nucleic acids of the invention; or

(ii) at least 10, 15, 20 or 50 artificial nucleic acids of the invention; or

(iii) 2-10, 10-15, 15-20, 20-50, 50-100 or 100-200 artificial nucleic acids of the invention.

In a further embodiment of the invention, the artificial nucleic acids of the vaccine of the invention

(i) are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GI Noroviruses; or

(ii) are derived from a single GII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GII Noroviruses; or

(iii) are derived from a single GIII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GIII Noroviruses; or

(iv) are derived from a single GIV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GIV Noroviruses; or

(v) are derived from a single GV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GV Noroviruses; or

(vi) are derived from a single GI Norovirus and additionally from a single GII Norovirus, GIII Norovirus, GIV Norovirus and/or GV Norovirus; or

(vii) are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GI Noroviruses and additionally from a single GII, GIII, GIV and/or GV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more GII, GIII, GIV and/or GV Noroviruses.

In another embodiment of the invention, the artificial nucleic acids of the vaccine of the invention

(i) are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GI.1 Noroviruses; or

(ii) are derived from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GII.4 Noroviruses; or

(iii) are derived from a single GI.1 Norovirus and additionally from a single GII.4 Norovirus; or

(iv) are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more different GI.1 Noroviruses and additionally from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100 or more GII.4 Noroviruses.

As with the composition according to the present invention, the entities of the vaccine may be provided in liquid and or in dry (e.g. lyophylized) form. They may contain further components, in particular further components allowing for its pharmaceutical use. The inventive vaccine or the inventive composition may, e.g., additionally contain a pharmaceutically acceptable carrier and/or further auxiliary substances and additives and/or adjuvants.

The inventive vaccine or composition typically comprises a safe and effective amount of the inventive artificial nucleic acid as defined herein. As used herein, "safe and effective amount" means an amount of the artificial nucleic acid of the composition or the vaccine as defined above, that is sufficient to significantly induce an immune response against a Norovirus protein. At the same time, however, a "safe and effective amount" is small enough to avoid serious side effects that is to say to permit a sensible relationship between advantage and risk. The determination of these limits typically lies within the scope of sensible medical judgment. In relation to the inventive vaccine or composition, the expression "safe and effective amount" preferably means an amount of the artificial nucleic acid that is suitable for stimulating the adaptive immune system in such a manner that no excessive or damaging immune reactions are achieved but, preferably, also no such immune reactions below a measurable level. Such a "safe and effective amount" of the artificial nucleic acid of the composition or vaccine as defined above may furthermore be selected in dependence of the type of artificial nucleic acid, e.g. monocistronic, bi- or even multicistronic mRNA, since a bi- or even multicistronic mRNA may lead to a significantly higher expression of the encoded polypeptide(s) than use of an equal amount of a monocistronic mRNA. A "safe and effective amount" of the artificial nucleic acid of the composition or vaccine as defined above may furthermore vary in connection with the particular objective of the treatment and also with the age and physical condition of the patient to be treated, and similar factors, within the knowledge and experience of the accompanying doctor. The vaccine or composition according to the invention can be used according to the invention for human and also for veterinary medical purposes, as a pharmaceutical composition or as a vaccine.

In a preferred embodiment, the artificial nucleic acid of the composition, vaccine or kit of parts according to the invention is provided in lyophilized form. Preferably, the lyophilized artificial nucleic acid is reconstituted in a suitable buffer, advantageously based on an aqueous carrier, prior to administration, e.g. Ringer-Lactate solution, which is preferred, Ringer solution, a phosphate buffer solution.

According to a preferred embodiment, the buffer suitable for injection may be used as a carrier in the inventive vaccine or composition or for resuspending the inventive vaccine or the inventive composition. Such a buffer suitable for injection may contain salts selected from sodium chloride (NaCl), calcium chloride ($CaCl_2$) and optionally potassium chloride (KCl), wherein further anions may be present additional to the chlorides. $CaCl_2$ can also be replaced by another salt like KCl. Typically, the salts in the injection buffer are present in a concentration of at least 50 mM sodium chloride (NaCl), at least 3 mM potassium chloride (KCl) and at least 0,01 mM calcium chloride ($CaCl_2$). The injection buffer may be hypertonic, isotonic or hypotonic with reference to the specific reference medium, i.e. the buffer may have a higher, identical or lower salt content with reference to the specific reference medium, wherein preferably such concentrations of the afore mentioned salts may be used, which do not lead to damage of cells due to osmosis or other concentration effects. Reference media are e.g. in "in vivo" methods occurring liquids such as blood, lymph, cytosolic liquids, or other body liquids, or e.g. liquids, which may be used as reference media in "in vitro" methods, such as common buffers or liquids. Such common buffers or liquids are known to a skilled person. Ringer-Lactate solution is particularly preferred as a liquid basis.

The choice of a pharmaceutically acceptable carrier is determined, in principle, by the manner, in which the inventive vaccine or the inventive composition is administered. The inventive vaccine or composition can be administered, for example, systemically or locally. Routes for systemic administration in general include, for example, transdermal, oral, parenteral routes, including subcutaneous, intravenous, intramuscular, intraarterial, intradermal and intraperitoneal injections and/or intranasal administration routes. Routes for local administration in general include, for example, topical administration routes but also intradermal, transdermal, subcutaneous, or intramuscular injections or intralesional, intracranial, intrapulmonal, intracardial, and sublingual injections. More preferably, the inventive vaccine or the inventive composition may be administered by an intradermal, subcutaneous, or intramuscular route, preferably by injection, which may be needle-free and/or needle injection. Compositions/vaccines are therefore preferably formulated in liquid or solid form. The suitable amount of the inventive vaccine or composition to be administered can be determined by routine experiments with animal models. Such models include, without implying any limitation, rabbit, sheep, mouse, rat, dog and non-human primate models. Preferred unit dose forms for injection include sterile solutions of water, physiological saline or mixtures thereof. The pH of such solutions should be adjusted to about 7.4. Suitable carriers for injection include hydrogels, devices for controlled or delayed release, polylactic acid and collagen matrices. Suitable pharmaceutically acceptable carriers for topical application include those which are suitable for use in lotions, creams, gels and the like. If the inventive vaccine is to be administered perorally, tablets, capsules and the like are the preferred unit dose form. The pharmaceutically acceptable carriers for the preparation of unit dose forms which can be used for oral administration are well known in the prior art. The choice thereof will depend on secondary considerations such as taste, costs and storability, which are not critical for the purposes of the present invention, and can be made without difficulty by a person skilled in the art.

Adjuvants:

According to another embodiment, the inventive (pharmaceutical) composition or the inventive vaccine may comprise an adjuvant. An adjuvant may be used, for example, in order to enhance the immunostimulatory properties of the vaccine or composition. In this context, an adjuvant may be understood as any compound, which is suitable to support administration and delivery of the vaccine or composition according to the invention. Furthermore, such an adjuvant may, without being bound thereto, initiate or increase an immune response of the innate immune system, i.e. a non-specific immune response. In other words, when administered, the vaccine or composition according to the invention typically initiates an adaptive immune response due to the at least one polypeptide encoded by the artificial nucleic acid contained in the inventive vaccine or composition. Additionally, the vaccine or composition according to the invention may generate an (supportive) innate immune response due to addition of an adjuvant as defined herein to the vaccine or composition according to the invention.

In one embodiment, the adjuvant is selected from the group consisting of:

cationic or polycationic compounds, comprising cationic or polycationic peptides or proteins, including protamine, nucleoline, spermin or spermidine, poly-L-lysine (PLL), poly-arginine, basic polypeptides, cell penetrating peptides (CPPs), including HIV-binding peptides, Tat, HIV-1 Tat (HIV), Tat-derived peptides, Penetratin, VP22 derived or analog peptides, HSV VP22 (Herpes simplex), MAP, KALA or protein transduction domains (PTDs, PpT620, proline-rich peptides, arginine-rich peptides, lysine-rich peptides, MPG-peptide(s), Pep-1, L-oligomers, Calcitonin peptide(s), Antennapedia-derived peptides (particularly from Drosophila antennapedia), pAntp, plsl, FGF, Lactoferrin, Transportan, Buforin-2, Bac715-24, SynB, SynB(1), pVEC, hCT-derived peptides, SAP, protamine, spermine, spermidine, or histones, cationic polysaccharides, including chitosan, polybrene, cationic polymers, including polyethyleneimine (PEI), cationic lipids, including DOTMA: [1-(2,3-sioleyloxy)propyl)]-N,N,N-trimethylammonium chloride, DMRIE, di-C14-amidine, DOTIM, SAINT, DC-Chol, BGTC, CTAP, DOPC, DODAP, DOPE: Dioleyl phosphatidylethanol-amine, DOSPA, DODAB, DOIC, DMEPC, DOGS: Dioctadecylamidoglicylspermin, DIMRI: Dimyristo-oxypropyl dimethyl hydroxyethyl ammonium bromide, DOTAP: dioleoyloxy-3-(trimethylammonio)propane, DC-6-14: O,O-ditetradecanoyl-N-(α-trimethylammonioacetyl)diethanolamine chloride, CLIP1: rac-[(2,3-dioctadecyloxypropyl)(2-hydroxyethyl)]-dimethylammonium chloride, CLIP6: rac-[2(2,3-dihexadecyloxypropyl-oxymethyloxy)ethyl]-trimethylammonium, CLIP9: rac-[2(2,3-dihexadecyloxypropyl-oxysuccinyloxy)ethyl]-trimethylammonium, oligofectamine, or cationic or polycationic polymers, including modified polyaminoacids, including β-aminoacid-polymers or reversed polyamides, modified polyethylenes, including PVP (poly(N-ethyl-4-vinylpyridinium bromide)), modified acrylates, including pDMAEMA (poly(dimethylaminoethyl methylacrylate)), modified Amidoamines including pAMAM (poly(amidoamine)), modified polybetaaminoester (PBAE), including diamine end modified 1,4 butanediol diacrylate-co-5-amino-1-pentanol polymers, dendrimers, including polypropylamine dendrimers or pAMAM based dendrimers, polyimine(s), including PEI: poly(ethyleneimine), poly(propyleneimine), polyallylamine, sugar backbone based polymers, including cyclodextrin based polymers, dextran based polymers, Chitosan, etc., silan backbone based polymers , such as PMOXA-PDMS copolymers, etc., block polymers consisting of a combination of one or more cationic blocks selected from a cationic polymer as mentioned before, and of one or more hydrophilic- or hydrophobic blocks (e.g polyethyleneglycole);

or

cationic or polycationic proteins or peptides, selected from the following proteins or peptides having the following total formula (III): (Arg)l;(Lys)m;(His)n;(Orn)o;(Xaa)x, wherein l + m + n +o + x = 8-15, and l, m, n or o independently of each other may be any number selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 or 15, provided that the overall content of Arg, Lys, His and Orn represents at least 50% of all amino acids of the oligopeptide; and Xaa may be any amino acid selected from native (= naturally occurring) or non-native amino acids except from Arg, Lys, His or Orn; and x may be any number selected from 0, 1, 2, 3 or 4, provided, that the overall content of Xaa does not exceed 50% of all amino acids of the oligopeptide; or

nucleic acids having the formula (V): GlXmGn, wherein: G is guanosine, uracil or an analogue of guanosine or uracil; X is guanosine, uracil, adenosine, thymidine, cytosine or an analogue of the above-mentioned nucleotides; l is an integer from 1 to 40, wherein, when l = 1 G is guanosine or an analogue thereof, when l > 1 at least 50% of the nucleotides are guanosine or an analogue thereof; m is an integer and is at least 3; wherein when m = 3 X is uracil or an analogue thereof, when m > 3 at least 3 successive uracils or analogues of uracil occur; n is an integer from 1 to 40, wherein when n = 1 G is guanosine or an analogue thereof, when n > 1 at least 50% of the nucleotides are guanosine or an analogue thereof;

or

nucleic acids having the formula (VI): ClXmCn, wherein: C is cytosine, uracil or an analogue of cytosine or uracil; X is guanosine, uracil, adenosine, thymidine, cytosine or an analogue of the above-mentioned nucleotides; l is an integer from 1 to 40, wherein when l = 1 C is cytosine or an analogue thereof, when l > 1 at least 50% of the nucleotides are cytosine or an analogue thereof; m is an integer and is at least 3; wherein when m = 3 X is uracil or an analogue thereof, when m > 3 at least 3 successive uracils or analogues of uracil occur; n is an integer from 1 to 40, wherein when n = 1 C is cytosine or an analogue thereof, when n > 1 at least 50% of the nucleotides are cytosine or an analogue thereof;

or

adjuvants selected from the group consisting of:

TDM, MDP, muramyl dipeptide, pluronics, alum solution, aluminium hydroxide, ADJUMER™ (polyphosphazene); aluminium phosphate gel; glucans from algae; algammulin; aluminium hydroxide gel (alum); highly protein-adsorbing aluminium hydroxide gel; low viscosity aluminium hydroxide gel; AF or SPT (emulsion of squalane (5%), Tween 80 (0.2%), Pluronic L121 (1.25%), phosphate-buffered saline, pH 7.4); AVRIDINE™ (propanediamine); BAY R1005™ ((N-(2-deoxy-2-L-leucylamino-b-D-glucopyranosyl)-N-octadecyl-dodecanoyl-amide hydroacetate); CALCITRIOL™ (1-alpha,25-dihydroxy-vitamin D3); calcium phosphate gel; CAP™ (calcium phosphate nanoparticles); cholera holotoxin, cholera-toxin-A1-protein-A-D-fragment fusion protein, sub-unit B of the cholera toxin; CRL 1005 (block copolymer P1205); cytokine-containing liposomes; DDA (dimethyldioctadecylammonium bromide); DHEA (dehydroepiandrosterone); DMPC (dimyristoylphosphatidylcholine); DMPG (dimyristoylphosphatidylglycerol); DOC/alum complex (deoxycholic acid sodium salt); Freund's complete adjuvant; Freund's incomplete adjuvant; gamma inulin; Gerbu adjuvant (mixture of: i) N-acetylglucosaminyl-(P1-4)-N-acetylmuramyl-L-alanyl-D-glutamine (GMDP), ii) dimethyldioctadecylammonium chloride (DDA), iii) zinc-L-proline salt complex (ZnPro-8); GM-CSF); GMDP (N-acetylglucosaminyl-(b1-4)-N-acetylmuramyl-L-alanyl-D-isoglutamine); imiquimod (1-(2-methypropyl)-1H-imidazo[4,5-c]quinoline-4-amine); ImmTher™ (N-acetylglucosaminyl-N-acetylmuramyl-L-Ala-D-isoGlu-L-Ala-glycerol dipalmitate); DRVs (immunoliposomes prepared from dehydration-rehydration vesicles); interferon-gamma; interleukin-1beta; interleukin-2; interleukin-7; interleukin-12; ISCOMSTM; ISCOPREP 7.0.3.TM; liposomes; LOXORIBINE™ (7-allyl-8-oxoguanosine); LT oral adjuvant

(E.coli labile enterotoxin-protoxin); microspheres and microparticles of any composition; MF59TM; (squalene-water emulsion); MONTANIDE ISA 51™ (purified incomplete Freund's adjuvant); MONTANIDE ISA 720™ (metabolisable oil adjuvant); MPL™ (3-O-desacyl-4'-monophosphoryl lipid A); MTP-PE and MTP-PE liposomes ((N-acetyl-L-alanyl-D-isoglutaminyl-L-alanine-2-(1,2-dipalmitoyl-sn-glycero-3-(hydroxyphosphoryloxy))-ethylamide, monosodium salt); MURAMETIDE™ (Nac-Mur-L-Ala-D-Gln-OCH3); MURAPALMITINE™ and D-MURAPALMITINE™ (Nac-Mur-L-Thr-D-isoGln-sn-glyceroldipalmitoyl); NAGO (neuraminidase-galactose oxidase); nanospheres or nanoparticles of any composition; NISVs (non-ionic surfactant vesicles); PLEURAN™ (β-glucan); PLGA, PGA and PLA (homo- and co-polymers of lactic acid and glycolic acid; microspheres/nanospheres); PLURONIC L121TM; PMMA (polymethyl methacrylate); PODDS™ (proteinoid microspheres); polyethylene carbamate derivatives; poly-rA: poly-rU (polyadenylic acid-polyuridylic acid complex); polysorbate 80 (Tween 80); protein cochleates (Avanti Polar Lipids, Inc., Alabaster, AL); STIMULON™ (QS-21); Quil-A (Quil-A saponin); S-28463 (4-amino-otec-dimethyl-2-ethoxymethyl-1H-imidazo[4,5 c]quinoline-1-ethanol); SAF-1™ ("Syntex adjuvant formulation"); Sendai proteoliposomes and Sendai-containing lipid matrices; Span-85 (sorbitan trioleate); Specol (emulsion of Marcol 52, Span 85 and Tween 85); squalene or Robane® (2,6,10,15,19,23-hexamethyltetracosan and 2,6,10,15,19,23-hexamethyl-2,6,10,14,18,22-tetracosahexane); stearyltyrosine (octadecyltyrosine hydrochloride); Theramid® (N-acetylglucosaminyl-N-acetylmuramyl-L-Ala-D-isoGlu-L-Ala-dipalmitoxypropylamide); Theronyl-MDP (Termurtide™ or [thr 1]-MDP; N-acetylmuramyl-L-threonyl-D-isoglutamine); Ty particles (Ty-VLPs or virus-like particles); Walter-Reed liposomes (liposomes containing lipid A adsorbed on aluminium hydroxide), and lipopeptides, including Pam3Cys, in particular aluminium salts, such as Adju-phos, Alhydrogel, Rehydragel; emulsions, including CFA, SAF, IFA, MF59, Provax, TiterMax, Montanide, Vaxfectin; copolymers, including Optivax (CRL1005), L121, Poloaxmer4010), etc.; liposomes, including Stealth, cochleates, including BIORAL; plant derived adjuvants, including QS21, Quil A, Iscomatrix, ISCOM; adjuvants suitable for costimulation including Tomatine, biopolymers, including PLG, PMM, Inulin; microbe derived adjuvants, including Romurtide, DETOX, MPL, CWS, Mannose, CpG nucleic acid sequences, CpG7909, ligands of human TLR 1-10, ligands of murine TLR 1-13, ISS-1018, IC31, Imidazoquinolines, Ampligen, Ribi529, IMOxine, IRIVs, VLPs, cholera toxin, heat-labile toxin, Pam3Cys, Flagellin, GPI anchor, LNFPIII/Lewis X, antimicrobial peptides, UC-1V150, RSV fusion protein, cdiGMP; and adjuvants suitable as antagonists including CGRP neuropeptide.

Particularly preferred are aluminium salts, such as aluminium phosphate ($AlPO_4$) or aluminium hydroxide ($Al(OH)_3$) and adjuvant compounds based thereon. More preferably, an aluminium salt, such as $AlPO_4$ (e.g. Adju-Phos) may be used in combination with the inventive artificial nucleic acid in its free form or with the inventive artificial nucleic acid complexed with a cationic or polycationic compound as described herein. Most preferably, an aluminium salt, such as $AlPO_4$ (e.g. Adju-Phos) may be used as adjuvant in combination with the inventive artificial nucleic acid in its free form.

Suitable adjuvants may also be selected from cationic or polycationic compounds, preferably as described herein, wherein the adjuvant is preferably prepared upon complexing the at least one artificial nucleic acid of the inventive composition or vaccine with the cationic or polycationic compound. Association or complexing the artificial nucleic acid with cationic or polycationic compounds as defined herein preferably provides adjuvant properties and confers a stabilizing effect to the artificial nucleic acid.

The ratio of the artificial nucleic acid to the cationic or polycationic compound in the adjuvant component may be calculated on the basis of the nitrogen/phosphate ratio (N/P-ratio) of the entire artificial nucleic acid complex, i.e. the ratio of positively charged (nitrogen) atoms of the cationic or polycationic compound to the negatively charged phosphate atoms of the nucleic acids. For example, 1 µg RNA typically contains about 3 nmol phosphate residues, provided the RNA exhibits a statistical distribution of bases. Additionally, 1 µg peptide typically contains about x nmol nitrogen residues, dependent on the molecular weight and the number of basic amino acids. When exemplarily calculated for $(Arg)_9$ (molecular weight 1424 g/mol, 9 nitrogen atoms), 1 µg $(Arg)_9$ contains about 700 pmol $(Arg)_9$ and thus 700 x 9=6300 pmol basic amino acids = 6.3 nmol nitrogen atoms. For a mass ratio of about 1:1 RNA/(Arg)9 an N/P ratio of about 2 can be calculated. When exemplarily calculated for protamine (molecular weight about 4250 g/mol, 21 nitrogen atoms, when protamine from salmon is used) with a mass ratio of about 2:1 with 2 µg RNA, 6 nmol phosphate are to be calulated for the RNA; 1 µg protamine contains about 235 pmol protamine molecues and thus 235 x 21 = 4935 pmol basic nitrogen atoms = 4.9 nmol nitrogen atoms. For a mass ratio of about 2:1 RNA/protamine an N/P ratio of about 0.81 can be calculated. For a mass ratio of about 8:1 RNA/protamine an N/P ratio of about 0.2 can be calculated. In the context of the present invention, an N/P-ratio is preferably in the range of about 0.1-10, preferably in a range of about 0.3-4 and most preferably in a range of about 0.5-2 or 0.7-2 regarding the ratio of nucleic acid:peptide in the complex, and most preferably in the range of about 0.7-1.5.

In a preferred embodiment, the inventive vaccine or the inventive composition is obtained in two separate steps in order to obtain both, an efficient immunostimulatory effect and efficient translation of the artificial nucleic acid according to the invention. Therein, a so called "adjuvant component" is prepared by complexing – in a first step – a nucleic acid, preferably an RNA, of the adjuvant component with a cationic or polycationic compound in a specific ratio to form a stable complex. In this context, it is important, that no free cationic or polycationic compound or only a neglibly small amount remains in the adjuvant component after complexing the nucleic acid. Accordingly, the ratio of the nucleic acid, preferably an RNA, and the cationic or polycationic compound in the adjuvant component is typically selected in a range that the artificial nucleic acid is entirely complexed and no free cationic or polycationic compound or only a neglectably small amount remains in the composition. Preferably the ratio of the adjuvant component, i.e. the ratio of the artificial nucleic acid to the cationic or polycationic compound is selected from a range of about 6:1 (w/w) to about 0,25:1 (w/w), more preferably from about 5:1 (w/w) to about 0,5:1 (w/w), even more preferably of about 4:1 (w/w) to about 1:1 (w/w) or of about 3:1 (w/w) to about 1:1 (w/w), and most preferably a ratio of about 3:1 (w/w) to about 2:1 (w/w).

According to a preferred embodiment, the artificial nucleic acid, preferably an mRNA, is added in a second step to the complexed nucleic acid, preferably an RNA, of the adjuvant component in order to form the (immunostimulatory) composition of the invention. Therein, the artificial nucleic acid is added as free nucleic acid, i.e. nucleic acid, which is not complexed by other compounds. Prior to addition, the free artificial nucleic acid is not complexed and will preferably not undergo any detectable or significant complexation reaction upon the addition of the adjuvant component. This is due to the strong binding of the cationic or polycationic compound to the above described artificial nucleic acid in the adjuvant component. In other words, when the artificial nucleic

acid according to the invention, is added to the "adjuvant component", preferably no free or substantially no free cationic or polycationic compound is present, which may form a complex with the free artificial nucleic acid. Accordingly, an efficient translation of the free artificial nucleic acid of the inventive vaccine or composition is possible in vivo. Therein, the free artificial nucleic acid may occur, for example, as a mono-, di-, or multicistronic nucleic acid, i.e. an artificial nucleic acid which carries the coding sequences of one or more polypeptides. Such coding sequences in a di-, or even multicistronic nucleic acid may be separated by at least one IRES sequence, e.g. as defined herein.

In a particularly preferred embodiment, the free artificial nucleic acid, which is comprised in the inventive vaccine or composition, may be identical or different to the RNA of the adjuvant component of the inventive composition, depending on the specific requirements of therapy. Even more preferably, the artificial nucleic acid, preferably an mRNA, which is comprised in the inventive vaccine or composition, is identical to the RNA of the adjuvant component of the inventive vaccine or composition.

In a particularly preferred embodiment, the composition comprises the artificial nucleic acid, preferably an mRNA, wherein said artificial nucleic acid is present in the composition partially as free nucleic acid and partially as complexed nucleic acid. Preferably, the artificial nucleic acid, preferably an mRNA, is complexed as described above and the same artificial nucleic acid is then added as free nucleic acid, wherein preferably the compound, which is used for complexing the artificial nucleic acid is not present in free form in the composition at the moment of addition of the free nucleic acid component.

The ratio of the first component (i.e. the adjuvant component comprising or consisting of artificial nucleic acid complexed with a cationic or polycationic compound) and the second component (i.e. the free nucleic acid) may be selected in the inventive composition according to the specific requirements of a particular therapy. Typically, the ratio of the nucleic acid, preferably an RNA, in the adjuvant component and the at least one free artificial nucleic acid, preferably an mRNA, (artificial nucleic acid, preferably mRNA in the adjuvant component : free RNA) of the inventive composition is selected such that a significant stimulation of the innate immune system is elicited due to the adjuvant component. In parallel, the ratio is selected such that a significant amount of the at least one free artificial nucleic acid, preferably an mRNA, can be provided in vivo leading to an efficient translation and concentration of the expressed protein in vivo, e.g. the at least one encoded polypeptide as defined herein. Preferably, the ratio of the mRNA in the adjuvant component : free mRNA in the inventive composition is selected from a range of about 5:1 (w/w) to about 1:10 (w/w), more preferably from a range of about 4:1 (w/w) to about 1:8 (w/w), even more preferably from a range of about 3:1 (w/w) to about 1:5 (w/w) or 1:3 (w/w), and most preferably the ratio of mRNA in the adjuvant component : free mRNA in the inventive composition is selected from a ratio of about 1:1 (w/w).

Additionally or alternatively, the ratio of the first component (i.e. the adjuvant component comprising or consisting of artificial nucleic acid complexed with a cationic or polycationic compound) and the second component (i.e. free artificial nucleic acid) may be calculated on the basis of the nitrogen/phosphate ratio (N/P-ratio) of the entire mRNA complex. In the context of the present invention, an N/P-ratio is preferably in the range of about 0.1-10, preferably in a range of about 0.3-4 and most preferably in a

range of about 0.5-2 or 0.7-2 regarding the ratio of mRNA:peptide in the complex, and most preferably in the range of about 0.7-1.5.

Additionally or alternatively, the ratio of the first component (i.e. the adjuvant component comprising or consisting of artificial nucleic acid, preferably mRNA, complexed with a cationic or polycationic compound) and the second component (i.e. free artificial nucleic acid, preferably mRNA) may also be selected in the inventive composition on the basis of the molar ratio of both nucleic acids to each other, i.e. the nucleic acid of the adjuvant component, being complexed with a cationic or polycationic compound and the free nucleic acid of the second component. Typically, the molar ratio of the nucleic acid of the adjuvant component to the free nucleic acid of the second component may be selected such, that the molar ratio suffices the above (w/w) and/or N/P-definitions. More preferably, the molar ratio of the nucleic acid, preferably an mRNA, of the adjuvant component to the free nucleic acid, preferably an mRNA, of the second component may be selected e.g. from a molar ratio of about 0.001:1, 0.01:1, 0.1:1, 0.2:1, 0.3:1, 0.4:1, 0.5:1, 0.6:1, 0.7:1, 0.8:1, 0.9:1, 1:1, 1:0.9, 1:0.8, 1:0.7, 1:0.6, 1:0.5, 1:0.4, 1:0.3, 1:0.2, 1:0.1, 1:0.01, 1:0.001, etc. or from any range formed by any two of the above values, e.g. a range selected from about 0.001:1 to 1:0.001, including a range of about 0.01:1 to 1:0.001, 0.1:1 to 1:0.001, 0.2:1 to 1:0.001, 0.3:1 to 1:0.001, 0.4:1 to 1:0.001, 0.5:1 to 1:0.001, 0.6:1 to 1:0.001, 0.7:1 to 1:0.001, 0.8:1 to 1:0.001, 0.9:1 to 1:0.001, 1:1 to 1:0.001, 1:0.9 to 1:0.001, 1:0.8 to 1:0.001, 1:0.7 to 1:0.001, 1:0.6 to 1:0.001, 1:0.5 to 1:0.001, 1:0.4 to 1:0.001, 1:0.3 to 1:0.001, 1:0.2 to 1:0.001, 1:0.1 to 1:0.001, 1:0.01 to 1:0.001, or a range of about 0.01:1 to 1:0.01, 0.1:1 to 1:0.01, 0.2:1 to 1:0.01, 0.3:1 to 1:0.01, 0.4:1 to 1:0.01, 0.5:1 to 1:0.01, 0.6:1 to 1:0.01, 0.7:1 to 1:0.01, 0.8:1 to 1:0.01, 0.9:1 to 1:0.01, 1:1 to 1:0.01, 1:0.9 to 1:0.01, 1:0.8 to 1:0.01, 1:0.7 to 1:0.01, 1:0.6 to 1:0.01, 1:0.5 to 1:0.01, 1:0.4 to 1:0.01, 1:0.3 to 1:0.01, 1:0.2 to 1:0.01, 1:0.1 to 1:0.01, 1:0.01 to 1:0.01, or including a range of about 0.001:1 to 1:0.01, 0.001:1 to 1:0.1, 0.001:1 to 1:0.2, 0.001:1 to 1:0.3, 0.001:1 to 1:0.4, 0.001:1 to 1:0.5, 0.001:1 to 1:0.6, 0.001:1 to 1:0.7, 0.001:1 to 1:0.8, 0.001:1 to 1:0.9, 0.001:1 to 1:1, 0.001 to 0.9:1, 0.001 to 0.8:1, 0.001 to 0.7:1, 0.001 to 0.6:1, 0.001 to 0.5:1, 0.001 to 0.4:1, 0.001 to 0.3:1, 0.001 to 0.2:1, 0.001 to 0.1:1, or a range of about 0.01:1 to 1:0.01, 0.01:1 to 1:0.1, 0.01:1 to 1:0.2, 0.01:1 to 1:0.3, 0.01:1 to 1:0.4, 0.01:1 to 1:0.5, 0.01:1 to 1:0.6, 0.01:1 to 1:0.7, 0.01:1 to 1:0.8, 0.01:1 to 1:0.9, 0.01:1 to 1:1, 0.001 to 0.9:1, 0.001 to 0.8:1, 0.001 to 0.7:1, 0.001 to 0.6:1, 0.001 to 0.5:1, 0.001 to 0.4:1, 0.001 to 0.3:1, 0.001 to 0.2:1, 0.001 to 0.1:1, etc.

Even more preferably, the molar ratio of the artificial nucleic acid, preferably an mRNA, of the adjuvant component to the free nucleic acid, preferably an mRNA, of the second component may be selected e.g. from a range of about 0.01:1 to 1:0.01. Most preferably, the molar ratio of the nucleic acid of the adjuvant component to the free nucleic acid of the second component may be selected e.g. from a molar ratio of about 1:1. Any of the above definitions with regard to (w/w) and/or N/P ratio may also apply.

Suitable adjuvants may furthermore be selected from nucleic acids having the formula (V): $G_lX_mG_n$, wherein: G is guanosine, uracil or an analogue of guanosine or uracil; X is guanosine, uracil, adenosine, thymidine, cytosine or an analogue of the above-mentioned nucleotides; l is an integer from 1 to 40, wherein when l = 1 G is guanosine or an analogue thereof, when l > 1 at least 50% of the nucleotides are guanosine or an analogue thereof; m is an integer and is at least 3; wherein when m = 3 X is uracil or an analogue thereof, when m > 3 at least 3 successive uracils or analogues of uracil occur; n is an integer from 1 to 40,

wherein when n = 1 G is guanosine or an analogue thereof, when n > 1 at least 50% of the nucleotides are guanosine or an analogue thereof.

Other suitable adjuvants may furthermore be selected from nucleic acids having the formula (VI): $C_lX_mC_n$, wherein: C is cytosine, uracil or an analogue of cytosine or uracil; X is guanosine, uracil, adenosine, thymidine, cytosine or an analogue of the above-mentioned nucleotides; l is an integer from 1 to 40, wherein when l = 1 C is cytosine or an analogue thereof, when l > 1 at least 50% of the nucleotides are cytosine or an analogue thereof; m is an integer and is at least 3; wherein when m = 3 X is uracil or an analogue thereof, when m > 3 at least 3 successive uracils or analogues of uracil occur; n is an integer from 1 to 40, wherein when n = 1 C is cytosine or an analogue thereof, when n > 1 at least 50% of the nucleotides are cytosine or an analogue thereof.

The inventive vaccine or composition can additionally contain one or more auxiliary substances in order to further increase the immunogenicity. A synergistic action of the artificial nucleic acid of the composition or vaccine as defined herein and of an auxiliary substance, which may be optionally be co-formulated (or separately formulated) with the inventive vaccine or composition as described above, is preferably achieved thereby. Depending on the various types of auxiliary substances, various mechanisms can come into consideration in this respect. For example, compounds that permit the maturation of dendritic cells (DCs), for example lipopolysaccharides, TNF-alpha or CD40 ligand, form a first class of suitable auxiliary substances. In general, it is possible to use as auxiliary substance any agent that influences the immune system in the manner of a "danger signal" (LPS, GP96, etc.) or cytokines, such as GM-CFS, which allow an immune response produced by the immune-stimulating adjuvant according to the invention to be enhanced and/or influenced in a targeted manner. Particularly preferred auxiliary substances are cytokines, such as monokines, lymphokines, interleukins or chemokines, that – additional to induction of the adaptive immune response by the encoded at least one antigen – promote the innate immune response, such as IL-1, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-12, IL-13, IL-14, IL-15, IL-16, IL-17, IL-18, IL-19, IL-20, IL-21, IL-22, IL-23, IL-24, IL-25, IL-26, IL-27, IL-28, IL-29, IL-30, IL-31, IL-32, IL-33, INF-alpha, IFN-beta, INF-gamma, GM-CSF, G-CSF, M-CSF, LT-beta or TNF-alpha, growth factors, such as hGH. Preferably, such immunogenicity increasing agents or compounds are provided separately (not co-formulated with the inventive vaccine or composition) and administered individually.

The inventive vaccine or composition can also additionally contain any further compound, which is known to be immune-stimulating due to its binding affinity (as ligands) to human Toll-like receptors TLR1, TLR2, TLR3, TLR4, TLR5, TLR6, TLR7, TLR8, TLR9, TLR10, or due to its binding affinity (as ligands) to murine Toll-like receptors TLR1, TLR2, TLR3, TLR4, TLR5, TLR6, TLR7, TLR8, TLR9, TLR10, TLR11, TLR12 or TLR13.

Another class of compounds, which may be added to an inventive vaccine or composition in this context, may be CpG nucleic acids, in particular CpG-RNA or CpG-DNA. A CpG-RNA or CpG-DNA can be a single-stranded CpG-DNA (ss CpG-DNA), a double-stranded CpG-DNA (dsDNA), a single-stranded CpG-RNA (ss CpG-RNA) or a double-stranded CpG-RNA (ds CpG-RNA). The CpG nucleic acid is preferably in the form of CpG-RNA, more preferably in the form of single-stranded CpG-RNA (ss CpG-RNA). The CpG nucleic acid preferably contains at least one or more (mitogenic) cytosine/guanine dinucleotide sequence(s) (CpG motif(s)).

According to a first preferred alternative, at least one CpG motif contained in these sequences, that is to say the C (cytosine) and the G (guanine) of the CpG motif, is unmethylated. All further cytosines or guanines optionally contained in these sequences can be either methylated or unmethylated. According to a further preferred alternative, however, the C (cytosine) and the G (guanine) of the CpG motif can also be present in methylated form.

Preferably, the above compounds are formulated and administered separately from the above composition or vaccine (of the invention) containing the artificial nucleic acid according to the invention.

Polypeptide:

In a further aspect, the present invention concerns a polypeptide encoded by the inventive artificial nucleic acid as described herein, or a fragment of said polypeptide.

More preferably, the inventive polypeptide comprises or consists of, preferably in this order from N-terminus to C-terminus:

a) an amino acid sequence derived from a C-terminal fragment from mature Norovirus capsid protein VP1, or a variant thereof, wherein the C-terminal fragment preferably comprises or consists of 3 to 20 amino acid residues,

b) an amino acid sequence derived from a signal sequence of Norovirus capsid protein VP1, or a fragment or variant thereof, or an amino acid sequence derived from a C-terminal fragment, or a variant thereof, of Norovirus capsid protein VP1 as present in Norovirus polyprotein before cleavage, preferably as described herein.

More preferably, the inventive polypeptide is selected from the group consisting of Norovirus NS1/NS2, NS3, NS4, NS5, NS6, NS7, VP1, and VP2, or a fragment or variant of any of these proteins, and

at least one amino acid sequence selected from the group consisting of:

a) an amino acid sequence derived from a C-terminal fragment from mature Norovirus capsid protein VP1, or a variant thereof, wherein the C-terminal fragment consists of 3 to 20 amino acid residues,

b) an amino acid sequence derived from a signal sequence of Norovirus capsid protein VP1, or a fragment or variant thereof, and

c) an amino acid sequence derived from an N-terminal fragment from mature Norovirus non-structural protein NS1/NS2, NS3, NS4, NS5, NS6, or NS7, or a variant thereof, wherein the N-terminal fragment consists of 3 to 20 amino acid residues.

In a preferred embodiment, the inventive polypeptide does not comprise an amino acid sequence from Norovirus capsid protein VP1 or from Norovirus non-structural protein 1 (NS1) distinct from the following amino acid sequences:

a) an amino acid sequence derived from a C-terminal fragment from mature Norovirus capsid protein VP1, or a variant thereof, wherein the C-terminal fragment preferably comprises or consists of 3 to 20 amino acid residues,

b) an amino acid sequence derived from a signal sequence of Norovirus capsid protein VP1, or a fragment or variant thereof, or an amino acid sequence derived from a C-terminal fragment, or a variant thereof, of Norovirus capsid protein VP1 as present in Norovirus polyprotein before cleavage, preferably as described herein, and

c) an amino acid sequence derived from an N-terminal fragment from mature Norovirus non-structural protein (NS1), or a variant thereof, wherein the N-terminal fragment preferably comprises or consists of 3 to 20 amino acid residues.

According to a preferred embodiment, the inventive polypeptides as described herein comprises a molecular tag, wherein the molecular tag is selected from the group consisting of a FLAG tag, a glutathione-S-transferase (GST) tag, a His tag, a Myc tag, an E tag, a Strep tag, a green fluorescent protein (GFP) tag and an HA tag.

In a further aspect, the present invention provides a composition comprising at least one of the inventive polypeptides as described herein. In a preferred embodiment, the inventive composition comprises one type of polypeptide as described herein. Alternatively, the inventive composition may comprise at least two different inventive polypeptides as described herein.

Preferably, the inventive composition comprises or consists of at least one of the inventive polypeptides described herein and a pharmaceutically acceptable carrier. In this context, the pharmaceutically acceptable carrier as well as optional further components of the composition are preferably as described herein with respect to the inventive composition comprising at least one inventive artificial nucleic acid.

In a further aspect, the invention concerns a vaccine comprising the inventive composition comprising at least one of the polypeptides according to the invention. Therein, the at least one of the inventive polypeptides preferably elicits an adaptive immune response upon administration to a subject. More preferably, the vaccine according to the invention comprising at least one of the inventive polypeptides or the inventive composition comprising at least one of the polypeptides according to the invention is preferably a vaccine as described herein. Reference is made to the respective description herein.

As used herein, the term 'inventive composition' may refer to the inventive composition comprising at least one artificial nucleic acid according to the invention as well as to the inventive composition comprising at least one of the polypeptides according to the invention. Likewise, the term 'inventive vaccine', as used in this context, may refer to an inventive vaccine, which is based on the inventive artificial nucleic acid, i.e. which comprises at least one artificial nucleic acid according to the invention or which comprises the inventive composition comprising said artificial nucleic acid, as well as to an inventive vaccine, which is based on the inventive polypeptide(s), i.e. which comprises at least one polypeptide according to the invention or which comprises the inventive composition comprising said at least one polypeptide according to the invention.

According to another embodiment, the present invention also provides kits, particularly kits of parts, comprising the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide

or the inventive vaccine as described herein, optionally a liquid vehicle for solubilising and optionally technical instructions with information on the administration and dosage of the artificial nucleic acid according as described herein, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide or the inventive vaccine. The technical instructions may contain information about administration and dosage. Such kits, preferably kits of parts, may be applied e.g. for any of the applications or uses mentioned herein, preferably for the use of the artificial nucleic acid according as described herein, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide or the inventive vaccine for the treatment or prophylaxis of a Norovirus infection or diseases or disorders related thereto. The kits may also be applied for the use of the artificial nucleic acid according as described herein, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide or the inventive vaccine for the treatment or prophylaxis of Norovirus infection or diseases or disorders related thereto, wherein the artificial nucleic acid according as described herein, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide or the inventive vaccine may induce or enhance an immune response in a mammal as defined above. Preferably, the artificial nucleic acid according as described herein, the inventive composition comprising at least one artificial nucleic acid according to the invention, or the inventive vaccine is provided in a separate part of the kit, wherein the artificial nucleic acid according as described herein, the inventive composition comprising at least one artificial nucleic acid according to the invention, or the inventive vaccine are preferably lyophilised. More preferably, the kit further contains as a part a vehicle for solubilising the artificial nucleic acid according as described herein, the inventive composition comprising at least one artificial nucleic acid according to the invention, or the inventive vaccine, the vehicle preferably being Ringer-lactate solution. Any of the above kits may be used in a treatment or prophylaxis as defined above. More preferably, any of the above kits may be used as a vaccine, preferably a vaccine against Norovirus infection or a related disease or disorder.

The present invention furthermore provides several applications and uses of the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide or the inventive vaccine or of kits comprising same. In particular, the inventive (pharmaceutical) composition(s) or the inventive vaccine may be used for human and also for veterinary medical purposes, preferably for human medical purposes, as a pharmaceutical composition in general or as a vaccine.

In a further aspect, the invention provides the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide, the inventive vaccine or the inventive kit or kit of parts for use in a method of prophylactic (pre-exposure prophylaxis or post-exposure prophylaxis) and/or therapeutic treatment of Norovirus infections. Consequently, in a further aspect, the present invention is directed to the first medical use of the artificial

nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide, the inventive vaccine or the inventive kit or kit of parts as defined herein as a medicament. Particularly, the invention provides the use of an artificial nucleic acid comprising at least one coding region encoding at least one polypeptide comprising at least one Norovirus protein as defined herein, or a fragment or variant thereof as described herein for the preparation of a medicament.

According to another aspect, the present invention is directed to the second medical use of the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide, the inventive vaccine or the inventive kit or kit of parts for the treatment of an infection with Norovirus or a disease or disorder related to an infection with Norovirus as defined herein. Particularly, the artificial nucleic acid comprising at least one coding region encoding at least one polypeptide comprising at least one Norovirus protein as defined herein, or a fragment or variant thereof as described herein to be used in a method as said above is an artificial nucleic acid formulated together with a pharmaceutically acceptable vehicle and an optionally additional adjuvant and an optionally additional further component as defined herein.

The invention provides the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide, the inventive vaccine or the inventive kit or kit of parts for medical use, in particular for the treatment of an infection with Norovirus or a disease or disorder related to an infection with Norovirus, wherein preferably an infection with Norovirus may involve any Norovirus strain. More preferably, the Norovirus infection is caused by a Norovirus strain, which is selected from the group consisting of GII.4 CIN-1 Norovirus or a GII.4 Sydney Norovirus, GI.1 and GII.4 Sydney 2012 Norovirus. Further preferably, the Norovirus infection is caused by a Norovirus strain GII.4 Sydney or GII.4 Sydney 2012.

As used herein, "a disorder related to a Norovirus infection" or "a disease related to a Norovirus infection" may preferably comprise a complication of Norovirus infection, such as abdominal pain, diarrhea, DIC (disseminated intravascular coagulation), fever, fever/chills, gastrointestinal symptoms, headache, nausea, neck stiffness, obtundation, photophobia, and/or vomiting. In a preferred embodiment, the inventive composition or vaccine is thus used for treatment or prophylaxis, preferably prophylaxis, of complications associated with a Norovirus infection.

The inventive composition or the inventive vaccine, in particular the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein or the inventive composition comprising at least one inventive polypeptide, can be administered, for example, systemically or locally. Routes for systemic administration in general include, for example, transdermal, oral, parenteral routes, including subcutaneous, intravenous, intramuscular, intraarterial, intradermal and intraperitoneal injections and/or intranasal administration routes. Routes for local administration in general include, for example, topical administration routes but also intradermal, transdermal, subcutaneous, or intramuscular

injections or intralesional, intracranial, intrapulmonal, intracardial, and sublingual injections. More preferably, vaccines may be administered by an intradermal, subcutaneous, or intramuscular route. Inventive vaccines are therefore preferably formulated in liquid (or sometimes in solid) form. Preferably, the inventive vaccine may be administered by conventional needle injection or needle-free jet injection. In a preferred embodiment the inventive vaccine or composition may be administered by jet injection as defined herein, preferably intramuscularly or intradermally, more preferably intradermally.

In a preferred embodiment, a single dose of the inventive artificial nucleic acid, composition or vaccine comprises a specific amount of the artificial nucleic acid according to the invention. Preferably, the inventive artificial nucleic acid is provided in an amount of at least 10 µg per dose, 40 µg per dose, preferably in an amount of from 40 to 700 µg per dose, more preferably in an amount of from 80 to 400 µg per dose. More specifically, in the case of intradermal injection, which is preferably carried out by using a conventional needle, the amount of the inventive artificial nucleic acid comprised in a single dose is typically at least 200 µg, preferably from 200 µg to 1.000 µg, more preferably from 300 µg to 850 µg, even more preferably from 300 µg to 700 µg. In the case of intradermal injection, which is preferably carried out via jet injection (e.g. using a Tropis device), the amount of the inventive artificial nucleic acid comprised in a single dose is typically at least 80 µg, preferably from 80 µg to 700 µg, more preferably from 80 µg to 400 µg. Moreover, in the case of intramuscular injection, which is preferably carried out by using a conventional needle or via jet injection, the amount of the inventive artificial nucleic acid comprised in a single dose is typically at least 80 µg, preferably from 80 µg to 1000 µg, more preferably from 80 µg to 850 µg, even more preferably from 80 µg to 700 µg.

Depending on the used formulation, the used route of application, and depending on the subject (human, animal), the dose of the inventive artificial nucleic acid may range from about 1 µg to about 1000 µg, preferably from about 10 µg to about 500 µg.

The immunization protocol for the treatment or prophylaxis of a Norovirus infection, i.e the immunization of a subject against Norovirus, typically comprises a series of single doses or dosages of the inventive composition or the inventive vaccine. A single dosage, as used herin, refers to the initial/first dose, a second dose or any futher doses, respectively, which are preferably administered in order to "boost" the immune reaction.

According to a preferred embodiment, the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide, the inventive vaccine or the inventive kit or kit of parts is provided for use in treatment or prophylaxis, preferably treatment or prophylaxis of a Norovirus infection or a related disorder or disease, wherein the treatment or prophylaxis comprises the administration of a further active pharmaceutical ingredient. More preferably, in the case of the inventive vaccine or composition, which is based on the inventive artificial nucleic acid, a polypeptide may be co-administered as a further active pharmaceutical ingredient. For example, at least one Norovirus protein as described herein, or a fragment or variant thereof, may be co-administered in order to induce or enhance an immune response. Likewise, in the case of the inventive vaccine or composition, which is based on the inventive polypeptide as described herein, an artificial

nucleic acid as described herein may be co-administered as a further active pharmaceutical ingredient. For example, an artificial nucleic acid as described herein encoding at least one polypeptide as described herein may be co-administered in order to induce or enhance an immune response.

A further component of the inventive vaccine or composition may be an immunotherapeutic agent that can be selected from immunoglobulins, preferably IgGs, monoclonal or polyclonal antibodies, polyclonal serum or sera, etc, most preferably immunoglobulins directed against a Norovirus. Preferably, such a further immunotherapeutic agent may be provided as a peptide/protein or may be encoded by a nucleic acid, preferably by a DNA or an RNA, more preferably an mRNA. Such an immunotherapeutic agent allows providing passive vaccination additional to active vaccination triggered by the inventive artificial nucleic acid or by the inventive polypeptide.

In a further aspect the invention provides a method of treating or preventing a disorder, wherein the disorder is preferably an infection with Norovirus or a disorder related to an infection with Norovirus, wherein the method comprises administering to a subject in need thereof the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide, the inventive vaccine or the inventive kit or kit of parts.

In particular, such a method may preferably comprise the steps of:

a) providing the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide, the inventive vaccine or the inventive kit or kit of parts;
b) applying or administering the artificial nucleic acid according to the invention, the inventive composition comprising at least one artificial nucleic acid according to the invention, the inventive polypeptides as described herein, the inventive composition comprising at least one inventive polypeptide, the inventive vaccine or the inventive kit or kit of parts to a tissue or an organism;
c) optionally administering immune globuline against Norovirus.

According to a further aspect, the present invention also provides a method for expression of at least one polypeptide comprising at least one Norovirus, or a fragment or variant thereof, wherein the method preferably comprises the following steps:

a) providing the inventive artificial nucleic acid comprising at least one coding region encoding at least one polypeptide comprising at least one Norovirus, or a fragment or variant thereof, preferably as defined herein, or a composition comprising said artificial nucleic acid; and
b) applying or administering the inventive artificial nucleic acid or the inventive composition comprising said artificial nucleic acid to an expression system, e.g. to a cell-free expression system, a cell (e.g. an expression host cell or a somatic cell), a tissue or an organism.

The method may be applied for laboratory, for research, for diagnostic, for commercial production of peptides or proteins and/or for therapeutic purposes. In this context, typically after preparing the inventive artificial nucleic acid as defined herein or of the inventive composition or vaccine as defined herein, it is typically applied or administered to a cell-free expression system, a cell (e.g. an expression host cell or a somatic cell), a tissue or an organism, e.g. in naked or complexed form or as a (pharmaceutical) composition or vaccine as described herein, preferably via transfection or by using any of the administration modes as described herein. The method may be carried out in vitro, in vivo or ex vivo. The method may furthermore be carried out in the context of the treatment of a specific disease, particularly in the treatment of infectious diseases, preferably Norovirus infection or a related disorder as defined herein.

In this context, in vitro is defined herein as transfection or transduction of the inventive artificial nucleic acid as defined herein or of the inventive composition or vaccine as defined herein into cells in culture outside of an organism; in vivo is defined herein as transfection or transduction of the inventive artificial nucleic acid or of the inventive composition or vaccine into cells by application of the inventive mRNA or of the inventive composition to the whole organism or individual and ex vivo is defined herein as transfection or transduction of the inventive artificial nucleic acid or of the inventive composition or vaccine into cells outside of an organism or individual and subsequent application of the transfected cells to the organism or individual.

Likewise, according to another aspect, the present invention also provides the use of the inventive artificial nucleic acid as defined herein or of the inventive composition or vaccine as defined herein, preferably for diagnostic or therapeutic purposes, for expression of an encoded antigenic peptide or protein, e.g. by applying or administering the inventive artificial nucleic acid as defined herein or of the inventive composition or vaccine as defined herein, e.g. to a cell-free expression system, a cell (e.g. an expression host cell or a somatic cell), a tissue or an organism. The use may be applied for a (diagnostic) laboratory, for research, for diagnostics, for commercial production of peptides or proteins and/or for therapeutic purposes. In this context, typically after preparing the inventive artificial nucleic acid as defined herein or of the inventive composition or vaccine as defined herein, it is typically applied or administered to a cell-free expression system, a cell (e.g. an expression host cell or a somatic cell), a tissue or an organism, preferably in naked form or complexed form, or as a (pharmaceutical) composition or vaccine as described herein, preferably via transfection or by using any of the administration modes as described herein. The use may be carried out in vitro, in vivo or ex vivo. The use may furthermore be carried out in the context of the treatment of a specific disease, particularly in the treatment of Norovirus infection or a related disorder.

In a particularly preferred embodiment, the invention provides the artificial nucleic acid, the inventive composition or the inventive vaccine for use as defined herein, preferably for use as a medicament, for use in treatment or prophylaxis, preferably treatment or prophylaxis of a Norovirus infection or a related disorder, or for use as a vaccine. The vaccine or composition according to the invention can be used according to the invention for human and also for veterinary medical purposes (mammals, vertebrates), as a pharmaceutical composition or as a vaccine.

Adjuvants:

According to another embodiment, the (pharmaceutical) composition or vaccine according to the invention may comprise an adjuvant, which is preferably added in order to enhance the immunostimulatory properties of the composition. In this context, an adjuvant may be understood as any compound, which is suitable to support administration and delivery of the composition according to the invention. Furthermore, such an adjuvant may, without being bound thereto, initiate or increase an immune response of the innate immune system, i.e. a non-specific immune response. In other words, when administered, the composition according to the invention typically initiates an adaptive immune response due to an antigen as defined herein or a fragment or variant thereof, which is encoded by the at least one coding sequence of the inventive mRNA contained in the composition of the present invention. Additionally, the composition according to the invention may generate an (supportive) innate immune response due to addition of an adjuvant as defined herein to the composition according to the invention.

Particularly preferred, an adjuvant may be selected from adjuvants, which support induction of a Th1-immune response or maturation of naïve T-cells, such as GM-CSF, IL-12, IFNO, any immunostimulatory nucleic acid as defined above, preferably an immunostimulatory RNA, CpG DNA, etc.

In a further preferred embodiment it is also possible that the inventive composition contains besides the antigen-providing mRNA further components which are selected from the group comprising: further antigens (e.g. in the form of a peptide or protein) or further antigen-encoding nucleic acids; a further immunotherapeutic agent; one or more auxiliary substances; or any further compound, which is known to be immunostimulating due to its binding affinity (as ligands) to human Toll-like receptors; and/or an adjuvant nucleic acid, preferably an immunostimulatory RNA (isRNA).

The composition of the present invention can additionally contain one or more auxiliary substances in order to increase its immunogenicity or immunostimulatory capacity, if desired. A synergistic action of the mRNA as defined herein and of an auxiliary substance, which may be optionally contained in the inventive composition, is preferably achieved thereby. Depending on the various types of auxiliary substances, various mechanisms can come into consideration in this respect. For example, compounds that permit the maturation of dendritic cells (DCs), for example lipopolysaccharides, TNF-alpha or CD40 ligand, form a first class of suitable auxiliary substances. In general, it is possible to use as auxiliary substance any agent that influences the immune system in the manner of a "danger signal" (LPS, GP96, etc.) or cytokines, such as GM-CFS, which allow an immune response to be enhanced and/or influenced in a targeted manner. Particularly preferred auxiliary substances are cytokines, such as monokines, lymphokines, interleukins or chemokines, that further promote the innate immune response, such as IL-1, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-12, IL-13, IL-14, IL-15, IL-16, IL-17, IL-18, IL-19, IL-20, IL-21, IL-22, IL-23, IL-24, IL-25, IL-26, IL-27, IL-28, IL-29, IL-30, IL-31, IL-32, IL-33, IFN-alpha, IFN-beta, IFN-gamma, GM-CSF, G-CSF, M-CSF, LT-beta or TNF-alpha, growth factors, such as hGH.

Suitable adjuvants may also be selected from cationic or polycationic compounds wherein the adjuvant is preferably prepared upon complexing the mRNA of the composition according to the invention with the cationic or polycationic compound. Associating

or complexing the mRNA of the composition with cationic or polycationic compounds as defined herein preferably provides adjuvant properties and confers a stabilizing effect to the mRNA of the composition. In particular, such preferred cationic or polycationic compounds are selected from cationic or polycationic peptides or proteins, including protamine, nucleoline, spermin or spermidine, or other cationic peptides or proteins, such as poly-L-lysine (PLL), poly-arginine, basic polypeptides, cell penetrating peptides (CPPs), including HIV-binding peptides, Tat, HIV-1 Tat (HIV), Tat-derived peptides, Penetratin, VP22 derived or analog peptides, HSV VP22 (Herpes simplex), MAP, KALA or protein transduction domains (PTDs, PpT620, prolin-rich peptides, arginine-rich peptides, lysine-rich peptides, MPG-peptide(s), Pep-1, L-oligomers, Calcitonin peptide(s), Antennapedia-derived peptides (particularly from Drosophila antennapedia), pAntp, pIsl, FGF, Lactoferrin, Transportan, Buforin-2, Bac715-24, SynB, SynB(1), pVEC, hCT-derived peptides, SAP, protamine, spermine, spermidine, or histones. Further preferred cationic or polycationic compounds may include cationic polysaccharides, for example chitosan, polybrene, cationic polymers, e.g. polyethyleneimine (PEI), cationic lipids, e.g. DOTMA: [1-(2,3-sioleyloxy)propyl)]-N,N,N-trimethylammonium chloride, DMRIE, di-C14-amidine, DOTIM, SAINT, DC-Chol, BGTC, CTAP, DOPC, DODAP, DOPE: Dioleyl phosphatidylethanol-amine, DOSPA, DODAB, DOIC, DMEPC, DOGS: Dioctadecylamidoglicylspermin, DIMRI: Dimyristo-oxypropyl dimethyl hydroxyethyl ammonium bromide, DOTAP: dioleoyloxy-3-(trimethylammonio)propane, DC-6-14: O,O-ditetradecanoyl-N-(α-trimethylammonioacetyl)diethanolamine chloride, CLIP1: rac-[(2,3-dioctadecyloxypropyl)(2-hydroxyethyl)]-dimethylammonium chloride, CLIP6: rac-[2(2,3-dihexadecyloxypropyl-oxymethyloxy)ethyl]-trimethylammonium, CLIP9: rac-[2(2,3-dihexadecyloxypropyl-oxysuccinyloxy)ethyl]-trimethylammonium, oligofectamine, or cationic or polycationic polymers, e.g. modified polyaminoacids, such as β-aminoacid-polymers or reversed polyamides, etc., modified polyethylenes, such as PVP (poly(N-ethyl-4-vinylpyridinium bromide)), etc., modified acrylates, such as pDMAEMA (poly(dimethylaminoethyl methylacrylate)), etc., modified Amidoamines such as pAMAM (poly(amidoamine)), etc., modified polybetaaminoester (PBAE), such as diamine end modified 1,4 butanediol diacrylate-co-5-amino-1-pentanol polymers, etc., dendrimers, such as polypropylamine dendrimers or pAMAM based dendrimers, etc., polyimine(s), such as PEI: poly(ethyleneimine), poly(propyleneimine), etc., polyallylamine, sugar backbone based polymers, such as cyclodextrin based polymers, dextran based polymers, Chitosan, etc., silan backbone based polymers, such as PMOXA-PDMS copolymers, etc., blockpolymers consisting of a combination of one or more cationic blocks (e.g. selected of a cationic polymer as mentioned above) and of one or more hydrophilic- or hydrophobic blocks (e.g polyethyleneglycole); etc.

Additionally, preferred cationic or polycationic proteins or peptides, which can be used as an adjuvant by complexing the mRNA of the composition according to the invention, may be selected from following proteins or peptides having the following total formula (III): (Arg)l;(Lys)m;(His)n;(Orn)o;(Xaa)x, wherein l + m + n +o + x = 8-15, and l, m, n or o independently of each other may be any number selected from 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 or 15, provided that the overall content of Arg, Lys, His and Orn represents at least 50% of all amino acids of the oligopeptide; and Xaa may be any amino acid selected from native (= naturally occurring) or non-native amino acids except of Arg, Lys, His or Orn; and x may be any number selected from 0, 1, 2, 3 or 4, provided, that the overall content of Xaa does not exceed 50% of all amino acids of the oligopeptide. Particularly preferred oligoarginines in this context are e.g. Arg7, Arg8, Arg9, Arg7, H3R9, R9H3, H3R9H3, YSSR9SSY, (RKH)4, Y(RKH)2R, etc.

The ratio of the mRNA to the cationic or polycationic compound in the adjuvant component may be calculated on the basis of the nitrogen/phosphate ratio (N/P-ratio) of the entire mRNA complex, i.e. the ratio of positively charged (nitrogen) atoms of the cationic or polycationic compound to the negatively charged phosphate atoms of the nucleic acids. For example, 1 µg of RNA typically contains about 3 nmol phosphate residues, provided the RNA exhibits a statistical distribution of bases. Additionally, 1 µg of peptide typically contains about x nmol nitrogen residues, dependent on the molecular weight and the number of basic amino acids. When exemplarily calculated for (Arg)9 (molecular weight 1424 g/mol, 9 nitrogen atoms), 1 µg (Arg)9 contains about 700 pmol (Arg)9 and thus 700 x 9=6300 pmol basic amino acids = 6.3 nmol nitrogen atoms. For a mass ratio of about 1:1 RNA/(Arg)9 an N/P ratio of about 2 can be calculated. When exemplarily calculated for protamine (molecular weight about 4250 g/mol, 21 nitrogen atoms, when protamine from salmon is used) with a mass ratio of about 2:1 with 2 µg RNA, 6 nmol phosphate are to be calulated for the RNA; 1 µg protamine contains about 235 pmol protamine molecues and thus 235 x 21 = 4935 pmol basic nitrogen atoms = 4.9 nmol nitrogen atoms. For a mass ratio of about 2:1 RNA/protamine an N/P ratio of about 0.81 can be calculated. For a mass ratio of about 8:1 RNA/protamine an N/P ratio of about 0.2 can be calculated. In the context of the present invention, an N/P-ratio is preferably in the range of about 0.1-10, preferably in a range of about 0.3-4 and most preferably in a range of about 0.5-2 or 0.7-2 regarding the ratio of RNA : peptide in the complex, and most preferably in the range of about 0.7-1.5.

In a preferred embodiment, the composition of the present invention is obtained in two separate steps in order to obtain both, an efficient immunostimulatory effect and efficient translation of the mRNA according to the invention. Therein, a so called "adjuvant component" is prepared by complexing – in a first step – an mRNA as defined herein of the adjuvant component with a cationic or polycationic compound in a specific ratio to form a stable complex. In this context, it is important, that no free cationic or polycationic compound or only a negligibly small amount remains in the adjuvant component after complexing the mRNA. Accordingly, the ratio of the mRNA and the cationic or polycationic compound in the adjuvant component is typically selected in a range that the mRNA is entirely complexed and no free cationic or polycationic compound or only a negligible small amount remains in the composition. Preferably the ratio of the adjuvant component, i.e. the ratio of the mRNA to the cationic or polycationic compound is selected from a range of about 6:1 (w/w) to about 0.25:1 (w/w), more preferably from about 5:1 (w/w) to about 0.5:1 (w/w), even more preferably of about 4:1 (w/w) to about 1:1 (w/w) or of about 3:1 (w/w) to about 1:1 (w/w), and most preferably a ratio of about 3:1 (w/w) to about 2:1 (w/w).

According to a preferred embodiment, the mRNA of the invention comprising at least one mRNA sequence comprising at least one coding region as defined herein is added in a second step to the complexed mRNA of the adjuvant component in order to form the (immunostimulatory) composition of the invention. Therein, the mRNA of the composition according to the invention is added as free mRNA, which is not complexed by other compounds. Prior to addition, the free mRNA is not complexed and will preferably not undergo any detectable or significant complexation reaction upon the addition of the adjuvant component. This is due to the strong binding of the cationic or polycationic compound to the above described mRNA according to the invention comprised in the adjuvant component. In other words, when the mRNA comprising at least one coding region as defined herein is added to the "adjuvant component", preferably no free or substantially no free cationic or polycationic compound is present, which could form

a complex with the free mRNA. Accordingly, an efficient translation of the mRNA of the composition is possible in vivo. Therein, the free mRNA, may occur as a mono-, di-, or multicistronic mRNA, i.e. an mRNA which carries the coding sequences of one or more proteins. Such coding sequences in di-, or even multicistronic mRNA may be separated by at least one IRES sequence, e.g. as defined herein.

In a particularly preferred embodiment, the free mRNA as defined herein, which is comprised in the composition of the present invention, may be identical or different to the RNA as defined herein, which is comprised in the adjuvant component of the composition, depending on the specific requirements of therapy. Even more preferably, the free RNA, which is comprised in the composition according to the invention, is identical to the RNA of the adjuvant component of the inventive composition.

In a particularly preferred embodiment, the composition according to the invention comprises the mRNA of the invention, which encodes at least one antigenic peptide or protein as defined herein and wherein said mRNA is present in the composition partially as free mRNA and partially as complexed mRNA. Preferably, the mRNA as defined herein is complexed as described above and the same mRNA is then added as free mRNA, wherein preferably the compound, which is used for complexing the mRNA is not present in free form in the composition at the moment of addition of the free mRNA component.

The ratio of the first component (i.e. the adjuvant component comprising or consisting of the mRNA as defined herein complexed with a cationic or polycationic compound) and the second component (i.e. the free mRNA as defined herein) may be selected in the inventive composition according to the specific requirements of a particular therapy. Typically, the ratio of the mRNA in the adjuvant component and the at least one free mRNA (mRNA in the adjuvant component : free mRNA) of the composition according to the invention is selected such that a significant stimulation of the innate immune system is elicited due to the adjuvant component. In parallel, the ratio is selected such that a significant amount of the free mRNA can be provided in vivo leading to an efficient translation and concentration of the expressed protein in vivo, e.g. the at least one antigenic peptide or protein as defined herein. Preferably the ratio of the mRNA in the adjuvant component : free mRNA in the inventive composition is selected from a range of about 5:1 (w/w) to about 1:10 (w/w), more preferably from a range of about 4:1 (w/w) to about 1:8 (w/w), even more preferably from a range of about 3:1 (w/w) to about 1:5 (w/w) or 1:3 (w/w), and most preferably the ratio of mRNA in the adjuvant component : free mRNA in the inventive composition is selected from a ratio of about 1:1 (w/w).

Additionally or alternatively, the ratio of the first component (i.e. the adjuvant component comprising or consisting of the mRNA complexed with a cationic or polycationic compound) and the second component (i.e. the free mRNA) may be calculated on the basis of the nitrogen/phosphate ratio (N/P-ratio) of the entire mRNA complex. In the context of the present invention, an N/P-ratio is preferably in the range of about 0.1-10, preferably in a range of about 0.3-4 and most preferably in a range of about 0.5-2 or 0.7-2 regarding the ratio of mRNA : peptide in the complex, and most preferably in the range of about 0.7-1.5.

Additionally or alternatively, the ratio of the first component (i.e. the adjuvant component comprising or consisting of the mRNA complexed with a cationic or polycationic compound) and the second component (i.e. the free mRNA) may also be selected in the

composition according to the invention on the basis of the molar ratio of both mRNAs to each other, i.e. the mRNA of the adjuvant component, being complexed with a cationic or polycationic compound and the free mRNA of the second component. Typically, the molar ratio of the mRNA of the adjuvant component to the free mRNA of the second component may be selected such, that the molar ratio suffices the above (w/w) and/or N/P-definitions. More preferably, the molar ratio of the mRNA of the adjuvant component to the free mRNA of the second component may be selected e.g. from a molar ratio of about 0.001:1, 0.01:1, 0.1:1, 0.2:1, 0.3:1, 0.4:1, 0.5:1, 0.6:1, 0.7:1, 0.8:1, 0.9:1, 1:1, 1:0.9, 1:0.8, 1:0.7, 1:0.6, 1:0.5, 1:0.4, 1:0.3, 1:0.2, 1:0.1, 1:0.01, 1:0.001, etc. or from any range formed by any two of the above values, e.g. a range selected from about 0.001:1 to 1:0.001, including a range of about 0.01:1 to 1:0.001, 0.1:1 to 1:0.001, 0.2:1 to 1:0.001, 0.3:1 to 1:0.001, 0.4:1 to 1:0.001, 0.5:1 to 1:0.001, 0.6:1 to 1:0.001, 0.7:1 to 1:0.001, 0.8:1 to 1:0.001, 0.9:1 to 1:0.001, 1:1 to 1:0.001, 1:0.9 to 1:0.001, 1:0.8 to 1:0.001, 1:0.7 to 1:0.001, 1:0.6 to 1:0.001, 1:0.5 to 1:0.001, 1:0.4 to 1:0.001, 1:0.3 to 1:0.001, 1:0.2 to 1:0.001, 1:0.1 to 1:0.001, 1:0.01 to 1:0.001, or a range of about 0.01:1 to 1:0.01, 0.1:1 to 1:0.01, 0.2:1 to 1:0.01, 0.3:1 to 1:0.01, 0.4:1 to 1:0.01, 0.5:1 to 1:0.01, 0.6:1 to 1:0.01, 0.7:1 to 1:0.01, 0.8:1 to 1:0.01, 0.9:1 to 1:0.01, 1:1 to 1:0.01, 1:0.9 to 1:0.01, 1:0.8 to 1:0.01, 1:0.7 to 1:0.01, 1:0.6 to 1:0.01, 1:0.5 to 1:0.01, 1:0.4 to 1:0.01, 1:0.3 to 1:0.01, 1:0.2 to 1:0.01, 1:0.1 to 1:0.01, 1:0.01 to 1:0.01, or including a range of about 0.001:1 to 1:0.01, 0.001:1 to 1:0.1, 0.001:1 to 1:0.2, 0.001:1 to 1:0.3, 0.001:1 to 1:0.4, 0.001:1 to 1:0.5, 0.001:1 to 1:0.6, 0.001:1 to 1:0.7, 0.001:1 to 1:0.8, 0.001:1 to 1:0.9, 0.001:1 to 1:1, 0.001 to 0.9:1, 0.001 to 0.8:1, 0.001 to 0.7:1, 0.001 to 0.6:1, 0.001 to 0.5:1, 0.001 to 0.4:1, 0.001 to 0.3:1, 0.001 to 0.2:1, 0.001 to 0.1:1, or a range of about 0.01:1 to 1:0.01, 0.01:1 to 1:0.1, 0.01:1 to 1:0.2, 0.01:1 to 1:0.3, 0.01:1 to 1:0.4, 0.01:1 to 1:0.5, 0.01:1 to 1:0.6, 0.01:1 to 1:0.7, 0.01:1 to 1:0.8, 0.01:1 to 1:0.9, 0.01:1 to 1:1, 0.001 to 0.9:1, 0.001 to 0.8:1, 0.001 to 0.7:1, 0.001 to 0.6:1, 0.001 to 0.5:1, 0.001 to 0.4:1, 0.001 to 0.3:1, 0.001 to 0.2:1, 0.001 to 0.1:1, etc.

Even more preferably, the molar ratio of the mRNA of the adjuvant component to the free mRNA of the second component may be selected e.g. from a range of about 0.01:1 to 1:0.01. Most preferably, the molar ratio of the mRNA of the adjuvant component to the free mRNA of the second component may be selected e.g. from a molar ratio of about 1:1. Any of the above definitions with regard to (w/w) and/or N/P ratio may also apply.

Suitable adjuvants may furthermore be selected from nucleic acids having the formula (Va): GlXmGn, wherein: G is guanosine, uracil or an analogue of guanosine or uracil; X is guanosine, uracil, adenosine, thymidine, cytosine or an analogue of the above-mentioned nucleotides; l is an integer from 1 to 40, wherein when l = 1 G is guanosine or an analogue thereof, when l > 1 at least 50% of the nucleotides are guanosine or an analogue thereof; m is an integer and is at least 3; wherein when m = 3 X is uracil or an analogue thereof, when m > 3 at least 3 successive uracils or analogues of uracil occur; n is an integer from 1 to 40, wherein when n = 1 G is guanosine or an analogue thereof, when n > 1 at least 50% of the nucleotides are guanosine or an analogue thereof, or formula (Vb): (NuGlXmGnNv)a, wherein: G is guanosine (guanine), uridine (uracil) or an analogue of guanosine (guanine) or uridine (uracil), preferably guanosine (guanine) or an analogue thereof; X is guanosine (guanine), uridine (uracil), adenosine (adenine), thymidine (thymine), cytidine (cytosine), or an analogue of these nucleotides (nucleosides), preferably uridine (uracil) or an analogue thereof; N is a nucleic acid sequence having a length of about 4 to 50, preferably of about 4 to 40, more preferably of about 4 to 30 or 4 to 20 nucleic acids, each N independently being selected from guanosine (guanine), uridine (uracil), adenosine (adenine), thymidine (thymine), cytidine (cytosine) or an analogue of these nucleotides (nucleosides); a is an integer from 1 to 20, preferably from 1 to 15, most preferably from 1 to 10; l is an integer from 1 to 40, wherein when l = 1, G is guanosine

(guanine) or an analogue thereof, when l > 1, at least 50% of these nucleotides (nucleosides) are guanosine (guanine) or an analogue thereof; m is an integer and is at least 3; wherein when m = 3, X is uridine (uracil) or an analogue thereof, and when m > 3, at least 3 successive uridines (uracils) or analogues of uridine (uracil) occur; n is an integer from 1 to 40, wherein when n = 1, G is guanosine (guanine) or an analogue thereof, when n > 1, at least 50% of these nucleotides (nucleosides) are guanosine (guanine) or an analogue thereof; u,v may be independently from each other an integer from 0 to 50, preferably wherein when u = 0, v ≥ 1, or when v = 0, u ≥ 1; wherein the nucleic acid molecule of formula (Vb) has a length of at least 50 nucleotides, preferably of at least 100 nucleotides, more preferably of at least 150 nucleotides, even more preferably of at least 200 nucleotides and most preferably of at least 250 nucleotides.

Other suitable adjuvants may furthermore be selected from nucleic acids having the formula (VI): ClXmCn, wherein: C is cytosine, uracil or an analogue of cytosine or uracil; X is guanosine, uracil, adenosine, thymidine, cytosine or an analogue of the above-mentioned nucleotides; l is an integer from 1 to 40, wherein when l = 1 C is cytosine or an analogue thereof, when l > 1 at least 50% of the nucleotides are cytosine or an analogue thereof; m is an integer and is at least 3; wherein when m = 3 X is uracil or an analogue thereof, when m > 3 at least 3 successive uracils or analogues of uracil occur; n is an integer from 1 to 40, wherein when n = 1 C is cytosine or an analogue thereof, when n > 1 at least 50% of the nucleotides are cytosine or an analogue thereof.

In this context the disclosure of WO 2008/014979 and WO 2009/095226 is also incorporated herein by reference.

In a further aspect, the present invention provides a vaccine, which is based on the mRNA sequence according to the invention comprising at least one coding region as defined herein. The vaccine according to the invention is preferably a (pharmaceutical) composition as defined herein.

Accordingly, the vaccine according to the invention is based on the same components as the (pharmaceutical) composition described herein. Insofar, it may be referred to the description of the (pharmaceutical) composition as provided herein. Preferably, the vaccine according to the invention comprises at least one mRNA comprising at least one mRNA sequence as defined herein and a pharmaceutically acceptable carrier. In embodiments, where the vaccine comprises more than one mRNA sequence (such as a plurality of RNA sequences according to the invention, wherein each preferably encodes a distinct antigenic peptide or protein), the vaccine may be provided in physically separate form and may be administered by separate administration steps. The vaccine according to the invention may correspond to the (pharmaceutical) composition as described herein, especially where the mRNA sequences are provided by one single composition. However, the inventive vaccine may also be provided physically separated. For instance, in embodiments, wherein the vaccine comprises more than one mRNA sequences/species, these RNA species may be provided such that, for example, two, three, four, five or six separate compositions, which may contain at least one mRNA species/sequence each (e.g. three distinct mRNA species/sequences), each encoding distinct antigenic peptides or proteins, are provided, which may or may not be combined. Also, the inventive vaccine may be a combination of at least two distinct compositions, each composition comprising at least one mRNA encoding at least one of the antigenic peptides or proteins defined herein. Alternatively, the vaccine may be provided as a combination of at least

one mRNA, preferably at least two, three, four, five, six or more mRNAs, each encoding one of the antigenic peptides or proteins defined herein. The vaccine may be combined to provide one single composition prior to its use or it may be used such that more than one administration is required to administer the distinct mRNA sequences/species encoding any of the antigenic peptides or proteins as defined herein. If the vaccine contains at least one mRNA sequence, typically at least two mRNA sequences, encoding the antigen combinations defined herein, it may e.g. be administered by one single administration (combining all mRNA species/sequences), by at least two separate administrations. Accordingly; any combination of mono-, bi- or multicistronic mRNAs encoding the at least one antigenic peptide or protein or any combination of antigens as defined herein (and optionally further antigens), provided as separate entities (containing one mRNA species) or as combined entity (containing more than one mRNA species), is understood as a vaccine according to the present invention. According to a particularly preferred embodiment of the inventive vaccine, the at least one antigen, preferably a combination as defined herein of at least two, three, four, five, six or more antigens encoded by the inventive composition as a whole, is provided as an individual (monocistronic) mRNA, which is administered separately.

As with the (pharmaceutical) composition according to the present invention, the entities of the vaccine may be provided in liquid and or in dry (e.g. lyophilized) form. They may contain further components, in particular further components allowing for its pharmaceutical use. The vaccine or the (pharmaceutical) composition may, e.g., additionally contain a pharmaceutically acceptable carrier and/or further auxiliary substances and additives and/or adjuvants.

The vaccine or (pharmaceutical) composition typically comprises a safe and effective amount of the mRNA according to the invention as defined herein, encoding an antigenic peptide or protein as defined herein or a fragment or variant thereof or a combination of antigens, preferably as defined herein. As used herein, "safe and effective amount" means an amount of the mRNA that is sufficient to significantly induce a positive modification of cancer or a disease or disorder related to cancer. At the same time, however, a "safe and effective amount" is small enough to avoid serious side-effects, that is to say to permit a sensible relationship between advantage and risk. The determination of these limits typically lies within the scope of sensible medical judgment. In relation to the vaccine or (pharmaceutical) composition of the present invention, the expression "safe and effective amount" preferably means an amount of the mRNA (and thus of the encoded antigen) that is suitable for stimulating the adaptive immune system in such a manner that no excessive or damaging immune reactions are achieved but, preferably, also no such immune reactions below a measurable level. Such a "safe and effective amount" of the mRNA of the (pharmaceutical) composition or vaccine as defined herein may furthermore be selected in dependence of the type of mRNA, e.g. monocistronic, bi- or even multicistronic mRNA, since a bi- or even multicistronic mRNA may lead to a significantly higher expression of the encoded antigen(s) than the use of an equal amount of a monocistronic mRNA. A "safe and effective amount" of the mRNA of the (pharmaceutical) composition or vaccine as defined above will furthermore vary in connection with the particular condition to be treated and also with the age and physical condition of the patient to be treated, the severity of the condition, the duration of the treatment, the nature of the accompanying therapy, of the particular pharmaceutically acceptable carrier used, and similar factors, within the knowledge and experience of the accompanying doctor. The vaccine or composition according to the invention

can be used according to the invention for human and also for veterinary medical purposes, as a pharmaceutical composition or as a vaccine.

In a preferred embodiment, the mRNA of the (pharmaceutical) composition, vaccine or kit of parts according to the invention is provided in lyophilized form. Preferably, the lyophilized mRNA is reconstituted in a suitable buffer, advantageously based on an aqueous carrier, prior to administration, e.g. Ringer-Lactate solution, which is preferred, Ringer solution, a phosphate buffer solution. In a preferred embodiment, the (pharmaceutical) composition, the vaccine or the kit of parts according to the invention contains at least one, two, three, four, five, six or more mRNAs, preferably mRNAs which are provided separately in lyophilized form (optionally together with at least one further additive) and which are preferably reconstituted separately in a suitable buffer (such as Ringer-Lactate solution) prior to their use so as to allow individual administration of each of the (monocistronic) mRNAs.

The vaccine or (pharmaceutical) composition according to the invention may typically contain a pharmaceutically acceptable carrier. The expression "pharmaceutically acceptable carrier" as used herein preferably includes the liquid or non-liquid basis of the inventive vaccine. If the inventive vaccine is provided in liquid form, the carrier will be water, typically pyrogen-free water; isotonic saline or buffered (aqueous) solutions, e.g phosphate, citrate etc. buffered solutions. Particularly for injection of the inventive vaccine, water or preferably a buffer, more preferably an aqueous buffer, may be used, containing a sodium salt, preferably at least 50 mM of a sodium salt, a calcium salt, preferably at least 0,01 mM of a calcium salt, and optionally a potassium salt, preferably at least 3 mM of a potassium salt. According to a preferred embodiment, the sodium, calcium and, optionally, potassium salts may occur in the form of their halogenides, e.g. chlorides, iodides, or bromides, in the form of their hydroxides, carbonates, hydrogen carbonates, or sulfates, etc. Without being limited thereto, examples of sodium salts include e.g. NaCl, NaI, NaBr, Na2CO3, NaHCO3, Na2SO4, examples of the optional potassium salts include e.g. KCl, KI, KBr, K2CO3, KHCO3, K2SO4, and examples of calcium salts include e.g. CaCl2, CaI2, CaBr2, CaCO3, CaSO4, Ca(OH)2. Furthermore, organic anions of the aforementioned cations may be contained in the buffer. According to a more preferred embodiment, the buffer suitable for injection purposes as defined above, may contain salts selected from sodium chloride (NaCl), calcium chloride (CaCl2) and optionally potassium chloride (KCl), wherein further anions may be present additional to the chlorides. CaCl2 can also be replaced by another salt like KCl. Typically, the salts in the injection buffer are present in a concentration of at least 50 mM sodium chloride (NaCl), at least 3 mM potassium chloride (KCl) and at least 0,01 mM calcium chloride (CaCl2). The injection buffer may be hypertonic, isotonic or hypotonic with reference to the specific reference medium, i.e. the buffer may have a higher, identical or lower salt content with reference to the specific reference medium, wherein preferably such concentrations of the afore mentioned salts may be used, which do not lead to damage of cells due to osmosis or other concentration effects. Reference media are e.g. in "in vivo" methods occurring liquids such as blood, lymph, cytosolic liquids, or other body liquids, or e.g. liquids, which may be used as reference media in "in vitro" methods, such as common buffers or liquids. Such common buffers or liquids are known to a skilled person. Ringer-Lactate solution is particularly preferred as a liquid basis.

However, one or more compatible solid or liquid fillers or diluents or encapsulating compounds may be used as well, which are suitable for administration to a person. The term "compatible" as used herein means that the constituents of the inventive vaccine are capable of being mixed with the mRNA according to the invention as defined herein, in such a manner that no interaction occurs, which would substantially reduce the pharmaceutical effectiveness of the inventive vaccine under typical use conditions. Pharmaceutically acceptable carriers, fillers and diluents must, of course, have sufficiently high purity and sufficiently low toxicity to make them suitable for administration to a person to be treated. Some examples of compounds which can be used as pharmaceutically acceptable carriers, fillers or constituents thereof are sugars, such as, for example, lactose, glucose, trehalose and sucrose; starches, such as, for example, corn starch or potato starch; dextrose; cellulose and its derivatives, such as, for example, sodium carboxymethylcellulose, ethylcellulose, cellulose acetate; powdered tragacanth; malt; gelatin; tallow; solid glidants, such as, for example, stearic acid, magnesium stearate; calcium sulfate; vegetable oils, such as, for example, groundnut oil, cottonseed oil, sesame oil, olive oil, corn oil and oil from theobroma; polyols, such as, for example, polypropylene glycol, glycerol, sorbitol, mannitol and polyethylene glycol; alginic acid.

The choice of a pharmaceutically acceptable carrier is determined, in principle, by the manner, in which the pharmaceutical composition or vaccine according to the invention is administered. The composition or vaccine can be administered, for example, systemically or locally. Routes for systemic administration in general include, for example, transdermal, oral, parenteral routes, including subcutaneous, intravenous, intramuscular, intraarterial, intradermal and intraperitoneal injections and/or intranasal administration routes. Routes for local administration in general include, for example, topical administration routes but also intradermal, transdermal, subcutaneous, or intramuscular injections or intralesional, intracranial, intrapulmonal, intracardial, and sublingual injections. More preferably, composition or vaccines according to the present invention may be administered by an intradermal, subcutaneous, or intramuscular route, preferably by injection, which may be needle-free and/or needle injection. Compositions/vaccines are therefore preferably formulated in liquid or solid form. The suitable amount of the vaccine or composition according to the invention to be administered can be determined by routine experiments, e.g. by using animal models. Such models include, without implying any limitation, rabbit, sheep, mouse, rat, dog and non-human primate models. Preferred unit dose forms for injection include sterile solutions of water, physiological saline or mixtures thereof. The pH of such solutions should be adjusted to about 7.4. Suitable carriers for injection include hydrogels, devices for controlled or delayed release, polylactic acid and collagen matrices. Suitable pharmaceutically acceptable carriers for topical application include those which are suitable for use in lotions, creams, gels and the like. If the inventive composition or vaccine is to be administered perorally, tablets, capsules and the like are the preferred unit dose form. The pharmaceutically acceptable carriers for the preparation of unit dose forms which can be used for oral administration are well known in the prior art. The choice thereof will depend on secondary considerations such as taste, costs and storability, which are not critical for the purposes of the present invention, and can be made without difficulty by a person skilled in the art.

The inventive vaccine or composition can additionally contain one or more auxiliary substances in order to further increase the immunogenicity. A synergistic action of the mRNA contained in the inventive composition and of an auxiliary substance, which may be optionally be co-formulated (or separately formulated) with the inventive vaccine or composition as described above, is

preferably achieved thereby. Depending on the various types of auxiliary substances, various mechanisms may play a role in this respect. For example, compounds that permit the maturation of dendritic cells (DCs), for example lipopolysaccharides, TNF-alpha or CD40 ligand, form a first class of suitable auxiliary substances. In general, it is possible to use as auxiliary substance any agent that influences the immune system in the manner of a "danger signal" (LPS, GP96, etc.) or cytokines, such as GM-CFS, which allow an immune response produced by the immune-stimulating adjuvant according to the invention to be enhanced and/or influenced in a targeted manner. Particularly preferred auxiliary substances are cytokines, such as monokines, lymphokines, interleukins or chemokines, that – additional to induction of the adaptive immune response by the encoded at least one antigen – promote the innate immune response, such as IL-1, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-12, IL-13, IL-14, IL-15, IL-16, IL-17, IL-18, IL-19, IL-20, IL-21, IL-22, IL-23, IL-24, IL-25, IL-26, IL-27, IL-28, IL-29, IL-30, IL-31, IL-32, IL-33, INF-alpha, IFN-beta, INF-gamma, GM-CSF, G-CSF, M-CSF, LT-beta or TNF-alpha, growth factors, such as hGH. Preferably, such immunogenicity increasing agents or compounds are provided separately (not co-formulated with the inventive vaccine or composition) and administered individually.

Further additives which may be included in the inventive vaccine or composition are emulsifiers, such as, for example, Tween; wetting agents, such as, for example, sodium lauryl sulfate; colouring agents; taste-imparting agents, pharmaceutical carriers; tablet-forming agents; stabilizers; antioxidants; preservatives.

The inventive vaccine or composition can also additionally contain any further compound, which is known to be immune-stimulating due to its binding affinity (as ligands) to human Toll-like receptors TLR1, TLR2, TLR3, TLR4, TLR5, TLR6, TLR7, TLR8, TLR9, TLR10, or due to its binding affinity (as ligands) to murine Toll-like receptors TLR1, TLR2, TLR3, TLR4, TLR5, TLR6, TLR7, TLR8, TLR9, TLR10, TLR11, TLR12 or TLR13.

Another class of compounds, which may be added to an inventive vaccine or composition in this context, may be CpG nucleic acids, in particular CpG-RNA or CpG-DNA. A CpG-RNA or CpG-DNA can be a single-stranded CpG-DNA (ss CpG-DNA), a double-stranded CpG-DNA (dsDNA), a single-stranded CpG-RNA (ss CpG-RNA) or a double-stranded CpG-RNA (ds CpG-RNA). The CpG nucleic acid is preferably in the form of CpG-RNA, more preferably in the form of single-stranded CpG-RNA (ss CpG-RNA). The CpG nucleic acid preferably contains at least one or more (mitogenic) cytosine/guanine dinucleotide sequence(s) (CpG motif(s)). According to a first preferred alternative, at least one CpG motif contained in these sequences, that is to say the C (cytosine) and the G (guanine) of the CpG motif, is unmethylated. All further cytosines or guanines optionally contained in these sequences can be either methylated or unmethylated. According to a further preferred alternative, however, the C (cytosine) and the G (guanine) of the CpG motif can also be present in methylated form.

Application and medical Use:

According to one aspect of the present invention, the mRNA sequence, the (pharmaceutical) composition or the vaccine may be used according to the invention (for the preparation of a medicament) for the treatment or prophylaxis of Norovirus infections or disorders related thereto.

In this context, also included in the present invention are methods of treating or preventing Norovirus infections or disorders related thereto, preferably as defined herein, by administering to a subject in need thereof a pharmaceutically effective amount of the mRNA sequence, the (pharmaceutical) composition or the vaccine according to the invention. Such a method typically comprises an optional first step of preparing the mRNA sequence, the composition or the vaccine of the present invention, and a second step, comprising administering (a pharmaceutically effective amount of) said composition or vaccine to a patient/subject in need thereof. A subject in need thereof will typically be a mammal. In the context of the present invention, the mammal is preferably selected from the group comprising, without being limited thereto, e.g. goat, cattle, swine, dog, cat, donkey, monkey, ape, a rodent such as a mouse, hamster, rabbit and, particularly, human. A subject in need thereof may also be a non-mammalian vertebrate, e.g. a bird (chicken).

The invention also relates to the use of the mRNA sequence, the composition or the vaccine according to the invention, preferably for eliciting an immune response in a mammal, preferably for the treatment or prophylaxis of Norovirus infections or a related condition as defined herein.

The present invention furthermore comprises the use of the mRNA sequence, the (pharmaceutical) composition or the vaccine according to the invention as defined herein for modulating, preferably for inducing or enhancing, an immune response in a mammal as defined herein, more preferably for preventing and/or treating Norovirus infections, or of diseases or disorders related thereto. In this context, support of the treatment or prophylaxis of Norovirus infections may be any combination of a conventional Norovirus therapy method such as therapy with antivirals such as neuraminidase inhibitors (e.g. oseltamivir and zanamivir) and M2 protein inhibitors (e.g. adamantane derivatives), and a therapy using the RNA or the pharmaceutical composition as defined herein. Support of the treatment or prophylaxis of Norovirus infections may be also envisaged in any of the other embodiments defined herein. Accordingly, any use of the mRNA sequence, the (pharmaceutical) composition or the vaccine according to the invention in co-therapy with any other approach, preferably one or more of the above therapeutic approaches, in particular in combination with antivirals is within the scope of the present invention.

For administration, preferably any of the administration routes may be used as defined herein. In particular, an administration route is used, which is suitable for treating or preventing an Norovirus infection as defined herein or diseases or disorders related thereto, by inducing or enhancing an adaptive immune response on the basis of an antigen encoded by the mRNA sequence according to the invention. Administration of the composition and/or the vaccine according to the invention may then occur prior, concurrent and/or subsequent to administering another composition and/or vaccine as defined herein, which may – in addition – contain another mRNA sequence or combination of mRNA sequences encoding a different antigen or combination of antigens, wherein each antigen encoded by the mRNA sequence according to the invention is preferably suitable for the treatment or prophylaxis of Norovirus infections and diseases or disorders related thereto. In this context, a treatment as defined herein may also comprise the modulation of a disease associated to Norovirus infection and of diseases or disorders related thereto.

According to a preferred embodiment of this aspect of the invention, the (pharmaceutical) composition or the vaccine according to the invention is administered by injection. Any suitable injection technique known in the art may be employed. Preferably, the inventive composition is administered by injection, preferably by needle-less injection, for example by jet-injection.

In one embodiment, the inventive composition comprises at least one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve or more mRNAs as defined herein, each of which is preferably injected separately, preferably by needle-less injection. Alternatively, the inventive composition comprises at least one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more mRNAs, wherein the at least one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more mRNAs are administered, preferably by injection as defined herein, as a mixture.

The immunization protocol for the immunization of a subject against an antigen or a combination of at least two, three, four, five, six, seven, eight, nine, ten, eleven, twelve or more antigens as defined herein typically comprises a series of single doses or dosages of the (pharmaceutical) composition or the vaccine according to the invention. A single dosage, as used herein, refers to the initial/first dose, a second dose or any further doses, respectively, which are preferably administered in order to "boost" the immune reaction. In this context, each single dosage preferably comprises the administration of the same antigen or the same combination of antigens as defined herein, wherein the interval between the administration of two single dosages can vary from at least one day, preferably 2, 3, 4, 5, 6 or 7 days, to at least one week, preferably 2, 3, 4, 5, 6, 7 or 8 weeks. The intervals between single dosages may be constant or vary over the course of the immunization protocol, e.g. the intervals may be shorter in the beginning and longer towards the end of the protocol. Depending on the total number of single dosages and the interval between single dosages, the immunization protocol may extend over a period of time, which preferably lasts at least one week, more preferably several weeks (e.g. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 or 12 weeks), even more preferably several months (e.g. 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 18 or 24 months). Each single dosage preferably encompasses the administration of an antigen, preferably of a combination of at least two, three, four, five, six, seven, eight, nine, ten, eleven, twelve or more antigens as defined herein and may therefore involve at least one, preferably 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 or 12 injections. In some cases, the composition or the vaccine according to the invention is administered as a single dosage typically in one injection. In the case, where the vaccine according to the invention comprises separate mRNA formulations encoding distinct antigens as defined herein, the minimum number of injections carried out during the administration of a single dosage corresponds to the number of separate components of the vaccine. In certain embodiments, the administration of a single dosage may encompass more than one injection for each component of the vaccine (e.g. a specific mRNA formulation comprising an mRNA encoding, for instance, one antigenic peptide or protein as defined herein). For example, parts of the total volume of an individual component of the vaccine may be injected into different body parts, thus involving more than one injection. In a more specific example, a single dosage of a vaccine comprising four separate mRNA formulations, each of which is administered in two different body parts, comprises eight injections. Typically, a single dosage comprises all injections required to administer all components of the vaccine, wherein a single component may be involve more than one injection as outlined above. In the case, where the administration of a single

dosage of the vaccine according to the invention encompasses more than one injection, the injection are carried out essentially simultaneously or concurrently, i.e. typically in a time-staggered fashion within the time-frame that is required for the practitioner to carry out the single injection steps, one after the other. The administration of a single dosage therefore preferably extends over a time period of several minutes, e.g. 2, 3, 4, 5, 10, 15, 30 or 60 minutes.

Administration of the mRNA sequence as defined herein, the (pharmaceutical) composition or the vaccine according to the invention may be carried out in a time staggered treatment. A time staggered treatment may be e.g. administration of the mRNA sequence, the composition or the vaccine prior, concurrent and/or subsequent to a conventional therapy of Norovirus infections or diseases or disorders related thereto, e.g. by administration of the mRNA sequence, the composition or the vaccine prior, concurrent and/or subsequent to a therapy or an administration of a therapeutic suitable for the treatment or prophylaxis of Norovirus infections or diseases or disorders related thereto. Such time staggered treatment may be carried out using e.g. a kit, preferably a kit of parts as defined herein.

Time staggered treatment may additionally or alternatively also comprise an administration of the mRNA sequence as defined herein, the (pharmaceutical) composition or the vaccine according to the invention in a form, wherein the mRNA encoding an antigenic peptide or protein as defined herein or a fragment or variant thereof, preferably forming part of the composition or the vaccine, is administered parallel, prior or subsequent to another mRNA sequence encoding an antigenic peptide or protein as defined above, preferably forming part of the same inventive composition or vaccine. Preferably, the administration (of all mRNA sequences) occurs within an hour, more preferably within 30 minutes, even more preferably within 15, 10, 5, 4, 3, or 2 minutes or even within 1 minute. Such time staggered treatment may be carried out using e.g. a kit, preferably a kit of parts as defined herein.

In a preferred embodiment, the pharmaceutical composition or the vaccine of the present invention is administered repeatedly, wherein each administration preferably comprises individual administration of the at least one mRNA of the inventive composition or vaccine. At each time point of administration, the at least one mRNA may be administered more than once (e.g. 2 or 3 times). In a particularly preferred embodiment of the invention, at least two, three, four, five, six or more mRNA sequences (each encoding a distinct one of the antigens as defined herein) are administered at each time point, wherein each mRNA is administered twice by injection, distributed over the four limbs.

Kit or kit of parts:

According to another aspect of the present invention, the present invention also provides a kit, in particular a kit of parts, comprising the mRNA sequence as defined herein, the (pharmaceutical) composition, and/or the vaccine according to the invention, optionally a liquid vehicle for solubilising and optionally technical instructions with information on the administration and dosage of the mRNA sequence, the composition and/or the vaccine. The technical instructions may contain information about administration and dosage of the mRNA sequence, the composition and/or the vaccine. Such kits, preferably kits of parts, may be applied e.g. for any of the above mentioned applications or uses, preferably for the use of the mRNA sequence according to

the invention (for the preparation of an inventive medicament, preferably a vaccine) for the treatment or prophylaxis of Norovirus infections or diseases or disorders related thereto. The kits may also be applied for the use of the mRNA sequence, the composition or the vaccine as defined herein (for the preparation of an inventive vaccine) for the treatment or prophylaxis of Norovirus infections or diseases or disorders related thereto, wherein the mRNA sequence, the composition and/or the vaccine may be capable of inducing or enhancing an immune response in a mammal as defined above. Such kits may further be applied for the use of the mRNA sequence, the composition or the vaccine as defined herein (for the preparation of an inventive vaccine) for modulating, preferably for eliciting, e.g. to induce or enhance, an immune response in a mammal as defined above, and preferably for supporting treatment or prophylaxis of Norovirus infections or diseases or disorders related thereto. Kits of parts, as a special form of kits, may contain one or more identical or different compositions and/or one or more identical or different vaccines as described herein in different parts of the kit. Kits of parts may also contain an (e.g. one) composition, an (e.g. one) vaccine and/or the mRNA sequence according to the invention in different parts of the kit, e.g. each part of the kit containing an mRNA sequence as defined herein, preferably encoding a distinct antigen. Preferably, the kit or the kit of parts contains as a part a vehicle for solubilising the mRNA according to the invention, the vehicle preferably being Ringer-lactate solution. Any of the above kits may be used in a treatment or prophylaxis as defined above.

In another embodiment of this aspect, the kit according to the present invention may additionally contain at least one adjuvant. In a further embodiment, the kit according to the present invention may additionally contain at least one further pharmaceutically active component, preferably a therapeutic compound suitable for treatment and/or prophylaxis of cancer or a related disorder. Moreover, in another embodiment, the kit may additionally contain parts and/or devices necessary or suitable for the administration of the composition or the vaccine according to the invention, including needles, applicators, patches, injection-devices.

Preferred items:

In one embodiment the invention relates to subject matter summarized as follows:

Item 1. Artificial nucleic acid comprising at least one coding region encoding at least one polypeptide derived from a Norovirus, and/or a fragment or variant thereof.

Item 2. The artificial nucleic acid according to item 1, wherein the at least one encoded polypeptide is selected from the group consisting of a non-structural protein derived from a Norovirus and/or a capsid protein derived from a Norovirus, and/or a fragment or variant thereof.

Item 3. The artificial nucleic acid according to item 1 or 2, wherein the at least one encoded polypeptide is selected from the group consisting of Norovirus non-structural proteins NS1/NS2, NS3, NS4, NS5, NS6, NS7, Norovirus capsid protein VP1 and Norovirus capsid protein VP2, and/or a fragment or variant thereof.

Item 4. The artificial nucleic acid according to any one of items 1 to 3, wherein the artificial nucleic acid is derived from a Norovirus selected from the group consisting of genogroup I Norovirus, genogroup II Norovirus, genogroup III Norovirus, genogroup IV Norovirus, and genogroup V Norovirus; preferably the artificial nucleic acid is derived from a Norovirus selected from the group consisting of a GI.1 to GI.17 Norovirus, GII.1 to GII.24 Norovirus, GIII.1 to GIII.4 Norovirus, GIV.1 to GIV.4 Norovirus and GV.1 to GV.4 Norovirus; more preferably, the artificial nucleic acid is derived from a Norovirus selected from the group consisting of GI.1 Norovirus and GII.4 Norovirus, even more preferably, the artificial nucleic acid is derived from a GII.4 Norovirus, still more preferably, the artificial nucleic acid is derived from a GII.4 CIN-1 Norovirus or a GII.4 Sydney Norovirus or a GII.4 Sydney 2012 Norovirus.

Item 5. The artificial nucleic acid according to any one of items 1 to 4, wherein the at least one encoded polypeptide comprises at least one Norovirus capsid protein VP1 or Norovirus capsid protein VP2 and/or a fragment or a variant thereof.

Item 6. The artificial nucleic acid according to any one of items 1 to 5, wherein the at least one encoded polypeptide comprises at least one Norovirus capsid protein VP1 and/or a fragment or variant thereof.

Item 7. The artificial nucleic acid according to any one of items 1 to 6, wherein the at least one encoded polypeptide comprises

(i) at least one of the amino acid sequences according to any one of SEQ ID NOs: 1-4410; and/or

(ii) at least one of the amino acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% sequence identity to the amino acid sequence represented by any one of SEQ ID NOs: 1-4410; and/or

(iii) an orthologue or a paralogue of any one of SEQ ID NOs: 1-39690, 39713-39746; and/or a fragment or variant of any of these sequences.

Item 8. The artificial nucleic acid according to any one of items 1 to 7, wherein the at least one coding region comprises

(i) at least one of the nucleic acid sequences according to any one of SEQ ID NOs: 4411-39690, 39713-39746; and/or

(ii) at least one of the nucleic acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% sequence identity to the nucleic acid sequence represented by any one of SEQ ID NOs: 4411-39690, 39713-39746; and/or

(iii) at least one complement of the nucleic acid sequences which are capable of hybridizing with a nucleic acid sequence comprising a sequence as shown in SEQ ID NOs: 4411-39690, 39713-39746, and/or to a nucleic acid encoding a polypeptide having a sequence as shown in SEQ ID NOs: 1-4410; and/or

(iv) an orthologue or a paralogue of any one of SEQ ID NOs: 1-39690, 39713-39746; and/or a fragment or variant of any of these sequences.

Item 9. The artificial nucleic acid according to any one of items 1 to 8, wherein the artificial nucleic acid is monocistronic, bicistronic or multicistronic.

Item 10. The artificial nucleic acid according to any one of items 1 to 9, wherein the artificial nucleic acid is monocistronic and wherein the coding region encodes a polypeptide comprising at least two different Norovirus proteins as defined in any one of items 1 to 9, or a fragment or variant thereof.

Item 11. The artificial nucleic acid according to any one of items 1 to 9, wherein the artificial nucleic acid is bi- or multicistronic and comprises at least two coding regions, wherein the at least two coding regions encode at least two polypeptides, wherein each of the at least two polypeptides comprises at least one Norovirus protein as defined in any one of items 1 to 9, or a fragment or variant of any one of these proteins, wherein the at least two polypeptides are preferably different polypeptides.

Item 12. The artificial nucleic acid according to any one of items 1 to 11, wherein the artificial nucleic acid is an RNA, preferably an mRNA.

Item 13. The artificial nucleic acid according to any one of items 1 to 12, wherein the artificial nucleic acid comprises a 5'-cap structure.

Item 14. The artificial nucleic acid according to any one of items 1 to 13, wherein the G/C content of the coding region of the mRNA sequence is increased compared to the G/C content of the corresponding coding sequence of the wild type mRNA, or wherein the C content of the coding region of the mRNA sequence is increased compared to the C content of the corresponding coding sequence of the wild type mRNA, or wherein the codon usage in the coding region of the mRNA sequence is adapted to the human codon usage, or wherein the codon adaptation index (CAI) is increased or maximised in the coding region of the mRNA sequence, wherein the encoded amino acid sequence of the mRNA sequence is preferably not being modified compared to the encoded amino acid sequence of the wild type mRNA.

Item 15. The artificial nucleic acid according to any one of items 1 to 14, wherein

(i) the at least one coding region comprises a nucleic acid sequence, which is codon-optimized; and/or

(ii) wherein the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 8821-13230, 26461-39690, 39715, 39716, 39717, 39720, 39721, 39724, 39725, 39728, 39729, 39730, 39733, 39734, 39737, 39738, 39741, 39742, 39745 and 39746, or a fragment or variant of any of these sequences; and/or

(iii) wherein the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 13231-17640, or a fragment or variant of any of these sequences; and/or

(iv) the artificial nucleic acid according to any one of the preceding items, wherein the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 17641-22050, or a fragment or variant of any of these sequences; and/or

(v) the artificial nucleic acid according to any one of the preceding items, wherein the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 22051-26460, or a fragment or variant of any of these sequences.

Item 16. The artificial nucleic acid according to any one of items 1 to 15, wherein the artificial nucleic acid comprises at least one histone stem-loop.

Item 17. The artificial nucleic acid according to item 16, wherein the at least one histone stem-loop comprises a nucleic acid sequence according to the following formulae (I) or (II):

formula (I) (stem-loop sequence without stem bordering elements):

$$\underbrace{[N_{0-2}GN_{3-5}]}_{\text{stem1}}\ \underbrace{[N_{0-4}(U/T)N_{0-4}]}_{\text{loop}}\ \underbrace{[N_{3-5}CN_{0-2}]}_{\text{stem2}}$$

formula (II) (stem-loop sequence with stem bordering elements):

$$\underbrace{N_{1-6}}_{\text{stem1 bordering element}}\ \underbrace{[N_{0-2}GN_{3-5}]}_{\text{stem1}}\ \underbrace{[N_{0-4}(U/T)N_{0-4}]}_{\text{loop}}\ \underbrace{[N_{3-5}CN_{0-2}]}_{\text{stem2}}\ \underbrace{N_{1-6}}_{\text{stem2 bordering element}}$$

wherein:

stem1 or stem2 bordering elements N_{1-6}	is a consecutive sequence of 1 to 6, preferably of 2 to 6, more preferably of 2 to 5, even more preferably of 3 to 5, most preferably of 4 to 5 or 5 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C, or a nucleotide analogue thereof;

stem1 [$N_{0-2}GN_{3-5}$]	is reverse complementary or partially reverse complementary with element stem2, and is a consecutive sequence between of 5 to 7 nucleotides;
	wherein N_{0-2} is a consecutive sequence of 0 to 2, preferably of 0 to 1, more preferably of 1 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof;
	wherein N_{3-5} is a consecutive sequence of 3 to 5, preferably of 4 to 5, more preferably of 4 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof, and
	wherein G is guanosine or an analogue thereof, and may be optionally replaced by a cytidine or an analogue thereof, provided that its complementary nucleotide cytidine in stem2 is replaced by guanosine;
loop sequence [$N_{0-4}(U/T)N_{0-4}$]	is located between elements stem1 and stem2, and is a consecutive sequence of 3 to 5 nucleotides, more preferably of 4 nucleotides;
	wherein each N_{0-4} is independent from another a consecutive sequence of 0 to 4, preferably of 1 to 3, more preferably of 1 to 2 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof; and
	wherein U/T represents uridine, or optionally thymidine;
stem2 [$N_{3-5}CN_{0-2}$]	is reverse complementary or partially reverse complementary with element stem1, and is a consecutive sequence between of 5 to 7 nucleotides;
	wherein N_{3-5} is a consecutive sequence of 3 to 5, preferably of 4 to 5, more preferably of 4 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof;

wherein N_{0-2} is a consecutive sequence of 0 to 2, preferably of 0 to 1, more preferably of 1 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof; and

wherein C is cytidine or an analogue thereof, and may be optionally replaced by a guanosine or an analogue thereof provided that its complementary nucleotide guanosine in stem1 is replaced by cytidine;

wherein

stem1 and stem2 are capable of base pairing with each other forming a reverse complementary sequence, wherein base pairing may occur between stem1 and stem2, or

forming a partially reverse complementary sequence, wherein an incomplete base pairing may occur between stem1 and stem2.

Item 18. The artificial nucleic acid according to item 17, wherein the at least one histone stem-loop comprises a nucleic acid sequence according to the following formulae (Ia) or (IIa):

formula (Ia) (stem-loop sequence without stem bordering elements):

$$\underbrace{[N_{0-1}GN_{3-5}]}_{\text{stem1}}\ \underbrace{[N_{1-3}(U/T)N_{0-2}]}_{\text{loop}}\ \underbrace{[N_{3-5}CN_{0-1}]}_{\text{stem2}}$$

formula (IIa) (stem-loop sequence with stem bordering elements):

$$\underbrace{N_{2-5}}_{\text{stem1}}\ \underbrace{[N_{0-1}GN_{3-5}]}_{\text{stem1}}\ \underbrace{[N_{1-3}(U/T)N_{0-2}]}_{\text{loop}}\ \underbrace{[N_{3-5}CN_{0-1}]}_{\text{stem2}}\ \underbrace{N_{2-5}}_{\text{stem2}}$$

bordering element bordering element

Item 19. The artificial nucleic acid according to any one of items 16 to 18, wherein the at least one histone stem loop comprises a nucleic acid sequence according to SEQ ID NO: 39709 to SEQ ID NO: 39710, or a fragment or variant thereof.

Item 20. The artificial nucleic acid molecule according to any one of items 1 to 19, wherein the artificial nucleic acid comprises an untranslated region (UTR).

Item 21. The artificial nucleic acid according to item 20, wherein the artificial nucleic acid comprises a 3'-UTR.

Item 22. The artificial nucleic acid according to item 21, wherein the 3'-UTR comprises at least one heterologous 3'-UTR element.

Item 23. The artificial nucleic acid according to item 21 or 22, wherein the 3'-UTR comprises a poly(A) sequence and/or a poly(C) sequence.

Item 24. The artificial nucleic acid according to item 23, wherein the poly(A) sequence comprises 10 to 200, 10 to 100, 40 to 80 or 50 to 70 adenosine nucleotides, and/or the poly(C) sequence comprises 10 to 200, 10 to 100, 20 to 70, 20 to 60 or 10 to 40 cytosine nucleotides.

Item 25. The artificial nucleic acid according to any one of items 1 to 24, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence derived from a 3'-UTR of a gene, which preferably encodes a stable mRNA, or from a homolog, a fragment or a variant of said gene.

Item 26. The artificial nucleic acid according to any one of items 1 to 25, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence derived from a 3'-UTR of a gene selected from the group consisting of an albumin gene, an α-globin gene, a β-globin gene, a tyrosine hydroxylase gene, a lipoxygenase gene, and a collagen alpha gene, or from a homolog, a fragment or a variant thereof.

Item 27. The artificial nucleic acid according to any one of items 1 to 26, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence derived from a 3'-UTR of an α-globin gene, preferably comprising the corresponding RNA sequence of the nucleic acid sequence according to SEQ ID NO: 39701, or SEQ ID NO: 39702, a homolog, a fragment, or a variant thereof.

Item 28. The artificial nucleic acid according to any one of items 1 to 27, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence, which is derived from the 3'-UTR of a vertebrate albumin gene or from a variant thereof, preferably from the 3'-UTR of a mammalian albumin gene or from a variant thereof, more preferably from the 3'-UTR of a human albumin gene or from a variant thereof, even more preferably from the 3'-UTR of the human albumin gene according to Genbank Accession number NM_000477.5, or from a fragment or variant thereof.

Item 29. The artificial nucleic acid according to any one of items 1 to 28, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence according to any one of SEQ ID NO: 39703 to SEQ ID NO: 39708, or a homolog, a fragment or a variant thereof.

Item 30. The artificial nucleic acid according to any one of items 1 to 29, wherein the artificial nucleic acid comprises a 5'-UTR.

Item 31. The artificial nucleic acid sequence according to any one of items 1 to 30, wherein the 5'-UTR comprises at least one heterologous 5'-UTR element.

Item 32. The artificial nucleic acid according to any one of items 1 to 31, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence, which is derived from the 5'-UTR of a TOP gene, preferably from a corresponding RNA sequence, or a homolog, a fragment, or a variant thereof, preferably lacking the 5'TOP motif.

Item 33. The artificial nucleic acid according to any one of items 1 to 32, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence, which is derived from a 5'-UTR of a TOP gene encoding a ribosomal protein, preferably from a corresponding RNA sequence, or from a homolog, a fragment or a variant thereof, preferably lacking the 5'TOP motif.

Item 34. The artificial nucleic acid according to any one of items 1 to 33, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence, which is derived from a 5'-UTR of a TOP gene encoding a ribosomal Large protein (RPL), preferably RPL32 or RPL35A, or from a gene selected from the group consisting of HSD17B4, ATP5A1, AIG1, ASAH1, COX6C or ABCB7 (MDR), or from a homolog, a fragment or variant of any one of these genes, preferably lacking the 5'TOP motif.

Item 35. The artificial nucleic acid according to any one of items 1 to 34, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence according to SEQ ID NO: 39691 to SEQ ID NO: 39694, or a homolog, a fragment or a variant thereof.

Item 36. The artificial nucleic acid according to any one of items 1 to 35 comprising, preferably in 5' to 3' direction, the following elements:

a) optionally a 5'-cap structure, preferably m7GpppN,
b) a coding region encoding at least one polypeptide derived from a Norovirus as described herein, preferably VP1, or a fragment or variant thereof,
c) optionally a poly(A) tail, preferably consisting of 10 to 200, 10 to 100, 40 to 80 or 50 to 70 adenosine nucleotides,
d) optionally a poly(C) tail, preferably consisting of 10 to 200, 10 to 100, 20 to 70, 20 to 60 or 10 to 40 cytosine nucleotides, and
e) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEQ ID NO: 39709 to SEQ ID NO: 39710.

Item 37. The artificial nucleic acid according to any one of items 1 to 36 comprising, preferably in 5' to 3' direction, the following elements:

a) optionally a 5'-cap structure, preferably m7GpppN,
b) a coding region encoding at least one polypeptide derived from a Norovirus, preferably VP1 as described herein, or a fragment or variant thereof,

c) a 3'-UTR element comprising a nucleic acid sequence, which is derived from an α-globin gene, preferably comprising the corresponding RNA sequence of the nucleic acid sequence according to SEQ ID NO: 39701, or SEQ ID NO: 39702, or a homolog, a fragment or a variant thereof,

d) optionally a poly(A) tail, preferably consisting of 10 to 200, 10 to 100, 40 to 80 or 50 to 70 adenosine nucleotides,

e) optionally a poly(C) tail, preferably consisting of 10 to 200, 10 to 100, 20 to 70, 20 to 60 or 10 to 40 cytosine nucleotides, and

f) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEQ ID NO: 39709 to SEQ ID NO: 39710.

Item 38. The artificial nucleic acid according to any one of items 1 to 37, wherein the artificial nucleic acid comprises a nucleic acid sequence according to any one of SEQ ID NO: 39713-39746, preferably a nucleic acid sequence according to any one of SEQ ID NO: 39716, 39721, 39729, 39734, 39738, 39725, or a fragment or variant of any of these sequences.

Item 39. The artificial nucleic acid according to any one of items 1 to 38, comprising, preferably in 5' to 3' direction, the following elements:

a) optionally a 5'-cap structure, preferably m7GpppN,

b) a 5'-UTR element, which comprises or consists of a nucleic acid sequence, which is derived from the 5'-UTR of a TOP gene, preferably comprising a nucleic acid sequence according to SEQ ID NO: 39691, or SEQ ID NO: 39692, or a homolog, a fragment or a variant thereof,

c) a coding region encoding at least one polypeptide derived from a Norovirus, preferably VP1 as described herein, or a fragment or variant thereof,

d) a 3'-UTR element comprising a nucleic acid sequence, which is derived from an albumin gene, preferably comprising the corresponding RNA sequence of the nucleic acid sequence according to SEQ ID NO: 39705, or SEQ ID NO: 39706, or a homolog, a fragment or a variant thereof,

e) optionally a poly(A) tail, preferably consisting of 10 to 200, 10 to 100, 40 to 80 or 50 to 70 adenosine nucleotides,

f) optionally a poly(C) tail, preferably consisting of 10 to 200, 10 to 100, 20 to 70, 20 to 60 or 10 to 40 cytosine nucleotides, and

g) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEQ ID NO: 39709 to SEQ ID NO: 39710.

Item 40. The artificial nucleic acid according to any one of items 1 to 39, wherein the artificial nucleic acid comprises a nucleic acid sequence according to any one of SEQ ID NOs: 39713-39746, preferably a nucleic acid sequence according to any one of SEQ ID NOs: 39716, 39721, 39729, 39734, 39738, 39725, or a fragment or variant of any of these sequences.

Item 41. The artificial nucleic acid according to any one of items 1 to 40, wherein the coding region comprises a modified nucleic acid sequence.

Item 42. The artificial nucleic acid according to any one of items 1 to 41, wherein the at least one coding region comprises a nucleic acid sequence encoding a molecular tag and wherein the molecular tag is selected from the group consisting of a FLAG tag, a glutathione-S-transferase (GST) tag, a His tag, a Myc tag, an E tag, a Strep tag, a green fluorescent protein (GFP) tag and an HA tag.

Item 43. Composition comprising at least one artificial nucleic acid as defined by any one of items 1 to 42 and a pharmaceutically acceptable carrier.

Item 44. The composition according to item 43, wherein the at least one mRNA is complexed with one or more cationic or polycationic compounds, preferably with cationic or polycationic polymers, cationic or polycationic peptides or proteins, e.g. protamine, cationic or polycationic polysaccharides and/or cationic or polycationic lipids.

Item 45. The composition according to any one of items 43 to 44, wherein the N/P ratio of the at least one mRNA to the one or more cationic or polycationic compounds is in the range of about 0.1 to 20, including a range of about 0.3 to 4, of about 0.5 to 2, of about 0.7 to 2 and of about 0.7 to 1.5.

Item 46. The composition according to any one of items 43 to 45 comprising the at least one mRNA, which is complexed with one or more cationic or polycationic compounds, and at least one free mRNA.

Item 47. The composition according to any one of items 43 to 46, wherein the at least one complexed mRNA is identical to the at least one free mRNA.

Item 48. The composition according to any one of items 43 to 47, wherein the mRNA is complexed with one or more lipids, thereby forming liposomes, lipid nanoparticles and/or lipoplexes.

Item 49. The composition according to any one of items 43 to 48, wherein the composition comprises at least one adjuvant.

Item 50. The composition according to any one of items 43 to 49, wherein

a) the composition comprises a plurality or more than one of the mRNA sequences each defined in any one of items 1 to 42;

or

b) the composition comprises at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more artificial nucleic acids as defined by any one of items 1 to 42, wherein each of the at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more

artificial nucleic acids comprises at least one coding region encoding at least one polypeptide comprising a Norovirus protein as defined in any one of items 1 to 42, and/or a fragment or a variant of any one of these proteins, wherein each coding region preferably encodes a different Norovirus protein, more preferably each coding region encodes a capsid protein, preferably VP1 of a different Norovirus.

Item 51. The composition according to any one of items 43 to 50, wherein

a) wherein each of the mRNA sequences encodes at least one different antigenic peptide or protein derived from proteins of the same Norovirus;

and/or

b) the composition comprises at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more artificial nucleic acids as defined by any one of items 1 to 42, wherein each of the at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more artificial nucleic acids comprises at least one coding region encoding at least one polypeptide comprising at least two different Norovirus proteins, preferably VP1 and VP2, as defined in any one of items 1 to 42, and/or a fragment or a variant of any one of these proteins.

Item 52. The composition according to any one of items 43 to 51, wherein the at least one artificial nucleic acid is complexed at least partially with a cationic or polycationic compound and/or a polymeric carrier, preferably a cationic protein or peptide.

Item 53. The composition according to any one of items 43 to 52, wherein

(i) the ratio of complexed nucleic acid to free nucleic acid is selected from a range of about 5:1 (w/w) to about 1:10 (w/w), more preferably from a range of about 4:1 (w/w) to about 1:8 (w/w), even more preferably from a range of about 3:1 (w/w) to about 1:5 (w/w) or 1:3 (w/w), wherein the ratio is most preferably about 1:1 (w/w); or

(ii) the mRNA is complexed with one or more cationic or polycationic compounds in a weight ratio selected from a range of about 6:1 (w/w) to about 0.25:1 (w/w), more preferably from about 5:1 (w/w) to about 0.5:1 (w/w), even more preferably of about 4:1 (w/w) to about 1:1 (w:w) or of about 3:1 (w/w) to about 1:1 (w/w), and most preferably a ratio of about 3:1 (w/w) to about 2:1 (w/w) of mRNA to cationic or polycationic compound and/or with a polymeric carrier; or optionally in a nitrogen/phosphate ratio of mRNA to cationic or polycationic compound and/or polymeric carrier in the range of about 0.1-10, preferably in a range of about 0.3-4 or 0.3-1, and most preferably in a range of about 0.5-1 or 0.7-1, and even most preferably in a range of about 0.3-0.9 or 0.5-0.9;

and/or wherein the at least one artificial nucleic acid or mRNA is complexed with one or more cationic or polycationic compounds, preferably with cationic or polycationic polymers, cationic or polycationic peptides or proteins, e.g. protamine, cationic or polycationic polysaccharides and/or cationic or polycationic lipids

and/or wherein the at least one artificial nucleic acid or mRNA is complexed with one or more lipids and thereby forming liposomes, lipid nanoparticles and/or lipoplexes.

Item 54. The composition according to any one of items 43 to 53 wherein the composition comprises

(i) at least 2, 3, 4, 5, 6, 7, 8, 9, 10 or more artificial nucleic acids as defined in items 1 to 42; or

(ii) at least 10, 15, 20 or 50 artificial nucleic acids as defined in items 1 to 42; or

(iii) 2-10, 10-15, 15-20, 20-50, 50-100 or 100-200 artificial nucleic acids as defined in items 1 to 42;

and a pharmaceutically acceptable carrier, wherein preferably the artificial nucleic acid encodes a capsid protein VP1 derived from a Norovirus.

Item 55. The composition according to any one of items 43 to 54, wherein

(i) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GII Noroviruses; or

(iii) the artificial nucleic acids are derived from a single GIII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GIII Noroviruses; or

(iv) the artificial nucleic acids are derived from a single GIV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GIV Noroviruses; or

(v) the artificial nucleic acids are derived from a single GV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GV Noroviruses; or

(vi) the artificial nucleic acids are derived from a single GI Norovirus and additionally from a single GII Norovirus, GIII Norovirus, GIV Norovirus and/or GV Norovirus; or

(vii) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI Noroviruses and additionally from a single GII, GIII, GIV or GV Norovirus and/or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 and/or more GII, GIII, GIV or GV Noroviruses;

wherein preferably the artificial nucleic acids encode a capsid protein VP1 derived from a Norovirus.

Item 56. The composition according to any one of items 43 to 55, wherein

(i) the artificial nucleic acids are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI.1 Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GII.4 Noroviruses; or

(iii) the artificial nucleic acids are derived from a single GI.1 Norovirus and additionally from a single GII.4 Norovirus; or

(iv) the artificial nucleic acids are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI.1 Noroviruses and additionally from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more GII.4 Noroviruses; and/or

wherein

(i) at least one of the nucleic acid sequences according to any one of SEQ ID NO: 39713 to SEQ ID NO: 39746; and/or

(ii) at least one of the nucleic acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% sequence identity to the nucleic acid sequence represented by any one of SEQ ID NO: 39713 to SEQ ID NO: 39746; and/or

(iii) at least one complement of the nucleic acid sequences which are capable of hybridizing with a nucleic acid sequence comprising a sequence as shown in SEQ ID NO: 39713 to SEQ ID NO: 39746; and/or

(iv) an orthologue or a paralogue of any one of SEQ ID NO: 39713 to SEQ ID NO: 39746; and/or a fragment or variant of any of these sequences.

Item 57. Polypeptide encoded by the artificial nucleic acid according to any one of items 1 to 42.

Item 58. Polypeptide according to any one of items 1 to 42 comprising at least one protein selected from the group consisting of NS1/NS2, NS3, NS4, NS5, NS6, NS7, VP1, and VP2 derived from Norovirus, or a fragment or variant of any of these proteins, and at least one amino acid sequence selected from the group consisting of:

a) an amino acid sequence derived from a C-terminal fragment from mature Norovirus capsid protein VP1, or a variant thereof, wherein the C-terminal fragment consists of 3 to 20 amino acid residues,

b) an amino acid sequence derived from a signal sequence of Norovirus capsid protein VP1, or a fragment or variant thereof, and

c) an amino acid sequence derived from an N-terminal fragment from mature Norovirus non-structural protein NS1/NS2, NS3, NS4, NS5, NS6, or NS7, or a variant thereof, wherein the N-terminal fragment consists of 3 to 20 amino acid residues.

Item 59. The polypeptide according to any one of items 57 to 58 comprising a molecular tag, wherein the molecular tag is selected from the group consisting of a FLAG tag, a glutathione-S-transferase (GST) tag, a His tag, a Myc tag, an E tag, a Strep tag, a green fluorescent protein (GFP) tag and an HA tag.

Item 60. Composition comprising the polypeptide according to any one of items 57 to 59, and a pharmaceutically acceptable carrier.

Item 61. Vaccine comprising the artificial nucleic acid according to any one of items 1 to 42, the composition according to any one of items 43 to 56, the polypeptide according to any one of items 57 to 59, and/or the composition according to item 60.

Item 62. The vaccine according to item 61, wherein the artificial nucleic acid according to any one of items 1 to 42, the composition according to any one of items 43 to 56, the polypeptide according to any one of items 57 to 59, or the composition according to item 60 elicits an adaptive immune response.

Item 63. The vaccine according to item 61 to 62, wherein the vaccine further comprises a pharmaceutically acceptable carrier.

Item 64. The vaccine according to any one of items 61 to 63 further comprising an adjuvant.

Item 65. The vaccine according to any one of items 61 to 64, wherein the vaccine is multivalent and comprises

(i) at least 2, 3, 4, 5, 6, 7, 8, 9, 10 or more artificial nucleic acids as defined in items 1 to 42; or

(ii) at least 10, 15, 20 or 50 artificial nucleic acids as defined in items 1 to 42; or

(iii) 2-10, 10-15, 15-20, 20-50, 50-100 or 100-200 artificial nucleic acids as defined in items 1 to 42.

Item 66. The vaccine according to any one of items 61 to 65, wherein

(i) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GII Noroviruses; or

(iii) the artificial nucleic acids are derived from a single GIII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GIII Noroviruses; or

(iv) the artificial nucleic acids are derived from a single GIV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GIV Noroviruses; or

(v) the artificial nucleic acids are derived from a single GV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GV Noroviruses; or

(vi) the artificial nucleic acids are derived from a single GI Norovirus and additionally from a single GII Norovirus, GIII Norovirus, GIV Norovirus and/or GV Norovirus; or

(vii) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI Noroviruses and additionally from a single GII, GIII, GIV and/or GV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more GII, GIII, GIV and/or GV Noroviruses.

Item 67. The vaccine according to any one of items 61 to 66, wherein

(i) the artificial nucleic acids are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI.1 Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GII.4 Noroviruses; or

(iii) the artificial nucleic acids are derived from a single GI.1 Norovirus and additionally from a single GII.4 Norovirus; or

(iv) the artificial nucleic acids are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI.1 Noroviruses and additionally from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more GII.4 Noroviruses.

Item 68. Kit or kit of parts comprising the artificial nucleic acid according to any one of items 1 to 42, the composition according to any one of items 43 to 56, the polypeptide according to any one of items 57 to 59, the composition according to item 60 or the vaccine according to any one of items 61 to 67, optionally comprising a liquid vehicle for solubilising, and optionally technical instructions providing information on administration and dosage of the components.

Item 69. The kit or kit of parts according to item 68 comprising Ringer lactate solution.

Item 70. The artificial nucleic acid according to any one of items 1 to 42, the composition according to any one of items 43 to 56, the polypeptide according to any one of items 57 to 59, the composition according to item 60, the vaccine according to any one of items 61 to 67, or the kit or kit of parts according to item 68 to 69 for use as a medicament.

Item 71. The artificial nucleic acid according to any one of items 1 to 42, the composition according to any one of items 43 to 56, the polypeptide according to any one of items 57 to 59, the composition according to item 60, the vaccine according to any one of items 61 to 67, or the kit or kit of parts according to item 68 to 69 for use in the treatment or prophylaxis of an infection with Norovirus or a disorder related to an infection with Norovirus.

Item 72. The artificial nucleic acid according to any one of according to any one of items 1 to 42, the composition according to any one of items 43 to 56, the polypeptide according to any one of items 57 to 59, the composition according to item 60, the vaccine according to any one of items 61 to 67, or the kit or kit of parts according to item 68 to 69, wherein the artificial nucleic acid, the composition, the vaccine or the active component of the kit or kit of parts is administered by injection, preferably by needle-less injection, more preferably by jet injection.

Item 73. The artificial nucleic acid according to any one of items 1 to 42, the composition according to any one of items 43 to 56, the polypeptide according to any one of items 57 to 59, the composition according to item 60, the vaccine according to any one of items 61 to 67, or the kit or kit of parts according to item 68 to 69 for use according to any one of items 70 to 72, wherein the treatment or prophylaxis comprises the administration of a further active pharmaceutical ingredient.

Item 74. Method of treating or preventing a disorder, wherein the method comprises administering to a subject in need thereof the artificial nucleic acid according to any one of items 1 to 42, the composition according to any one of items 43 to 56, the polypeptide according to any one of items 57 to 59, the composition according to item 60, the vaccine according to any one of items 61 to 67, or the kit or kit of parts according to item 68 to 69.

Item 75. The method according to item 74, wherein the disorder is an infection with Norovirus or a disorder related to an infection with Norovirus.

Brief description of the drawings:

Figure 1: shows that transfection of HeLa cells with mRNAs coding for Norovirus antigen VP1 leads to the expression of the encoded protein. For cell transfection, mRNA constructs (construct ID R2) and (construct ID R4) were used. Norovirus VP1 proteins were stained intracellularly with a specific anti-Norovirus GII.4 antibody and a FITC labelled secondary antibody and analyzed by FACS. A detailed description of the experiment is provided in the examples section, Example 2.

Figure 2: shows that transfection of HeLa cells with mRNAs coding for Norovirus antigen VP1 leads to the expression of the encoded protein. For cell transfection, mRNA constructs (construct ID R26), (construct ID R27), and (construct ID R28) were used. Norovirus VP1 proteins were stained with a specific anti-Norovirus GII.4 antibody and a FITC labelled secondary antibody and analyzed by FACS. A detailed description of the experiment is provided in the examples section, Example 2.

Figure 3: shows that transfection of HeLa cells with mRNAs coding for Norovirus antigen VP1 leads to protein expression. For cell transfection, mRNA constructs (construct ID R2) and (construct ID R4) were used. Western blot analysis was performed cell lysates of transfected cells. As a control, a commercial VLP preparation (Medigen; 59 kD) was used. Norovirus VP1 proteins were stained with a specific anti-Norovirus GII.4 antibody. M= marker lane; 1= mRNA construct R2; 2= mRNA construct R4; 3= WFI control; 4= empty control; 5= commercial VLP control. A detailed description of the experiment is provided in the examples section, Example 3.

Figure 4: shows that immunization of mice with formulated Norovirus mRNA vaccine (Norovirus GC-optimized VP1_X124V; construct ID R4; protamine formulated) induced binding IgG1 and IgG2 antibodies, both in a homologous ELISA design (Figure 4A; coating material VLP GII.4) and in a heterologous ELISA design (Figure 4B; coating material VLP GII.4 2011). 1= group vaccinated with Norovirus mRNA vaccine; 2= buffer control group. A detailed description of the experiment is provided in the examples section, Example 4.1.

Figure 5: shows that immunization of mice with formulated Norovirus mRNA vaccine (Norovirus GC-optimized VP1_X124V; construct ID R4; protamine formulated) induced heterologous blocking antibodies. The results of a Histo-Blood Group Antigen (HBGA) assay in serum dilution 1: 12.5 are shown. 1= group vaccinated with Norovirus mRNA vaccine; 2= buffer control group. A detailed description of the experiment is provided in the examples section, Example 4.2.

Figure 6: shows that immunization of mice with formulated Norovirus mRNA vaccine (Norovirus GC-optimized VP1_X124V; construct ID R4; protamine formulated) induced antigen specific T-cell responses. The results of an ICS assay are shown (CD8+ T-cells). 1= group vaccinated with Norovirus mRNA vaccine; 2= buffer control group. A detailed description of the experiment is provided in the examples section, Example 4.3.

Examples:

The Examples shown in the following are merely illustrative and shall describe the present invention in a further way. These Examples shall not be construed to limit the present invention thereto.

Example 1: Preparation of mRNA for in vitro and in vivo experiments:

1.1. Preparation of DNA and mRNA constructs:

For the present examples, DNA sequences encoding *Norovirus* antigenic proteins, derived from three or more different *Norovirus* strains were prepared and used for subsequent RNA *in vitro* transcription reactions. The prepared RNA constructs (coding sequences (cds) and mRNA sequences) are listed in Table 4 below.

Most DNA sequences were prepared by modifying the wild type encoding DNA sequences by introducing a codon modified sequence or GC-optimized sequence for stabilization, using three or more different *in silico* algorithms that e.g. increase the GC content of the respective coding sequence (indicated as "GC opt 1", "GC opt 2", "GC opt 3", "GC opt 4", "opt 5", "opt 6", "opt 7" in Table 4; further details relating to sequence modifications are provided in the specifications of the invention). Some DNA sequences were used as a wild type coding sequence, without altering the GC content and without altering the codon usage of the coding sequence (indicated as "wt" in Table 4).

DNA sequences were prepared by modifying the wild type encoding DNA sequences by introducing a GC-optimized sequence for stabilization, using an *in silico* algorithms that increase the GC content of the respective coding sequence (e.g., indicated as "opt1" in Table 4, see explanation in the paragraph above).

Moreover, sequences were introduced into a pUC19 derived vector and modified to comprise stabilizing sequences derived from alpha-globin-3'-UTR, a stretch of 30 cytosines, a histone-stem-loop structure, and a stretch of 64 adenosines at the 3'-terminal end (poly-A-tail), indicated as "design 1" in Table 4. Other sequences were introduced into a pUC19 derived vector to comprise stabilizing sequences derived from 32L4 5'-UTR ribosomal 5'TOP UTR and 3'-UTR derived from albumin 7, a stretch of 30 cytosines, a histone-stem-loop structure, and a stretch of 64 adenosines at the 3'-terminal end (poly-A-tail), indicated as "design 2" in Table 4. Further details are relating mRNA construct design are provided in the specifications of the invention)

The obtained plasmid DNA constructs were transformed and propagated in bacteria (*Escherichia coli*) using common protocols known in the art.

Table 4: VP1 coding sequences, protein sequences and mRNA constructs

RNA ID		Construct description	Norovirus strain	RNA design	SEQ ID NO
R1	mRNA	VP1_(X124V)	GII.4-031693-USA-2003	design 1, wt	39713
R2	mRNA	VP1_(X124V)	GII.4-031693-USA-2003	design 2, wt	39714
R3	mRNA	VP1_(X124V)	GII.4-031693-USA-2003	design 1, GC opt 1	39715
R4	mRNA	VP1_(X124V)	GII.4-031693-USA-2003; CINI	design 2, GC opt 1	39716
R5	protein	VP1_(X124V)	GII.4-031693-USA-2003	Protein*	2358
R6	cds	VP1_(X124V)	GII.4-031693-USA-2003	wild type, wt	6768
R7	cds	VP1_(X124V)	GII.4-031693-USA-2003	GC opt 1	39717
R8	cds	VP1_(X124V)	GII.4-031693-USA-2003	GC opt 2	11178
R9	cds	VP1_(X124V)	GII.4-031693-USA-2003	opt 5	15588
R10	cds	VP1_(X124V)	GII.4-031693-USA-2003	opt 6	19998
R11	cds	VP1_(X124V)	GII.4-031693-USA-2003	opt 7	24408
R12	cds	VP1_(X124V)	GII.4-031693-USA-2003	GC opt 3	28818
R13	cds	VP1_(X124V)	GII.4-031693-USA-2003	GC opt 4	33228
R14	mRNA	Capsidprotein	GII.4 Farmington Hills-2002-USA	design 1	39718
R15	mRNA	Capsidprotein	GII.4 Farmington Hills-2002-USA	design 2	39719
R16	mRNA	Capsidprotein	GII.4 Farmington Hills-2002-USA	design 1, GC opt 1	39720
R17	mRNA	Capsidprotein	GII.4 Farmington Hills-2002-USA	design 2, GC opt 1	39721
R18	protein	Capsidprotein	GII.4 Farmington Hills-2002-USA	Protein*	1487
R19	cds	Capsidprotein	GII.4 Farmington Hills-2002-USA	wild type	5897
R20	cds	Capsidprotein	GII.4 Farmington Hills-2002-USA	GC opt 2	10307
R21	cds	Capsidprotein	GII.4 Farmington Hills-2002-USA	opt 5	10307
R22	cds	Capsidprotein	GII.4 Farmington Hills-2002-USA	opt 6	19127
R23	cds	Capsidprotein	GII.4 Farmington Hills-2002-USA	opt 7	23537
R24	cds	Capsidprotein	GII.4 Farmington Hills-2002-USA	GC opt 3	27947
R25	cds	Capsidprotein	GII.4 Farmington Hills-2002-USA	GC opt 4	32357
R26	mRNA	VP1	GII.4-2006b 092895-USA-2008	design 2, GC opt 1	39729
R27	mRNA	VP1	GII.4-GZ2010-L87-Guangzhou-2011	design 2, GC opt 1	39734
R28	mRNA	VP1	GII.4-USA-1997	design 2, GC opt 1	39738
R29	mRNA	VP1	GI.1-USA-1968-Capsidprotein	design 2, GC opt 1	39725

*protein sequence is back translated into RNA according to the above paragraph "G/C content modification"

1.2. RNA *in vitro* transcription:

The DNA plasmids prepared according to paragraph 1.1 were enzymatically linearized using EcoRI and transcribed *in vitro* using DNA dependent T7 RNA polymerase in the presence of a nucleotide mixture and cap analog (m7GpppG) under suitable buffer conditions. The obtained mRNAs were purified using PureMessenger® (CureVac, Tübingen, Germany; WO 2008/077592 A1) and used for *in vitro* and *in vivo* experiments.

1.3. Preparation of protamine formulated RNA vaccine:

The obtained mRNA, e.g. HPLC purified RNA, was complexed with protamine by addition of protamine-trehalose solution to RNA solution at a RNA:protamine weight to weight ratio of 2:1. Then, complexed RNA was mixed with non-complexed RNA in a ratio of 50% free RNA and 50% complexed RNA to obtain formulated RNA. Formulated RNA was used for *in vivo* vaccination experiments.

1.4. Preparation of LNP formulated RNA vaccine:

RNA is encapsulated in lipid nanoparticle (LNP) using established protocols known in the art. Briefly, LNP-encapsulated RNA is prepared using an ionizable amino lipid (cationic lipid), phospholipid, cholesterol and a PEGylated lipid. Cationic lipid, DSPC, cholesterol and PEG-lipid are solubilized in ethanol. RNA is diluted to a total concentration of about 0.05 mg/mL in 50 mM citrate buffer pH 4. Syringe pumps are used to mix the ethanolic lipid solution with RNA at a ratio of about 1:6 to 1:2 (vol/vol). Ethanol is then removed and the external buffer replaced with PBS by dialysis. Lipid nanoparticles are filtered through a 0.2 µm pore sterile filter. Lipid nanoparticle particle diameter size may be determined by quasi-elastic light scattering using a Malvern Zetasizer Nano (Malvern, UK).

Example 2: Expression of Norovirus VP1 antigens in HeLa cells and analysis by FACS:

To determine *in vitro* protein expression of the inventive Norovirus mRNA constructs, HeLa cells were transfected with mRNA constructs encoding Norovirus VP1 antigens and analyzed by intracellular FACS staining. For cell transfection, an mRNA comprising VP1_X124V (GII.4-031693-USA-2003) wild type coding sequence (SEQ ID NO: 39714; construct ID R2) an mRNA comprising VP1_X124V (GII.4-031693-USA-2003) GC-optimized coding sequence (SEQ ID NO: 39716; construct ID R4), an mRNA comprising VP1 (GII.4-2006b 092895-USA-2008) GC-optimized coding sequence (SEQ ID NO: 39729; construct ID R26), an mRNA comprising VP1 (GII.4-GZ2010-L87-Guangzhou-2011) GC-optimized coding sequence (SEQ ID NO: 39734; construct R27) and an mRNA comprising VP1 NOV(GII.4-USA-1997)-Capsidprotein GC-optimized coding sequence (SEQ ID NO: 39738; construct ID R28) were used. The detailed description of the performed experiment is provided below.

HeLa cells were seeded in a 6-well plate at a density of 400,000 cells/well in cell culture medium (RPMI, 10% FCS, 1% L-Glutamine, 1% Pen/Strep), 24h prior to transfection. Cells were transfected with 1 µg and 2 µg mRNA per construct using Lipofectamine 2000 (Invitrogen) as transfection reagent. As a negative control, water for injection (WFI) was used.

24 hours post transfection, transfected HeLa cells were stained with a commercial mouse anti-Norovirus GII.4 antibody [2000-G5] (Abcam; 1:500) and an anti-mouse FITC labelled secondary antibody (F5262 from Sigma; 1:500) after Cytofix/Cytoperm (BD

Biosciences) treatment according to manufacturer's protocol. Subsequently, cells were analyzed by flow cytometry (FACS) on a BD FACS Canto II using the FACS Diva software. Quantitative analysis of the fluorescent FITC signal was performed using the FlowJo software package (Tree Star, Inc.). The results of the FACS expression analysis are shown in Figure 1 and Figure 2.

Results:

Figure 1 and Figure 2 show that the Norovirus proteins were expressed in HeLa cells transfected with the mRNA constructs R2, R4, R26, R27 and R28. Overall, around 80%-90% of transfected cells showed positive FITC signal, indicating that the inventive constructs tested here were able to efficiently drive protein expression without affecting cell viability. Of note, the data suggests that analogous mRNA constructs encoding other Norovirus VP1 or VP2 antigens (as defined in the specifications or listed in Table 1 and Table 3) may also drive protein expression in a similar manner.

Example 3: Analysis of protein expression using western blot

To determine *in vitro* protein expression upon HeLa cell transfection with the inventive mRNA constructs, HeLa cells were transiently transfected with an mRNA constructs comprising VP1_X124V coding sequences. Cell lysates were prepared and analyzed using western blot. The detailed description of the performed experiment is provided below.

HeLa cells are transfected with 2 µg mRNA comprising wild type VP1_X124V coding sequence (SEQ ID NO: 39714; construct ID R2) and 2 µg mRNA comprising GC-optimized VP1_X124V coding sequence (SEQ ID NO: 39716; construct ID R4). As a negative control water for injection (WFI) was used. After 24 hours post transfection lysis buffer was added to the culture to prepare cellular lysates. Cellular lysates as well as a commercial Norovirus virus like particle (VLP; obtained from Medigen) were reduced by heating the samples to 95°C for 10 minute. Subsequently, samples were subjected to SDS-PAGE under denaturating/reducing conditions followed by western blot detection. For the detection of Norovirus proteins, a commercial mouse anti-Norovirus GII.4 antibody [2002-65] (1:250; Abcam) was used as primary antibody followed by secondary goat anti mouse antibody coupled to IRDye 800CW (1:10000; Licor Biosciences). The results of the experiment are shown in Figure 3.

Results:

Figure 3 shows that the Norovirus proteins were expressed in HeLa cells transfected with the inventive mRNA constructs (SEQ ID NOs: 39714 and 39716). Of note, the data suggests that analogous mRNA constructs encoding other Norovirus antigens (as defined in the specifications or listed in Table 1 and Table 3) may also drive protein expression in a similar manner.

Example 4: Immunization of mice and evaluation of Norovirus specific immune responses

Female BALB/c mice were immunized intradermally (i.d.) with protamine formulated mRNA vaccine (construct ID R4) with doses, application routes and vaccination schedules as indicated in Table 5. As a negative control, one group of mice was injected with buffer (ringer lactate, RiLa). All animals were vaccinated on day 0, 21 and 35. Blood samples were collected on day 49 for the determination of binding antibody titers (using a homologous and heterologous ELISA assay), blocking antibody titers (using a

heterologous HGBA assay) and T-cell responses (intracellular cytokine assay). Detailed descriptions of the performed experiments are provided below.

Table 5: Vaccination regimen (Example 4)

Group	No of mice	Treatment	Dose	Route/Volume	Vaccination schedule
1	6	*Norovirus* GC-optimized VP1_X124V SEQ ID NO: 39716; R4 Protamine formulated	80 µg	i.d. 2x 50 µl	d0, d21, d35
2	6	100% RiLa Control		i.m. 1x 25 µl	d0, d21, d35

4.1. Determination of homologous and heterologous immune responses by ELISA:

ELISA was performed using synthetically produced norovirus Virus like particles (VLP) as coating material. For the analysis of homologous immune responses, plates were coated with VLP of the same strain of genotype GII.4 (GII.4 CINI). For the analysis of heterologous immune responses, plates were coated with VLPs of another strain of genotype GII.4 (GII.4 2011). Coated plates were incubated using respective serum dilutions, and binding of specific antibodies to the *Norovirus* coating material was detected using biotinylated isotype specific anti-mouse antibodies followed by streptavidin-HRP (horse radish peroxidase) with ABTS as substrate. Endpoint titers of antibodies were measured by ELISA on day 49 after three vaccinations (see Table 5). The results are shown in Figure 4A (homologous responses) and Figure 4B (heterologous responses).

4.2. Determination of blocking antibody titers using a HBGA blocking assay:

Respective sera (day 49 after three vaccinations) were pre-incubated with synthetic norovirus VLPs (VLP (GII.4 2011)) and subsequently added to HBGA coated plates. VLP binding to Histo-Blood Group Antigen (HBGA) was detected by norovirus specific antibodies. In the presence of functional blocking antibodies in serum of immunized animals, VLP binding to HBGA was blocked which results in a reduction of the detected antibody signal. The respective blocking index was calculated as commonly known in the art. The results of the assay are shown in Figure 5.

4.3. Determination of specific CD8 T-cell responses using ICS:

Splenocytes from vaccinated mice were isolated according to a standard protocol known in the art. Briefly, isolated spleens were grinded through a cell strainer and washed in PBS/1%FBS followed by red blood cell lysis. After an extensive washing step with PBS/1%FBS splenocytes were seeded into 96-well plates (2 x 10^6 cells per well). The cells were stimulated with ten Norovirus CD8 peptide epitopes (1µg/ml of each peptide) in the presence of 2.5 µg/ml of an anti-CD28 antibody (BD Biosciences) and anti-CD107α-PE-Cy7 antibody, after one hour at 37°C. After stimulation, cells were washed and stained and for staining of intracellular cytokines Cytofix/Cytoperm reagent (BD Biosciences) was used according to the manufacturer's instructions. The following antibodies were used for staining: CD3-FITC (1:100), CD8-PE-Cy7 (1:200), TNF-PE (1:100), IFNγ-APC (1:100) (eBioscience), CD4-BD Horizon V450 (1:200) (BD Biosciences) and incubated with Fcγ-block diluted 1:100. Aqua Dye was used to distinguish live/dead

cells (Invitrogen). Cells were acquired using a Canto II flow cytometer (Beckton Dickinson). Flow cytometry data was analyzed using FlowJo software package (Tree Star, Inc.). Results for CD8+ T-cells are shown in Figure 6.

Results:

Figure 4 shows that the tested Norovirus mRNA vaccine induced Norovirus specific IgG1 and IgG2 antibody titers in immunized mice. Humoral immune response was demonstrated in a homologous ELISA setting (see Figure 4A) as well as in a heterologous ELISA setting (see Figure 4B). Of note, the observed heterologous humoral immune response (against another strain of genotype GII.4) is of particular importance for a broad protection against Norovirus infections, as GII.4 strains are fast-evolving which is challenging in successful Norovirus vaccine development.

Figure 5 shows that the tested Norovirus mRNA vaccine induced Norovirus specific blocking antibody titers in immunized mice in a homologous and heterologous HGBA assay setup, showing that also functional antibodies were induced after immunization of mice with the inventive Norovirus mRNA vaccine. Of note, the induction of functional blocking antibodies also against another strain of genotype GII.4 demonstrates that the used mRNA Norovirus vaccine may also confer broad protection against different Norovirus strains of genotype GII.4.

Figure 6 shows that the tested Norovirus mRNA vaccine stimulated a robust CD8+ IFN-γ/TNF-α and CD8+ CD107a/IFN-γ in spleen of immunized mice.

Overall, the results of the immunization experiments in mice show that the inventive Norovirus mRNA vaccine induced a broad immune response engaging both the humoral-secretory and cellular immunity effector arms. Notably, heterologous immune responses were also observed (ELISA, HGBA). The data suggests that analogous mRNA constructs encoding other Norovirus antigens (as defined in the specifications or listed in Table 1 or Table 3) may also induce board immune responses in a similar manner.

Example 5: Immunization of mice and further evaluation of heterologous immune responses

Female BALB/c mice are immunized intradermally (i.d.) and intramuscularily (i.m.) with protamine formulated or LNP formulated mRNA vaccines with doses, application routes and vaccination schedules as indicated in Table 6. As a negative control, one group of mice was injected with buffer (ringer lactate). All animals were vaccinated on day 0, 21 and 35. Blood samples are collected on day 49 for the determination of binding antibody titers (using a homologous and heterologous ELISA assay), blocking antibody titers (using a homologous and heterologous HGBA assay). Detailed descriptions of the performed experiments are provided below.

Table 6: Vaccination regimen of mice (Example 5)

Group	No. of mice	Treatment	Dose	Route/Volume	Vaccination schedule
1	6	Norovirus GC-optimized VP1 GII.4-USA-1997 SEQ ID NO: 39738; R28 Protamine formulated	80 µg	i.d. 2x 50 µl	d0, d21, d35 .
2	6	Norovirus GC-optimized VP1 GII.4-2006b 092895-USA-2008 SEQ ID NO: 39729; R26 Protamine formulated	80 µg	i.d. 2x 50 µl	d0, d21, d35
3	6	Norovirus GC-optimized VP1 GII.4-GZ2010-L87-Guangzhou-2011 SEQ ID NO: 39734; R27 Protamine formulated	80 µg	i.d. 2x 50 µl	d0, d21, d35
4	6	Norovirus GC-optimized VP1_X124V SEQ ID NO: 39716; R4 Protamine formulated	80 µg	i.d. 2x 50 µl	d0, d21, d35
5	6	Norovirus GC-optimized VP1 GII.4-USA-1997 SEQ ID NO: 39738; R28 LNP formulated	20 µg	i.m. 2x 25 µl	d0, d21, d35
6	6	Norovirus GC-optimized VP1 GII.4-2006b 092895-USA-2008 SEQ ID NO: 39729; R26 LNP formulated	20 µg	i.m. 2x 25 µl	d0, d21, d35
7	6	Norovirus GC-optimized VP1 GII.4-GZ2010-L87-Guangzhou-2011 SEQ ID NO: 39734; R27 LNP formulated	20 µg	i.m. 2x 25 µl	d0, d21, d35
8	6	Norovirus GC-optimized VP1_X124V SEQ ID NO: 39716; R4 LNP formulated	20 µg	i.m. 2x 25 µl	d0, d21, d35
9	6	100% RiLa Control		i.m. 1x 25 µl	d0, d21, d35

5.1. Determination of homologous and heterologous immune responses by ELISA:

ELISA is performed essentially as described in Example 4.1. Plates are coated with VLP GII.4 CINI and VLP GII.4 2011 to determine homologous and heterologous immune responses.

5.2. Determination of blocking antibody titers using a heterologous HBGA blocking assay:

The HGBA assay is performed essentially as described in Example 4.2.The respective blocking index are calculated as commonly known in the art to evaluate homologous and heterologous cross neutralizing capacities of the used mRNA vaccines.

5.3. Determination of specific CD8 T-cell responses using ICS:

Multifunctional CD8 T-cell responses are analyzed as described in Example 4.3.

Example 6: Norovirus mRNA vaccine challenge study in gnotobiotic pigs

6.1. Immunization of gnotobiotic pigs:

Gnotobiotic pigs are derived by hysterectomy from near-term sows and maintained in germ-free isolator units. Pigs are fed commercial ultra-high-temperature-treated sterile food. All pigs are confirmed as seronegative for *Norovirus* and germ-free prior to immunization experiments. Gnotobiotic pigs are immunized with protamine formulated or LNP formulated mRNA vaccines (monovalent, bivalent, or tetravalent) with doses, application routes and vaccination schedules as indicated in Table 7. Analysis of immune responses is performed essentially as described in Example 4 (ELISA, HGBA, and ICS).

Table 7: Vaccination regimen of pigs (Example 6)

Group	No. of pigs	Treatment	Dose/Route	Vaccination schedule
1	6	*Monovalent vaccine; protamine formulated* GII.4-2006b 092895-USA-2008 SEQ ID NO: 39729; R26	240 µg i.d. 2x 200 µl	d0, d21
2	6	*Bivalent vaccine; protamine formulated* GI.1-USA-1968-Capsidprotein SEQ ID NO: 39725; R29 + GII.4-GZ2010-L87-Guangzhou-2011 SEQ ID NO: 39734; R27	240 µg (total) i.d. 2x 200 µl	d0, d21
3	6	*Tetravalent vaccine; protamine formulated* GII.4-USA-1997 SEQ ID NO: 39738; R28 + GII.4-031693-USA-2003	240 µg (total) i.d. 2x 200 µl	d0, d21

		SEQ ID NO: 39716; R4 + GII.4-2006b 092895-USA-2008 SEQ ID NO: 39729; R26 + GII.4-GZ2010-L87-Guangzhou-2011 SEQ ID NO: 39734; R27		
4	6	*Monovalent vaccine; LNP formulated* GII.4-2006b 092895-USA-2008 SEQ ID NO: 39729; R26	60 µg i.m. 2x 100 µl	d0, d21
5	6	*Bivalent vaccine; LNP formulated* GI.1-USA-1968-Capsidprotein SEQ ID NO: 39725; R29 + GII.4-GZ2010-L87-Guangzhou-2011 SEQ ID NO: 39734; R27	60 µg (total) i.m. 2x 100 µl	d0, d21
6	6	*Tetravalent vaccine; LNP formulated* GII.4-USA-1997 SEQ ID NO: 39738; R28 + GII.4-031693-USA-2003 SEQ ID NO: 39716; R4 + GII.4-2006b 092895-USA-2008 SEQ ID NO: 39729; R26 + GII.4-GZ2010-L87-Guangzhou-2011 SEQ ID NO: 39734; R27	60 µg (total) i.m. 2x 100 µl	d0, d21
7	6	100% RiLa Control	-	d0, d21

6.2. Norovirus challenge experiment:

At day 30 days post immunization, the vaccinated and buffer-injected control pigs are challenged orally with Norovirus GII.4 (isolated from human stool samples) to assess the protection against Norovirus-induced diarrhea and fecal virus shedding. After virus challenge, rectal swaps and feces samples are collected at day 1, 3, 5, 7 and 10. Norovirus loads in rectal swaps and feces samples are determined using quantitative PCR. In addition, pigs are monitored for Norovirus-associated symptoms and fecal consistence scores are recorded to assess severity of the Norovirus infection.

Example 7: Immunization of non-human primates and evaluation of immune responses

Non-human primates (NHPs) are immunized with protamine or LNP formulated mRNA vaccines with doses, application routes and vaccination schedules as indicated in Table 8. Analysis of immune responses is performed essentially as described in Example 4 (ELISA, HGBA, and ICS).

Table 8: Vaccination regimen of NHPs (Example 7)

Group	Number of NHPs	Treatment	Dose/Route	Vaccination schedule
1	6	*Monovalent vaccine* *protamine formulated* GII.4-2006b 092895-USA-2008 SEQ ID NO: 39729; R26	240 µg i.d. 2x 200 µl	d0, d21
2	6	*Bivalent vaccine;* *protamine formulated* GI.1-USA-1968-Capsidprotein SEQ ID NO: 39725; R29 + GII.4-GZ2010-L87-Guangzhou-2011 SEQ ID NO: 39734; R27	240 µg (total) i.d. 2x 200 µl	d0, d21
3	6	*Tetravalent vaccine; protamine formulated* GII.4-USA-1997 SEQ ID NO: 39738; R28 + GII.4-031693-USA-2003 SEQ ID NO: 39716; R4 + GII.4-2006b 092895-USA-2008 SEQ ID NO: 39729; R26 + GII.4-GZ2010-L87-Guangzhou-2011 SEQ ID NO: 39734; R27	240 µg (total) i.d. 2x 200 µl	d0, d21
4	6	*Monovalent vaccine; LNP formulated* GII.4-2006b 092895-USA-2008 SEQ ID NO: 39729; R26	60 µg i.m. 2x 100 µl	d0, d21
5	6	*Bivalent vaccine; LNP formulated*	60 µg	d0, d21

		GI.1-USA-1968-Capsidprotein SEQ ID NO: 39725; R29 + GII.4-GZ2010-L87-Guangzhou-2011 SEQ ID NO: 39734; R27	(total) i.m. 2x 100 µl	
6	6	*Tetravalent vaccine; LNP formulated* GII.4-USA-1997 SEQ ID NO: 39738; R28 + GII.4-031693-USA-2003 SEQ ID NO: 39716; R4 + GII.4-2006b 092895-USA-2008 SEQ ID NO: 39729; R26 + GII.4-GZ2010-L87-Guangzhou-2011 SEQ ID NO: 39734; R27	60 µg (total) i.m. 2x 100 µl	d0, d21
7	6	100% RiLa Control	i.m. 1x 100 µl	d0, d21

Example 8: Development of a multivalent Norovirus mRNA vaccine

8.1. Generation of bivalent, tetravalent and multivalent Norovirus mRNA vaccines

For bivalent and tetravalent Norovirus mRNA vaccines, each mRNA construct is individually produced (as described in Example 1).

Multivalent *Norovirus* vaccine compositions are produced according to procedures as disclosed in the PCT application PCT/EP2016/082487. In short, Norovirus DNA constructs (each of which comprising different norovirus coding sequences and a T7 promotor; e.g. synthetic DNA templates immobilized on a chip) are used as a matrix for simultaneous PCR amplification. The obtained PCR product mixture is purified and used as a template for simultaneous RNA *in vitro* transcription to generate a mixture of Norovirus mRNA constructs. The obtained Norovirus mRNA mixture is subjected to quantitative and qualitative measurements (e.g., RNA AGE, RT-qPCR, NGS, and Spectrometry). Following that, purification and formulation is performed (protamine formulation and LNP formulation). For the preparation of multivalent mRNA mixtures, Norovirus sequences as provided in Table 3 (see specifications) are used.

The produced bivalent, tetravalent and multivalent Norovirus mRNA vaccines are used for *in vitro* and *in vivo* experiments.

8.2. Expression analysis of multivalent Norovirus mRNA vaccines using quantitative mass spectrometry

Hela cells are transfected with bivalent, tetravalent and multivalent mRNA mixtures (see Table 9) and protein expression is analyzed using quantitative mass spectrometry to show that every mRNA comprised in the respective mRNA mixture is efficiently translated into Norovirus protein/antigen.

8.3. Immunization of mice and evaluation of Norovirus specific immune responses

Female BALB/c mice are with protamine or LNP formulated monovalent, bivalent, tetravalent or multivalent mRNA vaccines with doses, application routes and vaccination schedules as indicated in Table 9. As a negative control, one group of mice is injected with buffer (ringer lactate, RiLa). All animals are vaccinated on day 0, 21 and 35. Blood samples are collected on day 49 for the determination of binding antibody titers (using an ELISA assay), blocking antibody titers (using a HGBA assay) and cellular immune responses (ICS) performed essentially as described in Example 4.

Table 9: Vaccination regimen of mice (Example 8)

Group	Number of mice	Treatment	Dose/Route	Vaccination schedule
1	6	*Monovalent vaccine; Protamine formulated* GII.4-031693-USA-2003 SEQ ID NO: 39716; R4	40 µg i.d.	d0, d21, d35
2	6	*Bivalent vaccine; Protamine formulated* R4 or R26 or R27 or R28 + R4 or R26 or R27 or R28	80 µg (40 µg each) i.d.	d0, d21, d35
3	6	*Tetravalent vaccine; Protamine formulated* GII.4-USA-1997 SEQ ID NO: 39738; R28 + GII.4-031693-USA-2003 SEQ ID NO: 39716; R4 + GII.4-2006b 092895-USA-2008 SEQ ID NO: 39729; R26 + GII.4-GZ2010-L87-Guangzhou-2011 SEQ ID NO: 39734; R27	80 µg (20 µg each) i.d.	d0, d21, d35
4	6	*Bivalent vaccine; Protamine formulated* GI.1-USA-1968-Capsidprotein	80 µg (40 µg each)	d0, d21, d35

		SEQ ID NO: 39725; R29 + R4 or R26 or R27 or R28	i.d.	
5	6	*Tetravalent vaccine; Protamine formulated* GI.1-USA-1968-Capsidprotein SEQ ID NO: 39725; R29 + GII.4-USA-1997 SEQ ID NO: 39738; R28 + GII.4-031693-USA-2003 SEQ ID NO: 39716; R4 + GII.4-2006b 092895-USA-2008 SEQ ID NO: 39729; R26	80 µg (20 µg each) i.d.	d0, d21, d35
6	6	*Multivalent; Protamine formulated.* *20 constructs encoding Norovirus antigens of several genogroups, genotypes and strains (selected from **Table 3**).*	80 µg (total) i.d.	d0, d21, d35
7	6	*Multivalent; Protamine formulated.* *50 constructs encoding Norovirus antigens of several genogroups, genotypes and strains (selected from **Table 3**).*	80 µg (total) i.d.	d0, d21, d35
8	6	*Multivalent; LNP formulated.* *20 constructs encoding Norovirus antigens of several genogroups, genotypes and strains (selected from **Table 3**).*	80 µg (total) i.m.	d0, d21, d35
9	6	*Multivalent; LNP formulated.* *50 constructs encoding Norovirus antigens of several genogroups, genotypes and strains (selected from **Table 3**).*	80 µg (total) i.m.	d0, d21, d35
10	6	100% RiLa Control	-	d0, d21, d35

Example 9: Expression of Norovirus proteins in HeLa cells and analysis by FACS

To determine *in vitro* protein expression of the constructs, HeLa cells are transiently transfected with mRNA encoding *Norovirus* antigens and stained using suitable customized anti Norovirus-protein antibodies (raised in mouse) and a FITC-coupled secondary antibody (F5262 from Sigma).

HeLa cells are seeded in a 6-well plate at a density of 400000 cells/well in cell culture medium (RPMI, 10% FCS, 1% L-Glutamine, 1% Pen/Strep), 24h prior to transfection. HeLa cells are transfected with 1 and 2 µg unformulated mRNA using Lipofectamine 2000 (Invitrogen). The mRNA constructs are used in the experiment, including a negative control encoding an irrelevant protein. 24 hours post transfection, HeLa cells are stained with suitable anti Norovirus-protein antibodies (raised in mouse; 1:500) and anti-mouse FITC labelled secondary antibody (1:500) and subsequently analyzed by flow cytometry (FACS) on a BD FACS Canto II using the FACS Diva software. Quantitative analysis of the fluorescent FITC signal is performed using the FlowJo software package (Tree Star, Inc.).

Example 10: Expression and secretion of Norovirus proteins using western blot

For the analysis of Norovirus protein secretion, HeLa cells are transfected with 1µg and 2µg unformulated mRNA (R1 – R29, see Table 4) including a negative control encoding an irrelevant protein using Lipofectamine as the transfection agent. Supernatants, harvested 24 hours post transfection, are filtered through a 0.2µm filter. Clarified supernatants are applied on top of 1 ml 20% sucrose cushion (in PBS) and centrifuged at 14000 rcf (relative centrifugal force) for 2 hours at 4°C. *Norovirus* protein content is analyzed by Western Blot suitable customized anti Norovirus-protein antibodies (raised in mouse; 1:500 diluted) as primary antibody in combination with secondary anti mouse antibody coupled to IRDye 800CW (Licor Biosciences). The presence of αβ-tubulin is also analyzed as control for cellular contamination (αβ-tubulin; Cell Signalling Technology; 1:1000 diluted) in combination with secondary anti rabbit antibody coupled to IRDye 680RD (Licor Biosciences).

For the analysis of Norovirus proteins in cell lysates, HeLa cells are transfected with 1µg and 2 µg unformulated mRNAs (R1 – R29, see Table 4) including a negative control encoding an irrelevant protein using Lipofectamine as the transfection agent 24 hours post transfection, HeLa cells are detached by trypsin-free/EDTA buffer, harvested, and cell lysates are prepared. Cell lysates are subjected to SDS-PAGE under non-denaturating/non-reducting followed by western blot detection. Western Blot analysis is performed using a suitable customized anti Norovirus-protein antibodies antibody (raised in mouse; 1:500 diluted) as primary antibody in combination with secondary anti mouse antibody coupled to IRDye 800CW (Licor Biosciences).

Example 11: Preparation of Norovirus vaccine compositions

For in vivo vaccination experiments, different compositions of Norovirus mRNA vaccine are prepared using Norovirus mRNA constructs (see Table 4). One composition comprises protamine-complexed mRNA, one composition comprises mRNA that is formulated with an aluminum phosphate adjuvant.

11.1. Preparation of protamine complexed mRNA ("vaccine composition 1"; RNActive®):

Norovirus mRNA constructs are complexed with protamine prior to use in in vivo vaccination experiments. The mRNA complexation consists of a mixture of 50% free mRNA and 50% mRNA complexed with protamine at a weight ratio of 2:1. First, mRNA is complexed with protamine by addition of protamine-Ringer's lactate solution to mRNA. After incubation for 10 minutes, when the complexes are stably generated, free mRNA is added, and the final concentration of the vaccine is adjusted with Ringer's lactate solution.

11.2. Preparation of mRNA with alum phosphate ("vaccine composition 2"):

mRNA constructs are mixed with the desired amount of aluminum phosphate adjuvant in Ringer's lactate solution ("naked mRNA").

Example 12: Vaccination of mice and evaluation of Norovirus specific immune response

12.1. Immunization

Female BALB/c mice are injected intradermally (i.d.) and intramuscularly (i.m.) with respective mRNA vaccine compositions (prepared according to Example 11) with doses, application routes and vaccination schedules as indicated in Table 10. As a negative control, one group of mice is vaccinated with buffer (ringer lactate). All animals are vaccinated on day 1, 21 and 35. Blood samples are collected on day 21, 35, and 63 for the determination of binding and neutralizing antibody titers (see below).

Table 10: Vaccination regimen (Example 12)

Group	Number of mice	Vaccine composition	Route/Volume	Vaccination Schedule (day)
1	10	80 µg *Norovirus* RNActive® Composition 1	i. d. 2x 50 µl	0/21/35
2	10	40 µg *Norovirus* RNActive® Composition 1	i. d. 2x 50 µl	0/21/35
3	10	20 µg *Norovirus* RNActive® Composition 1	i. d. 2x 50 µl	0/21/35
4	10	40 µg *Norovirus* naked RNA Composition 2	i. m. 2x 25 µl	0/21/35
5	10	40 µg *Norovirus* naked RNA Composition 2	i. m. 2x 25 µl	0/21/35
6	10	40 µg *Norovirus* naked RNA Composition 2	i. m. 2x 25 µl	0/21/35
7	10	100% RiLa Control	i. d. 2x 50 µl	0/21/35

12.2. Determination of anti-*Norovirus* protein antibodies by ELISA:

ELISA is performed using inactivated *Norovirus* infected cell lysate for coating. Coated plates are incubated using respective serum dilutions, and binding of specific antibodies to the *Norovirus* antigens are detected using biotinylated isotype specific anti-mouse antibodies followed by streptavidin-HRP (horse radish peroxidase) with ABTS as substrate. Endpoint titers of antibodies directed against the *Norovirus* antigens are measured by ELISA on day 63 after three vaccinations.

12.3. Intracellular cytokine staining

Splenocytes from vaccinated mice are isolated according to a standard protocol known in the art. Briefly, isolated spleens are grinded through a cell strainer and washed in PBS/1%FBS followed by red blood cell lysis. After an extensive washing step with PBS/1%FBS splenocytes are seeded into 96-well plates (2×10^6 cells per well). The cells are stimulated with a mixture of four *Norovirus* protein specific peptide epitopes (5µg/ml of each peptide) in the presence of 2.5 µg/ml of an anti-CD28 antibody (BD Biosciences) for 6 hours at 37°C in the presence of a protein transport inhibitor. After stimulation, cells are washed and stained for intracellular cytokines using the Cytofix/Cytoperm reagent (BD Biosciences) according to the manufacturer's instructions. The following antibodies are used for staining: CD3-FITC (1:100), CD8-PE-Cy7 (1:200), TNF-PE (1:100), IFNγ-APC (1:100) (eBioscience), CD4-BD Horizon V450 (1:200) (BD Biosciences) and incubated with Fcγ-block diluted 1:100. Aqua Dye is used to distinguish live/dead cells (Invitrogen). Cells are acquired using a Canto II flow cytometer (Beckton Dickinson). Flow cytometry data is analyzed using FlowJo software package (Tree Star, Inc.)

12.4. *Norovirus* plaque reduction neutralization *test* (PRNT50)

Sera are analyzed by a plaque reduction neutralization test (PRNT50), performed as commonly known in the art. Briefly, obtained serum samples of vaccinated mice are incubated with *Norovirus*. That mixture is used to infect cultured cells, and the reduction in the number of plaques is determined.

Example 13: Clinical development of a Norovirus mRNA vaccine composition

To demonstrate safety and efficiency of the *Norovirus* mRNA vaccine composition, a randomized, double blind, placebo-controlled clinical trial (phase I) is initiated.

For clinical development, GMP-grade RNA is produced using an established GMP process, implementing various quality controls on DNA level and RNA level as described in detail in WO 2016/180430A1.

In the clinical trial, a cohort of human volunteers is intradermally or intramuscularly injected for at least two times with a monovalent, or a bivalent, or a tetravalent or a multivalent mRNA based Norovirus vaccine as specified herein.

In order to assess the safety profile of the *Norovirus* vaccine compositions according to the invention, subjects are monitored after administration (vital signs, vaccination site tolerability assessments, hematologic analysis).

The efficacy of the immunization is analysed by determination of virus neutralizing titers (VNT) or HBGA blocking titers in sera from vaccinated subjects. Blood samples are collected on day 0 as baseline and after completed vaccination. Sera are analyzed for virus neutralizing antibodies or HBGA blocking antibodies.

Furthermore, a subset of subjects is challenged with live GI.1 Norwalk virus or placebo by oral administration. Subjects are followed post-challenge for symptoms of Norovirus associated illness, infection and immune responses. There are multiple clinical assessments and collection of blood, emesis, saliva, and stool specimens.

Table 1: Norovirus VP1 constructs (row 1 – row 4410)

	column 1	column 2	column 3	column 4	column 5	column 6
Row	**Name**	**NCBI or Genbank Accession No.**	**A**	**B**	**C**	**Strain/Isolate**
1	VP1	ABY65350	1	4411	8821, 13231, 17641, 22051, 26461, 30871, 35281	norovirus Hu/Duan/Beijing/2006/China
2	VP1	AC055068	2	4412	8822, 13232, 17642, 22052, 26462, 30872, 35282	norovirus Hu/GII.4/Dijon/E872/2002/FRA
3	VP1	AD145808	3	4413	8823, 13233, 17643, 22053, 26463, 30873, 35283	norovirus Hu/GGII.4/Dijon/E3020/2008/FRA
4	VP1	AD145811	4	4414	8824, 13234, 17644, 22054, 26464, 30874, 35284	norovirus Hu/GGII.4/Dijon/E3436/2008/FRA
5	VP1	AD145812	5	4415	8825, 13235, 17645, 22055, 26465, 30875, 35285	norovirus Hu/GGII.4/Dijon/E3487/2009/FRA
6	VP1	AD145814	6	4416	8826, 13236, 17646, 22056, 26466, 30876, 35286	norovirus Hu/GGII.4/Dijon/E3642/2008/FRA
7	VP1	AD145815	7	4417	8827, 13237, 17647, 22057, 26467, 30877, 35287	norovirus Hu/GGII.4/Dijon/E3743/2009/FRA
8	VP1	AD145816	8	4418	8828, 13238, 17648, 22058, 26468, 30878, 35288	norovirus Hu/GGII.4/Dijon/E3808/2009/FRA
9	VP1	AD145817	9	4419	8829, 13239, 17649, 22059, 26469, 30879, 35289	norovirus Hu/GGII.4/Dijon/E3880/2009/FRA
10	VP1	AD145818	10	4420	8830, 13240, 17650, 22060, 26470, 30880, 35290	norovirus Hu/GGII.4/Dijon/E4032/2009/FRA

11	VP1	AET79296	11	4421	8831, 13241, 17651, 22061, 26471, 30881, 35291	murine norovirus
12	VP1	AFB18026	12	4422	8832, 13242, 17652, 22062, 26472, 30882, 35292	murine norovirus
13	VP1	AFB18027	13	4423	8833, 13243, 17653, 22063, 26473, 30883, 35293	murine norovirus
14	VP1	AFI08231	14	4424	8834, 13244, 17654, 22064, 26474, 30884, 35294	norovirus Hu/GI/10360/2010/VNM
15	VP1	AFI08240	15	4425	8835, 13245, 17655, 22065, 26475, 30885, 35295	norovirus Hu/GII/10012/2009/VNM
16	VP1	AFS33552	16	4426	8836, 13246, 17656, 22066, 26476, 30886, 35296	norovirus Hu/GII.4/MD120-12/1987/USA
17	VP1	AFS33555	17	4427	8837, 13247, 17657, 22067, 26477, 30887, 35297	norovirus Hu/GII.1/7EK/Hawaii/1971/USA
18	VP1	AFW15938	18	4428	8838, 13248, 17658, 22068, 26478, 30888, 35298	norovirus Hu/GII.4/N2/2008/HuZhou
19	VP1	AFW15940	19	4429	8839, 13249, 17659, 22069, 26479, 30889, 35299	norovirus Hu/GII.4/N4/2008/HuZhou
20	VP1	AFW15941	20	4430	8840, 13250, 17660, 22070, 26480, 30890, 35300	norovirus Hu/GII.4/N5/2008/HuZhou
21	VP1	AFW15944	21	4431	8841, 13251, 17661, 22071, 26481, 30891, 35301	norovirus Hu/GII.4/N78/2010/HuZhou
22	VP1	AFW15947	22	4432	8842, 13252, 17662, 22072, 26482, 30892, 35302	norovirus Hu/GII.4/N93/2011/HuZhou
23	VP1	AFW15948	23	4433	8843, 13253, 17663, 22073, 26483, 30893, 35303	norovirus Hu/GII.4/N94/2011/HuZhou
24	VP1	AFW15949	24	4434	8844, 13254, 17664, 22074, 26484, 30894, 35304	norovirus Hu/GII.4/N95/2011/HuZhou
25	VP1	AFW15950	25	4435	8845, 13255, 17665, 22075, 26485, 30895, 35305	norovirus Hu/GII.4/N100/2011/HuZhou
26	VP1	AFW15951	26	4436	8846, 13256, 17666, 22076, 26486, 30896, 35306	norovirus Hu/GII.4/N101/2011/HuZhou
27	VP1	AFX71665	27	4437	8847, 13257, 17667, 22077, 26487, 30897, 35307	norovirus Hu/GII.6/CHDC4073/1984/USA

28	VP1	AFX71668	28	4438	8848, 13258, 17668, 22078, 26488, 30898, 35308	norovirus Hu/GII.4/NIHIC9/2011/USA
29	VP1	AFX81121	29	4439	8849, 13259, 17669, 22079, 26489, 30899, 35309	norovirus Hu/Norwalk/10034/2009/VNM
30	VP1	AFX81127	30	4440	8850, 13260, 17670, 22080, 26490, 30900, 35310	norovirus Hu/Norwalk/10054/2009/VNM
31	VP1	AFX81130	31	4441	8851, 13261, 17671, 22081, 26491, 30901, 35311	norovirus Hu/Norwalk/10062/2009/VNM
32	VP1	AFX81136	32	4442	8852, 13262, 17672, 22082, 26492, 30902, 35312	norovirus Hu/Norwalk/10075/2009/VNM
33	VP1	AFX81139	33	4443	8853, 13263, 17673, 22083, 26493, 30903, 35313	norovirus Hu/Norwalk/10078/2009/VNM
34	VP1	AFX81142	34	4444	8854, 13264, 17674, 22084, 26494, 30904, 35314	norovirus Hu/Norwalk/10079/2009/VNM
35	VP1	AFX81145	35	4445	8855, 13265, 17675, 22085, 26495, 30905, 35315	norovirus Hu/Norwalk/10110/2009/VNM
36	VP1	AFX81148	36	4446	8856, 13266, 17676, 22086, 26496, 30906, 35316	norovirus Hu/Norwalk/10114/2009/VNM
37	VP1	AFX81154	37	4447	8857, 13267, 17677, 22087, 26497, 30907, 35317	norovirus Hu/Norwalk/10129/2009/VNM
38	VP1	AFX81157	38	4448	8858, 13268, 17678, 22088, 26498, 30908, 35318	norovirus Hu/Norwalk/10136/2009/VNM
39	VP1	AFX81163	39	4449	8859, 13269, 17679, 22089, 26499, 30909, 35319	norovirus Hu/Norwalk/10145/2009/VNM
40	VP1	AFX81166	40	4450	8860, 13270, 17680, 22090, 26500, 30910, 35320	norovirus Hu/Norwalk/10148/2009/VNM
41	VP1	AFX81169	41	4451	8861, 13271, 17681, 22091, 26501, 30911, 35321	norovirus Hu/Norwalk/10158/2009/VNM
42	VP1	AFX81172	42	4452	8862, 13272, 17682, 22092, 26502, 30912, 35322	norovirus Hu/Norwalk/10160/2009/VNM
43	VP1	AFX81178	43	4453	8863, 13273, 17683, 22093, 26503, 30913, 35323	norovirus Hu/Norwalk/10163/2009/VNM
44	VP1	AFX81181	44	4454	8864, 13274, 17684, 22094, 26504, 30914, 35324	norovirus Hu/Norwalk/10169/2009/VNM

45	VP1	AFX81190	45	4455	8865, 13275, 17685, 22095, 26505, 30915, 35325	norovirus Hu/Norwalk/10177/2009/VNM
46	VP1	AFX81193	46	4456	8866, 13276, 17686, 22096, 26506, 30916, 35326	norovirus Hu/Norwalk/10179/2009/VNM
47	VP1	AFX81196	47	4457	8867, 13277, 17687, 22097, 26507, 30917, 35327	norovirus Hu/Norwalk/10182/2009/VNM
48	VP1	AFX81199	48	4458	8868, 13278, 17688, 22098, 26508, 30918, 35328	norovirus Hu/Norwalk/10183/2009/VNM
49	VP1	AFX81202	49	4459	8869, 13279, 17689, 22099, 26509, 30919, 35329	norovirus Hu/Norwalk/10194/2009/VNM
50	VP1	AFX81205	50	4460	8870, 13280, 17690, 22100, 26510, 30920, 35330	norovirus Hu/Norwalk/10199/2009/VNM
51	VP1	AFX81208	51	4461	8871, 13281, 17691, 22101, 26511, 30921, 35331	norovirus Hu/Norwalk/10203/2009/VNM
52	VP1	AFX81211	52	4462	8872, 13282, 17692, 22102, 26512, 30922, 35332	norovirus Hu/Norwalk/10204/2009/VNM
53	VP1	AFX81214	53	4463	8873, 13283, 17693, 22103, 26513, 30923, 35333	norovirus Hu/Norwalk/10222/2009/VNM
54	VP1	AFX81226	54	4464	8874, 13284, 17694, 22104, 26514, 30924, 35334	norovirus Hu/Norwalk/10238/2009/VNM
55	VP1	AFX81229	55	4465	8875, 13285, 17695, 22105, 26515, 30925, 35335	norovirus Hu/Norwalk/10247/2009/VNM
56	VP1	AFX81232	56	4466	8876, 13286, 17696, 22106, 26516, 30926, 35336	norovirus Hu/Norwalk/10255/2009/VNM
57	VP1	AFX81238	57	4467	8877, 13287, 17697, 22107, 26517, 30927, 35337	norovirus Hu/Norwalk/10296/2010/VNM
58	VP1	AFX81241	58	4468	8878, 13288, 17698, 22108, 26518, 30928, 35338	norovirus Hu/Norwalk/10313/2010/VNM
59	VP1	AFX81247	59	4469	8879, 13289, 17699, 22109, 26519, 30929, 35339	norovirus Hu/Norwalk/10328/2010/VNM
60	VP1	AFX81250	60	4470	8880, 13290, 17700, 22110, 26520, 30930, 35340	norovirus Hu/Norwalk/10368/2010/VNM
61	VP1	AFX81253	61	4471	8881, 13291, 17701, 22111, 26521, 30931, 35341	norovirus Hu/Norwalk/10378/2010/VNM

62	VP1	AFX81256	62	4472	8882, 13292, 17702, 22112, 26522, 30932, 35342	norovirus Hu/Norwalk/10386/2010/VNM
63	VP1	AFX81262	63	4473	8883, 13293, 17703, 22113, 26523, 30933, 35343	norovirus Hu/Norwalk/20010/2009/VNM
64	VP1	AFX81265	64	4474	8884, 13294, 17704, 22114, 26524, 30934, 35344	norovirus Hu/Norwalk/20014/2009/VNM
65	VP1	AFX81268	65	4475	8885, 13295, 17705, 22115, 26525, 30935, 35345	norovirus Hu/Norwalk/20016/2009/VNM
66	VP1	AFX81271	66	4476	8886, 13296, 17706, 22116, 26526, 30936, 35346	norovirus Hu/Norwalk/20019/2009/VNM
67	VP1	AFX81274	67	4477	8887, 13297, 17707, 22117, 26527, 30937, 35347	norovirus Hu/Norwalk/20033/2009/VNM
68	VP1	AFX81277	68	4478	8888, 13298, 17708, 22118, 26528, 30938, 35348	norovirus Hu/Norwalk/20035/2009/VNM
69	VP1	AFX81283	69	4479	8889, 13299, 17709, 22119, 26529, 30939, 35349	norovirus Hu/Norwalk/20047/2009/VNM
70	VP1	AFX81289	70	4480	8890, 13300, 17710, 22120, 26530, 30940, 35350	norovirus Hu/Norwalk/20067/2009/VNM
71	VP1	AFX81292	71	4481	8891, 13301, 17711, 22121, 26531, 30941, 35351	norovirus Hu/Norwalk/20069/2009/VNM
72	VP1	AFX81295	72	4482	8892, 13302, 17712, 22122, 26532, 30942, 35352	norovirus Hu/Norwalk/20092/2009/VNM
73	VP1	AFX81298	73	4483	8893, 13303, 17713, 22123, 26533, 30943, 35353	norovirus Hu/Norwalk/20093/2009/VNM
74	VP1	AFX81301	74	4484	8894, 13304, 17714, 22124, 26534, 30944, 35354	norovirus Hu/Norwalk/20094/2009/VNM
75	VP1	AFX81304	75	4485	8895, 13305, 17715, 22125, 26535, 30945, 35355	norovirus Hu/Norwalk/20118/2009/VNM
76	VP1	AFX81307	76	4486	8896, 13306, 17716, 22126, 26536, 30946, 35356	norovirus Hu/Norwalk/20122/2009/VNM
77	VP1	AFX81313	77	4487	8897, 13307, 17717, 22127, 26537, 30947, 35357	norovirus Hu/Norwalk/20128/2009/VNM
78	VP1	AFX81316	78	4488	8898, 13308, 17718, 22128, 26538, 30948, 35358	norovirus Hu/Norwalk/20135/2009/VNM

79	VP1	AFX81319	79	4489	8899, 13309, 17719, 22129, 26539, 30949, 35359	norovirus Hu/Norwalk/20139/2009/VNM
80	VP1	AFX81322	80	4490	8900, 13310, 17720, 22130, 26540, 30950, 35360	norovirus Hu/Norwalk/20140/2009/VNM
81	VP1	AFX81325	81	4491	8901, 13311, 17721, 22131, 26541, 30951, 35361	norovirus Hu/Norwalk/20142/2009/VNM
82	VP1	AGE89433	82	4492	8902, 13312, 17722, 22132, 26542, 30952, 35362	norovirus Hu/GII/10101/2009/VNM
83	VP1	AGE89436	83	4493	8903, 13313, 17723, 22133, 26543, 30953, 35363	norovirus Hu/GII/10127/2009/VNM
84	VP1	AGE89439	84	4494	8904, 13314, 17724, 22134, 26544, 30954, 35364	norovirus Hu/GII/10370/2010/VNM
85	VP1	AGE89442	85	4495	8905, 13315, 17725, 22135, 26545, 30955, 35365	norovirus Hu/GII/10405/2010/VNM
86	VP1	AGE89445	86	4496	8906, 13316, 17726, 22136, 26546, 30956, 35366	norovirus Hu/GII/10406/2010/VNM
87	VP1	AGE89448	87	4497	8907, 13317, 17727, 22137, 26547, 30957, 35367	norovirus Hu/GII/10411/2010/VNM
88	VP1	AGE89451	88	4498	8908, 13318, 17728, 22138, 26548, 30958, 35368	norovirus Hu/GII/10420/2010/VNM
89	VP1	AGE89454	89	4499	8909, 13319, 17729, 22139, 26549, 30959, 35369	norovirus Hu/GII/20048/2009/VNM
90	VP1	AGE89457	90	4500	8910, 13320, 17730, 22140, 26550, 30960, 35370	norovirus Hu/GII/20064/2009/VNM
91	VP1	AGE89460	91	4501	8911, 13321, 17731, 22141, 26551, 30961, 35371	norovirus Hu/GII/20079/2009/VNM
92	VP1	AGE89463	92	4502	8912, 13322, 17732, 22142, 26552, 30962, 35372	norovirus Hu/GII/20107/2009/VNM
93	VP1	AGE89466	93	4503	8913, 13323, 17733, 22143, 26553, 30963, 35373	norovirus Hu/GII/20108/2009/VNM
94	VP1	AGE89472	94	4504	8914, 13324, 17734, 22144, 26554, 30964, 35374	norovirus Hu/GII/20146/2009/VNM
95	VP1	AGE89475	95	4505	8915, 13325, 17735, 22145, 26555, 30965, 35375	norovirus Hu/GII/20150/2009/VNM

96	VP1	AGE89478	96	4506	8916, 13326, 17736, 22146, 26556, 30966, 35376	norovirus Hu/GII/20151/2009/VNM
97	VP1	AGE89481	97	4507	8917, 13327, 17737, 22147, 26557, 30967, 35377	norovirus Hu/GII/20153/2009/VNM
98	VP1	AGE89490	98	4508	8918, 13328, 17738, 22148, 26558, 30968, 35378	norovirus Hu/GII/20159/2009/VNM
99	VP1	AGE89493	99	4509	8919, 13329, 17739, 22149, 26559, 30969, 35379	norovirus Hu/GII/20161/2009/VNM
100	VP1	AGE89496	100	4510	8920, 13330, 17740, 22150, 26560, 30970, 35380	norovirus Hu/GII/20162/2009/VNM
101	VP1	AGE89499	101	4511	8921, 13331, 17741, 22151, 26561, 30971, 35381	norovirus Hu/GII/20164/2009/VNM
102	VP1	AGE89502	102	4512	8922, 13332, 17742, 22152, 26562, 30972, 35382	norovirus Hu/GII/20171/2009/VNM
103	VP1	AGE89505	103	4513	8923, 13333, 17743, 22153, 26563, 30973, 35383	norovirus Hu/GII/20172/2009/VNM
104	VP1	AGE89508	104	4514	8924, 13334, 17744, 22154, 26564, 30974, 35384	norovirus Hu/GII/20173/2009/VNM
105	VP1	AGE89511	105	4515	8925, 13335, 17745, 22155, 26565, 30975, 35385	norovirus Hu/GII/20176/2009/VNM
106	VP1	AGE89514	106	4516	8926, 13336, 17746, 22156, 26566, 30976, 35386	norovirus Hu/GII/20180/2009/VNM
107	VP1	AGE89517	107	4517	8927, 13337, 17747, 22157, 26567, 30977, 35387	norovirus Hu/GII/20182/2009/VNM
108	VP1	AGE89520	108	4518	8928, 13338, 17748, 22158, 26568, 30978, 35388	norovirus Hu/GII/20184/2009/VNM
109	VP1	AGE89523	109	4519	8929, 13339, 17749, 22159, 26569, 30979, 35389	norovirus Hu/GII/20185/2009/VNM
110	VP1	AGE89526	110	4520	8930, 13340, 17750, 22160, 26570, 30980, 35390	norovirus Hu/GII/20187/2009/VNM
111	VP1	AGE89529	111	4521	8931, 13341, 17751, 22161, 26571, 30981, 35391	norovirus Hu/GII/20189/2009/VNM
112	VP1	AGE89532	112	4522	8932, 13342, 17752, 22162, 26572, 30982, 35392	norovirus Hu/GII/20190/2009/VNM

113	VP1	AGE89535	113	4523	8933, 13343, 17753, 22163, 26573, 30983, 35393	norovirus Hu/GII/20192/2009/VNM
114	VP1	AGE89538	114	4524	8934, 13344, 17754, 22164, 26574, 30984, 35394	norovirus Hu/GII/20196/2009/VNM
115	VP1	AGE89541	115	4525	8935, 13345, 17755, 22165, 26575, 30985, 35395	norovirus Hu/GII/20198/2009/VNM
116	VP1	AGE89544	116	4526	8936, 13346, 17756, 22166, 26576, 30986, 35396	norovirus Hu/GII/20202/2009/VNM
117	VP1	AGE89547	117	4527	8937, 13347, 17757, 22167, 26577, 30987, 35397	norovirus Hu/GII/20205/2009/VNM
118	VP1	AGE89550	118	4528	8938, 13348, 17758, 22168, 26578, 30988, 35398	norovirus Hu/GII/20206/2009/VNM
119	VP1	AGE89553	119	4529	8939, 13349, 17759, 22169, 26579, 30989, 35399	norovirus Hu/GII/20208/2009/VNM
120	VP1	AGE89556	120	4530	8940, 13350, 17760, 22170, 26580, 30990, 35400	norovirus Hu/GII/20215/2009/VNM
121	VP1	AGE89559	121	4531	8941, 13351, 17761, 22171, 26581, 30991, 35401	norovirus Hu/GII/20217/2009/VNM
122	VP1	AGE89562	122	4532	8942, 13352, 17762, 22172, 26582, 30992, 35402	norovirus Hu/GII/20229/2009/VNM
123	VP1	AGE89565	123	4533	8943, 13353, 17763, 22173, 26583, 30993, 35403	norovirus Hu/GII/20230/2009/VNM
124	VP1	AGE89568	124	4534	8944, 13354, 17764, 22174, 26584, 30994, 35404	norovirus Hu/GII/20233/2009/VNM
125	VP1	AGE89571	125	4535	8945, 13355, 17765, 22175, 26585, 30995, 35405	norovirus Hu/GII/20248/2009/VNM
126	VP1	AGE89574	126	4536	8946, 13356, 17766, 22176, 26586, 30996, 35406	norovirus Hu/GII/20258/2009/VNM
127	VP1	AGE89577	127	4537	8947, 13357, 17767, 22177, 26587, 30997, 35407	norovirus Hu/GII/20263/2009/VNM
128	VP1	AGE89580	128	4538	8948, 13358, 17768, 22178, 26588, 30998, 35408	norovirus Hu/GII/20271/2009/VNM
129	VP1	AGE89583	129	4539	8949, 13359, 17769, 22179, 26589, 30999, 35409	norovirus Hu/GII/20276/2009/VNM

130	VP1	AGE89586	130	4540	8950, 13360, 17770, 22180, 26590, 31000, 35410	norovirus Hu/GII/20302/2009/VNM
131	VP1	AGE89589	131	4541	8951, 13361, 17771, 22181, 26591, 31001, 35411	norovirus Hu/GII/20344/2009/VNM
132	VP1	AGE89592	132	4542	8952, 13362, 17772, 22182, 26592, 31002, 35412	norovirus Hu/GII/20350/2009/VNM
133	VP1	AGE89595	133	4543	8953, 13363, 17773, 22183, 26593, 31003, 35413	norovirus Hu/GII/20357/2009/VNM
134	VP1	AGE89598	134	4544	8954, 13364, 17774, 22184, 26594, 31004, 35414	norovirus Hu/GII/20365/2010/VNM
135	VP1	AGE89601	135	4545	8955, 13365, 17775, 22185, 26595, 31005, 35415	norovirus Hu/GII/20373/2010/VNM
136	VP1	AGE89604	136	4546	8956, 13366, 17776, 22186, 26596, 31006, 35416	norovirus Hu/GII/20407/2010/VNM
137	VP1	AGE89607	137	4547	8957, 13367, 17777, 22187, 26597, 31007, 35417	norovirus Hu/GII/20413/2010/VNM
138	VP1	AGE89610	138	4548	8958, 13368, 17778, 22188, 26598, 31008, 35418	norovirus Hu/GII/20424/2010/VNM
139	VP1	AGE89613	139	4549	8959, 13369, 17779, 22189, 26599, 31009, 35419	norovirus Hu/GII/20448/2010/VNM
140	VP1	AGE89616	140	4550	8960, 13370, 17780, 22190, 26600, 31010, 35420	norovirus Hu/GII/20457/2010/VNM
141	VP1	AGE89622	141	4551	8961, 13371, 17781, 22191, 26601, 31011, 35421	norovirus Hu/GII/20469/2010/VNM
142	VP1	AGE89625	142	4552	8962, 13372, 17782, 22192, 26602, 31012, 35422	norovirus Hu/GII/20477/2010/VNM
143	VP1	AGE89628	143	4553	8963, 13373, 17783, 22193, 26603, 31013, 35423	norovirus Hu/GII/20478/2010/VNM
144	VP1	AGE89631	144	4554	8964, 13374, 17784, 22194, 26604, 31014, 35424	norovirus Hu/GII/30017/2009/VNM
145	VP1	AGE89634	145	4555	8965, 13375, 17785, 22195, 26605, 31015, 35425	norovirus Hu/GII/30026/2009/VNM
146	VP1	AGE89637	146	4556	8966, 13376, 17786, 22196, 26606, 31016, 35426	norovirus Hu/GII/30040/2009/VNM

147	VP1	AGE89640	147	4557	8967, 13377, 17787, 22197, 26607, 31017, 35427	norovirus Hu/GII/30045/2009/VNM
148	VP1	AGE89643	148	4558	8968, 13378, 17788, 22198, 26608, 31018, 35428	norovirus Hu/GII/30112/2009/VNM
149	VP1	AGE89646	149	4559	8969, 13379, 17789, 22199, 26609, 31019, 35429	norovirus Hu/GII/30113/2009/VNM
150	VP1	AGE89649	150	4560	8970, 13380, 17790, 22200, 26610, 31020, 35430	norovirus Hu/GII/30129/2009/VNM
151	VP1	AGE89652	151	4561	8971, 13381, 17791, 22201, 26611, 31021, 35431	norovirus Hu/GII/30199/2009/VNM
152	VP1	AGE89655	152	4562	8972, 13382, 17792, 22202, 26612, 31022, 35432	norovirus Hu/GII/30201/2009/VNM
153	VP1	AGE89658	153	4563	8973, 13383, 17793, 22203, 26613, 31023, 35433	norovirus Hu/GII/30206/2009/VNM
154	VP1	AGE89661	154	4564	8974, 13384, 17794, 22204, 26614, 31024, 35434	norovirus Hu/GII/30207/2009/VNM
155	VP1	AGE89664	155	4565	8975, 13385, 17795, 22205, 26615, 31025, 35435	norovirus Hu/GII/30211/2009/VNM
156	VP1	AGE89667	156	4566	8976, 13386, 17796, 22206, 26616, 31026, 35436	norovirus Hu/GII/30212/2009/VNM
157	VP1	AGE89673	157	4567	8977, 13387, 17797, 22207, 26617, 31027, 35437	norovirus Hu/GII/30266/2009/VNM
158	VP1	AGE99603	158	4568	8978, 13388, 17798, 22208, 26618, 31028, 35438	norovirus Hu/GII.4/NIHIC4.1/2011/USA
159	VP1	AGI17592	159	4569	8979, 13389, 17799, 22209, 26619, 31029, 35439	norovirus Hu/GII.17/C142/1978/GUF
160	VP1	AGI17594	160	4570	8980, 13390, 17800, 22210, 26620, 31030, 35440	norovirus Hu/GII.3/NIHIC8.1/2011/USA
161	VP1	AGK36311	161	4571	8981, 13391, 17801, 22211, 26621, 31031, 35441	norovirus Hu/GII.4/20199/2009/VNM
162	VP1	AGK36314	162	4572	8982, 13392, 17802, 22212, 26622, 31032, 35442	norovirus Hu/GII.4/20406/2010/VNM
163	VP1	AGM33208	163	4573	8983, 13393, 17803, 22213, 26623, 31033, 35443	norovirus Hu/GI.1/CHA7A009/2010/USA

164	VP1	AGM33214	164	4574	8984, 13394, 17804, 22214, 26624, 31034, 35444	norovirus Hu/GI.1/CHA6A003_20091028/2009/USA
165	VP1	AGM33217	165	4575	8985, 13395, 17805, 22215, 26625, 31035, 35445	norovirus Hu/GI.1/CHA2A014/2008/USA
166	VP1	AGM33220	166	4576	8986, 13396, 17806, 22216, 26626, 31036, 35446	norovirus Hu/GI.1/CHA6A007/2010/USA
167	VP1	AGM33226	167	4577	8987, 13397, 17807, 22217, 26627, 31037, 35447	norovirus Hu/GI.1/CH4X0533/2009/USA
168	VP1	AGM33229	168	4578	8988, 13398, 17808, 22218, 26628, 31038, 35448	norovirus Hu/GI.1/CHA5A010/2009/USA
169	VP1	AGM33232	169	4579	8989, 13399, 17809, 22219, 26629, 31039, 35449	norovirus Hu/GI.1/CHA9A004_20110426/2011/USA
170	VP1	AGM33235	170	4580	8990, 13400, 17810, 22220, 26630, 31040, 35450	norovirus Hu/GI.1/CHA6A014/2009/USA
171	VP1	AGM33238	171	4581	8991, 13401, 17811, 22221, 26631, 31041, 35451	norovirus Hu/GI.1/CHA3A007/2008/USA
172	VP1	AGM33241	172	4582	8992, 13402, 17812, 22222, 26632, 31042, 35452	norovirus Hu/GI.1/CHA7A011/2010/USA
173	VP1	AGM33244	173	4583	8993, 13403, 17813, 22223, 26633, 31043, 35453	norovirus Hu/GI.1/CHA6A003_20091104/2009/USA
174	VP1	AGO59890	174	4584	8994, 13404, 17814, 22224, 26634, 31044, 35454	murine norovirus 1
175	VP1	AGT17782	175	4585	8995, 13405, 17815, 22225, 26635, 31045, 35455	norovirus Hu/GII.4/NIHIC28.4/2012/USA
176	VP1	AGT17785	176	4586	8996, 13406, 17816, 22226, 26636, 31046, 35456	norovirus Hu/GI.1/8MollIL/1972/USA
177	VP1	AGT17788	177	4587	8997, 13407, 17817, 22227, 26637, 31047, 35457	norovirus Hu/GII.4/NIHIC17.7/2012/USA
178	VP1	AGT17792	178	4588	8998, 13408, 17818, 22228, 26638, 31048, 35458	norovirus Hu/GI.1/8W/1968/USA
179	VP1	AGT17795	179	4589	8999, 13409, 17819, 22229, 26639, 31049, 35459	norovirus Hu/GII.4/NIHIC13/2011/USA
180	VP1	AGT17798	180	4590	9000, 13410, 17820, 22230, 26640, 31050, 35460	norovirus Hu/GII.4/NIHIC1.13/2012/USA

181	VP1	AGT17803	181	4591	9001, 13411, 17821, 22231, 26641, 31051, 35461	norovirus Hu/GI.1/8McIII/1973/USA
182	VP1	AGT17806	182	4592	9002, 13412, 17822, 22232, 26642, 31052, 35462	norovirus Hu/GI.1/8CKIIIc/1974/USA
183	VP1	AGT17809	183	4593	9003, 13413, 17823, 22233, 26643, 31053, 35463	norovirus Hu/GI.1/8UIIIf/1973/USA
184	VP1	AGT17813	184	4594	9004, 13414, 17824, 22234, 26644, 31054, 35464	norovirus Hu/GII.4/NIHIC17.1/2012/USA
185	VP1	AGT17816	185	4595	9005, 13415, 17825, 22235, 26645, 31055, 35465	norovirus Hu/GII.4/NIHIC27.1/2012/USA
186	VP1	AGT17819	186	4596	9006, 13416, 17826, 22236, 26646, 31056, 35466	norovirus Hu/GII.4/NIHIC18.1/2012/USA
187	VP1	AGT17823	187	4597	9007, 13417, 17827, 22237, 26647, 31057, 35467	norovirus Hu/GII.4/NIHIC1.3/2010/USA
188	VP1	AGT17826	188	4598	9008, 13418, 17828, 22238, 26648, 31058, 35468	norovirus Hu/GI.1/8K/1979/USA
189	VP1	AGT17830	189	4599	9009, 13419, 17829, 22239, 26649, 31059, 35469	norovirus Hu/GII.4/NIHIC28.5/2012/USA
190	VP1	AGT17833	190	4600	9010, 13420, 17830, 22240, 26650, 31060, 35470	norovirus Hu/GII.4/NIHIC20/2012/USA
191	VP1	AGT17836	191	4601	9011, 13421, 17831, 22241, 26651, 31061, 35471	norovirus Hu/GI.1/8MC/1978/USA
192	VP1	AGT17842	192	4602	9012, 13422, 17832, 22242, 26652, 31062, 35472	norovirus Hu/GII.4/NIHIC1.5/2011/USA
193	VP1	AGU68328	193	4603	9013, 13423, 17833, 22243, 26653, 31063, 35473	norovirus PA13/2013/ITA
194	VP1	AGX85889	194	4604	9014, 13424, 17834, 22244, 26654, 31064, 35474	norovirus Hu/GII.4/NIHIC1.8/2012/USA
195	VP1	AGX85892	195	4605	9015, 13425, 17835, 22245, 26655, 31065, 35475	norovirus Hu/GII.4/NIHIC1.10/2012/USA
196	VP1	AGX85895	196	4606	9016, 13426, 17836, 22246, 26656, 31066, 35476	norovirus Hu/GII.4/NIHIC1.7/2012/USA
197	VP1	AGX85904	197	4607	9017, 13427, 17837, 22247, 26657, 31067, 35477	norovirus Hu/GII.4/NIHIC27.2/2012/USA

198	VP1	AGX85913	198	4608	9018, 13428, 17838, 22248, 26658, 31068, 35478	norovirus Hu/GII.4/NIHIC1.14/2012/USA
199	VP1	AGX85916	199	4609	9019, 13429, 17839, 22249, 26659, 31069, 35479	norovirus Hu/GII.4/NIHIC17.6/2012/USA
200	VP1	AGX85931	200	4610	9020, 13430, 17840, 22250, 26660, 31070, 35480	norovirus Hu/GII.4/NIHIC1.12/2012/USA
201	VP1	AGX85934	201	4611	9021, 13431, 17841, 22251, 26661, 31071, 35481	norovirus Hu/GII.4/NIHIC1.11/2012/USA
202	VP1	AHI59154	202	4612	9022, 13432, 17842, 22252, 26662, 31072, 35482	norovirus Hu/GII.6/HS245/2010/USA
203	VP1	AHI59157	203	4613	9023, 13433, 17843, 22253, 26663, 31073, 35483	norovirus Hu/GII.4/HS292/2012/USA
204	VP1	AHI59159	204	4614	9024, 13434, 17844, 22254, 26664, 31074, 35484	norovirus Hu/GII.2/HS255/2011/USA
205	VP1	AHK24788	205	4615	9025, 13435, 17845, 22255, 26665, 31075, 35485	murine norovirus
206	VP1	AHX22018	206	4616	9026, 13436, 17846, 22256, 26666, 31076, 35486	norovirus Hu/GII/BGIC0434/2012/BGD
207	VP1	AHX22021	207	4617	9027, 13437, 17847, 22257, 26667, 31077, 35487	norovirus Hu/GII/BGIC0204/2011/BGD
208	VP1	AHX22025	208	4618	9028, 13438, 17848, 22258, 26668, 31078, 35488	norovirus Hu/GII/BGIC0282/2011/BGD
209	VP1	AHX22028	209	4619	9029, 13439, 17849, 22259, 26669, 31079, 35489	norovirus Hu/GII/BGIC0391/2012/BGD
210	VP1	AHX22032	210	4620	9030, 13440, 17850, 22260, 26670, 31080, 35490	norovirus Hu/GII/BGIC0066/2011/BGD
211	VP1	AHX22038	211	4621	9031, 13441, 17851, 22261, 26671, 31081, 35491	norovirus Hu/GII/BGIC0398/2012/BGD
212	VP1	AHX22041	212	4622	9032, 13442, 17852, 22262, 26672, 31082, 35492	norovirus Hu/GII/BGIC0405/2012/BGD
213	VP1	AHX22047	213	4623	9033, 13443, 17853, 22263, 26673, 31083, 35493	norovirus Hu/GII/BGIC0004/2010/BGD
214	VP1	AHX22050	214	4624	9034, 13444, 17854, 22264, 26674, 31084, 35494	norovirus Hu/GII/BGIC0241-33/2011/BGD

215	VP1	AHX22054	215	4625	9035, 13445, 17855, 22265, 26675, 31085, 35495	norovirus Hu/GII/BGIC0270/2011/BGD
216	VP1	AIA96988	216	4626	9036, 13446, 17856, 22266, 26676, 31086, 35496	norovirus GII
217	VP1	AII02569	217	4627	9037, 13447, 17857, 22267, 26677, 31087, 35497	norovirus Hu/GII/10116/2009/VNM
218	VP1	AII02572	218	4628	9038, 13448, 17858, 22268, 26678, 31088, 35498	norovirus Hu/GII/10054/2009/VNM
219	VP1	AII02575	219	4629	9039, 13449, 17859, 22269, 26679, 31089, 35499	norovirus Hu/GII/10114/2009/VNM
220	VP1	AII02578	220	4630	9040, 13450, 17860, 22270, 26680, 31090, 35500	norovirus Hu/GII/10313/2010/VNM
221	VP1	AII02581	221	4631	9041, 13451, 17861, 22271, 26681, 31091, 35501	norovirus Hu/GII/30212/2009/VNM
222	VP1	AII02584	222	4632	9042, 13452, 17862, 22272, 26682, 31092, 35502	norovirus Hu/GII/10148/2009/VNM
223	VP1	AII02590	223	4633	9043, 13453, 17863, 22273, 26683, 31093, 35503	norovirus Hu/GII/10110/2009/VNM
224	VP1	AII02593	224	4634	9044, 13454, 17864, 22274, 26684, 31094, 35504	norovirus Hu/GII/10325/2010/VNM
225	VP1	AII02596	225	4635	9045, 13455, 17865, 22275, 26685, 31095, 35505	norovirus Hu/GII/10101/2009/VNM
226	VP1	AII02599	226	4636	9046, 13456, 17866, 22276, 26686, 31096, 35506	norovirus Hu/GII/10002/2009/VNM
227	VP1	AII02602	227	4637	9047, 13457, 17867, 22277, 26687, 31097, 35507	norovirus Hu/GII/30351/2009/VNM
228	VP1	AII02605	228	4638	9048, 13458, 17868, 22278, 26688, 31098, 35508	norovirus Hu/GII/30448/2010/VNM
229	VP1	AII02608	229	4639	9049, 13459, 17869, 22279, 26689, 31099, 35509	norovirus Hu/GII/30468/2010/VNM
230	VP1	AII02614	230	4640	9050, 13460, 17870, 22280, 26690, 31100, 35510	norovirus Hu/GII/10193/2009/VNM
231	VP1	AII02623	231	4641	9051, 13461, 17871, 22281, 26691, 31101, 35511	norovirus Hu/GII/20088/2009/VNM

232	VP1	AII02626	232	4642	9052, 13462, 17872, 22282, 26692, 31102, 35512	norovirus Hu/GII/20118/2009/VNM
233	VP1	AII02629	233	4643	9053, 13463, 17873, 22283, 26693, 31103, 35513	norovirus Hu/GII/C2H-20/2011/VNM
234	VP1	AII02632	234	4644	9054, 13464, 17874, 22284, 26694, 31104, 35514	norovirus Hu/GII/10173/2009/VNM
235	VP1	AII02635	235	4645	9055, 13465, 17875, 22285, 26695, 31105, 35515	norovirus Hu/GII/10136/2009/VNM
236	VP1	AII02638	236	4646	9056, 13466, 17876, 22286, 26696, 31106, 35516	norovirus Hu/GII/C2033/2010/VNM
237	VP1	AII02641	237	4647	9057, 13467, 17877, 22287, 26697, 31107, 35517	norovirus Hu/GII/20151/2009/VNM
238	VP1	AII02644	238	4648	9058, 13468, 17878, 22288, 26698, 31108, 35518	norovirus Hu/GII/20460/2010/VNM
239	VP1	AII02647	239	4649	9059, 13469, 17879, 22289, 26699, 31109, 35519	norovirus Hu/GII/10199/2009/VNM
240	VP1	AII02650	240	4650	9060, 13470, 17880, 22290, 26700, 31110, 35520	norovirus Hu/GII/C2007/2010/VNM
241	VP1	AII02653	241	4651	9061, 13471, 17881, 22291, 26701, 31111, 35521	norovirus Hu/GII/20066/2009/VNM
242	VP1	AII02656	242	4652	9062, 13472, 17882, 22292, 26702, 31112, 35522	norovirus Hu/GII/20479/2010/VNM
243	VP1	AII02659	243	4653	9063, 13473, 17883, 22293, 26703, 31113, 35523	norovirus Hu/GII/10012/2009/VNM
244	VP1	AII02662	244	4654	9064, 13474, 17884, 22294, 26704, 31114, 35524	norovirus Hu/GII/C2H-24/2011/VNM
245	VP1	AII02665	245	4655	9065, 13475, 17885, 22295, 26705, 31115, 35525	norovirus Hu/GII/10062/2009/VNM
246	VP1	AII02668	246	4656	9066, 13476, 17886, 22296, 26706, 31116, 35526	norovirus Hu/GII/20494/2010/VNM
247	VP1	AII02671	247	4657	9067, 13477, 17887, 22297, 26707, 31117, 35527	norovirus Hu/GII/10079/2009/VNM
248	VP1	AII02674	248	4658	9068, 13478, 17888, 22298, 26708, 31118, 35528	norovirus Hu/GII/C2H-31/2011/VNM

249	VP1	AII02677	249	4659	9069, 13479, 17889, 22299, 26709, 31119, 35529	norovirus Hu/GII/10285/2010/VNM
250	VP1	AII02680	250	4660	9070, 13480, 17890, 22300, 26710, 31120, 35530	norovirus Hu/GII/30399/2010/VNM
251	VP1	AII02683	251	4661	9071, 13481, 17891, 22301, 26711, 31121, 35531	norovirus Hu/GII/10182/2009/VNM
252	VP1	AII02689	252	4662	9072, 13482, 17892, 22302, 26712, 31122, 35532	norovirus Hu/GII/10158/2009/VNM
253	VP1	AII02692	253	4663	9073, 13483, 17893, 22303, 26713, 31123, 35533	norovirus Hu/GII/10176/2009/VNM
254	VP1	AII02695	254	4664	9074, 13484, 17894, 22304, 26714, 31124, 35534	norovirus Hu/GII/20150/2009/VNM
255	VP1	AII02698	255	4665	9075, 13485, 17895, 22305, 26715, 31125, 35535	norovirus Hu/GII/10204/2009/VNM
256	VP1	AII02701	256	4666	9076, 13486, 17896, 22306, 26716, 31126, 35536	norovirus Hu/GII/10034/2009/VNM
257	VP1	AII02707	257	4667	9077, 13487, 17897, 22307, 26717, 31127, 35537	norovirus Hu/GII/10075/2009/VNM
258	VP1	AII02710	258	4668	9078, 13488, 17898, 22308, 26718, 31128, 35538	norovirus Hu/GII/10074/2009/VNM
259	VP1	AII02713	259	4669	9079, 13489, 17899, 22309, 26719, 31129, 35539	norovirus Hu/GII/C2H-25/2011/VNM
260	VP1	AII02716	260	4670	9080, 13490, 17900, 22310, 26720, 31130, 35540	norovirus Hu/GII/C2H-27/2011/VNM
261	VP1	AII02719	261	4671	9081, 13491, 17901, 22311, 26721, 31131, 35541	norovirus Hu/GII/20486/2010/VNM
262	VP1	AII02722	262	4672	9082, 13492, 17902, 22312, 26722, 31132, 35542	norovirus Hu/GII/30116/2009/VNM
263	VP1	AII02725	263	4673	9083, 13493, 17903, 22313, 26723, 31133, 35543	norovirus Hu/GII/10108/2009/VNM
264	VP1	AII02728	264	4674	9084, 13494, 17904, 22314, 26724, 31134, 35544	norovirus Hu/GII/30241/2009/VNM
265	VP1	AII02731	265	4675	9085, 13495, 17905, 22315, 26725, 31135, 35545	norovirus Hu/GII/30443/2010/VNM

266	VP1	AII02734	266	4676	9086, 13496, 17906, 22316, 26726, 31136, 35546	norovirus Hu/GII/20092/2009/VNM
267	VP1	AII02737	267	4677	9087, 13497, 17907, 22317, 26727, 31137, 35547	norovirus Hu/GII/20079/2009/VNM
268	VP1	AII02740	268	4678	9088, 13498, 17908, 22318, 26728, 31138, 35548	norovirus Hu/GII/10137/2009/VNM
269	VP1	AII02743	269	4679	9089, 13499, 17909, 22319, 26729, 31139, 35549	norovirus Hu/GII/10051/2009/VNM
270	VP1	AII02746	270	4680	9090, 13500, 17910, 22320, 26730, 31140, 35550	norovirus Hu/GII/C2H-36/2011/VNM
271	VP1	AII02749	271	4681	9091, 13501, 17911, 22321, 26731, 31141, 35551	norovirus Hu/GII/20145/2009/VNM
272	VP1	AII02752	272	4682	9092, 13502, 17912, 22322, 26732, 31142, 35552	norovirus Hu/GII/20188/2009/VNM
273	VP1	AII02758	273	4683	9093, 13503, 17913, 22323, 26733, 31143, 35553	norovirus Hu/GII/20357/2009/VNM
274	VP1	AII02761	274	4684	9094, 13504, 17914, 22324, 26734, 31144, 35554	norovirus Hu/GII/C2418/2010/VNM
275	VP1	AII02764	275	4685	9095, 13505, 17915, 22325, 26735, 31145, 35555	norovirus Hu/GII/10195/2009/VNM
276	VP1	AII02767	276	4686	9096, 13506, 17916, 22326, 26736, 31146, 35556	norovirus Hu/GII/20067/2009/VNM
277	VP1	AII02770	277	4687	9097, 13507, 17917, 22327, 26737, 31147, 35557	norovirus Hu/GII/C2H-47/2011/VNM
278	VP1	AII02773	278	4688	9098, 13508, 17918, 22328, 26738, 31148, 35558	norovirus Hu/GII/20107/2009/VNM
279	VP1	AII02776	279	4689	9099, 13509, 17919, 22329, 26739, 31149, 35559	norovirus Hu/GII/30473/2010/VNM
280	VP1	AII02779	280	4690	9100, 13510, 17920, 22330, 26740, 31150, 35560	norovirus Hu/GII/10078/2009/VNM
281	VP1	AII02782	281	4691	9101, 13511, 17921, 22331, 26741, 31151, 35561	norovirus Hu/GII/20108/2009/VNM
282	VP1	AII02785	282	4692	9102, 13512, 17922, 22332, 26742, 31152, 35562	norovirus Hu/GII/20154/2009/VNM

283	VP1	AII02788	283	4693	9103, 13513, 17923, 22333, 26743, 31153, 35563	norovirus Hu/GII/30381/2010/VNM
284	VP1	AII02791	284	4694	9104, 13514, 17924, 22334, 26744, 31154, 35564	norovirus Hu/GII/C2H-48/2011/VNM
285	VP1	AII02794	285	4695	9105, 13515, 17925, 22335, 26745, 31155, 35565	norovirus Hu/GII/C2035/2010/VNM
286	VP1	AII02797	286	4696	9106, 13516, 17926, 22336, 26746, 31156, 35566	norovirus Hu/GII/10127/2009/VNM
287	VP1	AII02800	287	4697	9107, 13517, 17927, 22337, 26747, 31157, 35567	norovirus Hu/GII/10194/2009/VNM
288	VP1	AII02803	288	4698	9108, 13518, 17928, 22338, 26748, 31158, 35568	norovirus Hu/GII/30257/2009/VNM
289	VP1	AII02806	289	4699	9109, 13519, 17929, 22339, 26749, 31159, 35569	norovirus Hu/GII/10129/2009/VNM
290	VP1	AII02809	290	4700	9110, 13520, 17930, 22340, 26750, 31160, 35570	norovirus Hu/GII/C2H-50/2011/VNM
291	VP1	AII02812	291	4701	9111, 13521, 17931, 22341, 26751, 31161, 35571	norovirus Hu/GII/30303/2009/VNM
292	VP1	AII02815	292	4702	9112, 13522, 17932, 22342, 26752, 31162, 35572	norovirus Hu/GII/C2H-55/2011/VNM
293	VP1	AII02818	293	4703	9113, 13523, 17933, 22343, 26753, 31163, 35573	norovirus Hu/GII/C2365/2010/VNM
294	VP1	AII02821	294	4704	9114, 13524, 17934, 22344, 26754, 31164, 35574	norovirus Hu/GII/C2H-44/2011/VNM
295	VP1	AII02824	295	4705	9115, 13525, 17935, 22345, 26755, 31165, 35575	norovirus Hu/GII/10169/2009/VNM
296	VP1	AII02827	296	4706	9116, 13526, 17936, 22346, 26756, 31166, 35576	norovirus Hu/GII/20093/2009/VNM
297	VP1	AII02830	297	4707	9117, 13527, 17937, 22347, 26757, 31167, 35577	norovirus Hu/GII/10255/2009/VNM
298	VP1	AII02833	298	4708	9118, 13528, 17938, 22348, 26758, 31168, 35578	norovirus Hu/GII/C2H-62/2011/VNM
299	VP1	AII02836	299	4709	9119, 13529, 17939, 22349, 26759, 31169, 35579	norovirus Hu/GII/10235/2009/VNM

300	VP1	AII02839	300	4710	9120, 13530, 17940, 22350, 26760, 31170, 35580	norovirus Hu/GII/20146/2009/VNM
301	VP1	AII02842	301	4711	9121, 13531, 17941, 22351, 26761, 31171, 35581	norovirus Hu/GII/20123/2009/VNM
302	VP1	AII02845	302	4712	9122, 13532, 17942, 22352, 26762, 31172, 35582	norovirus Hu/GII/20370/2010/VNM
303	VP1	AII02848	303	4713	9123, 13533, 17943, 22353, 26763, 31173, 35583	norovirus Hu/GII/C2H-45/2011/VNM
304	VP1	AII02851	304	4714	9124, 13534, 17944, 22354, 26764, 31174, 35584	norovirus Hu/GII/10183/2009/VNM
305	VP1	AII02854	305	4715	9125, 13535, 17945, 22355, 26765, 31175, 35585	norovirus Hu/GII/20069/2009/VNM
306	VP1	AII02857	306	4716	9126, 13536, 17946, 22356, 26766, 31176, 35586	norovirus Hu/GII/C2H-43/2011/VNM
307	VP1	AII02860	307	4717	9127, 13537, 17947, 22357, 26767, 31177, 35587	norovirus Hu/GII/10145/2009/VNM
308	VP1	AII02866	308	4718	9128, 13538, 17948, 22358, 26768, 31178, 35588	norovirus Hu/GII/10160/2009/VNM
309	VP1	AII02869	309	4719	9129, 13539, 17949, 22359, 26769, 31179, 35589	norovirus Hu/GII/10223/2009/VNM
310	VP1	AII02872	310	4720	9130, 13540, 17950, 22360, 26770, 31180, 35590	norovirus Hu/GII/10003/2009/VNM
311	VP1	AII02875	311	4721	9131, 13541, 17951, 22361, 26771, 31181, 35591	norovirus Hu/GII/30192/2010/VNM
312	VP1	AII02878	312	4722	9132, 13542, 17952, 22362, 26772, 31182, 35592	norovirus Hu/GII/20493/2010/VNM
313	VP1	AII02881	313	4723	9133, 13543, 17953, 22363, 26773, 31183, 35593	norovirus Hu/GII/10131/2009/VNM
314	VP1	AII02884	314	4724	9134, 13544, 17954, 22364, 26774, 31184, 35594	norovirus Hu/GII/10238/2009/VNM
315	VP1	AII02887	315	4725	9135, 13545, 17955, 22365, 26775, 31185, 35595	norovirus Hu/GII/30400/2010/VNM
316	VP1	AII02890	316	4726	9136, 13546, 17956, 22366, 26776, 31186, 35596	norovirus Hu/GII/20153/2009/VNM

317	VP1	AII02893	317	4727	9137, 13547, 17957, 22367, 26777, 31187, 35597	norovirus Hu/GII/10037/2009/VNM
318	VP1	AII02896	318	4728	9138, 13548, 17958, 22368, 26778, 31188, 35598	norovirus Hu/GII/20144/2009/VNM
319	VP1	AII02899	319	4729	9139, 13549, 17959, 22369, 26779, 31189, 35599	norovirus Hu/GII/C2H-39/2011/VNM
320	VP1	AII02902	320	4730	9140, 13550, 17960, 22370, 26780, 31190, 35600	norovirus Hu/GII/20122/2009/VNM
321	VP1	AIS24557	321	4731	9141, 13551, 17961, 22371, 26781, 31191, 35601	norovirus GII
322	VP1	AIY30135	322	4732	9142, 13552, 17962, 22372, 26782, 31192, 35602	murine norovirus
323	VP1	AKE07100	323	4733	9143, 13553, 17963, 22373, 26783, 31193, 35603	norovirus GII
324	VP1	AKE07103	324	4734	9144, 13554, 17964, 22374, 26784, 31194, 35604	norovirus GII
325	VP1	AKE07106	325	4735	9145, 13555, 17965, 22375, 26785, 31195, 35605	norovirus GII
326	VP1	ALQ12260	326	4736	9146, 13556, 17966, 22376, 26786, 31196, 35606	norovirus cat/GVI.2/TE/77-13/ITA
327	VP1	BAI49904	327	4737	9147, 13557, 17967, 22377, 26787, 31197, 35607	norovirus Hu/GII.4/Hiroshima/19/2001/JPN
328	VP1	BAI49905	328	4738	9148, 13558, 17968, 22378, 26788, 31198, 35608	norovirus Hu/GII.4/Hiroshima/42/2004/JPN
329	VP1	BAI49906	329	4739	9149, 13559, 17969, 22379, 26789, 31199, 35609	norovirus Hu/GII.4/Hiroshima/44/2004/JPN
330	VP1	BAI49907	330	4740	9150, 13560, 17970, 22380, 26790, 31200, 35610	norovirus Hu/GII.4/Hiroshima/48/2004/JPN
331	VP1	BAI49909	331	4741	9151, 13561, 17971, 22381, 26791, 31201, 35611	norovirus Hu/GII.4/Hiroshima/56/2005/JPN
332	VP1	BAI49910	332	4742	9152, 13562, 17972, 22382, 26792, 31202, 35612	norovirus Hu/GII.4/Hiroshima/57/2005/JPN
333	VP1	BAI49911	333	4743	9153, 13563, 17973, 22383, 26793, 31203, 35613	norovirus Hu/GII.4/Hiroshima/58/2005/JPN

334	VP1	BAI49912	334	4744	9154, 13564, 17974, 22384, 26794, 31204, 35614	norovirus Hu/GII.4/Hiroshima/59/2005/JPN
335	VP1	BAI49914	335	4745	9155, 13565, 17975, 22385, 26795, 31205, 35615	norovirus Hu/GII.4/Hiroshima/67/2006/JPN
336	VP1	BAI49916	336	4746	9156, 13566, 17976, 22386, 26796, 31206, 35616	norovirus Hu/GII.4/Hiroshima/69/2006/JPN
337	VP1	BAI49917	337	4747	9157, 13567, 17977, 22387, 26797, 31207, 35617	norovirus Hu/GII.4/Hiroshima/74/2006/JPN
338	VP1	BAI49918	338	4748	9158, 13568, 17978, 22388, 26798, 31208, 35618	norovirus Hu/GII.4/Hiroshima/91/2006/JPN
339	VP1	BAI49919	339	4749	9159, 13569, 17979, 22389, 26799, 31209, 35619	norovirus Hu/GII.4/Hiroshima/92/2006/JPN
340	VP1	BAI49920	340	4750	9160, 13570, 17980, 22390, 26800, 31210, 35620	norovirus Hu/GII.4/Hiroshima/108/2007/JPN
341	VP1	BAI49921	341	4751	9161, 13571, 17981, 22391, 26801, 31211, 35621	norovirus Hu/GII.4/Hiroshima/109/2007/JPN
342	VP1	BAI49923	342	4752	9162, 13572, 17982, 22392, 26802, 31212, 35622	norovirus Hu/GII.4/Hiroshima/115/2007/JPN
343	VP1	BAI49924	343	4753	9163, 13573, 17983, 22393, 26803, 31213, 35623	norovirus Hu/GII.4/Hiroshima/129/2007/JPN
344	VP1	BAI49925	344	4754	9164, 13574, 17984, 22394, 26804, 31214, 35624	norovirus Hu/GII.4/Hiroshima/134/2007/JPN
345	VP1	BAI49926	345	4755	9165, 13575, 17985, 22395, 26805, 31215, 35625	norovirus Hu/GII.4/Hiroshima/139/2007/JPN
346	VP1	BAI49927	346	4756	9166, 13576, 17986, 22396, 26806, 31216, 35626	norovirus Hu/GII.4/Hiroshima/151/2008/JPN
347	VP1	BAI49928	347	4757	9167, 13577, 17987, 22397, 26807, 31217, 35627	norovirus Hu/GII.4/Hiroshima/154/2008/JPN
348	VP1	BAJ25070	348	4758	9168, 13578, 17988, 22398, 26808, 31218, 35628	norovirus Hu/OC05024/2005/JP
349	VP1	BAJ25072	349	4759	9169, 13579, 17989, 22399, 26809, 31219, 35629	norovirus Hu/OC06060/2006/JP
350	VP1	BAJ25076	350	4760	9170, 13580, 17990, 22400, 26810, 31220, 35630	norovirus Hu/OH07011/2007/JP

351	VP1	BAN16283	351	4761	9171, 13581, 17991, 22401, 26811, 31221, 35631	norovirus Hu/GII.6/Ehime090646/2009/JP
352	VP1	BAN16285	352	4762	9172, 13582, 17992, 22402, 26812, 31222, 35632	norovirus Hu/GII.6/Ehime090056/2009/JP
353	VP1	BAN16287	353	4763	9173, 13583, 17993, 22403, 26813, 31223, 35633	norovirus Hu/GII.6/Ehime090549/2009/JP
354	VP1	BAN16289	354	4764	9174, 13584, 17994, 22404, 26814, 31224, 35634	norovirus Hu/GII.6/Ehime120246/2012/JP
355	VP1	BAN16291	355	4765	9175, 13585, 17995, 22405, 26815, 31225, 35635	norovirus Hu/GII.6/Ehime050007/2005/JP
356	VP1	BAN16293	356	4766	9176, 13586, 17996, 22406, 26816, 31226, 35636	norovirus Hu/GII.6/Ehime041525/2004/JP
357	VP1	BAN16295	357	4767	9177, 13587, 17997, 22407, 26817, 31227, 35637	norovirus Hu/GII.6/Ehime031163/2003/JP
358	VP1	BAN16297	358	4768	9178, 13588, 17998, 22408, 26818, 31228, 35638	norovirus Hu/GII.6/Ehime030769/2003/JP
359	VP1	BAR42289	359	4769	9179, 13589, 17999, 22409, 26819, 31229, 35639	norovirus Hu/GII/JP/2015/GII.P17_GII.17/Kawasaki308
360	VP1	BAR47616	360	4770	9180, 13590, 18000, 22410, 26820, 31230, 35640	norovirus Hu/GII/JP/2014/GII.P17_GII.17/Nagano7-1
361	VP1	BAR63715	361	4771	9181, 13591, 18001, 22411, 26821, 31231, 35641	norovirus Hu/GII/JP/2013/GII.P17_GII.17/Saitama5203
362	VP1	BAR63718	362	4772	9182, 13592, 18002, 22412, 26822, 31232, 35642	norovirus Hu/GII/JP/2013/GII.P17_GII.17/Saitama5309
363	VP1	BAR63721	363	4773	9183, 13593, 18003, 22413, 26823, 31233, 35643	norovirus Hu/GII/JP/2014/GII.P17_GII.17/Nagano8-1
364	VP1	BAS02083	364	4774	9184, 13594, 18004, 22414, 26824, 31234, 35644	norovirus Hu/GII/JP/2015/GII.Pe_GII.4/Osaka/OSF78
365	VP1	CRL46952	365	4775	9185, 13595, 18005, 22415, 26825, 31235, 35645	norovirus GI/Hu/NL/2011/GI.4/Groningen
366	VP1	CRL46955	366	4776	9186, 13596, 18006, 22416, 26826, 31236, 35646	norovirus GI/Hu/NL/2012/GI.6/Groningen
367	VP1	CRL46958	367	4777	9187, 13597, 18007, 22417, 26827, 31237, 35647	norovirus GII/Hu/NL/2012/GII.4/Groningen

368	VP1	CRL46961	368	4778	9188, 13598, 18008, 22418, 26828, 31238, 35648	norovirus GII/Hu/NL/2014/GII.4/Groningen01
369	VP1	CRL46964	369	4779	9189, 13599, 18009, 22419, 26829, 31239, 35649	norovirus GII/Hu/NL/2014/GII.4/Groningen02
370	VP1	CRL46967	370	4780	9190, 13600, 18010, 22420, 26830, 31240, 35650	norovirus GII/Hu/NL/2014/GII.6/Groningen
371	VP1	CRL46970	371	4781	9191, 13601, 18011, 22421, 26831, 31241, 35651	norovirus GII/Hu/NL/2014/GII.21/Groningen
372	VP1	CRL46973	372	4782	9192, 13602, 18012, 22422, 26832, 31242, 35652	norovirus GII/Hu/NL/2014/GII.2/Groningen
373	VP1	CRL46976	373	4783	9193, 13603, 18013, 22423, 26833, 31243, 35653	norovirus GII/Hu/NL/2012/GII.4/Nijmegen01
374	VP1	CRL46979	374	4784	9194, 13604, 18014, 22424, 26834, 31244, 35654	norovirus GII/Hu/NL/2012/GII.4/Nijmegen02
375	VP1	ABC96332	375	4785	9195, 13605, 18015, 22425, 26835, 31245, 35655	norovirus Hu/Guangzhou/NVgz01/CHN
376	VP1	ADB27027	376	4786	9196, 13606, 18016, 22426, 26836, 31246, 35656	norovirus Hu/GII.4/New Orleans1500/2008/USA
377	VP1	AEE10003	377	4787	9197, 13607, 18017, 22427, 26837, 31247, 35657	murine norovirus GV/NIH-2410/2005/USA
378	VP1	AEE10006	378	4788	9198, 13608, 18018, 22428, 26838, 31248, 35658	murine norovirus GV/NIH-2411/2005/USA
379	VP1	AEE10009	379	4789	9199, 13609, 18019, 22429, 26839, 31249, 35659	murine norovirus GV/NIH-2747/2005/USA
380	VP1	AEE10015	380	4790	9200, 13610, 18020, 22430, 26840, 31250, 35660	murine norovirus GV/NIH-4421/2005/USA
381	VP1	AEE10018	381	4791	9201, 13611, 18021, 22431, 26841, 31251, 35661	murine norovirus GV/NIH-4428/2005/USA
382	VP1	AEE10021	382	4792	9202, 13612, 18022, 22432, 26842, 31252, 35662	murine norovirus GV/NIH-4431/2005/USA
383	VP1	AEE10024	383	4793	9203, 13613, 18023, 22433, 26843, 31253, 35663	murine norovirus GV/NIH-A114/2006/USA
384	VP1	AEE10027	384	4794	9204, 13614, 18024, 22434, 26844, 31254, 35664	murine norovirus GV/NIH-D220/2007/USA

385	VP1	AGI96385	385	4795	9205, 13615, 18025, 22435, 26845, 31255, 35665	norovirus Hu/GII.1/Ohio/509/2012/USA
386	VP1	AGI96397	386	4796	9206, 13616, 18026, 22436, 26846, 31256, 35666	norovirus Hu/GII.6/Ohio/490/2012/USA
387	VP1	AGI96398	387	4797	9207, 13617, 18027, 22437, 26847, 31257, 35667	norovirus Hu/GII.1/Ohio/507/2012/USA
388	VP1	AGI96399	388	4798	9208, 13618, 18028, 22438, 26848, 31258, 35668	norovirus Hu/GII.1/Ohio/765/2012/USA
389	VP1	AGJ52175	389	4799	9209, 13619, 18029, 22439, 26849, 31259, 35669	norovirus Hu/GI/HuzhouNII/2008/CHN
390	VP1	AGX01092	390	4800	9210, 13620, 18030, 22440, 26850, 31260, 35670	norovirus Hu/GI.2/Jingzhou/2013401/CHN
391	VP1	AGX01095	391	4801	9211, 13621, 18031, 22441, 26851, 31261, 35671	norovirus Hu/GII.3/Jingzhou/2013402/CHN
392	VP1	AGX01098	392	4802	9212, 13622, 18032, 22442, 26852, 31262, 35672	norovirus Hu/GII.4/Jingzhou/2013403/CHN
393	VP1	AKI30060	393	4803	9213, 13623, 18033, 22443, 26853, 31263, 35673	norovirus Hu/GII.17/Gaithersburg/2014/US
394	VP1	BAQ94514	394	4804	9214, 13624, 18034, 22444, 26854, 31264, 35674	norovirus Hu/GII.13/08N2045/2008/NP
395	VP1	BAQ94516	395	4805	9215, 13625, 18035, 22445, 26855, 31265, 35675	norovirus Hu/GII.13/08N2250/2008/NP
396	VP1	BAQ94520	396	4806	9216, 13626, 18036, 22446, 26856, 31266, 35676	norovirus Hu/GII.13/09N3145/2009/NP
397	VP1	BAQ94524	397	4807	9217, 13627, 18037, 22447, 26857, 31267, 35677	norovirus Hu/GII.13/09N3206/2009/NP
398	VP1	BAQ94526	398	4808	9218, 13628, 18038, 22448, 26858, 31268, 35678	norovirus Hu/GII.13/09N3223/2009/NP
399	VP1	ACV89840	399	4809	9219, 13629, 18039, 22449, 26859, 31269, 35679	norovirus dog/GVI.1/HKU_Ca026F/2007/HKG
400	VP1	ACV89843	400	4810	9220, 13630, 18040, 22450, 26860, 31270, 35680	norovirus dog/GVI.1/HKU_Ca035F/2007/HKG
401	VP1	AFV48046	401	4811	9221, 13631, 18041, 22451, 26861, 31271, 35681	norovirus Rn/GV/HKU_CT2/HKG/2011

402	VP1	AFV48048	402	4812	9222, 13632, 18042, 22452, 26862, 31272, 35682	norovirus Rn/GV/HKU_KT/HKG/2012
403	VP1	AGH06682	403	4813	9223, 13633, 18043, 22453, 26863, 31273, 35683	norovirus rat/GI/KS12/1305/DNK
404	VP1	AGL98413	404	4814	9224, 13634, 18044, 22454, 26864, 31274, 35684	norovirus Hu/GII.4/C127/GF/1978
405	VP1	AGL98414	405	4815	9225, 13635, 18045, 22455, 26865, 31275, 35685	norovirus Hu/GII/KL45/MY/1978
406	VP1	AGL98416	406	4816	9226, 13636, 18046, 22456, 26866, 31276, 35686	norovirus Hu/GII/T091/TN/1976
407	VP1	BAL60749	407	4817	9227, 13637, 18047, 22457, 26867, 31277, 35687	norovirus Hu/GII.2/OC05114/2005/JP
408	VP1	BAL60753	408	4818	9228, 13638, 18048, 22458, 26868, 31278, 35688	norovirus Hu/GII.2/OC05145/2005/JP
409	VP1	BAL60755	409	4819	9229, 13639, 18049, 22459, 26869, 31279, 35689	norovirus Hu/GII.2/OC06005/2006/JP
410	VP1	BAL60759	410	4820	9230, 13640, 18050, 22460, 26870, 31280, 35690	norovirus Hu/GII.2/OC06014/2006/JP
411	VP1	BAL60767	411	4821	9231, 13641, 18051, 22461, 26871, 31281, 35691	norovirus Hu/GII.2/OC08124/2008/JP
412	VP1	BAL60769	412	4822	9232, 13642, 18052, 22462, 26872, 31282, 35692	norovirus Hu/GII.2/OC08154/2008/JP
413	VP1	BAL60771	413	4823	9233, 13643, 18053, 22463, 26873, 31283, 35693	norovirus Hu/GII.2/OC09044/2009/JP
414	VP1	BAL60773	414	4824	9234, 13644, 18054, 22464, 26874, 31284, 35694	norovirus Hu/GII.2/OH06023/2006/JP
415	VP1	BAL60775	415	4825	9235, 13645, 18055, 22465, 26875, 31285, 35695	norovirus Hu/GII.2/OH07001/2007/JP
416	VP1	BAL60777	416	4826	9236, 13646, 18056, 22466, 26876, 31286, 35696	norovirus Hu/GII.2/OH07013/2007/JP
417	VP1	BAL60779	417	4827	9237, 13647, 18057, 22467, 26877, 31287, 35697	norovirus Hu/GII.2/OH08009/2008/JP
418	VP1	BAL60781	418	4828	9238, 13648, 18058, 22468, 26878, 31288, 35698	norovirus Hu/GII.2/OH08019/2008/JP

419	VP1	BAL60783	419	4829	9239, 13649, 18059, 22469, 26879, 31289, 35699	norovirus Hu/GII.2/OH08020/2008/JP
420	VP1	BAL60785	420	4830	9240, 13650, 18060, 22470, 26880, 31290, 35700	norovirus Hu/GII.2/OH08029-2/2008/JP
421	VP1	BAL60791	421	4831	9241, 13651, 18061, 22471, 26881, 31291, 35701	norovirus Hu/GII.2/OC09103/2009/JP
422	VP1	BAL60793	422	4832	9242, 13652, 18062, 22472, 26882, 31292, 35702	norovirus Hu/GII.2/OC09104/2009/JP
423	VP1	BAL60795	423	4833	9243, 13653, 18063, 22473, 26883, 31293, 35703	norovirus Hu/GII.2/OC09109-2/2009/JP
424	VP1	BAL60797	424	4834	9244, 13654, 18064, 22474, 26884, 31294, 35704	norovirus Hu/GII.2/OC10009/2010/JP
425	VP1	BAL60799	425	4835	9245, 13655, 18065, 22475, 26885, 31295, 35705	norovirus Hu/GII.2/OC10012-2/2010/JP
426	VP1	BAL60801	426	4836	9246, 13656, 18066, 22476, 26886, 31296, 35706	norovirus Hu/GII.2/OC10018-2/2010/JP
427	VP1	BAL60803	427	4837	9247, 13657, 18067, 22477, 26887, 31297, 35707	norovirus Hu/GII.2/OC10019/2010/JP
428	VP1	BAL60805	428	4838	9248, 13658, 18068, 22478, 26888, 31298, 35708	norovirus Hu/GII.2/OC10026/2010/JP
429	VP1	BAL60809	429	4839	9249, 13659, 18069, 22479, 26889, 31299, 35709	norovirus Hu/GII.2/OH09028/2009/JP
430	VP1	BAL60811	430	4840	9250, 13660, 18070, 22480, 26890, 31300, 35710	norovirus Hu/GII.2/OH09029/2009/JP
431	VP1	BAL60813	431	4841	9251, 13661, 18071, 22481, 26891, 31301, 35711	norovirus Hu/GII.2/OH09030/2009/JP
432	VP1	BAL60815	432	4842	9252, 13662, 18072, 22482, 26892, 31302, 35712	norovirus Hu/GII.2/OH09032/2009/JP
433	VP1	BAL60817	433	4843	9253, 13663, 18073, 22483, 26893, 31303, 35713	norovirus Hu/GII.2/OH09034/2009/JP
434	VP1	BAL60819	434	4844	9254, 13664, 18074, 22484, 26894, 31304, 35714	norovirus Hu/GII.2/OH09035/2009/JP
435	VP1	BAL60821	435	4845	9255, 13665, 18075, 22485, 26895, 31305, 35715	norovirus Hu/GII.2/OH10001/2010/JP

436	VP1	BAL60823	436	4846	9256, 13666, 18076, 22486, 26896, 31306, 35716	norovirus Hu/GII.2/OH10005-2/2010/JP
437	VP1	BAL60825	437	4847	9257, 13667, 18077, 22487, 26897, 31307, 35717	norovirus Hu/GII.2/OH10006/2010/JP
438	VP1	BAL60827	438	4848	9258, 13668, 18078, 22488, 26898, 31308, 35718	norovirus Hu/GII.2/OH10007/2010/JP
439	VP1	BAL60829	439	4849	9259, 13669, 18079, 22489, 26899, 31309, 35719	norovirus Hu/GII.2/OH10008/2010/JP
440	VP1	BAL60831	440	4850	9260, 13670, 18080, 22490, 26900, 31310, 35720	norovirus Hu/GII.2/OH10011-2/2010/JP
441	VP1	BAL60833	441	4851	9261, 13671, 18081, 22491, 26901, 31311, 35721	norovirus Hu/GII.2/OH10012/2010/JP
442	VP1	BAL60835	442	4852	9262, 13672, 18082, 22492, 26902, 31312, 35722	norovirus Hu/GII.2/OH10013/2010/JP
443	VP1	BAL60837	443	4853	9263, 13673, 18083, 22493, 26903, 31313, 35723	norovirus Hu/GII.2/OH10015-2/2010/JP
444	VP1	BAL60839	444	4854	9264, 13674, 18084, 22494, 26904, 31314, 35724	norovirus Hu/GII.2/OH10020/2010/JP
445	VP1	BAL60841	445	4855	9265, 13675, 18085, 22495, 26905, 31315, 35725	norovirus Hu/GII.2/OH10021/2010/JP
446	VP1	BAL60843	446	4856	9266, 13676, 18086, 22496, 26906, 31316, 35726	norovirus Hu/GII.2/OH10024/2010/JP
447	VP1	BAL60845	447	4857	9267, 13677, 18087, 22497, 26907, 31317, 35727	norovirus Hu/GII.2/OH10025/2010/JP
448	VP1	BAL60847	448	4858	9268, 13678, 18088, 22498, 26908, 31318, 35728	norovirus Hu/GII.2/OH10026/2010/JP
449	VP1	BAL60849	449	4859	9269, 13679, 18089, 22499, 26909, 31319, 35729	norovirus Hu/GII.2/OH10029/2010/JP
450	VP1	BAL60851	450	4860	9270, 13680, 18090, 22500, 26910, 31320, 35730	norovirus Hu/GII.2/OH10031/2010/JP
451	VP1	AAT00378	451	4861	9271, 13681, 18091, 22501, 26911, 31321, 35731	norovirus Sydney 2212
452	VP1	ABD95934	452	4862	9272, 13682, 18092, 22502, 26912, 31322, 35732	norovirus GII

453	VP1	ABG49509	453	4863	9273, 13683, 18093, 22503, 26913, 31323, 35733	norovirus Hu/GII.4/MD-2004/2004/US
454	VP1	ABP88833	454	4864	9274, 13684, 18094, 22504, 26914, 31324, 35734	norovirus Hu/Guangzhou/NV-VP1/2006/China
455	VP1	ABY27560	455	4865	9275, 13685, 18095, 22505, 26915, 31325, 35735	norovirus Hu/Houston/TCH186/2002/US
456	VP1	ACT76139	456	4866	9276, 13686, 18096, 22506, 26916, 31326, 35736	norovirus Hu/GII.4/CHDC5191/1974/US
457	VP1	ACT76142	457	4867	9277, 13687, 18097, 22507, 26917, 31327, 35737	norovirus Hu/GII.4/CHDC2094/1974/US
458	VP1	ACT76145	458	4868	9278, 13688, 18098, 22508, 26918, 31328, 35738	norovirus Hu/GII.4/CHDC3967/1988/US
459	VP1	ACT76148	459	4869	9279, 13689, 18099, 22509, 26919, 31329, 35739	norovirus Hu/GII.4/CHDC4108/1987/US
460	VP1	ACT76151	460	4870	9280, 13690, 18100, 22510, 26920, 31330, 35740	norovirus Hu/GII.4/CHDC4871/1977/US
461	VP1	ACX31821	461	4871	9281, 13691, 18101, 22511, 26921, 31331, 35741	norovirus Hu/GII.4/Riviera1590/2008/US
462	VP1	ACX31837	462	4872	9282, 13692, 18102, 22512, 26922, 31332, 35742	norovirus Hu/GII.4/NSW515L/2007/AU
463	VP1	ACX31841	463	4873	9283, 13693, 18103, 22513, 26923, 31333, 35743	norovirus Hu/GII.4/VIC3863/2007/AU
464	VP1	ACX31851	464	4874	9284, 13694, 18104, 22514, 26924, 31334, 35744	norovirus Hu/GII.4/NSW618P/2008/AU
465	VP1	ACX31856	465	4875	9285, 13695, 18105, 22515, 26925, 31335, 35745	norovirus Hu/GII.4/NSW536S/2008/AU
466	VP1	ACX31860	466	4876	9286, 13696, 18106, 22516, 26926, 31336, 35746	norovirus Hu/GII.4/NSW587V/2007/AU
467	VP1	ACX31864	467	4877	9287, 13697, 18107, 22517, 26927, 31337, 35747	norovirus Hu/GII.4/NSW806J/2008/AU
468	VP1	ACX31889	468	4878	9288, 13698, 18108, 22518, 26928, 31338, 35748	norovirus Hu/GII.4/Orange/NSW001P/2008/AU
469	VP1	ACX31893	469	4879	9289, 13699, 18109, 22519, 26929, 31339, 35749	norovirus Hu/GII.g-GII.12/StGeorge/NSW199U/2008/AU

470	VP1	ACX69259	470	4880	9290, 13700, 18110, 22520, 26930, 31340, 35750	norovirus dog/GVI.1/Bari/91/2007/ITA
471	VP1	ADF47131	471	4881	9291, 13701, 18111, 22521, 26931, 31341, 35751	norovirus Hu/Shanghai/SH312/2009/CHN
472	VP1	ADR78869	472	4882	9292, 13702, 18112, 22522, 26932, 31342, 35752	norovirus Hu/GII.4/Hong Kong/CU060027/2006/CHN
473	VP1	ADR78872	473	4883	9293, 13703, 18113, 22523, 26933, 31343, 35753	norovirus Hu/GII.4/Hong Kong/CU060012/2006/CHN
474	VP1	ADR78875	474	4884	9294, 13704, 18114, 22524, 26934, 31344, 35754	norovirus Hu/GII.4/Hong Kong/CU060036/2006/CHN
475	VP1	ADR78878	475	4885	9295, 13705, 18115, 22525, 26935, 31345, 35755	norovirus Hu/GII.4/Hong Kong/CU060009/2006/CHN
476	VP1	ADR78881	476	4886	9296, 13706, 18116, 22526, 26936, 31346, 35756	norovirus Hu/GII.4/Hong Kong/CU060028/2006/CHN
477	VP1	ADR78884	477	4887	9297, 13707, 18117, 22527, 26937, 31347, 35757	norovirus Hu/GII.4/Hong Kong/CU060026/2006/CHN
478	VP1	ADR78887	478	4888	9298, 13708, 18118, 22528, 26938, 31348, 35758	norovirus Hu/GII.4/Hong Kong/CU060030/2006/CHN
479	VP1	ADR78890	479	4889	9299, 13709, 18119, 22529, 26939, 31349, 35759	norovirus Hu/GII.4/Hong Kong/CU060037/2006/CHN
480	VP1	ADR78893	480	4890	9300, 13710, 18120, 22530, 26940, 31350, 35760	norovirus Hu/GII.4/Hong Kong/CU060031/2006/CHN
481	VP1	ADR78896	481	4891	9301, 13711, 18121, 22531, 26941, 31351, 35761	norovirus Hu/GII.4/Hong Kong/CU060001/2006/CHN
482	VP1	ADR78899	482	4892	9302, 13712, 18122, 22532, 26942, 31352, 35762	norovirus Hu/GII.4/Hong Kong/CU060039/2006/CHN
483	VP1	ADR78902	483	4893	9303, 13713, 18123, 22533, 26943, 31353, 35763	norovirus Hu/GII.4/Hong Kong/CU060014/2006/CHN
484	VP1	ADR78905	484	4894	9304, 13714, 18124, 22534, 26944, 31354, 35764	norovirus Hu/GII.4/Hong Kong/CU060024/2006/CHN
485	VP1	ADR78908	485	4895	9305, 13715, 18125, 22535, 26945, 31355, 35765	norovirus Hu/GII.4/Hong Kong/CU060025/2006/CHN
486	VP1	ADR78911	486	4896	9306, 13716, 18126, 22536, 26946, 31356, 35766	norovirus Hu/GII.4/Hong Kong/CU050141/2005/CHN

487	VP1	ADR78914	487	4897	9307, 13717, 18127, 22537, 26947, 31357, 35767	norovirus Hu/GII.4/Hong Kong/CU041213/2004/CHN
488	VP1	ADR78917	488	4898	9308, 13718, 18128, 22538, 26948, 31358, 35768	norovirus Hu/GII.4/Hong Kong/CU050140/2005/CHN
489	VP1	ADR78920	489	4899	9309, 13719, 18129, 22539, 26949, 31359, 35769	norovirus Hu/GII.4/Hong Kong/CU050106/2005/CHN
490	VP1	ADR78923	490	4900	9310, 13720, 18130, 22540, 26950, 31360, 35770	norovirus Hu/GII.4/Hong Kong/CU051146/2005/CHN
491	VP1	ADR78929	491	4901	9311, 13721, 18131, 22541, 26951, 31361, 35771	norovirus Hu/GII.4/Hong Kong/CU041206/2004/CHN
492	VP1	ADR78932	492	4902	9312, 13722, 18132, 22542, 26952, 31362, 35772	norovirus Hu/GII.4/Hong Kong/CU041225/2004/CHN
493	VP1	ADR78938	493	4903	9313, 13723, 18133, 22543, 26953, 31363, 35773	norovirus Hu/GII.4/Hong Kong/CU050136/2005/CHN
494	VP1	ADR78941	494	4904	9314, 13724, 18134, 22544, 26954, 31364, 35774	norovirus Hu/GII.4/Hong Kong/CU050152/2005/CHN
495	VP1	ADR78944	495	4905	9315, 13725, 18135, 22545, 26955, 31365, 35775	norovirus Hu/GII.4/Hong Kong/CU041222/2004/CHN
496	VP1	ADR78947	496	4906	9316, 13726, 18136, 22546, 26956, 31366, 35776	norovirus Hu/GII.4/Hong Kong/CU050852/2005/CHN
497	VP1	ADR78950	497	4907	9317, 13727, 18137, 22547, 26957, 31367, 35777	norovirus Hu/GII.4/Hong Kong/CU051013/2005/CHN
498	VP1	ADR78956	498	4908	9318, 13728, 18138, 22548, 26958, 31368, 35778	norovirus Hu/GII.4/Hong Kong/CU050130/2005/CHN
499	VP1	AEA02124	499	4909	9319, 13729, 18139, 22549, 26959, 31369, 35779	norovirus Hu/GI/Vancouver730/2004/CAN
500	VP1	AED02033	500	4910	9320, 13730, 18140, 22550, 26960, 31370, 35780	norovirus Hu/GII.3/CHDC5365/1991/US
501	VP1	AED02034	501	4911	9321, 13731, 18141, 22551, 26961, 31371, 35781	norovirus Hu/GII.3/CHDC5261/1990/US
502	VP1	AED02035	502	4912	9322, 13732, 18142, 22552, 26962, 31372, 35782	norovirus Hu/GII.3/CHDC4671/1979/US
503	VP1	AED02037	503	4913	9323, 13733, 18143, 22553, 26963, 31373, 35783	norovirus Hu/GII.3/CHDC4031/1988/US

504	VP1	AED02038	504	4914	9324, 13734, 18144, 22554, 26964, 31374, 35784	norovirus Hu/GII.3/CHDC2005/1975/US
505	VP1	AED02039	505	4915	9325, 13735, 18145, 22555, 26965, 31375, 35785	norovirus Hu/GII.3/CHDC32/1976/US
506	VP1	AEG79290	506	4916	9326, 13736, 18146, 22556, 26966, 31376, 35786	norovirus Hu/GII.4/Hong Kong/CUB001/2010/CHN
507	VP1	AEI29586	507	4917	9327, 13737, 18147, 22557, 26967, 31377, 35787	norovirus Hu/GII.12/HS206/2010/USA
508	VP1	AEJ82646	508	4918	9328, 13738, 18148, 22558, 26968, 31378, 35788	norovirus Hu/GII.4/Houston/TCH492/2005/US
509	VP1	AER11308	509	4919	9329, 13739, 18149, 22559, 26969, 31379, 35789	norovirus Hu/GII.4/04R-2/2004/TW
510	VP1	AER11310	510	4920	9330, 13740, 18150, 22560, 26970, 31380, 35790	norovirus Hu/GII.4/05R-2/2005/TW
511	VP1	AER11312	511	4921	9331, 13741, 18151, 22561, 26971, 31381, 35791	norovirus Hu/GII.4/06-AM-2/2006/TW
512	VP1	AER11314	512	4922	9332, 13742, 18152, 22562, 26972, 31382, 35792	norovirus Hu/GII.4/06-CK-2/2006/TW
513	VP1	AER11316	513	4923	9333, 13743, 18153, 22563, 26973, 31383, 35793	norovirus Hu/GII.4/06-T-2/2006/TW
514	VP1	AER11318	514	4924	9334, 13744, 18154, 22564, 26974, 31384, 35794	norovirus Hu/GII.4/06-BQ-6/2006/TW
515	VP1	AER11320	515	4925	9335, 13745, 18155, 22565, 26975, 31385, 35795	norovirus Hu/GII.4/06-CJ-1/2006/TW
516	VP1	AER11324	516	4926	9336, 13746, 18156, 22566, 26976, 31386, 35796	norovirus Hu/GII.4/06-CI-1/2006/TW
517	VP1	AER11326	517	4927	9337, 13747, 18157, 22567, 26977, 31387, 35797	norovirus Hu/GII.4/07-B-1/2006/TW
518	VP1	AER11328	518	4928	9338, 13748, 18158, 22568, 26978, 31388, 35798	norovirus Hu/GII.4/07-AG-1/2006/TW
519	VP1	AER11330	519	4929	9339, 13749, 18159, 22569, 26979, 31389, 35799	norovirus Hu/GII.4/07-H-3/2006/TW
520	VP1	AER11332	520	4930	9340, 13750, 18160, 22570, 26980, 31390, 35800	norovirus Hu/GII.4/08-E/2006/TW

521	VP1	AER11334	521	4931	9341, 13751, 18161, 22571, 26981, 31391, 35801	norovirus Hu/GII.4/08-P-1(2006b)/2008/TW
522	VP1	AER11336	522	4932	9342, 13752, 18162, 22572, 26982, 31392, 35802	norovirus Hu/GII.4/08-D-1(2008a)/2008/TW
523	VP1	AER11340	523	4933	9343, 13753, 18163, 22573, 26983, 31393, 35803	norovirus Hu/GII.4/08-H-1(2008a)/2008/TW
524	VP1	AER11342	524	4934	9344, 13754, 18164, 22574, 26984, 31394, 35804	norovirus Hu/GII.4/08-K-1(2008a)/2008/TW
525	VP1	AER11344	525	4935	9345, 13755, 18165, 22575, 26985, 31395, 35805	norovirus Hu/GII.4/08-N-1(2008a)/2008/TW
526	VP1	AER11346	526	4936	9346, 13756, 18166, 22576, 26986, 31396, 35806	norovirus Hu/GII.4/08-D-2(2008a)/2008/TW
527	VP1	AER11348	527	4937	9347, 13757, 18167, 22577, 26987, 31397, 35807	norovirus Hu/GII.4/08-U-2(2008a)/2008/TW
528	VP1	AER11350	528	4938	9348, 13758, 18168, 22578, 26988, 31398, 35808	norovirus Hu/GII.4/08-W-1(2008b)/2008/TW
529	VP1	AER11352	529	4939	9349, 13759, 18169, 22579, 26989, 31399, 35809	norovirus Hu/GII.4/08-AA(2008b)/2008/TW
530	VP1	AER11354	530	4940	9350, 13760, 18170, 22580, 26990, 31400, 35810	norovirus Hu/GII.4/09-L-4(2009a)/2009/TW
531	VP1	AER11356	531	4941	9351, 13761, 18171, 22581, 26991, 31401, 35811	norovirus Hu/GII.4/09-N-1(2009a)/2009/TW
532	VP1	AER11358	532	4942	9352, 13762, 18172, 22582, 26992, 31402, 35812	norovirus Hu/GII.4/10-A-1(2009b)/2010/TW
533	VP1	AER11360	533	4943	9353, 13763, 18173, 22583, 26993, 31403, 35813	norovirus Hu/GII.4/09-BI-2-1(2009b)/2009/TW
534	VP1	AEX10549	534	4944	9354, 13764, 18174, 22584, 26994, 31404, 35814	norovirus Hu/GII.3/Milwaukee009/2010/USA
535	VP1	AEX91910	535	4945	9355, 13765, 18175, 22585, 26995, 31405, 35815	norovirus Hu/GII.4/New Orleans/2010/USA
536	VP1	AFD30970	536	4946	9356, 13766, 18176, 22586, 26996, 31406, 35816	norovirus cat/GIV.2/CU081210E/USA/2010
537	VP1	AFH88383	537	4947	9357, 13767, 18177, 22587, 26997, 31407, 35817	norovirus Hu/GI.6/Kingston/ACT1600/2010/AU

538	VP1	AFJ21376	538	4948	9358, 13768, 18178, 22588, 26998, 31408, 35818	norovirus Hu/GIV.1/LakeMacquarie/NSW2680/2010/AU
539	VP1	AFJ21379	539	4949	9359, 13769, 18179, 22589, 26999, 31409, 35819	norovirus Hu/GII.g-GII.12/Gunnedah/NSW895P/2010/AU
540	VP1	AFJ21382	540	4950	9360, 13770, 18180, 22590, 27000, 31410, 35820	norovirus Hu/GII.g-GII.12/Wahroonga/NSW004P/2009/AU
541	VP1	AFJ21387	541	4951	9361, 13771, 18181, 22591, 27001, 31411, 35821	norovirus Hu/GII.4/NSW375L/2007/AU
542	VP1	AFJ21388	542	4952	9362, 13772, 18182, 22592, 27002, 31412, 35822	norovirus Hu/GII.4/NSW721I/2007/AU
543	VP1	AFJ21389	543	4953	9363, 13773, 18183, 22593, 27003, 31413, 35823	norovirus Hu/GII.4/WA145H/2007/AU
544	VP1	AFJ21390	544	4954	9364, 13774, 18184, 22594, 27004, 31414, 35824	norovirus Hu/GII.4/NSW833M/2007/AU
545	VP1	AFJ21391	545	4955	9365, 13775, 18185, 22595, 27005, 31415, 35825	norovirus Hu/GII.4/WA223N/2007/AU
546	VP1	AFJ21392	546	4956	9366, 13776, 18186, 22596, 27006, 31416, 35826	norovirus Hu/GII.4/WA145Y/2007/AU
547	VP1	AFJ21393	547	4957	9367, 13777, 18187, 22597, 27007, 31417, 35827	norovirus Hu/GII.4/NSW0500/2007/AU
548	VP1	AFJ21394	548	4958	9368, 13778, 18188, 22598, 27008, 31418, 35828	norovirus Hu/GII.4/NSW115M/2007/AU
549	VP1	AFJ21395	549	4959	9369, 13779, 18189, 22599, 27009, 31419, 35829	norovirus Hu/GII.4/NSW358W/2007/AU
550	VP1	AFJ21396	550	4960	9370, 13780, 18190, 22600, 27010, 31420, 35830	norovirus Hu/GII.4/NSW360P/2007/AU
551	VP1	AFJ21397	551	4961	9371, 13781, 18191, 22601, 27011, 31421, 35831	norovirus Hu/GII.4/WA210Z/2007/AU
552	VP1	AFJ21398	552	4962	9372, 13782, 18192, 22602, 27012, 31422, 35832	norovirus Hu/GII.4/NSW1800/2008/AU
553	VP1	AFJ21399	553	4963	9373, 13783, 18193, 22603, 27013, 31423, 35833	norovirus Hu/GII.4/NSW3912/2008/AU
554	VP1	AFJ21400	554	4964	9374, 13784, 18194, 22604, 27014, 31424, 35834	norovirus Hu/GII.4/NSW041G/2008/AU

555	VP1	AFJ21401	555	4965	9375, 13785, 18195, 22605, 27015, 31425, 35835	norovirus Hu/GII.4/NSW3110/2008/AU
556	VP1	AFJ21402	556	4966	9376, 13786, 18196, 22606, 27016, 31426, 35836	norovirus Hu/GII.4/NSW7640/2008/AU
557	VP1	AFJ21403	557	4967	9377, 13787, 18197, 22607, 27017, 31427, 35837	norovirus Hu/GII.4/NSW8638/2008/AU
558	VP1	AFJ21404	558	4968	9378, 13788, 18198, 22608, 27018, 31428, 35838	norovirus Hu/GII.4/NSW868H/2008/AU
559	VP1	AFJ21405	559	4969	9379, 13789, 18199, 22609, 27019, 31429, 35839	norovirus Hu/GII.4/NSW8190/2009/AU
560	VP1	AFJ21406	560	4970	9380, 13790, 18200, 22610, 27020, 31430, 35840	norovirus Hu/GII.4/NSW891U/2009/AU
561	VP1	AFJ21407	561	4971	9381, 13791, 18201, 22611, 27021, 31431, 35841	norovirus Hu/GII.4/NSW821J/2009/AU
562	VP1	AFJ21409	562	4972	9382, 13792, 18202, 22612, 27022, 31432, 35842	norovirus Hu/GII.4/NSW963U/2009/AU
563	VP1	AFJ21410	563	4973	9383, 13793, 18203, 22613, 27023, 31433, 35843	norovirus Hu/GII.4/NSW957X/2009/AU
564	VP1	AFJ21411	564	4974	9384, 13794, 18204, 22614, 27024, 31434, 35844	norovirus Hu/GII.4/NSW972V/2009/AU
565	VP1	AFJ21413	565	4975	9385, 13795, 18205, 22615, 27025, 31435, 35845	norovirus Hu/GII.4/NSW4240/2009/AU
566	VP1	AFJ21414	566	4976	9386, 13796, 18206, 22616, 27026, 31436, 35846	norovirus Hu/GII.4/NSW674U/2009/AU
567	VP1	AFJ21415	567	4977	9387, 13797, 18207, 22617, 27027, 31437, 35847	norovirus Hu/GII.4/NSW514M/2009/AU
568	VP1	AFJ21416	568	4978	9388, 13798, 18208, 22618, 27028, 31438, 35848	norovirus Hu/GII.4/NSW8864/2009/AU
569	VP1	AFJ21417	569	4979	9389, 13799, 18209, 22619, 27029, 31439, 35849	norovirus Hu/GII.4/NSW399Z/2009/AU
570	VP1	AFJ21418	570	4980	9390, 13800, 18210, 22620, 27030, 31440, 35850	norovirus Hu/GII.4/NSW452P/2009/AU
571	VP1	AFJ21419	571	4981	9391, 13801, 18211, 22621, 27031, 31441, 35851	norovirus Hu/GII.4/NSW447T/2009/AU

572	VP1	AFJ21420	572	4982	9392, 13802, 18212, 22622, 27032, 31442, 35852	norovirus Hu/GII.4/NSW581T/2009/AU
573	VP1	AFJ21421	573	4983	9393, 13803, 18213, 22623, 27033, 31443, 35853	norovirus Hu/GII.4/NSW131L/2009/AU
574	VP1	AFJ21422	574	4984	9394, 13804, 18214, 22624, 27034, 31444, 35854	norovirus Hu/GII.4/NSW006P/2009/AU
575	VP1	AFJ21423	575	4985	9395, 13805, 18215, 22625, 27035, 31445, 35855	norovirus Hu/GII.4/NSW0159/2010/AU
576	VP1	AFJ21424	576	4986	9396, 13806, 18216, 22626, 27036, 31446, 35856	norovirus Hu/GII.4/NSW827P/2010/AU
577	VP1	AFJ21425	577	4987	9397, 13807, 18217, 22627, 27037, 31447, 35857	norovirus Hu/GII.4/NSW673P/2010/AU
578	VP1	AFJ21426	578	4988	9398, 13808, 18218, 22628, 27038, 31448, 35858	norovirus Hu/GII.4/NSW075J/2010/AU
579	VP1	AFJ21428	579	4989	9399, 13809, 18219, 22629, 27039, 31449, 35859	norovirus Hu/GII.4/NSW0396/2010/AU
580	VP1	AFJ21429	580	4990	9400, 13810, 18220, 22630, 27040, 31450, 35860	norovirus Hu/GII.4/NSW1449/2010/AU
581	VP1	AFJ21430	581	4991	9401, 13811, 18221, 22631, 27041, 31451, 35861	norovirus Hu/GII.4/NSW3044/2010/AU
582	VP1	AFJ21431	582	4992	9402, 13812, 18222, 22632, 27042, 31452, 35862	norovirus Hu/GII.4/NSW673H/2010/AU
583	VP1	AFJ21432	583	4993	9403, 13813, 18223, 22633, 27043, 31453, 35863	norovirus Hu/GII.4/NSW123B/2010/AU
584	VP1	AFJ21433	584	4994	9404, 13814, 18224, 22634, 27044, 31454, 35864	norovirus Hu/GII.4/NSW186M/2010/AU
585	VP1	AFJ21434	585	4995	9405, 13815, 18225, 22635, 27045, 31455, 35865	norovirus Hu/GII.4/NSW218E/2010/AU
586	VP1	AFJ21436	586	4996	9406, 13816, 18226, 22636, 27046, 31456, 35866	norovirus Hu/GII.4/NSW075G/2010/AU
587	VP1	AFJ21437	587	4997	9407, 13817, 18227, 22637, 27047, 31457, 35867	norovirus Hu/GII.4/NSW688R/2010/AU
588	VP1	AFJ21438	588	4998	9408, 13818, 18228, 22638, 27048, 31458, 35868	norovirus Hu/GII.4/NSW681I/2010/AU

589	VP1	AFJ21439	589	4999	9409, 13819, 18229, 22639, 27049, 31459, 35869	norovirus Hu/GII.4/NSW2004/2010/AU
590	VP1	AFJ21440	590	5000	9410, 13820, 18230, 22640, 27050, 31460, 35870	norovirus Hu/GII.4/NSW445E/2010/AU
591	VP1	AFJ21441	591	5001	9411, 13821, 18231, 22641, 27051, 31461, 35871	norovirus Hu/GII.4/NSW234D/2010/AU
592	VP1	AFJ21442	592	5002	9412, 13822, 18232, 22642, 27052, 31462, 35872	norovirus Hu/GII.4/NSW827D/2010/AU
593	VP1	AFJ21443	593	5003	9413, 13823, 18233, 22643, 27053, 31463, 35873	norovirus Hu/GII.4/NSW9039/2010/AU
594	VP1	AFJ21444	594	5004	9414, 13824, 18234, 22644, 27054, 31464, 35874	norovirus Hu/GII.4/NSW944J/2010/AU
595	VP1	AFJ21445	595	5005	9415, 13825, 18235, 22645, 27055, 31465, 35875	norovirus Hu/GII.4/NSW057J/2010/AU
596	VP1	AFJ21446	596	5006	9416, 13826, 18236, 22646, 27056, 31466, 35876	norovirus Hu/GII.4/NSW567H/2010/AU
597	VP1	AFJ21448	597	5007	9417, 13827, 18237, 22647, 27057, 31467, 35877	norovirus Hu/GII.4/Miranda/NSW817L/2010/AU
598	VP1	AFJ21451	598	5008	9418, 13828, 18238, 22648, 27058, 31468, 35878	norovirus Hu/GII.4/StVincents/NSW2171/2010/AU
599	VP1	AFJ21454	599	5009	9419, 13829, 18239, 22649, 27059, 31469, 35879	norovirus Hu/GII.4/Helensburgh/NSW295E/2010/AU
600	VP1	AFL70023	600	5010	9420, 13830, 18240, 22650, 27060, 31470, 35880	norovirus Hu/GII.4/SM/USA/2004
601	VP1	AFN06724	601	5011	9421, 13831, 18241, 22651, 27061, 31471, 35881	norovirus Hu/GII.6/S9c/SN/1976
602	VP1	AFN06725	602	5012	9422, 13832, 18242, 22652, 27062, 31472, 35882	norovirus Hu/GII.6/S7e/SN/1976
603	VP1	AFN06726	603	5013	9423, 13833, 18243, 22653, 27063, 31473, 35883	norovirus Hu/GII.2/KL109/MY/1978
604	VP1	AFN06727	604	5014	9424, 13834, 18244, 22654, 27064, 31474, 35884	norovirus Hu/GII.14/HK74/CN/1978
605	VP1	AFN06728	605	5015	9425, 13835, 18245, 22655, 27065, 31475, 35885	norovirus Hu/GII.3/HK71/CN/1978

606	VP1	AFN06729	606	5016	9426, 13836, 18246, 22656, 27066, 31476, 35886	norovirus Hu/GII.3/HK54/CN/1977
607	VP1	AFN06730	607	5017	9427, 13837, 18247, 22657, 27067, 31477, 35887	norovirus Hu/GII.6/HK28/CN/1977
608	VP1	AFN06731	608	5018	9428, 13838, 18248, 22658, 27068, 31478, 35888	norovirus Hu/GII.7/HK4/CN/1976
609	VP1	AFN06732	609	5019	9429, 13839, 18249, 22659, 27069, 31479, 35889	norovirus Hu/GII.17/C142/GF/1978
610	VP1	AFN06733	610	5020	9430, 13840, 18250, 22660, 27070, 31480, 35890	norovirus Hu/GII.5/C15/GF/1978
611	VP1	AFN06734	611	5021	9431, 13841, 18251, 22661, 27071, 31481, 35891	norovirus Hu/GI.6/HK60/CN/1977
612	VP1	AFN06735	612	5022	9432, 13842, 18252, 22662, 27072, 31482, 35892	norovirus Hu/GI.5/E57/UG/1975
613	VP1	AFN06736	613	5023	9433, 13843, 18253, 22663, 27073, 31483, 35893	norovirus Hu/GI/E8/UG/1976
614	VP1	AFN06738	614	5024	9434, 13844, 18254, 22664, 27074, 31484, 35894	norovirus Hu/GI.3/C9/GF/1978
615	VP1	AFN06739	615	5025	9435, 13845, 18255, 22665, 27075, 31485, 35895	norovirus Hu/GI.3/B8/CF/1977
616	VP1	AFV08771	616	5026	9436, 13846, 18256, 22666, 27076, 31486, 35896	norovirus Hu/GII.4/Randwick/NSW882J/2011/AU
617	VP1	AFV08774	617	5027	9437, 13847, 18257, 22667, 27077, 31487, 35897	norovirus Hu/GII.4/Caringbah/NSW4096/2011/AU
618	VP1	AFV08777	618	5028	9438, 13848, 18258, 22668, 27078, 31488, 35898	norovirus Hu/GII.4/Berowra/NSW767L/2012/AU
619	VP1	AFV08780	619	5029	9439, 13849, 18259, 22669, 27079, 31489, 35899	norovirus Hu/GII.4/Jannali/NSW774M/2011/AU
620	VP1	AFV08783	620	5030	9440, 13850, 18260, 22670, 27080, 31490, 35900	norovirus Hu/GII.4/Doonside/NSW536I/2011/AU
621	VP1	AFV08786	621	5031	9441, 13851, 18261, 22671, 27081, 31491, 35901	norovirus Hu/GII.4/Randwick/NSW938K/2011/AU
622	VP1	AFV08789	622	5032	9442, 13852, 18262, 22672, 27082, 31492, 35902	norovirus Hu/GII.4/Miranda/NSW850K/2011/AU

623	VP1	AFV08792	623	5033	9443, 13853, 18263, 22673, 27083, 31493, 35903	norovirus Hu/GII.4/Woonona/NSW3309/2012/AU
624	VP1	AFV08795	624	5034	9444, 13854, 18264, 22674, 27084, 31494, 35904	norovirus Hu/GII.4/Sydney/NSW0514/2012/AU
625	VP1	AFX95940	625	5035	9445, 13855, 18265, 22675, 27085, 31495, 35905	norovirus Hu/GII.4/Hong Kong/CUHK3630/2012/CHN
626	VP1	AFZ84663	626	5036	9446, 13856, 18266, 22676, 27086, 31496, 35906	norovirus Hu/GII.4/HS191/2004/USA
627	VP1	AGG37871	627	5037	9447, 13857, 18267, 22677, 27087, 31497, 35907	norovirus Hu/GII.4/Taichung/12-BA-1/2012/TW
628	VP1	AGI96383	628	5038	9448, 13858, 18268, 22678, 27088, 31498, 35908	norovirus Hu/GII.4/Ohio/684/USA
629	VP1	AGI99552	629	5039	9449, 13859, 18269, 22679, 27089, 31499, 35909	norovirus Hu/GII.4/VP1172/Shanghai/2012/CHN
630	VP1	AGI99553	630	5040	9450, 13860, 18270, 22680, 27090, 31500, 35910	norovirus Hu/GII.4/VP1214/Shanghai/2012/CHN
631	VP1	AGI99554	631	5041	9451, 13861, 18271, 22681, 27091, 31501, 35911	norovirus Hu/GII.4/VP1281/Shanghai/2012/CHN
632	VP1	AGI99555	632	5042	9452, 13862, 18272, 22682, 27092, 31502, 35912	norovirus Hu/GII.4/VP1451/Shanghai/2012/CHN
633	VP1	AGK25882	633	5043	9453, 13863, 18273, 22683, 27093, 31503, 35913	norovirus Hu/GII-4/New Taipei/CGMH49/2011/TW
634	VP1	AGK25884	634	5044	9454, 13864, 18274, 22684, 27094, 31504, 35914	norovirus Hu/GII-4/New Taipei/CGMH50/2011/TW
635	VP1	AGK25887	635	5045	9455, 13865, 18275, 22685, 27095, 31505, 35915	norovirus Hu/GII-4/Taoyuan/CGMH51/2012/TW
636	VP1	AGK25890	636	5046	9456, 13866, 18276, 22686, 27096, 31506, 35916	norovirus Hu/GII-4/Taoyuan/CGMH52/2012/TW
637	VP1	AGK25892	637	5047	9457, 13867, 18277, 22687, 27097, 31507, 35917	norovirus Hu/GII-4/New Taipei/CGMH53/2012/TW
638	VP1	AGK25898	638	5048	9458, 13868, 18278, 22688, 27098, 31508, 35918	norovirus Hu/GII-4/Taoyuan/CGMH55/2012/TW
639	VP1	AGK25900	639	5049	9459, 13869, 18279, 22689, 27099, 31509, 35919	norovirus Hu/GII-4/New Taipei/CGMH56/2012/TW

640	VP1	AGK25902	640	5050	9460, 13870, 18280, 22690, 27100, 31510, 35920	norovirus Hu/GII-4/Taoyuan/CGMH57/2012/TW
641	VP1	AGK25905	641	5051	9461, 13871, 18281, 22691, 27101, 31511, 35921	norovirus Hu/GII-4/New Taipei/CGMH58/2012/TW
642	VP1	AGK25908	642	5052	9462, 13872, 18282, 22692, 27102, 31512, 35922	norovirus Hu/GII-4/Taoyuan/CGMH59/2012/TW
643	VP1	AGK25910	643	5053	9463, 13873, 18283, 22693, 27103, 31513, 35923	norovirus Hu/GII-4/Taoyuan/CGMH60/2012/TW
644	VP1	AGK25912	644	5054	9464, 13874, 18284, 22694, 27104, 31514, 35924	norovirus Hu/GII-4/New Taipei/CGMH61/2012/TW
645	VP1	AGK25915	645	5055	9465, 13875, 18285, 22695, 27105, 31515, 35925	norovirus Hu/GII-4/New Taipei/CGMH62/2012/TW
646	VP1	AGK25917	646	5056	9466, 13876, 18286, 22696, 27106, 31516, 35926	norovirus Hu/GII-4/Taoyuan/CGMH63/2012/TW
647	VP1	AGK25919	647	5057	9467, 13877, 18287, 22697, 27107, 31517, 35927	norovirus Hu/GII-4/Taoyuan/CGMH64/2012/TW
648	VP1	AGK25921	648	5058	9468, 13878, 18288, 22698, 27108, 31518, 35928	norovirus Hu/GII-4/Taoyuan/CGMH65/2012/TW
649	VP1	AGK25924	649	5059	9469, 13879, 18289, 22699, 27109, 31519, 35929	norovirus Hu/GII-4/Taoyuan/CGMH66/2012/TW
650	VP1	AGK25927	650	5060	9470, 13880, 18290, 22700, 27110, 31520, 35930	norovirus Hu/GII-4/Taoyuan/CGMH67/2012/TW
651	VP1	AGK25930	651	5061	9471, 13881, 18291, 22701, 27111, 31521, 35931	norovirus Hu/GII-4/New Taipei/CGMH68/2012/TW
652	VP1	AGS08025	652	5062	9472, 13882, 18292, 22702, 27112, 31522, 35932	norovirus Hu/GII.4/ACT0675/2012/AU
653	VP1	AGS08026	653	5063	9473, 13883, 18293, 22703, 27113, 31523, 35933	norovirus Hu/GII.4/NSW0025/2011/AU
654	VP1	AGS08027	654	5064	9474, 13884, 18294, 22704, 27114, 31524, 35934	norovirus Hu/GII.4/NSW0066/2012/AU
655	VP1	AGS08028	655	5065	9475, 13885, 18295, 22705, 27115, 31525, 35935	norovirus Hu/GII.4/NSW007P/2012/AU
656	VP1	AGS08029	656	5066	9476, 13886, 18296, 22706, 27116, 31526, 35936	norovirus Hu/GII.4/NSW0287/2012/AU

657	VP1	AGS08030	657	5067	9477, 13887, 18297, 22707, 27117, 31527, 35937	norovirus Hu/GII.4/NSW035H/2012/AU
658	VP1	AGS08031	658	5068	9478, 13888, 18298, 22708, 27118, 31528, 35938	norovirus Hu/GII.4/NSW052I/2012/AU
659	VP1	AGS08032	659	5069	9479, 13889, 18299, 22709, 27119, 31529, 35939	norovirus Hu/GII.4/NSW076J/2011/AU
660	VP1	AGS08033	660	5070	9480, 13890, 18300, 22710, 27120, 31530, 35940	norovirus Hu/GII.4/NSW078G/2012/AU
661	VP1	AGS08035	661	5071	9481, 13891, 18301, 22711, 27121, 31531, 35941	norovirus Hu/GII.4/NSW097K/2012/AU
662	VP1	AGS08036	662	5072	9482, 13892, 18302, 22712, 27122, 31532, 35942	norovirus Hu/GII.4/NSW0988/2012/AU
663	VP1	AGS08037	663	5073	9483, 13893, 18303, 22713, 27123, 31533, 35943	norovirus Hu/GII.4/NSW1061/2012/AU
664	VP1	AGS08038	664	5074	9484, 13894, 18304, 22714, 27124, 31534, 35944	norovirus Hu/GII.4/NSW114H/2012/AU
665	VP1	AGS08040	665	5075	9485, 13895, 18305, 22715, 27125, 31535, 35945	norovirus Hu/GII.4/NSW150E/2011/AU
666	VP1	AGS08041	666	5076	9486, 13896, 18306, 22716, 27126, 31536, 35946	norovirus Hu/GII.4/NSW1523/2012/AU
667	VP1	AGS08042	667	5077	9487, 13897, 18307, 22717, 27127, 31537, 35947	norovirus Hu/GII.4/NSW1560/2011/AU
668	VP1	AGS08043	668	5078	9488, 13898, 18308, 22718, 27128, 31538, 35948	norovirus Hu/GII.4/NSW1627/2012/AU
669	VP1	AGS08044	669	5079	9489, 13899, 18309, 22719, 27129, 31539, 35949	norovirus Hu/GII.4/NSW1652/2012/AU
670	VP1	AGS08045	670	5080	9490, 13900, 18310, 22720, 27130, 31540, 35950	norovirus Hu/GII.4/NSW1749/2011/AU
671	VP1	AGS08047	671	5081	9491, 13901, 18311, 22721, 27131, 31541, 35951	norovirus Hu/GII.4/NSW2024/2012/AU
672	VP1	AGS08048	672	5082	9492, 13902, 18312, 22722, 27132, 31542, 35952	norovirus Hu/GII.4/NSW209B/2012/AU
673	VP1	AGS08050	673	5083	9493, 13903, 18313, 22723, 27133, 31543, 35953	norovirus Hu/GII.4/NSW230B/2012/AU

674	VP1	AGS08051	674	5084	9494, 13904, 18314, 22724, 27134, 31544, 35954	norovirus Hu/GII.4/NSW2317/2011/AU
675	VP1	AGS08052	675	5085	9495, 13905, 18315, 22725, 27135, 31545, 35955	norovirus Hu/GII.4/NSW2586/2012/AU
676	VP1	AGS08054	676	5086	9496, 13906, 18316, 22726, 27136, 31546, 35956	norovirus Hu/GII.4/NSW270F/2012/AU
677	VP1	AGS08056	677	5087	9497, 13907, 18317, 22727, 27137, 31547, 35957	norovirus Hu/GII.4/NSW2949/2012/AU
678	VP1	AGS08057	678	5088	9498, 13908, 18318, 22728, 27138, 31548, 35958	norovirus Hu/GII.4/NSW295G/2012/AU
679	VP1	AGS08058	679	5089	9499, 13909, 18319, 22729, 27139, 31549, 35959	norovirus Hu/GII.4/NSW3108/2012/AU
680	VP1	AGS08059	680	5090	9500, 13910, 18320, 22730, 27140, 31550, 35960	norovirus Hu/GII.4/Sutherland/NSW311A/2012/AU
681	VP1	AGS08060	681	5091	9501, 13911, 18321, 22731, 27141, 31551, 35961	norovirus Hu/GII.4/Randwick/NSW311A/2012/AU
682	VP1	AGS08061	682	5092	9502, 13912, 18322, 22732, 27142, 31552, 35962	norovirus Hu/GII.4/NSW313C/2011/AU
683	VP1	AGS08062	683	5093	9503, 13913, 18323, 22733, 27143, 31553, 35963	norovirus Hu/GII.4/NSW3192/2012/AU
684	VP1	AGS08063	684	5094	9504, 13914, 18324, 22734, 27144, 31554, 35964	norovirus Hu/GII.4/NSW323I/2012/AU
685	VP1	AGS08064	685	5095	9505, 13915, 18325, 22735, 27145, 31555, 35965	norovirus Hu/GII.4/NSW336H/2011/AU
686	VP1	AGS08065	686	5096	9506, 13916, 18326, 22736, 27146, 31556, 35966	norovirus Hu/GII.4/NSW3440/2012/AU
687	VP1	AGS08066	687	5097	9507, 13917, 18327, 22737, 27147, 31557, 35967	norovirus Hu/GII.4/NSW348I/2012/AU
688	VP1	AGS08067	688	5098	9508, 13918, 18328, 22738, 27148, 31558, 35968	norovirus Hu/GII.4/NSW349B/2012/AU
689	VP1	AGS08068	689	5099	9509, 13919, 18329, 22739, 27149, 31559, 35969	norovirus Hu/GII.4/NSW3522/2012/AU
690	VP1	AGS08069	690	5100	9510, 13920, 18330, 22740, 27150, 31560, 35970	norovirus Hu/GII.4/NSW364K/2011/AU

691	VP1	AGS08070	691	5101	9511, 13921, 18331, 22741, 27151, 31561, 35971	norovirus Hu/GII.4/NSW369N/2012/AU
692	VP1	AGS08071	692	5102	9512, 13922, 18332, 22742, 27152, 31562, 35972	norovirus Hu/GII.4/NSW389W/2012/AU
693	VP1	AGS08072	693	5103	9513, 13923, 18333, 22743, 27153, 31563, 35973	norovirus Hu/GII.4/NSW391I/2011/AU
694	VP1	AGS08073	694	5104	9514, 13924, 18334, 22744, 27154, 31564, 35974	norovirus Hu/GII.4/NSW392G/2011/AU
695	VP1	AGS08074	695	5105	9515, 13925, 18335, 22745, 27155, 31565, 35975	norovirus Hu/GII.4/NSW4118/2012/AU
696	VP1	AGS08076	696	5106	9516, 13926, 18336, 22746, 27156, 31566, 35976	norovirus Hu/GII.4/NSW426H/2011/AU
697	VP1	AGS08079	697	5107	9517, 13927, 18337, 22747, 27157, 31567, 35977	norovirus Hu/GII.4/NSW4379/2011/AU
698	VP1	AGS08080	698	5108	9518, 13928, 18338, 22748, 27158, 31568, 35978	norovirus Hu/GII.4/NSW4483/2012/AU
699	VP1	AGS08081	699	5109	9519, 13929, 18339, 22749, 27159, 31569, 35979	norovirus Hu/GII.4/NSW4512/2012/AU
700	VP1	AGS08082	700	5110	9520, 13930, 18340, 22750, 27160, 31570, 35980	norovirus Hu/GII.4/NSW4576/2012/AU
701	VP1	AGS08083	701	5111	9521, 13931, 18341, 22751, 27161, 31571, 35981	norovirus Hu/GII.4/NSW465J/2011/AU
702	VP1	AGS08084	702	5112	9522, 13932, 18342, 22752, 27162, 31572, 35982	norovirus Hu/GII.4/NSW468J/2011/AU
703	VP1	AGS08085	703	5113	9523, 13933, 18343, 22753, 27163, 31573, 35983	norovirus Hu/GII.4/NSW489T/2012/AU
704	VP1	AGS08086	704	5114	9524, 13934, 18344, 22754, 27164, 31574, 35984	norovirus Hu/GII.4/NSW5000/2012/AU
705	VP1	AGS08087	705	5115	9525, 13935, 18345, 22755, 27165, 31575, 35985	norovirus Hu/GII.4/NSW5047/2011/AU
706	VP1	AGS08088	706	5116	9526, 13936, 18346, 22756, 27166, 31576, 35986	norovirus Hu/GII.4/NSW512D/2012/AU
707	VP1	AGS08089	707	5117	9527, 13937, 18347, 22757, 27167, 31577, 35987	norovirus Hu/GII.4/NSW5263/2011/AU

708	VP1	AGS08090	708	5118	9528, 13938, 18348, 22758, 27168, 31578, 35988	norovirus Hu/GII.4/NSW550F/2012/AU
709	VP1	AGS08091	709	5119	9529, 13939, 18349, 22759, 27169, 31579, 35989	norovirus Hu/GII.4/NSW558V/2012/AU
710	VP1	AGS08092	710	5120	9530, 13940, 18350, 22760, 27170, 31580, 35990	norovirus Hu/GII.4/NSW5599/2011/AU
711	VP1	AGS08093	711	5121	9531, 13941, 18351, 22761, 27171, 31581, 35991	norovirus Hu/GII.4/NSW563F/2012/AU
712	VP1	AGS08094	712	5122	9532, 13942, 18352, 22762, 27172, 31582, 35992	norovirus Hu/GII.4/NSW571K/2011/AU
713	VP1	AGS08095	713	5123	9533, 13943, 18353, 22763, 27173, 31583, 35993	norovirus Hu/GII.4/NSW574H/2012/AU
714	VP1	AGS08096	714	5124	9534, 13944, 18354, 22764, 27174, 31584, 35994	norovirus Hu/GII.4/NSW576T/2012/AU
715	VP1	AGS08097	715	5125	9535, 13945, 18355, 22765, 27175, 31585, 35995	norovirus Hu/GII.4/NSW580G/2011/AU
716	VP1	AGS08098	716	5126	9536, 13946, 18356, 22766, 27176, 31586, 35996	norovirus Hu/GII.4/NSW584J/2011/AU
717	VP1	AGS08099	717	5127	9537, 13947, 18357, 22767, 27177, 31587, 35997	norovirus Hu/GII.4/NSW5868/2012/AU
718	VP1	AGS08100	718	5128	9538, 13948, 18358, 22768, 27178, 31588, 35998	norovirus Hu/GII.4/NSW590J/2012/AU
719	VP1	AGS08101	719	5129	9539, 13949, 18359, 22769, 27179, 31589, 35999	norovirus Hu/GII.4/NSW596M/2011/AU
720	VP1	AGS08102	720	5130	9540, 13950, 18360, 22770, 27180, 31590, 36000	norovirus Hu/GII.4/NSW596Q/2012/AU
721	VP1	AGS08103	721	5131	9541, 13951, 18361, 22771, 27181, 31591, 36001	norovirus Hu/GII.4/NSW6027/2012/AU
722	VP1	AGS08104	722	5132	9542, 13952, 18362, 22772, 27182, 31592, 36002	norovirus Hu/GII.4/NSW6142/2011/AU
723	VP1	AGS08105	723	5133	9543, 13953, 18363, 22773, 27183, 31593, 36003	norovirus Hu/GII.4/NSW615H/2012/AU
724	VP1	AGS08106	724	5134	9544, 13954, 18364, 22774, 27184, 31594, 36004	norovirus Hu/GII.4/NSW6168/2012/AU

725	VP1	AGS08107	725	5135	9545, 13955, 18365, 22775, 27185, 31595, 36005	norovirus Hu/GII.4/NSW619D/2012/AU
726	VP1	AGS08108	726	5136	9546, 13956, 18366, 22776, 27186, 31596, 36006	norovirus Hu/GII.4/NSW623B/2011/AU
727	VP1	AGS08109	727	5137	9547, 13957, 18367, 22777, 27187, 31597, 36007	norovirus Hu/GII.4/NSW628G/2012/AU
728	VP1	AGS08110	728	5138	9548, 13958, 18368, 22778, 27188, 31598, 36008	norovirus Hu/GII.4/NSW628T/2012/AU
729	VP1	AGS08111	729	5139	9549, 13959, 18369, 22779, 27189, 31599, 36009	norovirus Hu/GII.4/NSW636Q/2012/AU
730	VP1	AGS08112	730	5140	9550, 13960, 18370, 22780, 27190, 31600, 36010	norovirus Hu/GII.4/NSW651H/2011/AU
731	VP1	AGS08113	731	5141	9551, 13961, 18371, 22781, 27191, 31601, 36011	norovirus Hu/GII.4/NSW660C/2011/AU
732	VP1	AGS08114	732	5142	9552, 13962, 18372, 22782, 27192, 31602, 36012	norovirus Hu/GII.4/NSW6698/2012/AU
733	VP1	AGS08115	733	5143	9553, 13963, 18373, 22783, 27193, 31603, 36013	norovirus Hu/GII.4/NSW675N/2012/AU
734	VP1	AGS08116	734	5144	9554, 13964, 18374, 22784, 27194, 31604, 36014	norovirus Hu/GII.4/NSW676P/2012/AU
735	VP1	AGS08117	735	5145	9555, 13965, 18375, 22785, 27195, 31605, 36015	norovirus Hu/GII.4/NSW679Q/2011/AU
736	VP1	AGS08119	736	5146	9556, 13966, 18376, 22786, 27196, 31606, 36016	norovirus Hu/GII.4/NSW6982/2012/AU
737	VP1	AGS08120	737	5147	9557, 13967, 18377, 22787, 27197, 31607, 36017	norovirus Hu/GII.4/NSW707P/2011/AU
738	VP1	AGS08121	738	5148	9558, 13968, 18378, 22788, 27198, 31608, 36018	norovirus Hu/GII.4/NSW7107/2012/AU
739	VP1	AGS08122	739	5149	9559, 13969, 18379, 22789, 27199, 31609, 36019	norovirus Hu/GII.4/NSW7117/2012/AU
740	VP1	AGS08124	740	5150	9560, 13970, 18380, 22790, 27200, 31610, 36020	norovirus Hu/GII.4/NSW7188/2012/AU
741	VP1	AGS08125	741	5151	9561, 13971, 18381, 22791, 27201, 31611, 36021	norovirus Hu/GII.4/NSW746S/2012/AU

742	VP1	AGS08126	742	5152	9562, 13972, 18382, 22792, 27202, 31612, 36022	norovirus Hu/GII.4/NSW748N/2012/AU
743	VP1	AGS08127	743	5153	9563, 13973, 18383, 22793, 27203, 31613, 36023	norovirus Hu/GII.4/NSW767N/2011/AU
744	VP1	AGS08128	744	5154	9564, 13974, 18384, 22794, 27204, 31614, 36024	norovirus Hu/GII.4/NSW783I/2011/AU
745	VP1	AGS08129	745	5155	9565, 13975, 18385, 22795, 27205, 31615, 36025	norovirus Hu/GII.4/NSW783R/2011/AU
746	VP1	AGS08130	746	5156	9566, 13976, 18386, 22796, 27206, 31616, 36026	norovirus Hu/GII.4/NSW797K/2012/AU
747	VP1	AGS08131	747	5157	9567, 13977, 18387, 22797, 27207, 31617, 36027	norovirus Hu/GII.4/NSW811C/2012/AU
748	VP1	AGS08132	748	5158	9568, 13978, 18388, 22798, 27208, 31618, 36028	norovirus Hu/GII.4/NSW811G/2011/AU
749	VP1	AGS08133	749	5159	9569, 13979, 18389, 22799, 27209, 31619, 36029	norovirus Hu/GII.4/NSW820J/2011/AU
750	VP1	AGS08134	750	5160	9570, 13980, 18390, 22800, 27210, 31620, 36030	norovirus Hu/GII.4/NSW824F/2012/AU
751	VP1	AGS08135	751	5161	9571, 13981, 18391, 22801, 27211, 31621, 36031	norovirus Hu/GII.4/NSW826F/2011/AU
752	VP1	AGS08136	752	5162	9572, 13982, 18392, 22802, 27212, 31622, 36032	norovirus Hu/GII.4/NSW8347/2012/AU
753	VP1	AGS08137	753	5163	9573, 13983, 18393, 22803, 27213, 31623, 36033	norovirus Hu/GII.4/NSW838I/2012/AU
754	VP1	AGS08138	754	5164	9574, 13984, 18394, 22804, 27214, 31624, 36034	norovirus Hu/GII.4/NSW840H/2012/AU
755	VP1	AGS08139	755	5165	9575, 13985, 18395, 22805, 27215, 31625, 36035	norovirus Hu/GII.4/NSW8482/2012/AU
756	VP1	AGS08140	756	5166	9576, 13986, 18396, 22806, 27216, 31626, 36036	norovirus Hu/GII.4/NSW862G/2012/AU
757	VP1	AGS08141	757	5167	9577, 13987, 18397, 22807, 27217, 31627, 36037	norovirus Hu/GII.4/NSW8632/2012/AU
758	VP1	AGS08142	758	5168	9578, 13988, 18398, 22808, 27218, 31628, 36038	norovirus Hu/GII.4/NSW868I/2012/AU

759	VP1	AGS08143	759	5169	9579, 13989, 18399, 22809, 27219, 31629, 36039	norovirus Hu/GII.4/NSW8931/2011/AU
760	VP1	AGS08144	760	5170	9580, 13990, 18400, 22810, 27220, 31630, 36040	norovirus Hu/GII.4/NSW906P/2012/AU
761	VP1	AGS08145	761	5171	9581, 13991, 18401, 22811, 27221, 31631, 36041	norovirus Hu/GII.4/NSW916G/2012/AU
762	VP1	AGS08146	762	5172	9582, 13992, 18402, 22812, 27222, 31632, 36042	norovirus Hu/GII.4/NSW917I/2012/AU
763	VP1	AGS08147	763	5173	9583, 13993, 18403, 22813, 27223, 31633, 36043	norovirus Hu/GII.4/NSW9334/2012/AU
764	VP1	AGS08148	764	5174	9584, 13994, 18404, 22814, 27224, 31634, 36044	norovirus Hu/GII.4/NSW9393/2012/AU
765	VP1	AGS08149	765	5175	9585, 13995, 18405, 22815, 27225, 31635, 36045	norovirus Hu/GII.4/NSW959S/2012/AU
766	VP1	AGS08150	766	5176	9586, 13996, 18406, 22816, 27226, 31636, 36046	norovirus Hu/GII.4/NSW982P/2011/AU
767	VP1	AGS08152	767	5177	9587, 13997, 18407, 22817, 27227, 31637, 36047	norovirus Hu/GII.4/NLV-10-614/2010/NZ
768	VP1	AGS08153	768	5178	9588, 13998, 18408, 22818, 27228, 31638, 36048	norovirus Hu/GII.4/NLV-10-640/2010/NZ
769	VP1	AGS08154	769	5179	9589, 13999, 18409, 22819, 27229, 31639, 36049	norovirus Hu/GII.4/NLV-12-1034/2012/NZ
770	VP1	AGS08157	770	5180	9590, 14000, 18410, 22820, 27230, 31640, 36050	norovirus Hu/GII.4/NLV-12-1072/2012/NZ
771	VP1	AGS08158	771	5181	9591, 14001, 18411, 22821, 27231, 31641, 36051	norovirus Hu/GII.4/NLV-12-308/2012/NZ
772	VP1	AGS08160	772	5182	9592, 14002, 18412, 22822, 27232, 31642, 36052	norovirus Hu/GII.4/NLV-12-501/2012/NZ
773	VP1	AGS08161	773	5183	9593, 14003, 18413, 22823, 27233, 31643, 36053	norovirus Hu/GII.4/NLV-12-514/2012/NZ
774	VP1	AGS08162	774	5184	9594, 14004, 18414, 22824, 27234, 31644, 36054	norovirus Hu/GII.4/NLV-12-548/2012/NZ
775	VP1	AGS08163	775	5185	9595, 14005, 18415, 22825, 27235, 31645, 36055	norovirus Hu/GII.4/NLV-12-583/2012/NZ

776	VP1	AGS08164	776	5186	9596, 14006, 18416, 22826, 27236, 31646, 36056	norovirus Hu/GII.4/NLV-12-607/2012/NZ
777	VP1	AGS08165	777	5187	9597, 14007, 18417, 22827, 27237, 31647, 36057	norovirus Hu/GII.4/NLV-12-615/2012/NZ
778	VP1	AGS08166	778	5188	9598, 14008, 18418, 22828, 27238, 31648, 36058	norovirus Hu/GII.4/NLV-12-628/2012/NZ
779	VP1	AGS08167	779	5189	9599, 14009, 18419, 22829, 27239, 31649, 36059	norovirus Hu/GII.4/NLV-12-65/2012/NZ
780	VP1	AGS08168	780	5190	9600, 14010, 18420, 22830, 27240, 31650, 36060	norovirus Hu/GII.4/NLV-12-671/2012/NZ
781	VP1	AGS08169	781	5191	9601, 14011, 18421, 22831, 27241, 31651, 36061	norovirus Hu/GII.4/NLV-12-672/2012/NZ
782	VP1	AGS08170	782	5192	9602, 14012, 18422, 22832, 27242, 31652, 36062	norovirus Hu/GII.4/NLV-12-719/2012/NZ
783	VP1	AGS08171	783	5193	9603, 14013, 18423, 22833, 27243, 31653, 36063	norovirus Hu/GII.4/NLV-12-723/2012/NZ
784	VP1	AGS08172	784	5194	9604, 14014, 18424, 22834, 27244, 31654, 36064	norovirus Hu/GII.4/NLV-12-73/2012/NZ
785	VP1	AGS08173	785	5195	9605, 14015, 18425, 22835, 27245, 31655, 36065	norovirus Hu/GII.4/NLV-12-734/2012/NZ
786	VP1	AGS08174	786	5196	9606, 14016, 18426, 22836, 27246, 31656, 36066	norovirus Hu/GII.4/NLV-12-758/2012/NZ
787	VP1	AGS08175	787	5197	9607, 14017, 18427, 22837, 27247, 31657, 36067	norovirus Hu/GII.4/NLV-12-763/2012/NZ
788	VP1	AGS08176	788	5198	9608, 14018, 18428, 22838, 27248, 31658, 36068	norovirus Hu/GII.4/NLV-12-787/2012/NZ
789	VP1	AGS08177	789	5199	9609, 14019, 18429, 22839, 27249, 31659, 36069	norovirus Hu/GII.4/NLV-12-803/2012/NZ
790	VP1	AGS08178	790	5200	9610, 14020, 18430, 22840, 27250, 31660, 36070	norovirus Hu/GII.4/NLV-12-809/2012/NZ
791	VP1	AGS08179	791	5201	9611, 14021, 18431, 22841, 27251, 31661, 36071	norovirus Hu/GII.4/NLV-12-831/2012/NZ
792	VP1	AGS08180	792	5202	9612, 14022, 18432, 22842, 27252, 31662, 36072	norovirus Hu/GII.4/NLV-12-902/2012/NZ

793	VP1	AGS08181	793	5203	9613, 14023, 18433, 22843, 27253, 31663, 36073	norovirus Hu/GII.4/NLV-12-932/2012/NZ
794	VP1	AGS08182	794	5204	9614, 14024, 18434, 22844, 27254, 31664, 36074	norovirus Hu/GII.4/NLV-12-934/2012/NZ
795	VP1	AGT39181	795	5205	9615, 14025, 18435, 22845, 27255, 31665, 36075	norovirus Hu/GII.3/CGMH36/2010/TW
796	VP1	AGT39191	796	5206	9616, 14026, 18436, 22846, 27256, 31666, 36076	norovirus Hu/GII.12/CGMH38/2010/TW
797	VP1	AGT39194	797	5207	9617, 14027, 18437, 22847, 27257, 31667, 36077	norovirus Hu/GII.12/CGMH39/2010/TW
798	VP1	AGT39197	798	5208	9618, 14028, 18438, 22848, 27258, 31668, 36078	norovirus Hu/GII.12/CGMH40/2010/TW
799	VP1	AGT39200	799	5209	9619, 14029, 18439, 22849, 27259, 31669, 36079	norovirus Hu/GII.12/CGMH41/2010/TW
800	VP1	AGT39203	800	5210	9620, 14030, 18440, 22850, 27260, 31670, 36080	norovirus Hu/GII.12/CGMH42/2010/TW
801	VP1	AGT39206	801	5211	9621, 14031, 18441, 22851, 27261, 31671, 36081	norovirus Hu/GII.2/CGMH47/2011/TW
802	VP1	AHF45991	802	5212	9622, 14032, 18442, 22852, 27262, 31672, 36082	norovirus Hu/GII.4/Taipei/06-AM-11/2006/TW
803	VP1	AHF45993	803	5213	9623, 14033, 18443, 22853, 27263, 31673, 36083	norovirus Hu/GII.4/kaohsiung/12-AY-1/2010/TW
804	VP1	AHF45997	804	5214	9624, 14034, 18444, 22854, 27264, 31674, 36084	norovirus Hu/GII.4/Penghu/12-BQ-1/2012/TW
805	VP1	AHF45999	805	5215	9625, 14035, 18445, 22855, 27265, 31675, 36085	norovirus Hu/GII.4/Tainan/12-CD-2-4/2012/TW
806	VP1	AHF46001	806	5216	9626, 14036, 18446, 22856, 27266, 31676, 36086	norovirus Hu/GII.4/Changhua/12-CG-2-4/2012/TW
807	VP1	AHH44876	807	5217	9627, 14037, 18447, 22857, 27267, 31677, 36087	norovirus Hu/GII.4/patient_A/2010/USA
808	VP1	AHH44877	808	5218	9628, 14038, 18448, 22858, 27268, 31678, 36088	norovirus Hu/GII.4/patient_A/2010/USA
809	VP1	AHH44878	809	5219	9629, 14039, 18449, 22859, 27269, 31679, 36089	norovirus Hu/GII.4/patient_A/2010/USA

810	VP1	AHH44879	810	5220	9630, 14040, 18450, 22860, 27270, 31680, 36090	norovirus Hu/GII.4/patient_A/2010/USA
811	VP1	AHH44880	811	5221	9631, 14041, 18451, 22861, 27271, 31681, 36091	norovirus Hu/GII.4/patient_A/2010/USA
812	VP1	AHH44881	812	5222	9632, 14042, 18452, 22862, 27272, 31682, 36092	norovirus Hu/GII.4/patient_A/2010/USA
813	VP1	AHH44884	813	5223	9633, 14043, 18453, 22863, 27273, 31683, 36093	norovirus Hu/GII.4/patient_A/2010/USA
814	VP1	AHH44886	814	5224	9634, 14044, 18454, 22864, 27274, 31684, 36094	norovirus Hu/GII.4/patient_C/2010/USA
815	VP1	AHH44888	815	5225	9635, 14045, 18455, 22865, 27275, 31685, 36095	norovirus Hu/GII.4/patient_C/2010/USA
816	VP1	AHH44889	816	5226	9636, 14046, 18456, 22866, 27276, 31686, 36096	norovirus Hu/GII.4/patient_C/2010/USA
817	VP1	AHH44890	817	5227	9637, 14047, 18457, 22867, 27277, 31687, 36097	norovirus Hu/GII.4/patient_C/2010/USA
818	VP1	AHH44891	818	5228	9638, 14048, 18458, 22868, 27278, 31688, 36098	norovirus Hu/GII.4/patient_C/2010/USA
819	VP1	AHH44893	819	5229	9639, 14049, 18459, 22869, 27279, 31689, 36099	norovirus Hu/GII.4/patient_C/2010/USA
820	VP1	AHH44894	820	5230	9640, 14050, 18460, 22870, 27280, 31690, 36100	norovirus Hu/GII.4/patient_C/2010/USA
821	VP1	AHH44895	821	5231	9641, 14051, 18461, 22871, 27281, 31691, 36101	norovirus Hu/GII.4/patient_C/2010/USA
822	VP1	AHH44896	822	5232	9642, 14052, 18462, 22872, 27282, 31692, 36102	norovirus Hu/GII.4/patient_A+5mo/2010/USA
823	VP1	AHH44897	823	5233	9643, 14053, 18463, 22873, 27283, 31693, 36103	norovirus Hu/GII.4/patient_A+5mo/2010/USA
824	VP1	AHH44899	824	5234	9644, 14054, 18464, 22874, 27284, 31694, 36104	norovirus Hu/GII.4/patient_A+5mo/2010/USA
825	VP1	AHH44900	825	5235	9645, 14055, 18465, 22875, 27285, 31695, 36105	norovirus Hu/GII.4/patient_A+5mo/2010/USA
826	VP1	AHH44902	826	5236	9646, 14056, 18466, 22876, 27286, 31696, 36106	norovirus Hu/GII.4/patient_A+5mo/2010/USA

827	VP1	AHH44904	827	5237	9647, 14057, 18467, 22877, 27287, 31697, 36107	norovirus Hu/GII.4/patient_A+5mo/2010/USA
828	VP1	AHH44905	828	5238	9648, 14058, 18468, 22878, 27288, 31698, 36108	norovirus Hu/GII.4/patient_A+5mo/2010/USA
829	VP1	AHH44906	829	5239	9649, 14059, 18469, 22879, 27289, 31699, 36109	norovirus Hu/GII.4/patient_B/2010/USA
830	VP1	AHH44907	830	5240	9650, 14060, 18470, 22880, 27290, 31700, 36110	norovirus Hu/GII.4/patient_B/2010/USA
831	VP1	AHH44908	831	5241	9651, 14061, 18471, 22881, 27291, 31701, 36111	norovirus Hu/GII.4/patient_B/2010/USA
832	VP1	AHH44909	832	5242	9652, 14062, 18472, 22882, 27292, 31702, 36112	norovirus Hu/GII.4/patient_B/2010/USA
833	VP1	AHH44911	833	5243	9653, 14063, 18473, 22883, 27293, 31703, 36113	norovirus Hu/GII.4/patient_B/2010/USA
834	VP1	AHH44912	834	5244	9654, 14064, 18474, 22884, 27294, 31704, 36114	norovirus Hu/GII.4/patient_B/2010/USA
835	VP1	AHH44913	835	5245	9655, 14065, 18475, 22885, 27295, 31705, 36115	norovirus Hu/GII.4/patient_B/2010/USA
836	VP1	AHH44914	836	5246	9656, 14066, 18476, 22886, 27296, 31706, 36116	norovirus Hu/GII.4/patient_B/2010/USA
837	VP1	AHH44915	837	5247	9657, 14067, 18477, 22887, 27297, 31707, 36117	norovirus Hu/GII.4/patient_B/2010/USA
838	VP1	AID60853	838	5248	9658, 14068, 18478, 22888, 27298, 31708, 36118	norovirus Hu/GII.4/Beijing/PKUPH-02-01/inpatient/2012/CHN
839	VP1	AID60855	839	5249	9659, 14069, 18479, 22889, 27299, 31709, 36119	norovirus Hu/GII.4/Beijing/PKUPH-02-02/inpatient/2012/CHN
840	VP1	AID60857	840	5250	9660, 14070, 18480, 22890, 27300, 31710, 36120	norovirus Hu/GII.4/Beijing/PKUPH-02-03/inpatient/2012/CHN
841	VP1	AID60859	841	5251	9661, 14071, 18481, 22891, 27301, 31711, 36121	norovirus Hu/GII.4/Beijing/PKUPH-02-04/inpatient/2013/CHN
842	VP1	AID60861	842	5252	9662, 14072, 18482, 22892, 27302, 31712, 36122	norovirus Hu/GII.4/Beijing/PKUPH-02-05/inpatient/2013/CHN
843	VP1	AID60863	843	5253	9663, 14073, 18483, 22893, 27303, 31713, 36123	norovirus Hu/GII.4/Beijing/PKUPH-02-06/inpatient/2013/CHN

844	VP1	AID60865	844	5254	9664, 14074, 18484, 22894, 27304, 31714, 36124	norovirus Hu/GII.4/Beijing/PKUPH-02-07/inpatient/2013/CHN
845	VP1	AID60869	845	5255	9665, 14075, 18485, 22895, 27305, 31715, 36125	norovirus Hu/GII.4/Beijing/PKUPH-02-09/inpatient/2013/CHN
846	VP1	AID60871	846	5256	9666, 14076, 18486, 22896, 27306, 31716, 36126	norovirus Hu/GII.4/Beijing/PKUPH-05-01/inpatient/2013/CHN
847	VP1	AID60875	847	5257	9667, 14077, 18487, 22897, 27307, 31717, 36127	norovirus Hu/GII.4/Beijing/PKUPH-05-03/inpatient/2013/CHN
848	VP1	AID60877	848	5258	9668, 14078, 18488, 22898, 27308, 31718, 36128	norovirus Hu/GII.4/Beijing/PKUPH-05-04/inpatient/2013/CHN
849	VP1	AID60879	849	5259	9669, 14079, 18489, 22899, 27309, 31719, 36129	norovirus Hu/GII.4/Beijing/PKUPH-05-05/inpatient/2013/CHN
850	VP1	AID60881	850	5260	9670, 14080, 18490, 22900, 27310, 31720, 36130	norovirus Hu/GII.4/Beijing/PKUPH-05-06/inpatient/2013/CHN
851	VP1	AID60883	851	5261	9671, 14081, 18491, 22901, 27311, 31721, 36131	norovirus Hu/GII.4/Beijing/PKUPH-05-07/inpatient/2013/CHN
852	VP1	AID60885	852	5262	9672, 14082, 18492, 22902, 27312, 31722, 36132	norovirus Hu/GII.4/Beijing/PKUPH-07-01/inpatient/2013/CHN
853	VP1	AID60887	853	5263	9673, 14083, 18493, 22903, 27313, 31723, 36133	norovirus Hu/GII.4/Beijing/PKUPH-07-02/inpatient/2013/CHN
854	VP1	AID60889	854	5264	9674, 14084, 18494, 22904, 27314, 31724, 36134	norovirus Hu/GII.4/Beijing/PKUPH-07-03/inpatient/2013/CHN
855	VP1	AID60893	855	5265	9675, 14085, 18495, 22905, 27315, 31725, 36135	norovirus Hu/GII.4/Beijing/PKUPH-07-05/inpatient/2013/CHN
856	VP1	AID68577	856	5266	9676, 14086, 18496, 22906, 27316, 31726, 36136	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-244
857	VP1	AID68578	857	5267	9677, 14087, 18497, 22907, 27317, 31727, 36137	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-246
858	VP1	AID68579	858	5268	9678, 14088, 18498, 22908, 27318, 31728, 36138	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-250
859	VP1	AID68581	859	5269	9679, 14089, 18499, 22909, 27319, 31729, 36139	norovirus GII/Hu/HKG/2013/GII.4/CUHK-NS-141
860	VP1	AID69174	860	5270	9680, 14090, 18500, 22910, 27320, 31730, 36140	bat norovirus

861	VP1	AIG59994	861	5271	9681, 14091, 18501, 22911, 27321, 31731, 36141	norovirus Hu/GII.4/Beijing
862	VP1	AIG59996	862	5272	9682, 14092, 18502, 22912, 27322, 31732, 36142	norovirus Hu/GII.4/Beijing
863	VP1	AIG59998	863	5273	9683, 14093, 18503, 22913, 27323, 31733, 36143	norovirus Hu/GII.4/Beijing
864	VP1	AIG60000	864	5274	9684, 14094, 18504, 22914, 27324, 31734, 36144	norovirus Hu/GII.4/Beijing
865	VP1	AIG60002	865	5275	9685, 14095, 18505, 22915, 27325, 31735, 36145	norovirus Hu/GII.4/Beijing
866	VP1	AIG60004	866	5276	9686, 14096, 18506, 22916, 27326, 31736, 36146	norovirus Hu/GII.4/Beijing
867	VP1	AIG60006	867	5277	9687, 14097, 18507, 22917, 27327, 31737, 36147	norovirus Hu/GII.4/Beijing
868	VP1	AIG60008	868	5278	9688, 14098, 18508, 22918, 27328, 31738, 36148	norovirus Hu/GII.4/Beijing
869	VP1	AIG60010	869	5279	9689, 14099, 18509, 22919, 27329, 31739, 36149	norovirus Hu/GII.4/Beijing
870	VP1	AIG60012	870	5280	9690, 14100, 18510, 22920, 27330, 31740, 36150	norovirus Hu/GII.4/Beijing
871	VP1	AIG60014	871	5281	9691, 14101, 18511, 22921, 27331, 31741, 36151	norovirus Hu/GII.4/Beijing
872	VP1	AIG60016	872	5282	9692, 14102, 18512, 22922, 27332, 31742, 36152	norovirus Hu/GII.4/Beijing
873	VP1	AIG60018	873	5283	9693, 14103, 18513, 22923, 27333, 31743, 36153	norovirus Hu/GII.4/Beijing
874	VP1	AIG60020	874	5284	9694, 14104, 18514, 22924, 27334, 31744, 36154	norovirus Hu/GII.4/Beijing
875	VP1	AIG60022	875	5285	9695, 14105, 18515, 22925, 27335, 31745, 36155	norovirus Hu/GII.4/Beijing
876	VP1	AIG60024	876	5286	9696, 14106, 18516, 22926, 27336, 31746, 36156	norovirus Hu/GII.4/Beijing
877	VP1	AII73717	877	5287	9697, 14107, 18517, 22927, 27337, 31747, 36157	norovirus GII/Hu/JP/2002/GII.P12_GII.13/Saitama/T80

878	VP1	AII73720	878	5288	9698, 14108, 18518, 22928, 27338, 31748, 36158	norovirus GII/Hu/JP/2001/GII.P22_GII.5/Saitama/T49
879	VP1	AII73723	879	5289	9699, 14109, 18519, 22929, 27339, 31749, 36159	norovirus GII/Hu/JP/2007/GII.P7_GII.14/Sendai/YG99
880	VP1	AII73726	880	5290	9700, 14110, 18520, 22930, 27340, 31750, 36160	norovirus GII/Hu/JP/2012/GII.Pe_GII.4_ Sydney2012/Fukuyama/3
881	VP1	AII73729	881	5291	9701, 14111, 18521, 22931, 27341, 31751, 36161	norovirus GII/Hu/JP/2012/GII.Pe_GII.4_ Sydney2012/Fukuyama/2
882	VP1	AII73732	882	5292	9702, 14112, 18522, 22932, 27342, 31752, 36162	norovirus GII/Hu/JP/2012/GII.Pe_GII.4_ Sydney2012/Fukuyama/5
883	VP1	AII73735	883	5293	9703, 14113, 18523, 22933, 27343, 31753, 36163	norovirus GII/Hu/JP/2001/GII.P12_GII.12/Saitama/T15
884	VP1	AII73738	884	5294	9704, 14114, 18524, 22934, 27344, 31754, 36164	norovirus GII/Hu/TW/2012/GII.Pe_GII.4_ Sydney2012/Taipei/106
885	VP1	AII73741	885	5295	9705, 14115, 18525, 22935, 27345, 31755, 36165	norovirus GII/Hu/JP/2007/GII.P21_GII.21/Kawasaki/Y0284
886	VP1	AII73744	886	5296	9706, 14116, 18526, 22936, 27346, 31756, 36166	norovirus GII/Hu/TW/2012/GII.Pe_GII.4_ Sydney2012/Taipei/108
887	VP1	AII73747	887	5297	9707, 14117, 18527, 22937, 27347, 31757, 36167	norovirus GII/Hu/JP/2002/GII.P16_GII.17/Saitama/T87
888	VP1	AII73750	888	5298	9708, 14118, 18528, 22938, 27348, 31758, 36168	norovirus GII/Hu/JP/2010/GII.P4_GII.4/Shimada/ASC96
889	VP1	AII73753	889	5299	9709, 14119, 18529, 22939, 27349, 31759, 36169	norovirus GII/Hu/JP/2002/GII.P5_GII.5/Saitama/T52
890	VP1	AII73756	890	5300	9710, 14120, 18530, 22940, 27350, 31760, 36170	norovirus GII/Hu/TW/2012/GII.Pe_GII.4_ Sydney2012/Taipei/109
891	VP1	AII73759	891	5301	9711, 14121, 18531, 22941, 27351, 31761, 36171	norovirus GII/Hu/JP/2007/GII.P15_GII.15/Sapporo/HK299
892	VP1	AII73762	892	5302	9712, 14122, 18532, 22942, 27352, 31762, 36172	norovirus GII/Hu/JP/2011/GII/Yuzawa/Gira2HS

893	VP1	AII73765	893	5303	9713, 14123, 18533, 22943, 27353, 31763, 36173	norovirus GI/Hu/JP/2007/GI.P3_GI.3/Shimizu/KK2866
894	VP1	AII73768	894	5304	9714, 14124, 18534, 22944, 27354, 31764, 36174	norovirus GII/Hu/JP/2012/GII.Pe_GII.4_ Sydney2012/Fukuyama/1
895	VP1	AII73771	895	5305	9715, 14125, 18535, 22945, 27355, 31765, 36175	norovirus GII/Hu/JP/2000/GII.P12_GII.12/Saitama/KU16
896	VP1	AII73774	896	5306	9716, 14126, 18536, 22946, 27356, 31766, 36176	norovirus GII/Hu/JP/2010/GII.P7_GII.7/ Musashimurayama/TAKAsanKimchi
897	VP1	AII73777	897	5307	9717, 14127, 18537, 22947, 27357, 31767, 36177	norovirus GII/Hu/TW/2012/GII.Pe_GII.4_ Sydney2012/Taipei/105
898	VP1	AII73780	898	5308	9718, 14128, 18538, 22948, 27358, 31768, 36178	norovirus GII/Hu/JP/2007/GII.P7_GII.14/Fukuoka/KK282
899	VP1	AII73783	899	5309	9719, 14129, 18539, 22949, 27359, 31769, 36179	norovirus GI/Hu/JP/2007/GI.P8_GI.8/Nagoya/KY531
900	VP1	AII73786	900	5310	9720, 14130, 18540, 22950, 27360, 31770, 36180	norovirus GII/Hu/JP/2001/GII.P12_GII.12/Saitama/T18
901	VP1	AIS40019	901	5311	9721, 14131, 18541, 22951, 27361, 31771, 36181	norovirus Hu/GII.4/SJTUH1/CHN/2014
902	VP1	AIV43147	902	5312	9722, 14132, 18542, 22952, 27362, 31772, 36182	norovirus GII.4
903	VP1	AIV43148	903	5313	9723, 14133, 18543, 22953, 27363, 31773, 36183	norovirus GII.4
904	VP1	AIV43149	904	5314	9724, 14134, 18544, 22954, 27364, 31774, 36184	norovirus GII.4
905	VP1	AIV43150	905	5315	9725, 14135, 18545, 22955, 27365, 31775, 36185	norovirus GII.4
906	VP1	AIV43151	906	5316	9726, 14136, 18546, 22956, 27366, 31776, 36186	norovirus GII.4
907	VP1	AIV43152	907	5317	9727, 14137, 18547, 22957, 27367, 31777, 36187	norovirus GII.4
908	VP1	AIV43153	908	5318	9728, 14138, 18548, 22958, 27368, 31778, 36188	norovirus GII.4

909	VP1	AIV43154	909	5319	9729, 14139, 18549, 22959, 27369, 31779, 36189	norovirus GII.4
910	VP1	AIV43155	910	5320	9730, 14140, 18550, 22960, 27370, 31780, 36190	norovirus GII.4
911	VP1	AIV43156	911	5321	9731, 14141, 18551, 22961, 27371, 31781, 36191	norovirus GII.4
912	VP1	AIV43159	912	5322	9732, 14142, 18552, 22962, 27372, 31782, 36192	norovirus GII.4
913	VP1	AIV43160	913	5323	9733, 14143, 18553, 22963, 27373, 31783, 36193	norovirus GII.4
914	VP1	AIV43161	914	5324	9734, 14144, 18554, 22964, 27374, 31784, 36194	norovirus GII.4
915	VP1	AIV43162	915	5325	9735, 14145, 18555, 22965, 27375, 31785, 36195	norovirus GII.4
916	VP1	AIV43163	916	5326	9736, 14146, 18556, 22966, 27376, 31786, 36196	norovirus GII.4
917	VP1	AIV43164	917	5327	9737, 14147, 18557, 22967, 27377, 31787, 36197	norovirus GII.4
918	VP1	AIV43165	918	5328	9738, 14148, 18558, 22968, 27378, 31788, 36198	norovirus GII.4
919	VP1	AIV43166	919	5329	9739, 14149, 18559, 22969, 27379, 31789, 36199	norovirus GII.4
920	VP1	AIV43167	920	5330	9740, 14150, 18560, 22970, 27380, 31790, 36200	norovirus GII.4
921	VP1	AIV43171	921	5331	9741, 14151, 18561, 22971, 27381, 31791, 36201	norovirus GII.4
922	VP1	AIV43172	922	5332	9742, 14152, 18562, 22972, 27382, 31792, 36202	norovirus GII.4
923	VP1	AIV43173	923	5333	9743, 14153, 18563, 22973, 27383, 31793, 36203	norovirus GII.4
924	VP1	AIV43174	924	5334	9744, 14154, 18564, 22974, 27384, 31794, 36204	norovirus GII.4
925	VP1	AIV43175	925	5335	9745, 14155, 18565, 22975, 27385, 31795, 36205	norovirus GII.4

926	VP1	AIV43176	926	5336	9746, 14156, 18566, 22976, 27386, 31796, 36206	norovirus GII.4
927	VP1	AIV43177	927	5337	9747, 14157, 18567, 22977, 27387, 31797, 36207	norovirus GII.4
928	VP1	AIV43178	928	5338	9748, 14158, 18568, 22978, 27388, 31798, 36208	norovirus GII.4
929	VP1	AIV43179	929	5339	9749, 14159, 18569, 22979, 27389, 31799, 36209	norovirus GII.4
930	VP1	AIY27747	930	5340	9750, 14160, 18570, 22980, 27390, 31800, 36210	norovirus Hu/GII.4/variant Sydney 2012/FRA
931	VP1	AJA71387	931	5341	9751, 14161, 18571, 22981, 27391, 31801, 36211	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-337
932	VP1	AJA71388	932	5342	9752, 14162, 18572, 22982, 27392, 31802, 36212	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-340
933	VP1	AJA71389	933	5343	9753, 14163, 18573, 22983, 27393, 31803, 36213	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-342
934	VP1	AJA71390	934	5344	9754, 14164, 18574, 22984, 27394, 31804, 36214	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-345
935	VP1	AJA71392	935	5345	9755, 14165, 18575, 22985, 27395, 31805, 36215	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-348
936	VP1	AJA71393	936	5346	9756, 14166, 18576, 22986, 27396, 31806, 36216	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-349
937	VP1	AJA71394	937	5347	9757, 14167, 18577, 22987, 27397, 31807, 36217	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-350
938	VP1	AJA71395	938	5348	9758, 14168, 18578, 22988, 27398, 31808, 36218	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-351
939	VP1	AJA71396	939	5349	9759, 14169, 18579, 22989, 27399, 31809, 36219	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-354
940	VP1	AJA71399	940	5350	9760, 14170, 18580, 22990, 27400, 31810, 36220	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-358
941	VP1	AJA71400	941	5351	9761, 14171, 18581, 22991, 27401, 31811, 36221	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-359
942	VP1	AJA71401	942	5352	9762, 14172, 18582, 22992, 27402, 31812, 36222	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-361

943	VP1	AJA71402	943	5353	9763, 14173, 18583, 22993, 27403, 31813, 36223	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-362
944	VP1	AJA71403	944	5354	9764, 14174, 18584, 22994, 27404, 31814, 36224	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-363
945	VP1	AJA71404	945	5355	9765, 14175, 18585, 22995, 27405, 31815, 36225	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-364
946	VP1	AJA71405	946	5356	9766, 14176, 18586, 22996, 27406, 31816, 36226	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-365
947	VP1	AJA71406	947	5357	9767, 14177, 18587, 22997, 27407, 31817, 36227	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-367
948	VP1	AJA71407	948	5358	9768, 14178, 18588, 22998, 27408, 31818, 36228	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-369
949	VP1	AJA71408	949	5359	9769, 14179, 18589, 22999, 27409, 31819, 36229	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-370
950	VP1	AJA71409	950	5360	9770, 14180, 18590, 23000, 27410, 31820, 36230	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-368
951	VP1	AJA71410	951	5361	9771, 14181, 18591, 23001, 27411, 31821, 36231	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-372
952	VP1	AJA71411	952	5362	9772, 14182, 18592, 23002, 27412, 31822, 36232	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-374
953	VP1	AJA71412	953	5363	9773, 14183, 18593, 23003, 27413, 31823, 36233	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-377
954	VP1	AJA71413	954	5364	9774, 14184, 18594, 23004, 27414, 31824, 36234	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-378
955	VP1	AJA71416	955	5365	9775, 14185, 18595, 23005, 27415, 31825, 36235	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-384
956	VP1	AJA71417	956	5366	9776, 14186, 18596, 23006, 27416, 31826, 36236	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-385
957	VP1	AJA71418	957	5367	9777, 14187, 18597, 23007, 27417, 31827, 36237	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-386
958	VP1	AJA71419	958	5368	9778, 14188, 18598, 23008, 27418, 31828, 36238	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-387
959	VP1	AJA71420	959	5369	9779, 14189, 18599, 23009, 27419, 31829, 36239	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-389

960	VP1	AJA71421	960	5370	9780, 14190, 18600, 23010, 27420, 31830, 36240	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-393
961	VP1	AJA71422	961	5371	9781, 14191, 18601, 23011, 27421, 31831, 36241	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-394
962	VP1	AJA71423	962	5372	9782, 14192, 18602, 23012, 27422, 31832, 36242	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-395
963	VP1	AJA71424	963	5373	9783, 14193, 18603, 23013, 27423, 31833, 36243	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-396
964	VP1	AJA71425	964	5374	9784, 14194, 18604, 23014, 27424, 31834, 36244	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-397
965	VP1	AJA71426	965	5375	9785, 14195, 18605, 23015, 27425, 31835, 36245	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-398
966	VP1	AJA71427	966	5376	9786, 14196, 18606, 23016, 27426, 31836, 36246	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-399
967	VP1	AJA71428	967	5377	9787, 14197, 18607, 23017, 27427, 31837, 36247	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-402
968	VP1	AJA71429	968	5378	9788, 14198, 18608, 23018, 27428, 31838, 36248	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-404
969	VP1	AJA71430	969	5379	9789, 14199, 18609, 23019, 27429, 31839, 36249	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-406
970	VP1	AJA71456	970	5380	9790, 14200, 18610, 23020, 27430, 31840, 36250	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-426
971	VP1	AJA71457	971	5381	9791, 14201, 18611, 23021, 27431, 31841, 36251	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-341
972	VP1	AJA71458	972	5382	9792, 14202, 18612, 23022, 27432, 31842, 36252	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-346
973	VP1	AJA71459	973	5383	9793, 14203, 18613, 23023, 27433, 31843, 36253	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-352
974	VP1	AJA71460	974	5384	9794, 14204, 18614, 23024, 27434, 31844, 36254	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-356
975	VP1	AJA71461	975	5385	9795, 14205, 18615, 23025, 27435, 31845, 36255	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-371
976	VP1	AJA71462	976	5386	9796, 14206, 18616, 23026, 27436, 31846, 36256	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-376

977	VP1	AJA71463	977	5387	9797, 14207, 18617, 23027, 27437, 31847, 36257	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-379
978	VP1	AJA71464	978	5388	9798, 14208, 18618, 23028, 27438, 31848, 36258	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-407
979	VP1	AJA71465	979	5389	9799, 14209, 18619, 23029, 27439, 31849, 36259	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-412
980	VP1	AJA71466	980	5390	9800, 14210, 18620, 23030, 27440, 31850, 36260	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-415
981	VP1	AJA71467	981	5391	9801, 14211, 18621, 23031, 27441, 31851, 36261	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-416
982	VP1	AJA71470	982	5392	9802, 14212, 18622, 23032, 27442, 31852, 36262	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-420
983	VP1	AJA71471	983	5393	9803, 14213, 18623, 23033, 27443, 31853, 36263	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-421
984	VP1	AJA71472	984	5394	9804, 14214, 18624, 23034, 27444, 31854, 36264	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-429
985	VP1	AJA71473	985	5395	9805, 14215, 18625, 23035, 27445, 31855, 36265	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-430
986	VP1	AJA71474	986	5396	9806, 14216, 18626, 23036, 27446, 31856, 36266	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-431
987	VP1	AJA71475	987	5397	9807, 14217, 18627, 23037, 27447, 31857, 36267	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-433
988	VP1	AJA71476	988	5398	9808, 14218, 18628, 23038, 27448, 31858, 36268	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-435
989	VP1	AJF21974	989	5399	9809, 14219, 18629, 23039, 27449, 31859, 36269	norovirus GII.4
990	VP1	AJF21975	990	5400	9810, 14220, 18630, 23040, 27450, 31860, 36270	norovirus GII.4
991	VP1	AJF21976	991	5401	9811, 14221, 18631, 23041, 27451, 31861, 36271	norovirus GII.4
992	VP1	AJF21977	992	5402	9812, 14222, 18632, 23042, 27452, 31862, 36272	norovirus GII.4
993	VP1	AJF21978	993	5403	9813, 14223, 18633, 23043, 27453, 31863, 36273	norovirus GII.4

994	VP1	AJF21979	994	5404	9814, 14224, 18634, 23044, 27454, 31864, 36274	norovirus GII.4
995	VP1	AJF21980	995	5405	9815, 14225, 18635, 23045, 27455, 31865, 36275	norovirus GII.4
996	VP1	AJF21981	996	5406	9816, 14226, 18636, 23046, 27456, 31866, 36276	norovirus GII.4
997	VP1	AJF21982	997	5407	9817, 14227, 18637, 23047, 27457, 31867, 36277	norovirus GII.4
998	VP1	AJF21983	998	5408	9818, 14228, 18638, 23048, 27458, 31868, 36278	norovirus GII.4
999	VP1	AJF21984	999	5409	9819, 14229, 18639, 23049, 27459, 31869, 36279	norovirus GII.4
1000	VP1	AKE37037	1000	5410	9820, 14230, 18640, 23050, 27460, 31870, 36280	norovirus Hu/GII.17/41621/Guangzhou/2014/CHN
1001	VP1	AKM20815	1001	5411	9821, 14231, 18641, 23051, 27461, 31871, 36281	norovirus GI
1002	VP1	AKM20818	1002	5412	9822, 14232, 18642, 23052, 27462, 31872, 36282	norovirus GI
1003	VP1	ALD83748	1003	5413	9823, 14233, 18643, 23053, 27463, 31873, 36283	norovirus GII/Hu/HKG/2015/GII.Pe_GII.17/CUHK-NS-682
1004	VP1	ALF12528	1004	5414	9824, 14234, 18644, 23054, 27464, 31874, 36284	norovirus GII
1005	VP1	ALF12529	1005	5415	9825, 14235, 18645, 23055, 27465, 31875, 36285	norovirus GII
1006	VP1	ALF12530	1006	5416	9826, 14236, 18646, 23056, 27466, 31876, 36286	norovirus GII
1007	VP1	ALF12531	1007	5417	9827, 14237, 18647, 23057, 27467, 31877, 36287	norovirus GII
1008	VP1	ALF12532	1008	5418	9828, 14238, 18648, 23058, 27468, 31878, 36288	norovirus GII
1009	VP1	ALF12533	1009	5419	9829, 14239, 18649, 23059, 27469, 31879, 36289	norovirus GII
1010	VP1	ALF12534	1010	5420	9830, 14240, 18650, 23060, 27470, 31880, 36290	norovirus GII

1011	VP1	ALF12535	1011	5421	9831, 14241, 18651, 23061, 27471, 31881, 36291	norovirus GII
1012	VP1	ALF12536	1012	5422	9832, 14242, 18652, 23062, 27472, 31882, 36292	norovirus GII
1013	VP1	ALF12537	1013	5423	9833, 14243, 18653, 23063, 27473, 31883, 36293	norovirus GII
1014	VP1	ALF12538	1014	5424	9834, 14244, 18654, 23064, 27474, 31884, 36294	norovirus GII
1015	VP1	ALF12539	1015	5425	9835, 14245, 18655, 23065, 27475, 31885, 36295	norovirus GII
1016	VP1	ALF12541	1016	5426	9836, 14246, 18656, 23066, 27476, 31886, 36296	norovirus GII
1017	VP1	ALF12542	1017	5427	9837, 14247, 18657, 23067, 27477, 31887, 36297	norovirus GII
1018	VP1	ALF12543	1018	5428	9838, 14248, 18658, 23068, 27478, 31888, 36298	norovirus GII
1019	VP1	ALF12546	1019	5429	9839, 14249, 18659, 23069, 27479, 31889, 36299	norovirus GII
1020	VP1	ALF12547	1020	5430	9840, 14250, 18660, 23070, 27480, 31890, 36300	norovirus GII
1021	VP1	ALF12560	1021	5431	9841, 14251, 18661, 23071, 27481, 31891, 36301	norovirus GII
1022	VP1	ALF12562	1022	5432	9842, 14252, 18662, 23072, 27482, 31892, 36302	norovirus GII
1023	VP1	ALF12564	1023	5433	9843, 14253, 18663, 23073, 27483, 31893, 36303	norovirus GII
1024	VP1	ALF12566	1024	5434	9844, 14254, 18664, 23074, 27484, 31894, 36304	norovirus GII
1025	VP1	ALF12569	1025	5435	9845, 14255, 18665, 23075, 27485, 31895, 36305	norovirus GII
1026	VP1	ALQ28762	1026	5436	9846, 14256, 18666, 23076, 27486, 31896, 36306	norovirus GII.17
1027	VP1	ALS03883	1027	5437	9847, 14257, 18667, 23077, 27487, 31897, 36307	norovirus GII

1028	VP1	ALT06546	1028	5438	9848, 14258, 18668, 23078, 27488, 31898, 36308	norovirus Hu/GII.P17_GII.17/NSW6016/2014/AU
1029	VP1	BAG30939	1029	5439	9849, 14259, 18669, 23079, 27489, 31899, 36309	norovirus Hu/Texas/TCH04-577/2004/US
1030	VP1	BAG70428	1030	5440	9850, 14260, 18670, 23080, 27490, 31900, 36310	norovirus Hu/GII-4/Hokkaido1/2006/JP
1031	VP1	BAG70431	1031	5441	9851, 14261, 18671, 23081, 27491, 31901, 36311	norovirus Hu/GII-4/Hokkaido2/2006/JP
1032	VP1	BAG70434	1032	5442	9852, 14262, 18672, 23082, 27492, 31902, 36312	norovirus Hu/GII-4/Hokkaido3/2006/JP
1033	VP1	BAG70437	1033	5443	9853, 14263, 18673, 23083, 27493, 31903, 36313	norovirus Hu/GII-4/Hokkaido4/2006/JP
1034	VP1	BAG70440	1034	5444	9854, 14264, 18674, 23084, 27494, 31904, 36314	norovirus Hu/GII-4/Hokkaido5/2006/JP
1035	VP1	BAG70446	1035	5445	9855, 14265, 18675, 23085, 27495, 31905, 36315	norovirus Hu/GII-4/Aomori2/2006/JP
1036	VP1	BAG70449	1036	5446	9856, 14266, 18676, 23086, 27496, 31906, 36316	norovirus Hu/GII-4/Aomori4/2006/JP
1037	VP1	BAG70452	1037	5447	9857, 14267, 18677, 23087, 27497, 31907, 36317	norovirus Hu/GII-4/Aomori5/2006/JP
1038	VP1	BAG70458	1038	5448	9858, 14268, 18678, 23088, 27498, 31908, 36318	norovirus Hu/GII-4/Akita2/2006/JP
1039	VP1	BAG70461	1039	5449	9859, 14269, 18679, 23089, 27499, 31909, 36319	norovirus Hu/GII-4/Akita4/2006/JP
1040	VP1	BAG70464	1040	5450	9860, 14270, 18680, 23090, 27500, 31910, 36320	norovirus Hu/GII-4/Akita5/2006/JP
1041	VP1	BAG70467	1041	5451	9861, 14271, 18681, 23091, 27501, 31911, 36321	norovirus Hu/GII-4/Miyagi2/2006/JP
1042	VP1	BAG70470	1042	5452	9862, 14272, 18682, 23092, 27502, 31912, 36322	norovirus Hu/GII-4/Miyagi4/2006/JP
1043	VP1	BAG70473	1043	5453	9863, 14273, 18683, 23093, 27503, 31913, 36323	norovirus Hu/GII-4/Miyagi5/2006/JP
1044	VP1	BAG70476	1044	5454	9864, 14274, 18684, 23094, 27504, 31914, 36324	norovirus Hu/GII-4/Toyama1/2006/JP

1045	VP1	BAG70482	1045	5455	9865, 14275, 18685, 23095, 27505, 31915, 36325	norovirus Hu/GII-4/Toyama5/2006/JP
1046	VP1	BAG70485	1046	5456	9866, 14276, 18686, 23096, 27506, 31916, 36326	norovirus Hu/GII-4/Aichi3/2006/JP
1047	VP1	BAG70488	1047	5457	9867, 14277, 18687, 23097, 27507, 31917, 36327	norovirus Hu/GII-4/Aichi4/2006/JP
1048	VP1	BAG70491	1048	5458	9868, 14278, 18688, 23098, 27508, 31918, 36328	norovirus Hu/GII-4/Sakai2/2006/JP
1049	VP1	BAG70494	1049	5459	9869, 14279, 18689, 23099, 27509, 31919, 36329	norovirus Hu/GII-4/Sakai3/2006/JP
1050	VP1	BAG70497	1050	5460	9870, 14280, 18690, 23100, 27510, 31920, 36330	norovirus Hu/GII-4/Sakai4/2006/JP
1051	VP1	BAG70503	1051	5461	9871, 14281, 18691, 23101, 27511, 31921, 36331	norovirus Hu/GII-4/Hiroshima2/2006/JP
1052	VP1	BAG70506	1052	5462	9872, 14282, 18692, 23102, 27512, 31922, 36332	norovirus Hu/GII-4/Ehime1/2006/JP
1053	VP1	BAG70509	1053	5463	9873, 14283, 18693, 23103, 27513, 31923, 36333	norovirus Hu/GII-4/Ehime2/2006/JP
1054	VP1	BAG70512	1054	5464	9874, 14284, 18694, 23104, 27514, 31924, 36334	norovirus Hu/GII-4/Ehime5/2006/JP
1055	VP1	BAG70515	1055	5465	9875, 14285, 18695, 23105, 27515, 31925, 36335	norovirus Hu/GII-4/Saga1/2006/JP
1056	VP1	BAG70518	1056	5466	9876, 14286, 18696, 23106, 27516, 31926, 36336	norovirus Hu/GII-4/Saga4/2006/JP
1057	VP1	BAG70521	1057	5467	9877, 14287, 18697, 23107, 27517, 31927, 36337	norovirus Hu/GII-4/Saga5/2006/JP
1058	VP1	BAG70524	1058	5468	9878, 14288, 18698, 23108, 27518, 31928, 36338	norovirus Hu/GII-4/Kumamoto1/2006/JP
1059	VP1	BAG70527	1059	5469	9879, 14289, 18699, 23109, 27519, 31929, 36339	norovirus Hu/GII-4/Kumamoto2/2006/JP
1060	VP1	BAG70530	1060	5470	9880, 14290, 18700, 23110, 27520, 31930, 36340	norovirus Hu/GII-4/Kumamoto3/2006/JP
1061	VP1	BAG70533	1061	5471	9881, 14291, 18701, 23111, 27521, 31931, 36341	norovirus Hu/GII-4/Kumamoto4/2006/JP

1062	VP1	BAG70536	1062	5472	9882, 14292, 18702, 23112, 27522, 31932, 36342	norovirus Hu/GII-4/Kumamoto5/2006/JP
1063	VP1	BAI70518	1063	5473	9883, 14293, 18703, 23113, 27523, 31933, 36343	norovirus Hu/GII-4/FUMI/2010/JP
1064	VP1	BAJ13508	1064	5474	9884, 14294, 18704, 23114, 27524, 31934, 36344	norovirus Hu/GII-4/2007a_ORF2-3/JP
1065	VP1	BAJ13513	1065	5475	9885, 14295, 18705, 23115, 27525, 31935, 36345	norovirus Hu/GII-4/2007b_ORF2-3/JP
1066	VP1	BAJ13520	1066	5476	9886, 14296, 18706, 23116, 27526, 31936, 36346	norovirus Hu/GII-4/2008a_ORF2-3/JP
1067	VP1	BAJ13534	1067	5477	9887, 14297, 18707, 23117, 27527, 31937, 36347	norovirus Hu/GII-4/Aichi1/2007/JP
1068	VP1	BAJ13537	1068	5478	9888, 14298, 18708, 23118, 27528, 31938, 36348	norovirus Hu/GII-4/Aichi1/2008/JP
1069	VP1	BAJ13540	1069	5479	9889, 14299, 18709, 23119, 27529, 31939, 36349	norovirus Hu/GII-4/Aichi2/2007/JP
1070	VP1	BAJ13543	1070	5480	9890, 14300, 18710, 23120, 27530, 31940, 36350	norovirus Hu/GII-4/Aichi2/2008/JP
1071	VP1	BAJ13549	1071	5481	9891, 14301, 18711, 23121, 27531, 31941, 36351	norovirus Hu/GII-4/Aichi3/2008/JP
1072	VP1	BAJ13552	1072	5482	9892, 14302, 18712, 23122, 27532, 31942, 36352	norovirus Hu/GII-4/Aichi4/2007/JP
1073	VP1	BAJ13555	1073	5483	9893, 14303, 18713, 23123, 27533, 31943, 36353	norovirus Hu/GII-4/Aichi4/2008/JP
1074	VP1	BAJ13558	1074	5484	9894, 14304, 18714, 23124, 27534, 31944, 36354	norovirus Hu/GII-4/Aichi5/2007/JP
1075	VP1	BAJ13561	1075	5485	9895, 14305, 18715, 23125, 27535, 31945, 36355	norovirus Hu/GII-4/Aichi5/2008/JP
1076	VP1	BAJ13564	1076	5486	9896, 14306, 18716, 23126, 27536, 31946, 36356	norovirus Hu/GII-4/Akita1/2007/JP
1077	VP1	BAJ13567	1077	5487	9897, 14307, 18717, 23127, 27537, 31947, 36357	norovirus Hu/GII-4/Akita1/2008/JP
1078	VP1	BAJ13573	1078	5488	9898, 14308, 18718, 23128, 27538, 31948, 36358	norovirus Hu/GII-4/Akita3/2007/JP

1079	VP1	BAJ13576	1079	5489	9899, 14309, 18719, 23129, 27539, 31949, 36359	norovirus Hu/GII-4/Akita3/2008/JP
1080	VP1	BAJ13579	1080	5490	9900, 14310, 18720, 23130, 27540, 31950, 36360	norovirus Hu/GII-4/Akita4/2008/JP
1081	VP1	BAJ13582	1081	5491	9901, 14311, 18721, 23131, 27541, 31951, 36361	norovirus Hu/GII-4/Akita5/2007/JP
1082	VP1	BAJ13585	1082	5492	9902, 14312, 18722, 23132, 27542, 31952, 36362	norovirus Hu/GII-4/Aomori1/2007/JP
1083	VP1	BAJ13591	1083	5493	9903, 14313, 18723, 23133, 27543, 31953, 36363	norovirus Hu/GII-4/Aomori2/2007/JP
1084	VP1	BAJ13594	1084	5494	9904, 14314, 18724, 23134, 27544, 31954, 36364	norovirus Hu/GII-4/Aomori2/2008/JP
1085	VP1	BAJ13597	1085	5495	9905, 14315, 18725, 23135, 27545, 31955, 36365	norovirus Hu/GII-4/Aomori3/2007/JP
1086	VP1	BAJ13603	1086	5496	9906, 14316, 18726, 23136, 27546, 31956, 36366	norovirus Hu/GII-4/Aomori4/2007/JP
1087	VP1	BAJ13606	1087	5497	9907, 14317, 18727, 23137, 27547, 31957, 36367	norovirus Hu/GII-4/Aomori4/2008/JP
1088	VP1	BAJ13609	1088	5498	9908, 14318, 18728, 23138, 27548, 31958, 36368	norovirus Hu/GII-4/Aomori5/2007/JP
1089	VP1	BAJ13612	1089	5499	9909, 14319, 18729, 23139, 27549, 31959, 36369	norovirus Hu/GII-4/Aomori5/2008/JP
1090	VP1	BAJ13615	1090	5500	9910, 14320, 18730, 23140, 27550, 31960, 36370	norovirus Hu/GII-4/Chiba1/2007/JP
1091	VP1	BAJ13618	1091	5501	9911, 14321, 18731, 23141, 27551, 31961, 36371	norovirus Hu/GII-4/Chiba1/2008/JP
1092	VP1	BAJ13621	1092	5502	9912, 14322, 18732, 23142, 27552, 31962, 36372	norovirus Hu/GII-4/Chiba2/2007/JP
1093	VP1	BAJ13624	1093	5503	9913, 14323, 18733, 23143, 27553, 31963, 36373	norovirus Hu/GII-4/Chiba2/2008/JP
1094	VP1	BAJ13627	1094	5504	9914, 14324, 18734, 23144, 27554, 31964, 36374	norovirus Hu/GII-4/Chiba4/2007/JP
1095	VP1	BAJ13630	1095	5505	9915, 14325, 18735, 23145, 27555, 31965, 36375	norovirus Hu/GII-4/Chiba4/2008/JP

1096	VP1	BAJ13633	1096	5506	9916, 14326, 18736, 23146, 27556, 31966, 36376	norovirus Hu/GII-4/Chiba5/2007/JP
1097	VP1	BAJ13636	1097	5507	9917, 14327, 18737, 23147, 27557, 31967, 36377	norovirus Hu/GII-4/Chiba5/2008/JP
1098	VP1	BAJ13639	1098	5508	9918, 14328, 18738, 23148, 27558, 31968, 36378	norovirus Hu/GII-4/Ehime1/2007/JP
1099	VP1	BAJ13642	1099	5509	9919, 14329, 18739, 23149, 27559, 31969, 36379	norovirus Hu/GII-4/Ehime1/2008/JP
1100	VP1	BAJ13648	1100	5510	9920, 14330, 18740, 23150, 27560, 31970, 36380	norovirus Hu/GII-4/Ehime3/2007/JP
1101	VP1	BAJ13651	1101	5511	9921, 14331, 18741, 23151, 27561, 31971, 36381	norovirus Hu/GII-4/Ehime3/2008/JP
1102	VP1	BAJ13654	1102	5512	9922, 14332, 18742, 23152, 27562, 31972, 36382	norovirus Hu/GII-4/Ehime4/2007/JP
1103	VP1	BAJ13657	1103	5513	9923, 14333, 18743, 23153, 27563, 31973, 36383	norovirus Hu/GII-4/Ehime4/2008/JP
1104	VP1	BAJ13660	1104	5514	9924, 14334, 18744, 23154, 27564, 31974, 36384	norovirus Hu/GII-4/Ehime5/2008/JP
1105	VP1	BAJ13663	1105	5515	9925, 14335, 18745, 23155, 27565, 31975, 36385	norovirus Hu/GII-4/Fukui1/2008/JP
1106	VP1	BAJ13666	1106	5516	9926, 14336, 18746, 23156, 27566, 31976, 36386	norovirus Hu/GII-4/Fukui2/2007/JP
1107	VP1	BAJ13669	1107	5517	9927, 14337, 18747, 23157, 27567, 31977, 36387	norovirus Hu/GII-4/Fukui2/2008/JP
1108	VP1	BAJ13672	1108	5518	9928, 14338, 18748, 23158, 27568, 31978, 36388	norovirus Hu/GII-4/Fukui4/2007/JP
1109	VP1	BAJ13675	1109	5519	9929, 14339, 18749, 23159, 27569, 31979, 36389	norovirus Hu/GII-4/Fukui4/2008/JP
1110	VP1	BAJ13678	1110	5520	9930, 14340, 18750, 23160, 27570, 31980, 36390	norovirus Hu/GII-4/Fukui5/2007/JP
1111	VP1	BAJ13681	1111	5521	9931, 14341, 18751, 23161, 27571, 31981, 36391	norovirus Hu/GII-4/Fukui5/2008/JP
1112	VP1	BAJ13684	1112	5522	9932, 14342, 18752, 23162, 27572, 31982, 36392	norovirus Hu/GII-4/Hiroshima1/2007/JP

1113	VP1	BAJ13687	1113	5523	9933, 14343, 18753, 23163, 27573, 31983, 36393	norovirus Hu/GII-4/Hiroshima1/2008/JP
1114	VP1	BAJ13690	1114	5524	9934, 14344, 18754, 23164, 27574, 31984, 36394	norovirus Hu/GII-4/Hiroshima2/2007/JP
1115	VP1	BAJ13693	1115	5525	9935, 14345, 18755, 23165, 27575, 31985, 36395	norovirus Hu/GII-4/Hiroshima2/2008/JP
1116	VP1	BAJ13696	1116	5526	9936, 14346, 18756, 23166, 27576, 31986, 36396	norovirus Hu/GII-4/Hiroshima3/2007/JP
1117	VP1	BAJ13699	1117	5527	9937, 14347, 18757, 23167, 27577, 31987, 36397	norovirus Hu/GII-4/Hiroshima3/2008/JP
1118	VP1	BAJ13702	1118	5528	9938, 14348, 18758, 23168, 27578, 31988, 36398	norovirus Hu/GII-4/Hiroshima4/2007/JP
1119	VP1	BAJ13711	1119	5529	9939, 14349, 18759, 23169, 27579, 31989, 36399	norovirus Hu/GII-4/Hokkaido1/2007/JP
1120	VP1	BAJ13714	1120	5530	9940, 14350, 18760, 23170, 27580, 31990, 36400	norovirus Hu/GII-4/Hokkaido1/2008/JP
1121	VP1	BAJ13717	1121	5531	9941, 14351, 18761, 23171, 27581, 31991, 36401	norovirus Hu/GII-4/Hokkaido2/2007/JP
1122	VP1	BAJ13720	1122	5532	9942, 14352, 18762, 23172, 27582, 31992, 36402	norovirus Hu/GII-4/Hokkaido2/2008/JP
1123	VP1	BAJ13723	1123	5533	9943, 14353, 18763, 23173, 27583, 31993, 36403	norovirus Hu/GII-4/Hokkaido3/2008/JP
1124	VP1	BAJ13726	1124	5534	9944, 14354, 18764, 23174, 27584, 31994, 36404	norovirus Hu/GII-4/Hokkaido4/2007/JP
1125	VP1	BAJ13729	1125	5535	9945, 14355, 18765, 23175, 27585, 31995, 36405	norovirus Hu/GII-4/Hokkaido4/2008/JP
1126	VP1	BAJ13732	1126	5536	9946, 14356, 18766, 23176, 27586, 31996, 36406	norovirus Hu/GII-4/Hokkaido5/2007/JP
1127	VP1	BAJ13738	1127	5537	9947, 14357, 18767, 23177, 27587, 31997, 36407	norovirus Hu/GII-4/Iwate1/2008/JP
1128	VP1	BAJ13741	1128	5538	9948, 14358, 18768, 23178, 27588, 31998, 36408	norovirus Hu/GII-4/Iwate2/2007/JP
1129	VP1	BAJ13744	1129	5539	9949, 14359, 18769, 23179, 27589, 31999, 36409	norovirus Hu/GII-4/Iwate3/2007/JP

1130	VP1	BAJ13747	1130	5540	9950, 14360, 18770, 23180, 27590, 32000, 36410	norovirus Hu/GII-4/Iwate3/2008/JP
1131	VP1	BAJ13750	1131	5541	9951, 14361, 18771, 23181, 27591, 32001, 36411	norovirus Hu/GII-4/Iwate4/2007/JP
1132	VP1	BAJ13753	1132	5542	9952, 14362, 18772, 23182, 27592, 32002, 36412	norovirus Hu/GII-4/Iwate4/2008/JP
1133	VP1	BAJ13756	1133	5543	9953, 14363, 18773, 23183, 27593, 32003, 36413	norovirus Hu/GII-4/Iwate5/2007/JP
1134	VP1	BAJ13759	1134	5544	9954, 14364, 18774, 23184, 27594, 32004, 36414	norovirus Hu/GII-4/Iwate5/2008/JP
1135	VP1	BAJ13762	1135	5545	9955, 14365, 18775, 23185, 27595, 32005, 36415	norovirus Hu/GII-4/Kumamotol/2007/JP
1136	VP1	BAJ13765	1136	5546	9956, 14366, 18776, 23186, 27596, 32006, 36416	norovirus Hu/GII-4/Kumamoto2/2007/JP
1137	VP1	BAJ13768	1137	5547	9957, 14367, 18777, 23187, 27597, 32007, 36417	norovirus Hu/GII-4/Kumamoto3/2007/JP
1138	VP1	BAJ13771	1138	5548	9958, 14368, 18778, 23188, 27598, 32008, 36418	norovirus Hu/GII-4/Kumamoto4/2007/JP
1139	VP1	BAJ13774	1139	5549	9959, 14369, 18779, 23189, 27599, 32009, 36419	norovirus Hu/GII-4/Miyagil/2007/JP
1140	VP1	BAJ13777	1140	5550	9960, 14370, 18780, 23190, 27600, 32010, 36420	norovirus Hu/GII-4/Miyagi2/2007/JP
1141	VP1	BAJ13780	1141	5551	9961, 14371, 18781, 23191, 27601, 32011, 36421	norovirus Hu/GII-4/Miyagi3/2007/JP
1142	VP1	BAJ13783	1142	5552	9962, 14372, 18782, 23192, 27602, 32012, 36422	norovirus Hu/GII-4/Miyagi5/2008/JP
1143	VP1	BAJ13786	1143	5553	9963, 14373, 18783, 23193, 27603, 32013, 36423	norovirus Hu/GII-4/Miyazakil0/2008/JP
1144	VP1	BAJ13792	1144	5554	9964, 14374, 18784, 23194, 27604, 32014, 36424	norovirus Hu/GII-4/Miyazakil3/2008/JP
1145	VP1	BAJ13795	1145	5555	9965, 14375, 18785, 23195, 27605, 32015, 36425	norovirus Hu/GII-4/Miyazakil/2007/JP
1146	VP1	BAJ13801	1146	5556	9966, 14376, 18786, 23196, 27606, 32016, 36426	norovirus Hu/GII-4/Miyazaki2/2007/JP

1147	VP1	BAJ13804	1147	5557	9967, 14377, 18787, 23197, 27607, 32017, 36427	norovirus Hu/GII-4/Miyazaki2/2008/JP
1148	VP1	BAJ13807	1148	5558	9968, 14378, 18788, 23198, 27608, 32018, 36428	norovirus Hu/GII-4/Miyazaki3/2007/JP
1149	VP1	BAJ13810	1149	5559	9969, 14379, 18789, 23199, 27609, 32019, 36429	norovirus Hu/GII-4/Miyazaki3/2008/JP
1150	VP1	BAJ13816	1150	5560	9970, 14380, 18790, 23200, 27610, 32020, 36430	norovirus Hu/GII-4/Miyazaki4/2008/JP
1151	VP1	BAJ13819	1151	5561	9971, 14381, 18791, 23201, 27611, 32021, 36431	norovirus Hu/GII-4/Miyazaki5/2007/JP
1152	VP1	BAJ13822	1152	5562	9972, 14382, 18792, 23202, 27612, 32022, 36432	norovirus Hu/GII-4/Miyazaki6/2008/JP
1153	VP1	BAJ13825	1153	5563	9973, 14383, 18793, 23203, 27613, 32023, 36433	norovirus Hu/GII-4/Miyazaki7/2008/JP
1154	VP1	BAJ13828	1154	5564	9974, 14384, 18794, 23204, 27614, 32024, 36434	norovirus Hu/GII-4/Miyazaki8/2008/JP
1155	VP1	BAJ13831	1155	5565	9975, 14385, 18795, 23205, 27615, 32025, 36435	norovirus Hu/GII-4/Miyazaki9/2008/JP
1156	VP1	BAJ13834	1156	5566	9976, 14386, 18796, 23206, 27616, 32026, 36436	norovirus Hu/GII-4/Nagano1/2007/JP
1157	VP1	BAJ13837	1157	5567	9977, 14387, 18797, 23207, 27617, 32027, 36437	norovirus Hu/GII-4/Nagano1/2008/JP
1158	VP1	BAJ13840	1158	5568	9978, 14388, 18798, 23208, 27618, 32028, 36438	norovirus Hu/GII-4/Nagano2/2007/JP
1159	VP1	BAJ13843	1159	5569	9979, 14389, 18799, 23209, 27619, 32029, 36439	norovirus Hu/GII-4/Nagano2/2008/JP
1160	VP1	BAJ13846	1160	5570	9980, 14390, 18800, 23210, 27620, 32030, 36440	norovirus Hu/GII-4/Nagano3/2007/JP
1161	VP1	BAJ13849	1161	5571	9981, 14391, 18801, 23211, 27621, 32031, 36441	norovirus Hu/GII-4/Nagano3/2008/JP
1162	VP1	BAJ13852	1162	5572	9982, 14392, 18802, 23212, 27622, 32032, 36442	norovirus Hu/GII-4/Nagano4/2008/JP
1163	VP1	BAJ13855	1163	5573	9983, 14393, 18803, 23213, 27623, 32033, 36443	norovirus Hu/GII-4/Nagano5/2007/JP

1164	VP1	BAJ13858	1164	5574	9984, 14394, 18804, 23214, 27624, 32034, 36444	norovirus Hu/GII-4/Niigata1/2007/JP
1165	VP1	BAJ13861	1165	5575	9985, 14395, 18805, 23215, 27625, 32035, 36445	norovirus Hu/GII-4/Niigata1/2008/JP
1166	VP1	BAJ13864	1166	5576	9986, 14396, 18806, 23216, 27626, 32036, 36446	norovirus Hu/GII-4/Niigata2/2007/JP
1167	VP1	BAJ13867	1167	5577	9987, 14397, 18807, 23217, 27627, 32037, 36447	norovirus Hu/GII-4/Niigata2/2008/JP
1168	VP1	BAJ13873	1168	5578	9988, 14398, 18808, 23218, 27628, 32038, 36448	norovirus Hu/GII-4/Niigata3/2008/JP
1169	VP1	BAJ13876	1169	5579	9989, 14399, 18809, 23219, 27629, 32039, 36449	norovirus Hu/GII-4/Niigata4/2007/JP
1170	VP1	BAJ13879	1170	5580	9990, 14400, 18810, 23220, 27630, 32040, 36450	norovirus Hu/GII-4/Niigata4/2008/JP
1171	VP1	BAJ13882	1171	5581	9991, 14401, 18811, 23221, 27631, 32041, 36451	norovirus Hu/GII-4/Niigata5/2007/JP
1172	VP1	BAJ13885	1172	5582	9992, 14402, 18812, 23222, 27632, 32042, 36452	norovirus Hu/GII-4/Niigata5/2008/JP
1173	VP1	BAJ13891	1173	5583	9993, 14403, 18813, 23223, 27633, 32043, 36453	norovirus Hu/GII-4/Osaka1/2008/JP
1174	VP1	BAJ13894	1174	5584	9994, 14404, 18814, 23224, 27634, 32044, 36454	norovirus Hu/GII-4/Osaka2/2007/JP
1175	VP1	BAJ13897	1175	5585	9995, 14405, 18815, 23225, 27635, 32045, 36455	norovirus Hu/GII-4/Osaka2/2008/JP
1176	VP1	BAJ13900	1176	5586	9996, 14406, 18816, 23226, 27636, 32046, 36456	norovirus Hu/GII-4/Osaka3/2007/JP
1177	VP1	BAJ13903	1177	5587	9997, 14407, 18817, 23227, 27637, 32047, 36457	norovirus Hu/GII-4/Osaka3/2008/JP
1178	VP1	BAJ13906	1178	5588	9998, 14408, 18818, 23228, 27638, 32048, 36458	norovirus Hu/GII-4/Osaka4/2007/JP
1179	VP1	BAJ13909	1179	5589	9999, 14409, 18819, 23229, 27639, 32049, 36459	norovirus Hu/GII-4/Osaka4/2008/JP
1180	VP1	BAJ13912	1180	5590	10000, 14410, 18820, 23230, 27640, 32050, 36460	norovirus Hu/GII-4/Osaka5/2007/JP

1181	VP1	BAJ13918	1181	5591	10001, 14411, 18821, 23231, 27641, 32051, 36461	norovirus Hu/GII-4/Osaka6/2008/JP
1182	VP1	BAJ13924	1182	5592	10002, 14412, 18822, 23232, 27642, 32052, 36462	norovirus Hu/GII-4/Saga1/2008/JP
1183	VP1	BAJ13927	1183	5593	10003, 14413, 18823, 23233, 27643, 32053, 36463	norovirus Hu/GII-4/Saga2/2007/JP
1184	VP1	BAJ13930	1184	5594	10004, 14414, 18824, 23234, 27644, 32054, 36464	norovirus Hu/GII-4/Saga2/2008/JP
1185	VP1	BAJ13933	1185	5595	10005, 14415, 18825, 23235, 27645, 32055, 36465	norovirus Hu/GII-4/Saga3/2008/JP
1186	VP1	BAJ13936	1186	5596	10006, 14416, 18826, 23236, 27646, 32056, 36466	norovirus Hu/GII-4/Saga4/2007/JP
1187	VP1	BAJ13939	1187	5597	10007, 14417, 18827, 23237, 27647, 32057, 36467	norovirus Hu/GII-4/Saga4/2008/JP
1188	VP1	BAJ13942	1188	5598	10008, 14418, 18828, 23238, 27648, 32058, 36468	norovirus Hu/GII-4/Saga5/2007/JP
1189	VP1	BAJ13945	1189	5599	10009, 14419, 18829, 23239, 27649, 32059, 36469	norovirus Hu/GII-4/Saga5/2008/JP
1190	VP1	BAJ13948	1190	5600	10010, 14420, 18830, 23240, 27650, 32060, 36470	norovirus Hu/GII-4/Sakai1/2007/JP
1191	VP1	BAJ13951	1191	5601	10011, 14421, 18831, 23241, 27651, 32061, 36471	norovirus Hu/GII-4/Sakai1/2008/JP
1192	VP1	BAJ13954	1192	5602	10012, 14422, 18832, 23242, 27652, 32062, 36472	norovirus Hu/GII-4/Sakai2/2007/JP
1193	VP1	BAJ13957	1193	5603	10013, 14423, 18833, 23243, 27653, 32063, 36473	norovirus Hu/GII-4/Sakai3/2007/JP
1194	VP1	BAJ13960	1194	5604	10014, 14424, 18834, 23244, 27654, 32064, 36474	norovirus Hu/GII-4/Sakai3/2008/JP
1195	VP1	BAJ13963	1195	5605	10015, 14425, 18835, 23245, 27655, 32065, 36475	norovirus Hu/GII-4/Sakai4/2007/JP
1196	VP1	BAJ13966	1196	5606	10016, 14426, 18836, 23246, 27656, 32066, 36476	norovirus Hu/GII-4/Sakai4/2008/JP
1197	VP1	BAJ13969	1197	5607	10017, 14427, 18837, 23247, 27657, 32067, 36477	norovirus Hu/GII-4/Shimane1/2007/JP

1198	VP1	BAJ13972	1198	5608	10018, 14428, 18838, 23248, 27658, 32068, 36478	norovirus Hu/GII-4/Shimane2/2007/JP
1199	VP1	BAJ13975	1199	5609	10019, 14429, 18839, 23249, 27659, 32069, 36479	norovirus Hu/GII-4/Shimane2/2008/JP
1200	VP1	BAJ13978	1200	5610	10020, 14430, 18840, 23250, 27660, 32070, 36480	norovirus Hu/GII-4/Shimane3/2007/JP
1201	VP1	BAJ13981	1201	5611	10021, 14431, 18841, 23251, 27661, 32071, 36481	norovirus Hu/GII-4/Shimane3/2008/JP
1202	VP1	BAJ13984	1202	5612	10022, 14432, 18842, 23252, 27662, 32072, 36482	norovirus Hu/GII-4/Shimane4/2007/JP
1203	VP1	BAJ13987	1203	5613	10023, 14433, 18843, 23253, 27663, 32073, 36483	norovirus Hu/GII-4/Shimane5/2007/JP
1204	VP1	BAJ13990	1204	5614	10024, 14434, 18844, 23254, 27664, 32074, 36484	norovirus Hu/GII-4/Shimane5/2008/JP
1205	VP1	BAJ13993	1205	5615	10025, 14435, 18845, 23255, 27665, 32075, 36485	norovirus Hu/GII-4/Toyama1/2007/JP
1206	VP1	BAJ13996	1206	5616	10026, 14436, 18846, 23256, 27666, 32076, 36486	norovirus Hu/GII-4/Toyama2/2007/JP
1207	VP1	BAJ13999	1207	5617	10027, 14437, 18847, 23257, 27667, 32077, 36487	norovirus Hu/GII-4/Toyama2/2008/JP
1208	VP1	BAJ14002	1208	5618	10028, 14438, 18848, 23258, 27668, 32078, 36488	norovirus Hu/GII-4/Toyama3/2007/JP
1209	VP1	BAJ14005	1209	5619	10029, 14439, 18849, 23259, 27669, 32079, 36489	norovirus Hu/GII-4/Toyama3/2008/JP
1210	VP1	BAJ14008	1210	5620	10030, 14440, 18850, 23260, 27670, 32080, 36490	norovirus Hu/GII-4/Toyama4/2007/JP
1211	VP1	BAJ14011	1211	5621	10031, 14441, 18851, 23261, 27671, 32081, 36491	norovirus Hu/GII-4/Toyama4/2008/JP
1212	VP1	BAJ14014	1212	5622	10032, 14442, 18852, 23262, 27672, 32082, 36492	norovirus Hu/GII-4/Toyama5/2007/JP
1213	VP1	BAK43269	1213	5623	10033, 14443, 18853, 23263, 27673, 32083, 36493	norovirus Hu/Tokyo/10-14/2010/JPN
1214	VP1	BAK43272	1214	5624	10034, 14444, 18854, 23264, 27674, 32084, 36494	norovirus Hu/Tokyo/10-20/2010/JPN

1215	VP1	BAK43275	1215	5625	10035, 14445, 18855, 23265, 27675, 32085, 36495	norovirus Hu/Tokyo/10-1105/2010/JPN
1216	VP1	BAK43278	1216	5626	10036, 14446, 18856, 23266, 27676, 32086, 36496	norovirus Hu/Tokyo/10-1443/2010/JPN
1217	VP1	BAK43284	1217	5627	10037, 14447, 18857, 23267, 27677, 32087, 36497	norovirus Hu/Tokyo/10-4320/2011/JPN
1218	VP1	BAL14785	1218	5628	10038, 14448, 18858, 23268, 27678, 32088, 36498	norovirus Hu/GII.6/Ehime090371/2009/JP
1219	VP1	BAR88157	1219	5629	10039, 14449, 18859, 23269, 27679, 32089, 36499	norovirus GVI.1/Ca/JPN/2012/M49-1
1220	VP1	BAS29993	1220	5630	10040, 14450, 18860, 23270, 27680, 32090, 36500	norovirus Hu/GII.4/Toyama1/2009/JP
1221	VP1	BAS29996	1221	5631	10041, 14451, 18861, 23271, 27681, 32091, 36501	norovirus Hu/GII.4/Toyama4/2009/JP
1222	VP1	BAS29999	1222	5632	10042, 14452, 18862, 23272, 27682, 32092, 36502	norovirus Hu/GII.4/Shimane1/2009/JP
1223	VP1	BAS30005	1223	5633	10043, 14453, 18863, 23273, 27683, 32093, 36503	norovirus Hu/GII.4/Aomori2/2009/JP
1224	VP1	BAS30008	1224	5634	10044, 14454, 18864, 23274, 27684, 32094, 36504	norovirus Hu/GII.4/Hiroshimacity3/2009/JP
1225	VP1	BAS30011	1225	5635	10045, 14455, 18865, 23275, 27685, 32095, 36505	norovirus Hu/GII.4/Hiroshimacity4/2009/JP
1226	VP1	BAS30014	1226	5636	10046, 14456, 18866, 23276, 27686, 32096, 36506	norovirus Hu/GII.4/Hiroshimacity5/2009/JP
1227	VP1	BAS30017	1227	5637	10047, 14457, 18867, 23277, 27687, 32097, 36507	norovirus Hu/GII.4/Iwate2/2009/JP
1228	VP1	BAS30023	1228	5638	10048, 14458, 18868, 23278, 27688, 32098, 36508	norovirus Hu/GII.4/Aichi4/2009/JP
1229	VP1	BAS30026	1229	5639	10049, 14459, 18869, 23279, 27689, 32099, 36509	norovirus Hu/GII.4/Shimane2/2009/JP
1230	VP1	BAS30029	1230	5640	10050, 14460, 18870, 23280, 27690, 32100, 36510	norovirus Hu/GII.4/Miyazaki1/2009/JP
1231	VP1	BAS30035	1231	5641	10051, 14461, 18871, 23281, 27691, 32101, 36511	norovirus Hu/GII.4/Aomori4/2010/JP

1232	VP1	BAS30038	1232	5642	10052, 14462, 18872, 23282, 27692, 32102, 36512	norovirus Hu/GII.4/Iwate5/2010/JP
1233	VP1	BAS30041	1233	5643	10053, 14463, 18873, 23283, 27693, 32103, 36513	norovirus Hu/GII.4/Toyama5/2010/JP
1234	VP1	BAS30044	1234	5644	10054, 14464, 18874, 23284, 27694, 32104, 36514	norovirus Hu/GII.4/Chiba1/2010/JP
1235	VP1	BAS30047	1235	5645	10055, 14465, 18875, 23285, 27695, 32105, 36515	norovirus Hu/GII.4/Chiba3/2010/JP
1236	VP1	BAS30050	1236	5646	10056, 14466, 18876, 23286, 27696, 32106, 36516	norovirus Hu/GII.4/Chiba5/2010/JP
1237	VP1	BAS30053	1237	5647	10057, 14467, 18877, 23287, 27697, 32107, 36517	norovirus Hu/GII.4/Nagano1/2010/JP
1238	VP1	BAS30056	1238	5648	10058, 14468, 18878, 23288, 27698, 32108, 36518	norovirus Hu/GII.4/Aichi5/2010/JP
1239	VP1	BAS30059	1239	5649	10059, 14469, 18879, 23289, 27699, 32109, 36519	norovirus Hu/GII.4/Osaka2/2010/JP
1240	VP1	BAS30062	1240	5650	10060, 14470, 18880, 23290, 27700, 32110, 36520	norovirus Hu/GII.4/Osaka3/2010/JP
1241	VP1	BAS30065	1241	5651	10061, 14471, 18881, 23291, 27701, 32111, 36521	norovirus Hu/GII.4/Osaka4/2010/JP
1242	VP1	BAS30068	1242	5652	10062, 14472, 18882, 23292, 27702, 32112, 36522	norovirus Hu/GII.4/Sakai1/2010/JP
1243	VP1	BAS30071	1243	5653	10063, 14473, 18883, 23293, 27703, 32113, 36523	norovirus Hu/GII.4/Sakai2/2010/JP
1244	VP1	BAS30074	1244	5654	10064, 14474, 18884, 23294, 27704, 32114, 36524	norovirus Hu/GII.4/Hiroshima3/2010/JP
1245	VP1	BAS30077	1245	5655	10065, 14475, 18885, 23295, 27705, 32115, 36525	norovirus Hu/GII.4/Hiroshima4/2010/JP
1246	VP1	BAS30080	1246	5656	10066, 14476, 18886, 23296, 27706, 32116, 36526	norovirus Hu/GII.4/Miyazaki2/2010/JP
1247	VP1	BAS30083	1247	5657	10067, 14477, 18887, 23297, 27707, 32117, 36527	norovirus Hu/GII.4/Miyazaki3/2010/JP
1248	VP1	BAS30086	1248	5658	10068, 14478, 18888, 23298, 27708, 32118, 36528	norovirus Hu/GII.4/Hokkaido4/2010/JP

1249	VP1	BAS30089	1249	5659	10069, 14479, 18889, 23299, 27709, 32119, 36529	norovirus Hu/GII.4/Niigata2/2010/JP
1250	VP1	BAS30092	1250	5660	10070, 14480, 18890, 23300, 27710, 32120, 36530	norovirus Hu/GII.4/Niigata3/2010/JP
1251	VP1	BAS30095	1251	5661	10071, 14481, 18891, 23301, 27711, 32121, 36531	norovirus Hu/GII.4/Niigata4/2010/JP
1252	VP1	BAS30098	1252	5662	10072, 14482, 18892, 23302, 27712, 32122, 36532	norovirus Hu/GII.4/Fukui2/2010/JP
1253	VP1	BAS30101	1253	5663	10073, 14483, 18893, 23303, 27713, 32123, 36533	norovirus Hu/GII.4/Fukui3/2010/JP
1254	VP1	BAS30104	1254	5664	10074, 14484, 18894, 23304, 27714, 32124, 36534	norovirus Hu/GII.4/Fukui4/2010/JP
1255	VP1	BAS30107	1255	5665	10075, 14485, 18895, 23305, 27715, 32125, 36535	norovirus Hu/GII.4/Nagano3/2010/JP
1256	VP1	BAS30110	1256	5666	10076, 14486, 18896, 23306, 27716, 32126, 36536	norovirus Hu/GII.4/Sakai3/2010/JP
1257	VP1	BAS30113	1257	5667	10077, 14487, 18897, 23307, 27717, 32127, 36537	norovirus Hu/GII.4/Sakai4/2010/JP
1258	VP1	BAS30116	1258	5668	10078, 14488, 18898, 23308, 27718, 32128, 36538	norovirus Hu/GII.4/Ehime3/2010/JP
1259	VP1	BAS30119	1259	5669	10079, 14489, 18899, 23309, 27719, 32129, 36539	norovirus Hu/GII.4/Ehime5/2010/JP
1260	VP1	BAS30125	1260	5670	10080, 14490, 18900, 23310, 27720, 32130, 36540	norovirus Hu/GII.4/Shimane5/2010/JP
1261	VP1	BAS30128	1261	5671	10081, 14491, 18901, 23311, 27721, 32131, 36541	norovirus Hu/GII.4/Saga5/2010/JP
1262	VP1	BAS30134	1262	5672	10082, 14492, 18902, 23312, 27722, 32132, 36542	norovirus Hu/GII.4/Miyazaki5/2010/JP
1263	VP1	BAS30137	1263	5673	10083, 14493, 18903, 23313, 27723, 32133, 36543	norovirus Hu/GII.4/Nagano5/2011/JP
1264	VP1	BAS30140	1264	5674	10084, 14494, 18904, 23314, 27724, 32134, 36544	norovirus Hu/GII.4/Sakai7/2011/JP
1265	VP1	BAS30146	1265	5675	10085, 14495, 18905, 23315, 27725, 32135, 36545	norovirus Hu/GII.4/Sakai10/2011/JP

1266	VP1	BAS30149	1266	5676	10086, 14496, 18906, 23316, 27726, 32136, 36546	norovirus Hu/GII.4/Shimane1/2011/JP
1267	VP1	BAS30152	1267	5677	10087, 14497, 18907, 23317, 27727, 32137, 36547	norovirus Hu/GII.4/Shimane2/2011/JP
1268	VP1	BAS30155	1268	5678	10088, 14498, 18908, 23318, 27728, 32138, 36548	norovirus Hu/GII.4/Hiroshimacity2/2011/JP
1269	VP1	BAS30158	1269	5679	10089, 14499, 18909, 23319, 27729, 32139, 36549	norovirus Hu/GII.4/Akita2/2011/JP
1270	VP1	BAS30164	1270	5680	10090, 14500, 18910, 23320, 27730, 32140, 36550	norovirus Hu/GII.4/Akita3/2011/JP
1271	VP1	BAS30167	1271	5681	10091, 14501, 18911, 23321, 27731, 32141, 36551	norovirus Hu/GII.4/Osaka3/2011/JP
1272	VP1	BAS30170	1272	5682	10092, 14502, 18912, 23322, 27732, 32142, 36552	norovirus Hu/GII.4/Shimane4/2011/JP
1273	VP1	BAS30173	1273	5683	10093, 14503, 18913, 23323, 27733, 32143, 36553	norovirus Hu/GII.4/Ehime1/2011/JP
1274	VP1	BAS30176	1274	5684	10094, 14504, 18914, 23324, 27734, 32144, 36554	norovirus Hu/GII.4/Ehime2/2011/JP
1275	VP1	BAS30179	1275	5685	10095, 14505, 18915, 23325, 27735, 32145, 36555	norovirus Hu/GII.4/Saga1/2011/JP
1276	VP1	BAS30182	1276	5686	10096, 14506, 18916, 23326, 27736, 32146, 36556	norovirus Hu/GII.4/Saga2/2011/JP
1277	VP1	BAS30185	1277	5687	10097, 14507, 18917, 23327, 27737, 32147, 36557	norovirus Hu/GII.4/Hiroshimacity3/2011/JP
1278	VP1	BAS30188	1278	5688	10098, 14508, 18918, 23328, 27738, 32148, 36558	norovirus Hu/GII.4/Hokkaido1/2011/JP
1279	VP1	BAS30191	1279	5689	10099, 14509, 18919, 23329, 27739, 32149, 36559	norovirus Hu/GII.4/Aomori4/2011/JP
1280	VP1	BAS30194	1280	5690	10100, 14510, 18920, 23330, 27740, 32150, 36560	norovirus Hu/GII.4/Aomori5/2011/JP
1281	VP1	BAS30197	1281	5691	10101, 14511, 18921, 23331, 27741, 32151, 36561	norovirus Hu/GII.4/Aomori6/2011/JP
1282	VP1	BAS30200	1282	5692	10102, 14512, 18922, 23332, 27742, 32152, 36562	norovirus Hu/GII.4/Aomori7/2011/JP

1283	VP1	BAS30203	1283	5693	10103, 14513, 18923, 23333, 27743, 32153, 36563	norovirus Hu/GII.4/Iwate2/2011/JP
1284	VP1	BAS30206	1284	5694	10104, 14514, 18924, 23334, 27744, 32154, 36564	norovirus Hu/GII.4/Iwate4/2011/JP
1285	VP1	BAS30209	1285	5695	10105, 14515, 18925, 23335, 27745, 32155, 36565	norovirus Hu/GII.4/Iwate5/2011/JP
1286	VP1	BAS30212	1286	5696	10106, 14516, 18926, 23336, 27746, 32156, 36566	norovirus Hu/GII.4/Toyama5/2011/JP
1287	VP1	BAS30215	1287	5697	10107, 14517, 18927, 23337, 27747, 32157, 36567	norovirus Hu/GII.4/Aichi1/2011/JP
1288	VP1	BAS30218	1288	5698	10108, 14518, 18928, 23338, 27748, 32158, 36568	norovirus Hu/GII.4/Hiroshima1/2011/JP
1289	VP1	BAS30221	1289	5699	10109, 14519, 18929, 23339, 27749, 32159, 36569	norovirus Hu/GII.4/Hiroshima2/2011/JP
1290	VP1	BAS30224	1290	5700	10110, 14520, 18930, 23340, 27750, 32160, 36570	norovirus Hu/GII.4/Hiroshima4/2011/JP
1291	VP1	BAS30227	1291	5701	10111, 14521, 18931, 23341, 27751, 32161, 36571	norovirus Hu/GII.4/Ehime3/2011/JP
1292	VP1	BAS30230	1292	5702	10112, 14522, 18932, 23342, 27752, 32162, 36572	norovirus Hu/GII.4/Saga3/2011/JP
1293	VP1	BAS30233	1293	5703	10113, 14523, 18933, 23343, 27753, 32163, 36573	norovirus Hu/GII.4/Aichi3/2011/JP
1294	VP1	BAS30236	1294	5704	10114, 14524, 18934, 23344, 27754, 32164, 36574	norovirus Hu/GII.4/Shimane6/2011/JP
1295	VP1	BAS30239	1295	5705	10115, 14525, 18935, 23345, 27755, 32165, 36575	norovirus Hu/GII.4/Ehime4/2011/JP
1296	VP1	BAS30242	1296	5706	10116, 14526, 18936, 23346, 27756, 32166, 36576	norovirus Hu/GII.4/Chiba10/2011/JP
1297	VP1	BAS30245	1297	5707	10117, 14527, 18937, 23347, 27757, 32167, 36577	norovirus Hu/GII.4/Akita5/2009/JP
1298	VP1	BAS30248	1298	5708	10118, 14528, 18938, 23348, 27758, 32168, 36578	norovirus Hu/GII.4/Fukui5/2009/JP
1299	VP1	BAS30251	1299	5709	10119, 14529, 18939, 23349, 27759, 32169, 36579	norovirus Hu/GII.4/Ehime1/2009/JP

1300	VP1	BAS30254	1300	5710	10120, 14530, 18940, 23350, 27760, 32170, 36580	norovirus Hu/GII.4/Hokkaido1/2009/JP
1301	VP1	BAS30257	1301	5711	10121, 14531, 18941, 23351, 27761, 32171, 36581	norovirus Hu/GII.4/Hokkaido2/2009/JP
1302	VP1	BAS30260	1302	5712	10122, 14532, 18942, 23352, 27762, 32172, 36582	norovirus Hu/GII.4/Hokkaido5/2009/JP
1303	VP1	BAS30263	1303	5713	10123, 14533, 18943, 23353, 27763, 32173, 36583	norovirus Hu/GII.4/Aomori5/2009/JP
1304	VP1	BAS30266	1304	5714	10124, 14534, 18944, 23354, 27764, 32174, 36584	norovirus Hu/GII.4/Iwate4/2009/JP
1305	VP1	BAS30269	1305	5715	10125, 14535, 18945, 23355, 27765, 32175, 36585	norovirus Hu/GII.4/Aichi2/2009/JP
1306	VP1	BAS30272	1306	5716	10126, 14536, 18946, 23356, 27766, 32176, 36586	norovirus Hu/GII.4/Aichi3/2009/JP
1307	VP1	BAS30275	1307	5717	10127, 14537, 18947, 23357, 27767, 32177, 36587	norovirus Hu/GII.4/Niigata5/2009/JP
1308	VP1	BAS30278	1308	5718	10128, 14538, 18948, 23358, 27768, 32178, 36588	norovirus Hu/GII.4/Fukui1/2009/JP
1309	VP1	BAS30284	1309	5719	10129, 14539, 18949, 23359, 27769, 32179, 36589	norovirus Hu/GII.4/Chiba4/2009/JP
1310	VP1	BAS30287	1310	5720	10130, 14540, 18950, 23360, 27770, 32180, 36590	norovirus Hu/GII.4/Nagano2/2009/JP
1311	VP1	BAS30290	1311	5721	10131, 14541, 18951, 23361, 27771, 32181, 36591	norovirus Hu/GII.4/Nagano4/2009/JP
1312	VP1	BAS30293	1312	5722	10132, 14542, 18952, 23362, 27772, 32182, 36592	norovirus Hu/GII.4/Nagano5/2009/JP
1313	VP1	BAS30296	1313	5723	10133, 14543, 18953, 23363, 27773, 32183, 36593	norovirus Hu/GII.4/Aichi3/2010/JP
1314	VP1	BAS30299	1314	5724	10134, 14544, 18954, 23364, 27774, 32184, 36594	norovirus Hu/GII.4/Osaka1/2009/JP
1315	VP1	BAS30302	1315	5725	10135, 14545, 18955, 23365, 27775, 32185, 36595	norovirus Hu/GII.4/Osaka5/2009/JP
1316	VP1	BAS30305	1316	5726	10136, 14546, 18956, 23366, 27776, 32186, 36596	norovirus Hu/GII.4/Ehime5/2011/JP

1317	VP1	BAS30308	1317	5727	10137, 14547, 18957, 23367, 27777, 32187, 36597	norovirus Hu/GII.4/Sakai5/2009/JP
1318	VP1	BAS30311	1318	5728	10138, 14548, 18958, 23368, 27778, 32188, 36598	norovirus Hu/GII.4/Hiroshima1/2009/JP
1319	VP1	BAS30314	1319	5729	10139, 14549, 18959, 23369, 27779, 32189, 36599	norovirus Hu/GII.4/Hiroshima5/2009/JP
1320	VP1	BAS30317	1320	5730	10140, 14550, 18960, 23370, 27780, 32190, 36600	norovirus Hu/GII.4/Ehime2/2009/JP
1321	VP1	BAS30320	1321	5731	10141, 14551, 18961, 23371, 27781, 32191, 36601	norovirus Hu/GII.4/Ehime4/2009/JP
1322	VP1	BAS30323	1322	5732	10142, 14552, 18962, 23372, 27782, 32192, 36602	norovirus Hu/GII.4/Saga1/2009/JP
1323	VP1	BAS30326	1323	5733	10143, 14553, 18963, 23373, 27783, 32193, 36603	norovirus Hu/GII.4/Saga2/2009/JP
1324	VP1	BAS30329	1324	5734	10144, 14554, 18964, 23374, 27784, 32194, 36604	norovirus Hu/GII.4/Saga3/2009/JP
1325	VP1	BAS30332	1325	5735	10145, 14555, 18965, 23375, 27785, 32195, 36605	norovirus Hu/GII.4/Saga4/2009/JP
1326	VP1	BAS30335	1326	5736	10146, 14556, 18966, 23376, 27786, 32196, 36606	norovirus Hu/GII.4/Chiba6/2011/JP
1327	VP1	BAS30338	1327	5737	10147, 14557, 18967, 23377, 27787, 32197, 36607	norovirus Hu/GII.4/Nagano26/2011/JP
1328	VP1	BAS30341	1328	5738	10148, 14558, 18968, 23378, 27788, 32198, 36608	norovirus Hu/GII.4/Hiroshima5/2011/JP
1329	VP1	BAS30344	1329	5739	10149, 14559, 18969, 23379, 27789, 32199, 36609	norovirus Hu/GII.4/Osaka4/2011/JP
1330	VP1	BAS30347	1330	5740	10150, 14560, 18970, 23380, 27790, 32200, 36610	norovirus Hu/GII.4/Hokkaido4/2011/JP
1331	VP1	BAS30350	1331	5741	10151, 14561, 18971, 23381, 27791, 32201, 36611	norovirus Hu/GII.4/Osaka2/2011/JP
1332	VP1	BAS30353	1332	5742	10152, 14562, 18972, 23382, 27792, 32202, 36612	norovirus Hu/GII.4/Osaka1/2011/JP
1333	VP1	BAS30356	1333	5743	10153, 14563, 18973, 23383, 27793, 32203, 36613	norovirus Hu/GII.4/Aichi5/2011/JP

1334	VP1	BAS30359	1334	5744	10154, 14564, 18974, 23384, 27794, 32204, 36614	norovirus Hu/GII.4/Aichi4/2011/JP
1335	VP1	BAS30362	1335	5745	10155, 14565, 18975, 23385, 27795, 32205, 36615	norovirus Hu/GII.4/Hokkaido3/2011/JP
1336	VP1	BAS30365	1336	5746	10156, 14566, 18976, 23386, 27796, 32206, 36616	norovirus Hu/GII.4/Nagano7/2011/JP
1337	VP1	BAS30368	1337	5747	10157, 14567, 18977, 23387, 27797, 32207, 36617	norovirus Hu/GII.4/Nagano4/2011/JP
1338	VP1	BAS30371	1338	5748	10158, 14568, 18978, 23388, 27798, 32208, 36618	norovirus Hu/GII.4/Niigata3/2011/JP
1339	VP1	BAS30374	1339	5749	10159, 14569, 18979, 23389, 27799, 32209, 36619	norovirus Hu/GII.4/Hiroshimacity1/2011/JP
1340	VP1	BAU16297	1340	5750	10160, 14570, 18980, 23390, 27800, 32210, 36620	norovirus GII/Hu/Jp/2012/GII.4/sl20153
1341	VP1	BAU16299	1341	5751	10161, 14571, 18981, 23391, 27801, 32211, 36621	norovirus GII/Hu/Jp/2015/GII.17/MIY2
1342	VP1	BAU16301	1342	5752	10162, 14572, 18982, 23392, 27802, 32212, 36622	norovirus GI/Hu/Jp/2013/GI.4/sl30149
1343	VP1	BAU16303	1343	5753	10163, 14573, 18983, 23393, 27803, 32213, 36623	norovirus GI/Hu/Jp/2013/GI.6/sl30147
1344	VP1	BAU16305	1344	5754	10164, 14574, 18984, 23394, 27804, 32214, 36624	norovirus GII/Hu/Jp/2007/GII.3/Kodl
1345	VP1	BAU16306	1345	5755	10165, 14575, 18985, 23395, 27805, 32215, 36625	norovirus GIV/Hu/Jp/2001/GIV.1/OC01017023
1346	VP1	BAU16307	1346	5756	10166, 14576, 18986, 23396, 27806, 32216, 36626	norovirus GI/Hu/Jp/2002/GI.5/OC020180
1347	VP1	BAU24831	1347	5757	10167, 14577, 18987, 23397, 27807, 32217, 36627	norovirus Hu/GII.4/Hokkaido4/2012/JP
1348	VP1	BAU24834	1348	5758	10168, 14578, 18988, 23398, 27808, 32218, 36628	norovirus Hu/GII.4/Aomori2/2012/JP
1349	VP1	BAU24837	1349	5759	10169, 14579, 18989, 23399, 27809, 32219, 36629	norovirus Hu/GII.4/Aomori3/2012/JP
1350	VP1	BAU24840	1350	5760	10170, 14580, 18990, 23400, 27810, 32220, 36630	norovirus Hu/GII.4/Aomori5/2012/JP

1351	VP1	BAU24843	1351	5761	10171, 14581, 18991, 23401, 27811, 32221, 36631	norovirus Hu/GII.4/Akita4/2012/JP
1352	VP1	BAU24846	1352	5762	10172, 14582, 18992, 23402, 27812, 32222, 36632	norovirus Hu/GII.4/Akita5/2012/JP
1353	VP1	BAU24849	1353	5763	10173, 14583, 18993, 23403, 27813, 32223, 36633	norovirus Hu/GII.4/Iwate4/2012/JP
1354	VP1	BAU24852	1354	5764	10174, 14584, 18994, 23404, 27814, 32224, 36634	norovirus Hu/GII.4/Iwate5/2012/JP
1355	VP1	BAU24855	1355	5765	10175, 14585, 18995, 23405, 27815, 32225, 36635	norovirus Hu/GII.4/Miyagi3/2012/JP
1356	VP1	BAU24858	1356	5766	10176, 14586, 18996, 23406, 27816, 32226, 36636	norovirus Hu/GII.4/Saitama2/2012/JP
1357	VP1	BAU24861	1357	5767	10177, 14587, 18997, 23407, 27817, 32227, 36637	norovirus Hu/GII.4/Toyama2/2012/JP
1358	VP1	BAU24864	1358	5768	10178, 14588, 18998, 23408, 27818, 32228, 36638	norovirus Hu/GII.4/Niigata4/2012/JP
1359	VP1	BAU24867	1359	5769	10179, 14589, 18999, 23409, 27819, 32229, 36639	norovirus Hu/GII.4/Fukui3/2012/JP
1360	VP1	BAU24870	1360	5770	10180, 14590, 19000, 23410, 27820, 32230, 36640	norovirus Hu/GII.4/Fukui4/2012/JP
1361	VP1	BAU24873	1361	5771	10181, 14591, 19001, 23411, 27821, 32231, 36641	norovirus Hu/GII.4/Fukui6/2012/JP
1362	VP1	BAU24876	1362	5772	10182, 14592, 19002, 23412, 27822, 32232, 36642	norovirus Hu/GII.4/Fukui7/2012/JP
1363	VP1	BAU24879	1363	5773	10183, 14593, 19003, 23413, 27823, 32233, 36643	norovirus Hu/GII.4/Fukui8/2012/JP
1364	VP1	BAU24882	1364	5774	10184, 14594, 19004, 23414, 27824, 32234, 36644	norovirus Hu/GII.4/Ehime5/2012/JP
1365	VP1	BAU24885	1365	5775	10185, 14595, 19005, 23415, 27825, 32235, 36645	norovirus Hu/GII.4/OsakaCity1/2012/JP
1366	VP1	BAU24888	1366	5776	10186, 14596, 19006, 23416, 27826, 32236, 36646	norovirus Hu/GII.4/OsakaCity2/2012/JP
1367	VP1	BAU24891	1367	5777	10187, 14597, 19007, 23417, 27827, 32237, 36647	norovirus Hu/GII.4/OsakaCity4/2012/JP

1368	VP1	BAU24894	1368	5778	10188, 14598, 19008, 23418, 27828, 32238, 36648	norovirus Hu/GII.4/Sakai1/2012/JP
1369	VP1	BAU24897	1369	5779	10189, 14599, 19009, 23419, 27829, 32239, 36649	norovirus Hu/GII.4/Sakai2/2012/JP
1370	VP1	BAU24900	1370	5780	10190, 14600, 19010, 23420, 27830, 32240, 36650	norovirus Hu/GII.4/Sakai3/2012/JP
1371	VP1	BAU24903	1371	5781	10191, 14601, 19011, 23421, 27831, 32241, 36651	norovirus Hu/GII.4/Sakai4/2012/JP
1372	VP1	BAU24906	1372	5782	10192, 14602, 19012, 23422, 27832, 32242, 36652	norovirus Hu/GII.4/Sakai5/2012/JP
1373	VP1	BAU24909	1373	5783	10193, 14603, 19013, 23423, 27833, 32243, 36653	norovirus Hu/GII.4/Shimane3/2012/JP
1374	VP1	BAU24912	1374	5784	10194, 14604, 19014, 23424, 27834, 32244, 36654	norovirus Hu/GII.4/Shimane5/2012/JP
1375	VP1	BAU24915	1375	5785	10195, 14605, 19015, 23425, 27835, 32245, 36655	norovirus Hu/GII.4/Hiroshima4/2012/JP
1376	VP1	BAU24918	1376	5786	10196, 14606, 19016, 23426, 27836, 32246, 36656	norovirus Hu/GII.4/Hiroshima5/2012/JP
1377	VP1	BAU24921	1377	5787	10197, 14607, 19017, 23427, 27837, 32247, 36657	norovirus Hu/GII.4/HiroshimaCity3/2012/JP
1378	VP1	BAU24924	1378	5788	10198, 14608, 19018, 23428, 27838, 32248, 36658	norovirus Hu/GII.4/HiroshimaCity4/2012/JP
1379	VP1	BAU24927	1379	5789	10199, 14609, 19019, 23429, 27839, 32249, 36659	norovirus Hu/GII.4/Ehime3/2012/JP
1380	VP1	BAU24930	1380	5790	10200, 14610, 19020, 23430, 27840, 32250, 36660	norovirus Hu/GII.4/GII4-HK01/2011/JP
1381	VP1	BAU24933	1381	5791	10201, 14611, 19021, 23431, 27841, 32251, 36661	norovirus Hu/GII.4/GII4-HK02/2011/JP
1382	VP1	BAU24936	1382	5792	10202, 14612, 19022, 23432, 27842, 32252, 36662	norovirus Hu/GII.4/GII4-HK03/2011/JP
1383	VP1	BAU24942	1383	5793	10203, 14613, 19023, 23433, 27843, 32253, 36663	norovirus Hu/GII.4/GII4-NG1315/2011/JP
1384	VP1	BAU24945	1384	5794	10204, 14614, 19024, 23434, 27844, 32254, 36664	norovirus Hu/GII.4/GII4-NG1343/2011/JP

1385	VP1	BAU24948	1385	5795	10205, 14615, 19025, 23435, 27845, 32255, 36665	norovirus Hu/GII.4/GII4-NG1365/2011/JP
1386	VP1	BAU24950	1386	5796	10206, 14616, 19026, 23436, 27846, 32256, 36666	norovirus Hu/GII.4/Hokkaido2/2012/JP
1387	VP1	BAU24952	1387	5797	10207, 14617, 19027, 23437, 27847, 32257, 36667	norovirus Hu/GII.4/Hokkaido3/2012/JP
1388	VP1	BAU24954	1388	5798	10208, 14618, 19028, 23438, 27848, 32258, 36668	norovirus Hu/GII.4/Hokkaido5/2012/JP
1389	VP1	BAU24958	1389	5799	10209, 14619, 19029, 23439, 27849, 32259, 36669	norovirus Hu/GII.4/Aomori4/2012/JP
1390	VP1	BAU24960	1390	5800	10210, 14620, 19030, 23440, 27850, 32260, 36670	norovirus Hu/GII.4/Akita1/2012/JP
1391	VP1	BAU24962	1391	5801	10211, 14621, 19031, 23441, 27851, 32261, 36671	norovirus Hu/GII.4/Akita2/2012/JP
1392	VP1	BAU24964	1392	5802	10212, 14622, 19032, 23442, 27852, 32262, 36672	norovirus Hu/GII.4/Akita3/2012/JP
1393	VP1	BAU24966	1393	5803	10213, 14623, 19033, 23443, 27853, 32263, 36673	norovirus Hu/GII.4/Iwate1/2012/JP
1394	VP1	BAU24968	1394	5804	10214, 14624, 19034, 23444, 27854, 32264, 36674	norovirus Hu/GII.4/Iwate2/2012/JP
1395	VP1	BAU24972	1395	5805	10215, 14625, 19035, 23445, 27855, 32265, 36675	norovirus Hu/GII.4/Aichi3/2012/JP
1396	VP1	BAU24974	1396	5806	10216, 14626, 19036, 23446, 27856, 32266, 36676	norovirus Hu/GII.4/Aichi4/2012/JP
1397	VP1	BAU24976	1397	5807	10217, 14627, 19037, 23447, 27857, 32267, 36677	norovirus Hu/GII.4/Aichi5/2012/JP
1398	VP1	BAU24978	1398	5808	10218, 14628, 19038, 23448, 27858, 32268, 36678	norovirus Hu/GII.4/Aichi6/2012/JP
1399	VP1	BAU24980	1399	5809	10219, 14629, 19039, 23449, 27859, 32269, 36679	norovirus Hu/GII.4/Ehime4/2012/JP
1400	VP1	BAU24982	1400	5810	10220, 14630, 19040, 23450, 27860, 32270, 36680	norovirus Hu/GII.4/Niigata2/2012/JP
1401	VP1	BAU24984	1401	5811	10221, 14631, 19041, 23451, 27861, 32271, 36681	norovirus Hu/GII.4/Toyama1/2012/JP

1402	VP1	BAU24986	1402	5812	10222, 14632, 19042, 23452, 27862, 32272, 36682	norovirus Hu/GII.4/Toyama3/2012/JP
1403	VP1	BAU24988	1403	5813	10223, 14633, 19043, 23453, 27863, 32273, 36683	norovirus Hu/GII.4/Toyama4/2012/JP
1404	VP1	BAU24990	1404	5814	10224, 14634, 19044, 23454, 27864, 32274, 36684	norovirus Hu/GII.4/Fukui5/2012/JP
1405	VP1	BAU24992	1405	5815	10225, 14635, 19045, 23455, 27865, 32275, 36685	norovirus Hu/GII.4/OsakaCity3/2012/JP
1406	VP1	BAU24994	1406	5816	10226, 14636, 19046, 23456, 27866, 32276, 36686	norovirus Hu/GII.4/Hiroshima1/2012/JP
1407	VP1	BAU24996	1407	5817	10227, 14637, 19047, 23457, 27867, 32277, 36687	norovirus Hu/GII.4/Hiroshima2/2012/JP
1408	VP1	BAU24998	1408	5818	10228, 14638, 19048, 23458, 27868, 32278, 36688	norovirus Hu/GII.4/Hiroshima3/2012/JP
1409	VP1	BAU25002	1409	5819	10229, 14639, 19049, 23459, 27869, 32279, 36689	norovirus Hu/GII.4/Shimane2/2012/JP
1410	VP1	BAU25004	1410	5820	10230, 14640, 19050, 23460, 27870, 32280, 36690	norovirus Hu/GII.4/Shimane4/2012/JP
1411	VP1	ADN84676	1411	5821	10231, 14641, 19051, 23461, 27871, 32281, 36691	norovirus pig/D035/2007/KOR
1412	VP1	BAK68870	1412	5822	10232, 14642, 19052, 23462, 27872, 32282, 36692	norovirus sewage/GII/Influent/Nov2006/JPN
1413	VP1	AAC54893	1413	5823	10233, 14643, 19053, 23463, 27873, 32283, 36693	norovirus isolates
1414	VP1	AAW30195	1414	5824	10234, 14644, 19054, 23464, 27874, 32284, 36694	norovirus Hu/C14/2002/AU
1415	VP1	ABD36491	1415	5825	10235, 14645, 19055, 23465, 27875, 32285, 36695	norovirus Hu/GII/Goulburn Valley G5175 A/1983/AUS
1416	VP1	ABD36494	1416	5826	10236, 14646, 19056, 23466, 27876, 32286, 36696	norovirus Hu/GII/Goulburn Valley G5175 B/1983/AUS
1417	VP1	ABD36497	1417	5827	10237, 14647, 19057, 23467, 27877, 32287, 36697	norovirus Hu/GII/Goulburn Valley G5175 C/1983/AUS
1418	VP1	ABL74387	1418	5828	10238, 14648, 19058, 23468, 27878, 32288, 36698	norovirus Hu/GII.4/Dongen46/2006/NL

1419	VP1	ABL74389	1419	5829	10239, 14649, 19059, 23469, 27879, 32289, 36699	norovirus Hu/GII.4/DenHaag54/2006/NL
1420	VP1	ABL74397	1420	5830	10240, 14650, 19060, 23470, 27880, 32290, 36700	norovirus Hu/GII.4/Nijmegen115/2006/NL
1421	VP1	ABQ44562	1421	5831	10241, 14651, 19061, 23471, 27881, 32291, 36701	norovirus Hu/Maizuru/030512/2003/JP/4656
1422	VP1	ABQ44563	1422	5832	10242, 14652, 19062, 23472, 27882, 32292, 36702	norovirus Hu/Osaka/010314/2001/JP/3634
1423	VP1	ABQ44564	1423	5833	10243, 14653, 19063, 23473, 27883, 32293, 36703	norovirus Hu/Saga/000313/2000/JP/2876
1424	VP1	ABQ44565	1424	5834	10244, 14654, 19064, 23474, 27884, 32294, 36704	norovirus Hu/Osaka/000321/2000/JP/3006
1425	VP1	ABQ44566	1425	5835	10245, 14655, 19065, 23475, 27885, 32295, 36705	norovirus Hu/Akabane/991130/1999/JP/2258
1426	VP1	ABQ44567	1426	5836	10246, 14656, 19066, 23476, 27886, 32296, 36706	norovirus Hu/Saga/001215/2000/JP/3101
1427	VP1	ABQ44568	1427	5837	10247, 14657, 19067, 23477, 27887, 32297, 36707	norovirus Hu/Maizuru/000602/2000/JP/2840
1428	VP1	ABQ44569	1428	5838	10248, 14658, 19068, 23478, 27888, 32298, 36708	norovirus Hu/Maizuru/010524/2001/JP/3229
1429	VP1	ABQ44570	1429	5839	10249, 14659, 19069, 23479, 27889, 32299, 36709	norovirus Hu/Osaka/010203/2001/JP/3611
1430	VP1	ABQ44571	1430	5840	10250, 14660, 19070, 23480, 27890, 32300, 36710	norovirus Hu/Osaka/010203/2001/JP/3612
1431	VP1	ABQ44572	1431	5841	10251, 14661, 19071, 23481, 27891, 32301, 36711	norovirus Hu/Kurume/951228/1995/JP/419
1432	VP1	ABQ44573	1432	5842	10252, 14662, 19072, 23482, 27892, 32302, 36712	norovirus Hu/Akabane/990206/1999/JP/2087
1433	VP1	ABQ44574	1433	5843	10253, 14663, 19073, 23483, 27893, 32303, 36713	norovirus Hu/Maizuru/010426/2001/JP/3385
1434	VP1	ABQ44575	1434	5844	10254, 14664, 19074, 23484, 27894, 32304, 36714	norovirus Hu/Maizuru/000324/2000/JP/2468
1435	VP1	ABQ44576	1435	5845	10255, 14665, 19075, 23485, 27895, 32305, 36715	norovirus Hu/Osaka/010228/2001/JP/3625

1436	VP1	ACJ04900	1436	5846	10256, 14666, 19076, 23486, 27896, 32306, 36716	norovirus Bo/GIII/BV15/2007/BEL
1437	VP1	ACJ04903	1437	5847	10257, 14667, 19077, 23487, 27897, 32307, 36717	norovirus Bo/GIII/BV24/2007/BEL
1438	VP1	ACJ04906	1438	5848	10258, 14668, 19078, 23488, 27898, 32308, 36718	norovirus Bo/GIII/B309/2003/BEL
1439	VP1	ACY00565	1439	5849	10259, 14669, 19079, 23489, 27899, 32309, 36719	norovirus Hu/GII.4/Beijing/53952/2007/CHN
1440	VP1	ACY00568	1440	5850	10260, 14670, 19080, 23490, 27900, 32310, 36720	norovirus Hu/GII.4/Beijing/54023/2007/CHN
1441	VP1	ACY00571	1441	5851	10261, 14671, 19081, 23491, 27901, 32311, 36721	norovirus Hu/GII.4/Beijing/54091/2007/CHN
1442	VP1	ACY00573	1442	5852	10262, 14672, 19082, 23492, 27902, 32312, 36722	norovirus Hu/GII.4/Beijing/54116/2007/CHN
1443	VP1	ACY00576	1443	5853	10263, 14673, 19083, 23493, 27903, 32313, 36723	norovirus Hu/GII.4/Beijing/54125/2007/CHN
1444	VP1	ACY00579	1444	5854	10264, 14674, 19084, 23494, 27904, 32314, 36724	norovirus Hu/GII.4/Beijing/54135/2007/CHN
1445	VP1	ACY00582	1445	5855	10265, 14675, 19085, 23495, 27905, 32315, 36725	norovirus Hu/GII.4/Beijing/54651/2007/CHN
1446	VP1	ACY00588	1446	5856	10266, 14676, 19086, 23496, 27906, 32316, 36726	norovirus Hu/GII.4/Beijing/55047/2007/CHN
1447	VP1	ACY00594	1447	5857	10267, 14677, 19087, 23497, 27907, 32317, 36727	norovirus Hu/GII.4/Beijing/55058/2007/CHN
1448	VP1	ACY00597	1448	5858	10268, 14678, 19088, 23498, 27908, 32318, 36728	norovirus Hu/GII.4/Beijing/55065/2007/CHN
1449	VP1	ACY00600	1449	5859	10269, 14679, 19089, 23499, 27909, 32319, 36729	norovirus Hu/GII.4/Beijing/55150/2008/CHN
1450	VP1	ACY00603	1450	5860	10270, 14680, 19090, 23500, 27910, 32320, 36730	norovirus Hu/GII.4/Beijing/55162/2008/CHN
1451	VP1	ACY00606	1451	5861	10271, 14681, 19091, 23501, 27911, 32321, 36731	norovirus Hu/GII.4/Beijing/55176/2008/CHN
1452	VP1	ACY00609	1452	5862	10272, 14682, 19092, 23502, 27912, 32322, 36732	norovirus Hu/GII.4/Beijing/55184/2008/CHN

1453	VP1	ACY00612	1453	5863	10273, 14683, 19093, 23503, 27913, 32323, 36733	norovirus Hu/GII.4/Beijing/54667/2007/CHN
1454	VP1	ACY00615	1454	5864	10274, 14684, 19094, 23504, 27914, 32324, 36734	norovirus Hu/GII.4/Beijing/53671/2007/CHN
1455	VP1	ACY00618	1455	5865	10275, 14685, 19095, 23505, 27915, 32325, 36735	norovirus Hu/GII.4/Beijing/53997/2007/CHN
1456	VP1	ACY00621	1456	5866	10276, 14686, 19096, 23506, 27916, 32326, 36736	norovirus Hu/GII.4/Beijing/55063/2007/CHN
1457	VP1	ACY00623	1457	5867	10277, 14687, 19097, 23507, 27917, 32327, 36737	norovirus Hu/GII.4/Beijing/55028/2007/CHN
1458	VP1	ACY00629	1458	5868	10278, 14688, 19098, 23508, 27918, 32328, 36738	norovirus Hu/GII.4/Beijing/55040/2007/CHN
1459	VP1	ACY00632	1459	5869	10279, 14689, 19099, 23509, 27919, 32329, 36739	norovirus Hu/GII.4/Beijing/55185/2008/CHN
1460	VP1	ACY00635	1460	5870	10280, 14690, 19100, 23510, 27920, 32330, 36740	norovirus Hu/GII.4/Beijing/53931/2007/CHN
1461	VP1	ACY00638	1461	5871	10281, 14691, 19101, 23511, 27921, 32331, 36741	norovirus Hu/GII.4/Beijing/54108/2007/CHN
1462	VP1	ACY00641	1462	5872	10282, 14692, 19102, 23512, 27922, 32332, 36742	norovirus Hu/GII.4/Beijing/54114/2007/CHN
1463	VP1	ACY00645	1463	5873	10283, 14693, 19103, 23513, 27923, 32333, 36743	norovirus Hu/GII.4/Beijing/54660/2007/CHN
1464	VP1	ACY00647	1464	5874	10284, 14694, 19104, 23514, 27924, 32334, 36744	norovirus Hu/GII.4/Beijing/55042/2007/CHN
1465	VP1	ACY00650	1465	5875	10285, 14695, 19105, 23515, 27925, 32335, 36745	norovirus Hu/GII.4/Beijing/55161/2008/CHN
1466	VP1	ACY00656	1466	5876	10286, 14696, 19106, 23516, 27926, 32336, 36746	norovirus Hu/GII.4/Beijing/55171/2008/CHN
1467	VP1	ADK47170	1467	5877	10287, 14697, 19107, 23517, 27927, 32337, 36747	norovirus Hu/II.4/2200661/HK/2010
1468	VP1	ADR30514	1468	5878	10288, 14698, 19108, 23518, 27928, 32338, 36748	norovirus Hu/GII.6/8913/Shizuoka/2008/JPN
1469	VP1	ADR78255	1469	5879	10289, 14699, 19109, 23519, 27929, 32339, 36749	norovirus Hu/II.4/2221223/HK/2009

1470	VP1	ADR78259	1470	5880	10290, 14700, 19110, 23520, 27930, 32340, 36750	norovirus Hu/II.4/2845694/HK/2009
1471	VP1	ADR78262	1471	5881	10291, 14701, 19111, 23521, 27931, 32341, 36751	norovirus Hu/II.4/2856357/HK/2009
1472	VP1	ADR78266	1472	5882	10292, 14702, 19112, 23522, 27932, 32342, 36752	norovirus Hu/II.4/2849738/HK/2009
1473	VP1	ADR78268	1473	5883	10293, 14703, 19113, 23523, 27933, 32343, 36753	norovirus Hu/II.4/2201480/HK/2010
1474	VP1	AFQ00093	1474	5884	10294, 14704, 19114, 23524, 27934, 32344, 36754	norovirus GIII
1475	VP1	BAI52939	1475	5885	10295, 14705, 19115, 23525, 27935, 32345, 36755	norovirus Hu/GII.2/OC080306/2008/JPN
1476	VP1	BAI52940	1476	5886	10296, 14706, 19116, 23526, 27936, 32346, 36756	norovirus Hu/GII.4/OC090053/2009/JPN
1477	VP1	BAQ20801	1477	5887	10297, 14707, 19117, 23527, 27937, 32347, 36757	norovirus Hu/GII.4/Aichi368-14/2014
1478	VP1	BAQ20803	1478	5888	10298, 14708, 19118, 23528, 27938, 32348, 36758	norovirus Hu/GII.4/AichiNishio1-14/2014
1479	VP1	BAQ20805	1479	5889	10299, 14709, 19119, 23529, 27939, 32349, 36759	norovirus Hu/GII.4/Aichi351-14/2014
1480	VP1	AAB06271	1480	5890	10300, 14710, 19120, 23530, 27940, 32350, 36760	norovirus isolates
1481	VP1	AAK96218	1481	5891	10301, 14711, 19121, 23531, 27941, 32351, 36761	norovirus GII
1482	VP1	AAR97648	1482	5892	10302, 14712, 19122, 23532, 27942, 32352, 36762	norovirus GII
1483	VP1	AAR97651	1483	5893	10303, 14713, 19123, 23533, 27943, 32353, 36763	norovirus GII
1484	VP1	AAR97654	1484	5894	10304, 14714, 19124, 23534, 27944, 32354, 36764	norovirus GII
1485	VP1	AAR97657	1485	5895	10305, 14715, 19125, 23535, 27945, 32355, 36765	norovirus GII
1486	VP1	AAR97660	1486	5896	10306, 14716, 19126, 23536, 27946, 32356, 36766	norovirus GII

1487	VP1	AAR97663	1487	5897	10307, 14717, 19127, 23537, 27947, 32357, 36767	norovirus GII
1488	VP1	AAS86774	1488	5898	10308, 14718, 19128, 23538, 27948, 32358, 36768	norovirus GII
1489	VP1	AAS86777	1489	5899	10309, 14719, 19129, 23539, 27949, 32359, 36769	norovirus GII
1490	VP1	AAS86780	1490	5900	10310, 14720, 19130, 23540, 27950, 32360, 36770	norovirus GI
1491	VP1	AAS86783	1491	5901	10311, 14721, 19131, 23541, 27951, 32361, 36771	norovirus GI
1492	VP1	AAS86786	1492	5902	10312, 14722, 19132, 23542, 27952, 32362, 36772	norovirus GII
1493	VP1	AAS86792	1493	5903	10313, 14723, 19133, 23543, 27953, 32363, 36773	norovirus GII
1494	VP1	AAS86795	1494	5904	10314, 14724, 19134, 23544, 27954, 32364, 36774	norovirus GII
1495	VP1	AAS86798	1495	5905	10315, 14725, 19135, 23545, 27955, 32365, 36775	norovirus GII
1496	VP1	AAS86801	1496	5906	10316, 14726, 19136, 23546, 27956, 32366, 36776	norovirus GII
1497	VP1	AAS86804	1497	5907	10317, 14727, 19137, 23547, 27957, 32367, 36777	norovirus GII
1498	VP1	AAS86807	1498	5908	10318, 14728, 19138, 23548, 27958, 32368, 36778	norovirus GI
1499	VP1	AAT00237	1499	5909	10319, 14729, 19139, 23549, 27959, 32369, 36779	norovirus Hu/NLV/Oxford/B4S5/2002/UK
1500	VP1	AAT00240	1500	5910	10320, 14730, 19140, 23550, 27960, 32370, 36780	norovirus Hu/NLV/Oxford/B4S6/2002/UK
1501	VP1	AAT00243	1501	5911	10321, 14731, 19141, 23551, 27961, 32371, 36781	norovirus Hu/NLV/Oxford/B4S4/2002/UK
1502	VP1	AAT00246	1502	5912	10322, 14732, 19142, 23552, 27962, 32372, 36782	norovirus Hu/NLV/Oxford/B4S7/2002/UK
1503	VP1	AAT00249	1503	5913	10323, 14733, 19143, 23553, 27963, 32373, 36783	norovirus Hu/NLV/Oxford/B4S1/2002/UK

1504	VP1	AAT00255	1504	5914	10324, 14734, 19144, 23554, 27964, 32374, 36784	norovirus Hu/NLV/Oxford/BIS1/2002/UK
1505	VP1	AAT00258	1505	5915	10325, 14735, 19145, 23555, 27965, 32375, 36785	norovirus Hu/NLV/Oxford/BIS2/2002/UK
1506	VP1	AAT00261	1506	5916	10326, 14736, 19146, 23556, 27966, 32376, 36786	norovirus Hu/NLV/Oxford/BIS4/2002/UK
1507	VP1	AAT00264	1507	5917	10327, 14737, 19147, 23557, 27967, 32377, 36787	norovirus Hu/NLV/Oxford/BIS11/2002/UK
1508	VP1	AAT00267	1508	5918	10328, 14738, 19148, 23558, 27968, 32378, 36788	norovirus Hu/NLV/Oxford/BIS12/2002/UK
1509	VP1	AAT00270	1509	5919	10329, 14739, 19149, 23559, 27969, 32379, 36789	norovirus Hu/NLV/Oxford/BIS16/2002/UK
1510	VP1	AAT00273	1510	5920	10330, 14740, 19150, 23560, 27970, 32380, 36790	norovirus Hu/NLV/Oxford/BIS21/2002/UK
1511	VP1	AAT00276	1511	5921	10331, 14741, 19151, 23561, 27971, 32381, 36791	norovirus Hu/NLV/Oxford/B2S10/2002/UK
1512	VP1	AAT00279	1512	5922	10332, 14742, 19152, 23562, 27972, 32382, 36792	norovirus Hu/NLV/Oxford/B2S11/2002/UK
1513	VP1	AAT00282	1513	5923	10333, 14743, 19153, 23563, 27973, 32383, 36793	norovirus Hu/NLV/Oxford/B2S14/2002/UK
1514	VP1	AAT00285	1514	5924	10334, 14744, 19154, 23564, 27974, 32384, 36794	norovirus Hu/NLV/Oxford/B2S15/2002/UK
1515	VP1	AAT00288	1515	5925	10335, 14745, 19155, 23565, 27975, 32385, 36795	norovirus Hu/NLV/Oxford/B2S17/2002/UK
1516	VP1	AAT00291	1516	5926	10336, 14746, 19156, 23566, 27976, 32386, 36796	norovirus Hu/NLV/Oxford/B2S18/2002/UK
1517	VP1	AAT00294	1517	5927	10337, 14747, 19157, 23567, 27977, 32387, 36797	norovirus Hu/NLV/Oxford/B2S20/2002/UK
1518	VP1	AAT00297	1518	5928	10338, 14748, 19158, 23568, 27978, 32388, 36798	norovirus Hu/NLV/Oxford/B2S23/2002/UK
1519	VP1	AAT00300	1519	5929	10339, 14749, 19159, 23569, 27979, 32389, 36799	norovirus Hu/NLV/Oxford/B2S24/2002/UK
1520	VP1	AAT00303	1520	5930	10340, 14750, 19160, 23570, 27980, 32390, 36800	norovirus Hu/NLV/Oxford/B2S25/2002/UK

1521	VP1	AAT00306	1521	5931	10341, 14751, 19161, 23571, 27981, 32391, 36801	norovirus Hu/NLV/Oxford/B2S26/2002/UK
1522	VP1	AAT00309	1522	5932	10342, 14752, 19162, 23572, 27982, 32392, 36802	norovirus Hu/NLV/Oxford/B3S4/2003/UK
1523	VP1	AAT00312	1523	5933	10343, 14753, 19163, 23573, 27983, 32393, 36803	norovirus Hu/NLV/Oxford/B3S16/2003/UK
1524	VP1	AAT00315	1524	5934	10344, 14754, 19164, 23574, 27984, 32394, 36804	norovirus Hu/NLV/Oxford/B3S18/2003/UK
1525	VP1	AAT00318	1525	5935	10345, 14755, 19165, 23575, 27985, 32395, 36805	norovirus Hu/NLV/Oxford/B3S19/2003/UK
1526	VP1	AAT00321	1526	5936	10346, 14756, 19166, 23576, 27986, 32396, 36806	norovirus Hu/NLV/Oxford/B3S20/2003/UK
1527	VP1	AAT00324	1527	5937	10347, 14757, 19167, 23577, 27987, 32397, 36807	norovirus Hu/NLV/Oxford/B5S1/22002/UK
1528	VP1	AAT00330	1528	5938	10348, 14758, 19168, 23578, 27988, 32398, 36808	norovirus Hu/NLV/Oxford/B5S8/2002/UK
1529	VP1	AAT00333	1529	5939	10349, 14759, 19169, 23579, 27989, 32399, 36809	norovirus Hu/NLV/Oxford/B5S9/2002/UK
1530	VP1	AAT00336	1530	5940	10350, 14760, 19170, 23580, 27990, 32400, 36810	norovirus Hu/NLV/Oxford/B5S10/2002/UK
1531	VP1	AAT00342	1531	5941	10351, 14761, 19171, 23581, 27991, 32401, 36811	norovirus Hu/NLV/Oxford/B5S19/2002/UK
1532	VP1	AAT00345	1532	5942	10352, 14762, 19172, 23582, 27992, 32402, 36812	norovirus Hu/NLV/Oxford/B6S3/2003/UK
1533	VP1	AAT00348	1533	5943	10353, 14763, 19173, 23583, 27993, 32403, 36813	norovirus Hu/NLV/Oxford/B6S6/2003/UK
1534	VP1	AAT00351	1534	5944	10354, 14764, 19174, 23584, 27994, 32404, 36814	norovirus Hu/NLV/Oxford/B6S2/2003/UK
1535	VP1	AAT00354	1535	5945	10355, 14765, 19175, 23585, 27995, 32405, 36815	norovirus Hu/NLV/Oxford/B5S23/2003/UK
1536	VP1	AAT00357	1536	5946	10356, 14766, 19176, 23586, 27996, 32406, 36816	norovirus Hu/NLV/Oxford/B6S5/2003/UK
1537	VP1	AAT00360	1537	5947	10357, 14767, 19177, 23587, 27997, 32407, 36817	norovirus Hu/NLV/Oxford/B6S4/2003/UK

1538	VP1	AAT00363	1538	5948	10358, 14768, 19178, 23588, 27998, 32408, 36818	norovirus Hu/NLV/Oxford/B8S5/2002/UK
1539	VP1	AAT00366	1539	5949	10359, 14769, 19179, 23589, 27999, 32409, 36819	norovirus Hu/NLV/Didcot/B9S2/2003/UK
1540	VP1	AAT00369	1540	5950	10360, 14770, 19180, 23590, 28000, 32410, 36820	norovirus Hu/NLV/ChippingNorton/2003/UK
1541	VP1	AAT00372	1541	5951	10361, 14771, 19181, 23591, 28001, 32411, 36821	norovirus Hu/NLV/Banbury/B9S23/2003/UK
1542	VP1	AAT00375	1542	5952	10362, 14772, 19182, 23592, 28002, 32412, 36822	norovirus Hu/NLV/Witney/B7S2/2003/UK
1543	VP1	AAT70110	1543	5953	10363, 14773, 19183, 23593, 28003, 32413, 36823	norovirus NLV/Paris Island/2003/USA
1544	VP1	AAT73592	1544	5954	10364, 14774, 19184, 23594, 28004, 32414, 36824	norovirus NLV/BUDS/2002/USA
1545	VP1	AAT78480	1545	5955	10365, 14775, 19185, 23595, 28005, 32415, 36825	norovirus NLV/IF1998/2003/Iraq
1546	VP1	AAT78481	1546	5956	10366, 14776, 19186, 23596, 28006, 32416, 36826	norovirus NLV/IF2036/2003/Iraq
1547	VP1	AAU95776	1547	5957	10367, 14777, 19187, 23597, 28007, 32417, 36827	norovirus Hu/NLV/Dresden174/pUS-Norll/1997/GE
1548	VP1	AAX32874	1548	5958	10368, 14778, 19188, 23598, 28008, 32418, 36828	norovirus swine/GII/MI-QW48/02/US
1549	VP1	AAX32877	1549	5959	10369, 14779, 19189, 23599, 28009, 32419, 36829	norovirus swine/GII/OH-QW101/03/US
1550	VP1	AAX32880	1550	5960	10370, 14780, 19190, 23600, 28010, 32420, 36830	norovirus swine/GII/OH-QW125/03/US
1551	VP1	AAX32886	1551	5961	10371, 14781, 19191, 23601, 28011, 32421, 36831	norovirus swine/GII/OH-QW218/03/US
1552	VP1	AAZ31376	1552	5962	10372, 14782, 19192, 23602, 28012, 32422, 36832	norovirus Hu/GII.4/Hunter 284E/040/AU
1553	VP1	AAZ31396	1553	5963	10373, 14783, 19193, 23603, 28013, 32423, 36833	norovirus Hu/GII.4/Hunter504D/040/AU
1554	VP1	AAZ31402	1554	5964	10374, 14784, 19194, 23604, 28014, 32424, 36834	norovirus Hu/GII.4/Sydney917J/020/AU

1555	VP1	AAZ31411	1555	5965	10375, 14785, 19195, 23605, 28015, 32425, 36835	norovirus Hu/GII.4/Sydney348/970/AU
1556	VP1	AAZ31423	1556	5966	10376, 14786, 19196, 23606, 28016, 32426, 36836	norovirus Hu/GII.4/Sydney7150/04S/AU
1557	VP1	AAZ31428	1557	5967	10377, 14787, 19197, 23607, 28017, 32427, 36837	norovirus Hu/GII.4/Sydney4477/02S/AU
1558	VP1	ABB02420	1558	5968	10378, 14788, 19198, 23608, 28018, 32428, 36838	murine norovirus 3
1559	VP1	ABB02423	1559	5969	10379, 14789, 19199, 23609, 28019, 32429, 36839	murine norovirus 4
1560	VP1	ABC96746	1560	5970	10380, 14790, 19200, 23610, 28020, 32430, 36840	norovirus GII
1561	VP1	ABD77588	1561	5971	10381, 14791, 19201, 23611, 28021, 32431, 36841	norovirus Hu/Beijing/CR2905/2004/CHN
1562	VP1	ABD77589	1562	5972	10382, 14792, 19202, 23612, 28022, 32432, 36842	norovirus Hu/Beijing/CR2932/2004/CHN
1563	VP1	ABD77590	1563	5973	10383, 14793, 19203, 23613, 28023, 32433, 36843	norovirus Hu/Beijing/CR2987/2004/CHN
1564	VP1	ABG45845	1564	5974	10384, 14794, 19204, 23614, 28024, 32434, 36844	murine norovirus
1565	VP1	ABG45847	1565	5975	10385, 14795, 19205, 23615, 28025, 32435, 36845	murine norovirus
1566	VP1	ABG45849	1566	5976	10386, 14796, 19206, 23616, 28026, 32436, 36846	murine norovirus
1567	VP1	ABG45851	1567	5977	10387, 14797, 19207, 23617, 28027, 32437, 36847	murine norovirus
1568	VP1	ABI95835	1568	5978	10388, 14798, 19208, 23618, 28028, 32438, 36848	murine norovirus
1569	VP1	ABI97981	1569	5979	10389, 14799, 19209, 23619, 28029, 32439, 36849	norovirus Hu/GII-4/Osaka/1998/JPN
1570	VP1	ABP99038	1570	5980	10390, 14800, 19210, 23620, 28030, 32440, 36850	murine norovirus
1571	VP1	ABP99041	1571	5981	10391, 14801, 19211, 23621, 28031, 32441, 36851	murine norovirus

1572	VP1	ABQ12784	1572	5982	10392, 14802, 19212, 23622, 28032, 32442, 36852	norovirus Hu/GII/Toronto/SK/2005/CAN
1573	VP1	ABR15783	1573	5983	10393, 14803, 19213, 23623, 28033, 32443, 36853	norovirus lion/GIV.2/Pistoia/387/06/ITA
1574	VP1	ABR24136	1574	5984	10394, 14804, 19214, 23624, 28034, 32444, 36854	norovirus Hu/Guangzhou/NV-VP2/2006/China
1575	VP1	ABS12173	1575	5985	10395, 14805, 19215, 23625, 28035, 32445, 36855	norovirus Hu/Hebei/48580/2006/CHN
1576	VP1	ABS12175	1576	5986	10396, 14806, 19216, 23626, 28036, 32446, 36856	norovirus Hu/Shanxi/50106/2006/CHN
1577	VP1	ABS29273	1577	5987	10397, 14807, 19217, 23627, 28037, 32447, 36857	murine norovirus 5
1578	VP1	ABS29275	1578	5988	10398, 14808, 19218, 23628, 28038, 32448, 36858	murine norovirus 6
1579	VP1	ABU55541	1579	5989	10399, 14809, 19219, 23629, 28039, 32449, 36859	murine norovirus 1
1580	VP1	ABU55544	1580	5990	10400, 14810, 19220, 23630, 28040, 32450, 36860	murine norovirus 1
1581	VP1	ABU55547	1581	5991	10401, 14811, 19221, 23631, 28041, 32451, 36861	murine norovirus 1
1582	VP1	ABU55550	1582	5992	10402, 14812, 19222, 23632, 28042, 32452, 36862	murine norovirus 1
1583	VP1	ABU55553	1583	5993	10403, 14813, 19223, 23633, 28043, 32453, 36863	murine norovirus 1
1584	VP1	ABU55556	1584	5994	10404, 14814, 19224, 23634, 28044, 32454, 36864	murine norovirus 1
1585	VP1	ABU55559	1585	5995	10405, 14815, 19225, 23635, 28045, 32455, 36865	murine norovirus 1
1586	VP1	ABU55562	1586	5996	10406, 14816, 19226, 23636, 28046, 32456, 36866	murine norovirus 1
1587	VP1	ABU55565	1587	5997	10407, 14817, 19227, 23637, 28047, 32457, 36867	murine norovirus 1
1588	VP1	ABU55568	1588	5998	10408, 14818, 19228, 23638, 28048, 32458, 36868	murine norovirus GV/WUII/2005/USA

1589	VP1	ABU55571	1589	5999	10409, 14819, 19229, 23639, 28049, 32459, 36869	murine norovirus GV/WU12/2005/USA
1590	VP1	ABU55577	1590	6000	10410, 14820, 19230, 23640, 28050, 32460, 36870	murine norovirus GV/WU21/2005/USA
1591	VP1	ABU55580	1591	6001	10411, 14821, 19231, 23641, 28051, 32461, 36871	murine norovirus GV/WU22/2005/USA
1592	VP1	ABU55586	1592	6002	10412, 14822, 19232, 23642, 28052, 32462, 36872	murine norovirus GV/WU24/2005/USA
1593	VP1	ABU55589	1593	6003	10413, 14823, 19233, 23643, 28053, 32463, 36873	murine norovirus GV/WU25/2005/USA
1594	VP1	ABU55598	1594	6004	10414, 14824, 19234, 23644, 28054, 32464, 36874	murine norovirus GV/CR3/2005/USA
1595	VP1	ABU55601	1595	6005	10415, 14825, 19235, 23645, 28055, 32465, 36875	murine norovirus GV/CR4/2005/USA
1596	VP1	ABU55604	1596	6006	10416, 14826, 19236, 23646, 28056, 32466, 36876	murine norovirus GV/CR5/2005/USA
1597	VP1	ABU55607	1597	6007	10417, 14827, 19237, 23647, 28057, 32467, 36877	murine norovirus GV/CR6/2005/USA
1598	VP1	ABU55610	1598	6008	10418, 14828, 19238, 23648, 28058, 32468, 36878	murine norovirus GV/CR7/2005/USA
1599	VP1	ABU55613	1599	6009	10419, 14829, 19239, 23649, 28059, 32469, 36879	murine norovirus GV/CR10/2005/USA
1600	VP1	ABU55616	1600	6010	10420, 14830, 19240, 23650, 28060, 32470, 36880	murine norovirus GV/CR11/2005/USA
1601	VP1	ABU55619	1601	6011	10421, 14831, 19241, 23651, 28061, 32471, 36881	murine norovirus GV/CR13/2005/USA
1602	VP1	ABU55622	1602	6012	10422, 14832, 19242, 23652, 28062, 32472, 36882	murine norovirus GV/CR15/2005/USA
1603	VP1	ABU55628	1603	6013	10423, 14833, 19243, 23653, 28063, 32473, 36883	murine norovirus GV/CR18/2005/DEU
1604	VP1	ABW74121	1604	6014	10424, 14834, 19244, 23654, 28064, 32474, 36884	norovirus Hu/GI.1/Mussels/M10nov2004/Foto/Sweden
1605	VP1	ABW74123	1605	6015	10425, 14835, 19245, 23655, 28065, 32475, 36885	norovirus Hu/GI.1/Mussels/M8nov2004/Foto/Sweden

1606	VP1	ABW74124	1606	6016	10426, 14836, 19246, 23656, 28066, 32476, 36886	norovirus Hu/GI.1/P738.Delsjo2004/Gothenburg/Sweden
1607	VP1	ABW74125	1607	6017	10427, 14837, 19247, 23657, 28067, 32477, 36887	norovirus Hu/GI.1/Mussels/M127nov2004/Foto/Sweden
1608	VP1	ABW74126	1608	6018	10428, 14838, 19248, 23658, 28068, 32478, 36888	norovirus Hu/GI.1/P725.Delsjo2004/Gothenburg/Sweden
1609	VP1	ABW74127	1609	6019	10429, 14839, 19249, 23659, 28069, 32479, 36889	norovirus Hu/GI.1/P715.Delsjo2004/Gothenburg/Sweden
1610	VP1	ABW74128	1610	6020	10430, 14840, 19250, 23660, 28070, 32480, 36890	norovirus Hu/GI.1/P774.Delsjo2004/Gothenburg/Sweden
1611	VP1	ABW74532	1611	6021	10431, 14841, 19251, 23661, 28071, 32481, 36891	norovirus Hu/Richmond/1994/USA
1612	VP1	ABW74533	1612	6022	10432, 14842, 19252, 23662, 28072, 32482, 36892	norovirus Hu/Houston/1995/USA
1613	VP1	ABW74534	1613	6023	10433, 14843, 19253, 23663, 28073, 32483, 36893	norovirus Hu/Lonaconing/2001/USA
1614	VP1	ABW74535	1614	6024	10434, 14844, 19254, 23664, 28074, 32484, 36894	norovirus Hu/Warren/2002/USA
1615	VP1	ABW74536	1615	6025	10435, 14845, 19255, 23665, 28075, 32485, 36895	norovirus Hu/GCanyon/2002/USA
1616	VP1	ABW74537	1616	6026	10436, 14846, 19256, 23666, 28076, 32486, 36896	norovirus Hu/QM2-CS/2004/USA
1617	VP1	ABW74538	1617	6027	10437, 14847, 19257, 23667, 28077, 32487, 36897	norovirus Hu/FL04/2004/USA
1618	VP1	ABW74539	1618	6028	10438, 14848, 19258, 23668, 28078, 32488, 36898	norovirus Hu/GA04/2004/USA
1619	VP1	ABW74540	1619	6029	10439, 14849, 19259, 23669, 28079, 32489, 36899	norovirus Hu/Cumberland/2004/USA
1620	VP1	ABW74541	1620	6030	10440, 14850, 19260, 23670, 28080, 32490, 36900	norovirus Hu/Ryndam/2005/USA
1621	VP1	ABW74542	1621	6031	10441, 14851, 19261, 23671, 28081, 32491, 36901	norovirus Hu/Billings/2006/USA

1622	VP1	ABW74544	1622	6032	10442, 14852, 19262, 23672, 28082, 32492, 36902	norovirus Hu/Mississip/2006/USA
1623	VP1	ABW74545	1623	6033	10443, 14853, 19263, 23673, 28083, 32493, 36903	norovirus Hu/CL-CS/2006/USA
1624	VP1	ABW74546	1624	6034	10444, 14854, 19264, 23674, 28084, 32494, 36904	norovirus Hu/MT01/2006/USA
1625	VP1	ABW75843	1625	6035	10445, 14855, 19265, 23675, 28085, 32495, 36905	norovirus sheep/Norsewood30/2007/NZL
1626	VP1	ABX71062	1626	6036	10446, 14856, 19266, 23676, 28086, 32496, 36906	norovirus dog/170/07/Ita
1627	VP1	ABY77754	1627	6037	10447, 14857, 19267, 23677, 28087, 32497, 36907	norovirus Hu/GII/Luckenwalde591/2002/DE
1628	VP1	ABZ89549	1628	6038	10448, 14858, 19268, 23678, 28088, 32498, 36908	norovirus Hu/GII/Leverkusen267/2005/DE
1629	VP1	ACC69023	1629	6039	10449, 14859, 19269, 23679, 28089, 32499, 36909	norovirus pig/GII.11/F18-10/2005/CAN
1630	VP1	ACC69026	1630	6040	10450, 14860, 19270, 23680, 28090, 32500, 36910	norovirus pig/GII.11/F12-8/2005/CAN
1631	VP1	ACC69028	1631	6041	10451, 14861, 19271, 23681, 28091, 32501, 36911	norovirus pig/GII-18/F15-10nv/CAN
1632	VP1	ACC96732	1632	6042	10452, 14862, 19272, 23682, 28092, 32502, 36912	norovirus mouse/TW2006/TWN
1633	VP1	ACC96735	1633	6043	10453, 14863, 19273, 23683, 28093, 32503, 36913	norovirus mouse/TW2007/TWN
1634	VP1	ACF41177	1634	6044	10454, 14864, 19274, 23684, 28094, 32504, 36914	norovirus Hu/GII/Beijing/30/2004/CHN
1635	VP1	ACF41180	1635	6045	10455, 14865, 19275, 23685, 28095, 32505, 36915	norovirus Hu/GII/Beijing/221/2005/CHN
1636	VP1	ACF41181	1636	6046	10456, 14866, 19276, 23686, 28096, 32506, 36916	norovirus Hu/GII/Beijing/274/2005/CHN
1637	VP1	ACF41182	1637	6047	10457, 14867, 19277, 23687, 28097, 32507, 36917	norovirus Hu/GII/Beijing/484/2005/CHN
1638	VP1	ACF41183	1638	6048	10458, 14868, 19278, 23688, 28098, 32508, 36918	norovirus Hu/GII/Beijing/493/2005/CHN

1639	VP1	ACF41184	1639	6049	10459, 14869, 19279, 23689, 28099, 32509, 36919	norovirus Hu/GII/Beijing/07/2006/CHN
1640	VP1	ACF41185	1640	6050	10460, 14870, 19280, 23690, 28100, 32510, 36920	norovirus Hu/GII/Beijing/34/2006/CHN
1641	VP1	ACF41186	1641	6051	10461, 14871, 19281, 23691, 28101, 32511, 36921	norovirus Hu/GII/Beijing/116/2007/CHN
1642	VP1	ACF41187	1642	6052	10462, 14872, 19282, 23692, 28102, 32512, 36922	norovirus Hu/GII/Beijing/125/2007/CHN
1643	VP1	ACF41188	1643	6053	10463, 14873, 19283, 23693, 28103, 32513, 36923	norovirus Hu/GII/Beijing/127/2007/CHN
1644	VP1	ACF41190	1644	6054	10464, 14874, 19284, 23694, 28104, 32514, 36924	norovirus Hu/GII/Beijing/361/2007/CHN
1645	VP1	ACF41191	1645	6055	10465, 14875, 19285, 23695, 28105, 32515, 36925	norovirus Hu/GII/Beijing/362/2007/CHN
1646	VP1	ACF60293	1646	6056	10466, 14876, 19286, 23696, 28106, 32516, 36926	norovirus Hu/Beijing/06/2005/CHN
1647	VP1	ACF60294	1647	6057	10467, 14877, 19287, 23697, 28107, 32517, 36927	norovirus Hu/Beijing/48/2005/CHN
1648	VP1	ACF60295	1648	6058	10468, 14878, 19288, 23698, 28108, 32518, 36928	norovirus Hu/Beijing/148/2005/CHN
1649	VP1	ACF60296	1649	6059	10469, 14879, 19289, 23699, 28109, 32519, 36929	norovirus Hu/Beijing/169/2005/CHN
1650	VP1	ACF60297	1650	6060	10470, 14880, 19290, 23700, 28110, 32520, 36930	norovirus Hu/Beijing/375/2005/CHN
1651	VP1	ACF72688	1651	6061	10471, 14881, 19291, 23701, 28111, 32521, 36931	norovirus mouse/Hannover1/2007/DEU
1652	VP1	ACH42093	1652	6062	10472, 14882, 19292, 23702, 28112, 32522, 36932	norovirus Hu/Monastir 8655/2007/TUN
1653	VP1	ACH42094	1653	6063	10473, 14883, 19293, 23703, 28113, 32523, 36933	norovirus Hu/Monastir 127/2003/TUN
1654	VP1	ACH42096	1654	6064	10474, 14884, 19294, 23704, 28114, 32524, 36934	norovirus Hu/Monastir 529/2003/TUN
1655	VP1	ACH42097	1655	6065	10475, 14885, 19295, 23705, 28115, 32525, 36935	norovirus Hu/Monastir 493/2003/TUN

1656	VP1	ACH42098	1656	6066	10476, 14886, 19296, 23706, 28116, 32526, 36936	norovirus Hu/Monastir 715/2003/TUN
1657	VP1	ACJ66263	1657	6067	10477, 14887, 19297, 23707, 28117, 32527, 36937	norovirus Hu/GII.4/Cairo2/2006/EGY
1658	VP1	ACJ66265	1658	6068	10478, 14888, 19298, 23708, 28118, 32528, 36938	norovirus Hu/GII.4/Cairo3/2006/EGY
1659	VP1	ACJ66267	1659	6069	10479, 14889, 19299, 23709, 28119, 32529, 36939	norovirus Hu/GII.4/Cairo4/2006/EGY
1660	VP1	ACJ66269	1660	6070	10480, 14890, 19300, 23710, 28120, 32530, 36940	norovirus Hu/GII.4/Cairo5/2006/EGY
1661	VP1	ACJ66271	1661	6071	10481, 14891, 19301, 23711, 28121, 32531, 36941	norovirus Hu/GII.4/Cairo6/2006/EGY
1662	VP1	ACJ66273	1662	6072	10482, 14892, 19302, 23712, 28122, 32532, 36942	norovirus Hu/GII.4/Cairo7/2007/EGY
1663	VP1	ACJ66275	1663	6073	10483, 14893, 19303, 23713, 28123, 32533, 36943	norovirus Hu/GII.4/Cairo8/2007/EGY
1664	VP1	ACJ66279	1664	6074	10484, 14894, 19304, 23714, 28124, 32534, 36944	norovirus Hu/GII.4/Dijon-E1057/2002/FRA
1665	VP1	ACJ66281	1665	6075	10485, 14895, 19305, 23715, 28125, 32535, 36945	norovirus Hu/GII.4/Dijon-E2703/2008/FRA
1666	VP1	ACJ66283	1666	6076	10486, 14896, 19306, 23716, 28126, 32536, 36946	norovirus Hu/GII.4/Cairo1/2006/EGY
1667	VP1	ACJ66285	1667	6077	10487, 14897, 19307, 23717, 28127, 32537, 36947	norovirus Hu/GII.4/Dijon-E1501/2006/FRA
1668	VP1	ACJ66286	1668	6078	10488, 14898, 19308, 23718, 28128, 32538, 36948	norovirus Hu/GII.4/Dijon-E1267/2006/FRA
1669	VP1	ACJ72216	1669	6079	10489, 14899, 19309, 23719, 28129, 32539, 36949	murine norovirus 4
1670	VP1	ACL27297	1670	6080	10490, 14900, 19310, 23720, 28130, 32540, 36950	norovirus Hu/GII.4/Wellington/1995/USA
1671	VP1	ACL27298	1671	6081	10491, 14901, 19311, 23721, 28131, 32541, 36951	norovirus Hu/GII.4/Henry/2000/USA
1672	VP1	ACL27299	1672	6082	10492, 14902, 19312, 23722, 28132, 32542, 36952	norovirus Hu/GII.4/SSCS/2005/USA

1673	VP1	ACL27300	1673	6083	10493, 14903, 19313, 23723, 28133, 32543, 36953	norovirus Hu/GII.4/RIS/2006/USA
1674	VP1	ACL31312	1674	6084	10494, 14904, 19314, 23724, 28134, 32544, 36954	norovirus GII/Hu/IN/2006/GII.P4_GII.4_Yerseke2006a/Pune-PC11
1675	VP1	ACL31313	1675	6085	10495, 14905, 19315, 23725, 28135, 32545, 36955	norovirus GII/Hu/IN/2006/GII.P4_GII.4_Hunter2004/Pune-PC12
1676	VP1	ACL31316	1676	6086	10496, 14906, 19316, 23726, 28136, 32546, 36956	norovirus Hu/Pune/PC15/2006/India
1677	VP1	ACL31317	1677	6087	10497, 14907, 19317, 23727, 28137, 32547, 36957	norovirus GII/Hu/IN/2006/GII.P4_GII.4_Yerseke2006a/Pune-PC16
1678	VP1	ACL31319	1678	6088	10498, 14908, 19318, 23728, 28138, 32548, 36958	norovirus GII/Hu/IN/2006/GII.P4_GII.4_Yerseke2006a/Pune-PC18
1679	VP1	ACL31320	1679	6089	10499, 14909, 19319, 23729, 28139, 32549, 36959	norovirus GII/Hu/IN/2006/GII.P4_GII.4_Yerseke2006a/Pune-PC19
1680	VP1	ACL31322	1680	6090	10500, 14910, 19320, 23730, 28140, 32550, 36960	norovirus GII/Hu/IN/2006/GII.P4_GII.4_Yerseke2006a/Pune-PC21
1681	VP1	ACL31324	1681	6091	10501, 14911, 19321, 23731, 28141, 32551, 36961	norovirus GII/Hu/IN/2006/GII.P4_GII.4_Yerseke2006a/Pune-PC23
1682	VP1	ACL31325	1682	6092	10502, 14912, 19322, 23732, 28142, 32552, 36962	norovirus Hu/Pune/PC24/2006/India
1683	VP1	ACL31326	1683	6093	10503, 14913, 19323, 23733, 28143, 32553, 36963	norovirus Hu/Pune/PC25/2006/India
1684	VP1	ACL31340	1684	6094	10504, 14914, 19324, 23734, 28144, 32554, 36964	norovirus GII/Hu/IN/2007/GII.P4_GII.4_Hunter2004/Pune-PC31
1685	VP1	ACL31354	1685	6095	10505, 14915, 19325, 23735, 28145, 32555, 36965	norovirus GII/Hu/IN/2007/GII.P4_GII.4_DenHaag2006b/Pune-PC45
1686	VP1	ACL31355	1686	6096	10506, 14916, 19326, 23736, 28146, 32556, 36966	norovirus GII/Hu/IN/2007/GII.P4_GII.4_DenHaag2006b/Pune-PC46
1687	VP1	ACL31356	1687	6097	10507, 14917, 19327, 23737, 28147, 32557, 36967	norovirus GII/Hu/IN/2007/GII.P4_GII.4_DenHaag2006b/Pune-PC47
1688	VP1	ACL31358	1688	6098	10508, 14918, 19328, 23738, 28148, 32558, 36968	norovirus GII/Hu/IN/2007/GII.P4_GII.4_DenHaag2006b/Pune-PC49

1689	VP1	ACL31361	1689	6099	10509, 14919, 19329, 23739, 28149, 32559, 36969	norovirus Hu/Pune/PC52/2007/India
1690	VP1	ACL31365	1690	6100	10510, 14920, 19330, 23740, 28150, 32560, 36970	norovirus GII/Hu/IN/2007/GII.P4_GII.4_DenHaag2006b/Pune-PC56
1691	VP1	ACL36375	1691	6101	10511, 14921, 19331, 23741, 28151, 32561, 36971	norovirus Hu/GII-4/CUK-3/2008/KR
1692	VP1	ACN32270	1692	6102	10512, 14922, 19332, 23742, 28152, 32562, 36972	norovirus Hu/GI.1/P7-587/2007/Stromstad/Sweden
1693	VP1	ACT52403	1693	6103	10513, 14923, 19333, 23743, 28153, 32563, 36973	norovirus Hu/CHN42973/CZ05
1694	VP1	ACT52405	1694	6104	10514, 14924, 19334, 23744, 28154, 32564, 36974	norovirus Hu/CHN39186/CC04
1695	VP1	ACT52407	1695	6105	10515, 14925, 19335, 23745, 28155, 32565, 36975	norovirus Hu/CHN39246/CC04
1696	VP1	ACT52409	1696	6106	10516, 14926, 19336, 23746, 28156, 32566, 36976	norovirus Hu/CHN41808/LL04
1697	VP1	ACT78459	1697	6107	10517, 14927, 19337, 23747, 28157, 32567, 36977	norovirus Hu/Mannheim131/2009/DE
1698	VP1	ACU56258	1698	6108	10518, 14928, 19338, 23748, 28158, 32568, 36978	norovirus Hu/GI.2/Leuven/2003/BEL
1699	VP1	ACX33982	1699	6109	10519, 14929, 19339, 23749, 28159, 32569, 36979	norovirus Hu/GI.3/JKPG_881/SWE/2007
1700	VP1	ACX33983	1700	6110	10520, 14930, 19340, 23750, 28160, 32570, 36980	norovirus Hu/GI.3/JKPG_883/SWE/2007
1701	VP1	ACX81341	1701	6111	10521, 14931, 19341, 23751, 28161, 32571, 36981	norovirus Hu/GII.14/8533/Maizuru/2008/JPN
1702	VP1	ACX81343	1702	6112	10522, 14932, 19342, 23752, 28162, 32572, 36982	norovirus Hu/GII.14/8542/Maizuru/2008/JPN
1703	VP1	ACX81345	1703	6113	10523, 14933, 19343, 23753, 28163, 32573, 36983	norovirus Hu/GII.14/8533/Maizuru/2008/JPN
1704	VP1	ACX81347	1704	6114	10524, 14934, 19344, 23754, 28164, 32574, 36984	norovirus Hu/GII.14/8559/Maizuru/2008/JPN
1705	VP1	ACX81349	1705	6115	10525, 14935, 19345, 23755, 28165, 32575, 36985	norovirus Hu/GII.14/8560/Maizuru/2008/JPN

1706	VP1	ACX81351	1706	6116	10526, 14936, 19346, 23756, 28166, 32576, 36986	norovirus Hu/GII.14/8591/Maizuru/2008/JPN
1707	VP1	ACX81353	1707	6117	10527, 14937, 19347, 23757, 28167, 32577, 36987	norovirus Hu/GII.14/8594/Maizuru/2008/JPN
1708	VP1	ACX81355	1708	6118	10528, 14938, 19348, 23758, 28168, 32578, 36988	norovirus Hu/GII.14/8599/Maizuru/2008/JPN
1709	VP1	ACX85806	1709	6119	10529, 14939, 19349, 23759, 28169, 32579, 36989	norovirus Hu/GII.4/NSW023C/2008/AUS
1710	VP1	ACX85807	1710	6120	10530, 14940, 19350, 23760, 28170, 32580, 36990	norovirus Hu/GII.b-GII.3/Sydney740C/2007/AUS
1711	VP1	ACX85809	1711	6121	10531, 14941, 19351, 23761, 28171, 32581, 36991	norovirus Hu/GII.7/NSW088L/2007/AUS
1712	VP1	ACX85810	1712	6122	10532, 14942, 19352, 23762, 28172, 32582, 36992	norovirus Hu/GII.7/NSW743L/2008/AUS
1713	VP1	ACY41155	1713	6123	10533, 14943, 19353, 23763, 28173, 32583, 36993	norovirus cattle/BV416/2008/BEL
1714	VP1	ADA77528	1714	6124	10534, 14944, 19354, 23764, 28174, 32584, 36994	norovirus Hu/GII-4/Beijing/hl/2005/CHN
1715	VP1	ADB22512	1715	6125	10535, 14945, 19355, 23765, 28175, 32585, 36995	norovirus Hu/Ahm/PC03/2006/India
1716	VP1	ADC91993	1716	6126	10536, 14946, 19356, 23766, 28176, 32586, 36996	norovirus Hu/GII.4/Chungnam(11-94)/2008/Kor
1717	VP1	ADC91994	1717	6127	10537, 14947, 19357, 23767, 28177, 32587, 36997	norovirus Hu/GII.4/Chungnam(12-107)/2008/Kor
1718	VP1	ADE28701	1718	6128	10538, 14948, 19358, 23768, 28178, 32588, 36998	norovirus Hu/GII.14/8610/Saga/2008/JPN
1719	VP1	ADE28721	1719	6129	10539, 14949, 19359, 23769, 28179, 32589, 36999	norovirus Hu/GII.6/8915/Maizuru/2008/JPN
1720	VP1	ADE28722	1720	6130	10540, 14950, 19360, 23770, 28180, 32590, 37000	norovirus Hu/GII.6/8920/Maizuru/2008/JPN
1721	VP1	ADE28723	1721	6131	10541, 14951, 19361, 23771, 28181, 32591, 37001	norovirus Hu/GII.6/8966/Maizuru/2008/JPN
1722	VP1	ADE28724	1722	6132	10542, 14952, 19362, 23772, 28182, 32592, 37002	norovirus Hu/GII.6/9088/Maizuru/2008/JPN

1723	VP1	ADK23787	1723	6133	10543, 14953, 19363, 23773, 28183, 32593, 37003	norovirus Hu/GII.3/CBNU1/2006/KOR
1724	VP1	ADM52743	1724	6134	10544, 14954, 19364, 23774, 28184, 32594, 37004	norovirus Hu/GII.4/JB-15/KOR/2008
1725	VP1	ADR57234	1725	6135	10545, 14955, 19365, 23775, 28185, 32595, 37005	norovirus Hu/GII.4/8483/2008/ZAF
1726	VP1	AEA07712	1726	6136	10546, 14956, 19366, 23776, 28186, 32596, 37006	murine norovirus
1727	VP1	AEK05311	1727	6137	10547, 14957, 19367, 23777, 28187, 32597, 37007	norovirus Hu/GII.4/TH-S597/THA/2006
1728	VP1	AEP16505	1728	6138	10548, 14958, 19368, 23778, 28188, 32598, 37008	norovirus Hu/GIIg-GIII/Kazincbarcika/HUN4593/2010/HUN
1729	VP1	AEY77318	1729	6139	10549, 14959, 19369, 23779, 28189, 32599, 37009	norovirus Hu/GI.3/S29/2008/Lilla Edet/Sweden
1730	VP1	AEY83583	1730	6140	10550, 14960, 19370, 23780, 28190, 32600, 37010	murine norovirus GV/CR6/2005/USA
1731	VP1	AFB18010	1731	6141	10551, 14961, 19371, 23781, 28191, 32601, 37011	norovirus Hu/GII.2/NF2002/USA/2002
1732	VP1	AFB18013	1732	6142	10552, 14962, 19372, 23782, 28192, 32602, 37012	norovirus Hu/GII.4/NF2003/USA/2003
1733	VP1	AFJ05624	1733	6143	10553, 14963, 19373, 23783, 28193, 32603, 37013	norovirus dog/FD53/2007/Ita
1734	VP1	AFJ05628	1734	6144	10554, 14964, 19374, 23784, 28194, 32604, 37014	norovirus dog/FD210/2007/Ita
1735	VP1	AFJ24945	1735	6145	10555, 14965, 19375, 23785, 28195, 32605, 37015	norovirus Hu/GII-4/CBNU2/2007/KR
1736	VP1	AFK75851	1736	6146	10556, 14966, 19376, 23786, 28196, 32606, 37016	norovirus Hu/GI.3/1999
1737	VP1	AFK75852	1737	6147	10557, 14967, 19377, 23787, 28197, 32607, 37017	norovirus Hu/GI.4/2000
1738	VP1	AFK75853	1738	6148	10558, 14968, 19378, 23788, 28198, 32608, 37018	norovirus Hu/GI.2/1999
1739	VP1	AFK75854	1739	6149	10559, 14969, 19379, 23789, 28199, 32609, 37019	norovirus Hu/GII.3/1999

1740	VP1	AFN61315	1740	6150	10560, 14970, 19380, 23790, 28200, 32610, 37020	norovirus Hu/GIV.1/Ahrenshoop246/DEU/2012
1741	VP1	AFQ00511	1741	6151	10561, 14971, 19381, 23791, 28201, 32611, 37021	norovirus Hu/GII.4/Xi'an/P19/2010/CHN
1742	VP1	AFQ00512	1742	6152	10562, 14972, 19382, 23792, 28202, 32612, 37022	norovirus Hu/GII.4/Xi'an/P46/2010/CHN
1743	VP1	AFQ00513	1743	6153	10563, 14973, 19383, 23793, 28203, 32613, 37023	norovirus Hu/GII.4/Xi'an/P49/2010/CHN
1744	VP1	AFQ00516	1744	6154	10564, 14974, 19384, 23794, 28204, 32614, 37024	norovirus Hu/GII.4/Xi'an/P143/2010/CHN
1745	VP1	AFQ00517	1745	6155	10565, 14975, 19385, 23795, 28205, 32615, 37025	norovirus Hu/GII.4/Xi'an/P152/2010/CHN
1746	VP1	AFQ00518	1746	6156	10566, 14976, 19386, 23796, 28206, 32616, 37026	norovirus Hu/GII.4/Xi'an/P154/2010/CHN
1747	VP1	AFQ00519	1747	6157	10567, 14977, 19387, 23797, 28207, 32617, 37027	norovirus Hu/GII.4/Xi'an/P158/2010/CHN
1748	VP1	AFQ00520	1748	6158	10568, 14978, 19388, 23798, 28208, 32618, 37028	norovirus Hu/GII.4/Xi'an/P185/2010/CHN
1749	VP1	AFQ00521	1749	6159	10569, 14979, 19389, 23799, 28209, 32619, 37029	norovirus Hu/GII.4/Xi'an/C6/2010/CHN
1750	VP1	AFQ00522	1750	6160	10570, 14980, 19390, 23800, 28210, 32620, 37030	norovirus Hu/GII.4/Xi'an/C12/2010/CHN
1751	VP1	AFQ00523	1751	6161	10571, 14981, 19391, 23801, 28211, 32621, 37031	norovirus Hu/GII.4/Xi'an/C15/2010/CHN
1752	VP1	AFQ00524	1752	6162	10572, 14982, 19392, 23802, 28212, 32622, 37032	norovirus Hu/GII.4/Xi'an/C21/2010/CHN
1753	VP1	AFQ00525	1753	6163	10573, 14983, 19393, 23803, 28213, 32623, 37033	norovirus Hu/GII.4/Xi'an/C30/2010/CHN
1754	VP1	AFQ00526	1754	6164	10574, 14984, 19394, 23804, 28214, 32624, 37034	norovirus Hu/GII.4/Xi'an/C31/2010/CHN
1755	VP1	AFQ00527	1755	6165	10575, 14985, 19395, 23805, 28215, 32625, 37035	norovirus Hu/GII.4/Xi'an/C41/2010/CHN
1756	VP1	AFQ00528	1756	6166	10576, 14986, 19396, 23806, 28216, 32626, 37036	norovirus Hu/GII.4/Xi'an/C45/2010/CHN

1757	VP1	AGC66782	1757	6167	10577, 14987, 19397, 23807, 28217, 32627, 37037	norovirus Hu/GII.6/GZ2010-L1/Guangzhou/CHN/2010
1758	VP1	AGC66784	1758	6168	10578, 14988, 19398, 23808, 28218, 32628, 37038	norovirus Hu/GII.4/GZ2010-L32/Guangzhou/CHN/2010
1759	VP1	AGC66785	1759	6169	10579, 14989, 19399, 23809, 28219, 32629, 37039	norovirus Hu/GII.3/GZ2010-L63/Guangzhou/CHN/2010
1760	VP1	AGC66786	1760	6170	10580, 14990, 19400, 23810, 28220, 32630, 37040	norovirus Hu/GII.6/GZ2010-L72/Guangzhou/CHN/2010
1761	VP1	AGC66788	1761	6171	10581, 14991, 19401, 23811, 28221, 32631, 37041	norovirus Hu/GII.4/GZ2010-L88/Guangzhou/CHN/2011
1762	VP1	AGL96587	1762	6172	10582, 14992, 19402, 23812, 28222, 32632, 37042	norovirus Hu/GII/Hy-718/KOR
1763	VP1	AGQ57036	1763	6173	10583, 14993, 19403, 23813, 28223, 32633, 37043	norovirus Hu/GII.7/VLP 056954/2005/DE
1764	VP1	AGT95926	1764	6174	10584, 14994, 19404, 23814, 28224, 32634, 37044	norovirus Hu/GII.4/variant Sydney 2012/FRA
1765	VP1	AGT95927	1765	6175	10585, 14995, 19405, 23815, 28225, 32635, 37045	norovirus Hu/GII.4/variant Sydney 2012/FRA
1766	VP1	AGT95928	1766	6176	10586, 14996, 19406, 23816, 28226, 32636, 37046	norovirus Hu/GII.4/variant Sydney 2012/FRA
1767	VP1	AGT95929	1767	6177	10587, 14997, 19407, 23817, 28227, 32637, 37047	norovirus Hu/GII.4/variant Sydney 2012/FRA
1768	VP1	AGT95930	1768	6178	10588, 14998, 19408, 23818, 28228, 32638, 37048	norovirus Hu/GII.4/variant Sydney 2012/FRA
1769	VP1	AGT95931	1769	6179	10589, 14999, 19409, 23819, 28229, 32639, 37049	norovirus Hu/GII.4/variant Sydney 2012/FRA
1770	VP1	AHC12655	1770	6180	10590, 15000, 19410, 23820, 28230, 32640, 37050	norovirus Hu/GII.4/PA363/2011/ITA
1771	VP1	AHC12658	1771	6181	10591, 15001, 19411, 23821, 28231, 32641, 37051	norovirus Hu/GII.4/PA48/2012/ITA
1772	VP1	AHW99832	1772	6182	10592, 15002, 19412, 23822, 28232, 32642, 37052	norovirus Hu/GI.5/Siklos-HUN5407/2013/HUN
1773	VP1	AHZ12735	1773	6183	10593, 15003, 19413, 23823, 28233, 32643, 37053	norovirus GII.3

1774	VP1	AHZ12736	1774	6184	10594, 15004, 19414, 23824, 28234, 32644, 37054	norovirus GII.3
1775	VP1	AHZ12737	1775	6185	10595, 15005, 19415, 23825, 28235, 32645, 37055	norovirus GII.3
1776	VP1	AHZ12738	1776	6186	10596, 15006, 19416, 23826, 28236, 32646, 37056	norovirus GII.3
1777	VP1	AHZ12739	1777	6187	10597, 15007, 19417, 23827, 28237, 32647, 37057	norovirus GII.3
1778	VP1	AHZ12912	1778	6188	10598, 15008, 19418, 23828, 28238, 32648, 37058	norovirus Hu/GII.4/P3/2012/Gothenburg/Sweden
1779	VP1	AHZ12913	1779	6189	10599, 15009, 19419, 23829, 28239, 32649, 37059	norovirus Hu/GII.4/P4/2012/Gothenburg/Sweden
1780	VP1	AHZ12998	1780	6190	10600, 15010, 19420, 23830, 28240, 32650, 37060	norovirus Hu/GII.4/P54/2012/Gothenburg/Sweden
1781	VP1	AHZ13001	1781	6191	10601, 15011, 19421, 23831, 28241, 32651, 37061	norovirus Hu/GII.4/P55/2012/Gothenburg/Sweden
1782	VP1	AHZ13004	1782	6192	10602, 15012, 19422, 23832, 28242, 32652, 37062	norovirus Hu/GII.4/P56/2012/Gothenburg/Sweden
1783	VP1	AHZ13010	1783	6193	10603, 15013, 19423, 23833, 28243, 32653, 37063	norovirus Hu/GII.4/P58/2012/Gothenburg/Sweden
1784	VP1	AHZ13015	1784	6194	10604, 15014, 19424, 23834, 28244, 32654, 37064	norovirus Hu/GII.4/P60/2012/Gothenburg/Sweden
1785	VP1	AHZ13020	1785	6195	10605, 15015, 19425, 23835, 28245, 32655, 37065	norovirus Hu/GII.4/P62/2012/Gothenburg/Sweden
1786	VP1	AHZ13023	1786	6196	10606, 15016, 19426, 23836, 28246, 32656, 37066	norovirus Hu/GII.4/P63/2012/Gothenburg/Sweden
1787	VP1	AIC32559	1787	6197	10607, 15017, 19427, 23837, 28247, 32657, 37067	norovirus Hu/GII.4/Tanger/TM687/2011/MAR
1788	VP1	AID51474	1788	6198	10608, 15018, 19428, 23838, 28248, 32658, 37068	norovirus 12-AA-1/2012/GII.P22/GII.5
1789	VP1	AID51477	1789	6199	10609, 15019, 19429, 23839, 28249, 32659, 37069	norovirus 12-C-1/2012/GII.P22/GII.5
1790	VP1	AID51480	1790	6200	10610, 15020, 19430, 23840, 28250, 32660, 37070	norovirus 12-E-1/2012/GII.P22/GII.5

1791	VP1	AID51483	1791	6201	10611, 15021, 19431, 23841, 28251, 32661, 37071	norovirus 12-F-1/2012/GII.P22/GII.5
1792	VP1	AID51486	1792	6202	10612, 15022, 19432, 23842, 28252, 32662, 37072	norovirus 12-K-2/2012/GII.P22/GII.5
1793	VP1	AID51489	1793	6203	10613, 15023, 19433, 23843, 28253, 32663, 37073	norovirus 12-X-2/2012/GII.P22/GII.5
1794	VP1	AID51492	1794	6204	10614, 15024, 19434, 23844, 28254, 32664, 37074	norovirus 12-AG-2/2012/GII.P22/GII.5
1795	VP1	AID51495	1795	6205	10615, 15025, 19435, 23845, 28255, 32665, 37075	norovirus 12-AD-1/2012/GII.P22/GII.5
1796	VP1	AIE40036	1796	6206	10616, 15026, 19436, 23846, 28256, 32666, 37076	norovirus GII/Hu/ZA/2012/GII.Pe_GII.4 Sydney 2012/Johannesburg9814
1797	VP1	AJW87644	1797	6207	10617, 15027, 19437, 23847, 28257, 32667, 37077	norovirus Hu/GII.3/SW4/2012/TN
1798	VP1	ALG05457	1798	6208	10618, 15028, 19438, 23848, 28258, 32668, 37078	norovirus Hu/GII.17/CGMH69/2015/TW
1799	VP1	ALG05460	1799	6209	10619, 15029, 19439, 23849, 28259, 32669, 37079	norovirus Hu/GII.17/CGMH70/2015/TW
1800	VP1	ALL73873	1800	6210	10620, 15030, 19440, 23850, 28260, 32670, 37080	norovirus Hu/JSZJ14003/CHN
1801	VP1	ALL73876	1801	6211	10621, 15031, 19441, 23851, 28261, 32671, 37081	norovirus Hu/JSCZ14010/CHN
1802	VP1	ALL73879	1802	6212	10622, 15032, 19442, 23852, 28262, 32672, 37082	norovirus Hu/JSWX14012/CHN
1803	VP1	ALL73882	1803	6213	10623, 15033, 19443, 23853, 28263, 32673, 37083	norovirus Hu/JSSZ15080/CHN
1804	VP1	ALL73888	1804	6214	10624, 15034, 19444, 23854, 28264, 32674, 37084	norovirus Hu/JSWX15027/CHN
1805	VP1	ALQ43927	1805	6215	10625, 15035, 19445, 23855, 28265, 32675, 37085	norovirus GII.4
1806	VP1	ALQ43928	1806	6216	10626, 15036, 19446, 23856, 28266, 32676, 37086	norovirus GII.4
1807	VP1	ALQ44123	1807	6217	10627, 15037, 19447, 23857, 28267, 32677, 37087	norovirus GII.17

1808	VP1	ALQ44124	1808	6218	10628, 15038, 19448, 23858, 28268, 32678, 37088	norovirus GII.17
1809	VP1	ALQ44125	1809	6219	10629, 15039, 19449, 23859, 28269, 32679, 37089	norovirus GII.17
1810	VP1	BAB83514	1810	6220	10630, 15040, 19450, 23860, 28270, 32680, 37090	swine norovirus
1811	VP1	BAB83516	1811	6221	10631, 15041, 19451, 23861, 28271, 32681, 37091	swine norovirus
1812	VP1	BAD72797	1812	6222	10632, 15042, 19452, 23862, 28272, 32682, 37092	norovirus Hu/GII/Ina/02/JP
1813	VP1	BAD72798	1813	6223	10633, 15043, 19453, 23863, 28273, 32683, 37093	norovirus Hu/GII/Sinsiro/97/JP
1814	VP1	BAD72799	1814	6224	10634, 15044, 19454, 23864, 28274, 32684, 37094	norovirus Hu/GII/Hokushin/03/JP
1815	VP1	BAD72800	1815	6225	10635, 15045, 19455, 23865, 28275, 32685, 37095	norovirus Hu/GII/Kamo/03/JP
1816	VP1	BAD88558	1816	6226	10636, 15046, 19456, 23866, 28276, 32686, 37096	norovirus Hu/OC02202/2002/JP
1817	VP1	BAD98240	1817	6227	10637, 15047, 19457, 23867, 28277, 32687, 37097	norovirus Hu/Hokkaido/133/2003/JP
1818	VP1	BAE43833	1818	6228	10638, 15048, 19458, 23868, 28278, 32688, 37098	norovirus Hu/GI/Otofuke/1979/JP
1819	VP1	BAE48588	1819	6229	10639, 15049, 19459, 23869, 28279, 32689, 37099	norovirus Hu/Saga/5424/03/JP
1820	VP1	BAE48589	1820	6230	10640, 15050, 19460, 23870, 28280, 32690, 37100	norovirus Hu/Maizuru/5017/04/JP
1821	VP1	BAE48590	1821	6231	10641, 15051, 19461, 23871, 28281, 32691, 37101	norovirus Hu/78/04/Ru
1822	VP1	BAE92970	1822	6232	10642, 15052, 19462, 23872, 28282, 32692, 37102	norovirus swine/K5/JP
1823	VP1	BAE98191	1823	6233	10643, 15053, 19463, 23873, 28283, 32693, 37103	norovirus Hu/Chiba/04-1050/2005/JP
1824	VP1	BAE98194	1824	6234	10644, 15054, 19464, 23874, 28284, 32694, 37104	norovirus Hu/Sakai/04-179/2005/JP

1825	VP1	BAE98197	1825	6235	10645, 15055, 19465, 23875, 28285, 32695, 37105	norovirus Hu/Ehime/05-30/2005/JP
1826	VP1	BAF45861	1826	6236	10646, 15056, 19466, 23876, 28286, 32696, 37106	norovirus Hu/GII.4/Kobe034/2006/JP
1827	VP1	BAF74508	1827	6237	10647, 15057, 19467, 23877, 28287, 32697, 37107	norovirus Hu/GGII.4/Tiel001/1995/NL
1828	VP1	BAF74509	1828	6238	10648, 15058, 19468, 23878, 28288, 32698, 37108	norovirus Hu/GGII.4/DenHaag015/2000/NL
1829	VP1	BAF74510	1829	6239	10649, 15059, 19469, 23879, 28289, 32699, 37109	norovirus Hu/GGII.4/Waddinxveen016/2000/NL
1830	VP1	BAF74511	1830	6240	10650, 15060, 19470, 23880, 28290, 32700, 37110	norovirus Hu/GGII.4/Leeuwarden043/2000/NL
1831	VP1	BAF74512	1831	6241	10651, 15061, 19471, 23881, 28291, 32701, 37111	norovirus Hu/GGII.4/Schiedam018/2001/NL
1832	VP1	BAF74513	1832	6242	10652, 15062, 19472, 23882, 28292, 32702, 37112	norovirus Hu/GGII.4/Utrecht058/2001/NL
1833	VP1	BAF74514	1833	6243	10653, 15063, 19473, 23883, 28293, 32703, 37113	norovirus Hu/GGII.4/WeertE022/2002/NL
1834	VP1	BAF74515	1834	6244	10654, 15064, 19474, 23884, 28294, 32704, 37114	norovirus Hu/GGII.4/EmmenE006/2002/NL
1835	VP1	BAF74516	1835	6245	10655, 15065, 19475, 23885, 28295, 32705, 37115	norovirus Hu/GGII.4/Heerlen003/2003/NL
1836	VP1	BAF74517	1836	6246	10656, 15066, 19476, 23886, 28296, 32706, 37116	norovirus Hu/GGII.4/Apeldoorn023/2003/NL
1837	VP1	BAF74518	1837	6247	10657, 15067, 19477, 23887, 28297, 32707, 37117	norovirus Hu/GGII.4/DenHaag001/2003/NL
1838	VP1	BAF74519	1838	6248	10658, 15068, 19478, 23888, 28298, 32708, 37118	norovirus Hu/GGII.4/Haarlem457/2003/NL
1839	VP1	BAF74520	1839	6249	10659, 15069, 19479, 23889, 28299, 32709, 37119	norovirus Hu/GGII.4/DenHelder003/2004/NL
1840	VP1	BAF74521	1840	6250	10660, 15070, 19480, 23890, 28300, 32710, 37120	norovirus Hu/GGII.4/Middelburg007/2004/NL
1841	VP1	BAF74522	1841	6251	10661, 15071, 19481, 23891, 28301, 32711, 37121	norovirus Hu/GGII.4/Elsloo012/2004/NL

1842	VP1	BAF74523	1842	6252	10662, 15072, 19482, 23892, 28302, 32712, 37122	norovirus Hu/GGII.4/DenBosch028/2004/NL
1843	VP1	BAF74524	1843	6253	10663, 15073, 19483, 23893, 28303, 32713, 37123	norovirus Hu/GGII.4/Almelo039/2004/NL
1844	VP1	BAF74525	1844	6254	10664, 15074, 19484, 23894, 28304, 32714, 37124	norovirus Hu/GGII.4/Liempde048/2004/NL
1845	VP1	BAF74526	1845	6255	10665, 15075, 19485, 23895, 28305, 32715, 37125	norovirus Hu/GGII.4/Tilburg059/2004/NL
1846	VP1	BAF74527	1846	6256	10666, 15076, 19486, 23896, 28306, 32716, 37126	norovirus Hu/GGII.4/Nijmegen083/2004/NL
1847	VP1	BAF95499	1847	6257	10667, 15077, 19487, 23897, 28307, 32717, 37127	norovirus Hu/GII-4/Matsudo/021071/2002/JP
1848	VP1	BAF95501	1848	6258	10668, 15078, 19488, 23898, 28308, 32718, 37128	norovirus Hu/GII-4/Kaiso/030556/2003/JP
1849	VP1	BAF95503	1849	6259	10669, 15079, 19489, 23899, 28309, 32719, 37129	norovirus Hu/GII-4/Chiba/040095/2003/JP
1850	VP1	BAF95505	1850	6260	10670, 15080, 19490, 23900, 28310, 32720, 37130	norovirus Hu/GII-4/Awa/040354/2004/JP
1851	VP1	BAF95507	1851	6261	10671, 15081, 19491, 23901, 28311, 32721, 37131	norovirus Hu/GII-4/Chiba/040974/2004/JP
1852	VP1	BAF95509	1852	6262	10672, 15082, 19492, 23902, 28312, 32722, 37132	norovirus Hu/GII-4/Katori/041008/2004/JP
1853	VP1	BAF95511	1853	6263	10673, 15083, 19493, 23903, 28313, 32723, 37133	norovirus Hu/GII-4/Kimitsu/041440/2005/JP
1854	VP1	BAF95513	1854	6264	10674, 15084, 19494, 23904, 28314, 32724, 37134	norovirus Hu/GII-4/Inba/050590/2005/JP
1855	VP1	BAF95515	1855	6265	10675, 15085, 19495, 23905, 28315, 32725, 37135	norovirus Hu/GII-4/Funabashi/050601/2005/JP
1856	VP1	BAF95517	1856	6266	10676, 15086, 19496, 23906, 28316, 32726, 37136	norovirus Hu/GII-4/Ichikawa/050701/2005/JP
1857	VP1	BAF95519	1857	6267	10677, 15087, 19497, 23907, 28317, 32727, 37137	norovirus Hu/GII-4/Sanbu/050878/2006/JP
1858	VP1	BAF95521	1858	6268	10678, 15088, 19498, 23908, 28318, 32728, 37138	norovirus Hu/GII-4/Kashiwa/060802/2006/JP

1859	VP1	BAF95523	1859	6269	10679, 15089, 19499, 23909, 28319, 32729, 37139	norovirus Hu/GII-4/Isumi/060936/2006/JP
1860	VP1	BAF95525	1860	6270	10680, 15090, 19500, 23910, 28320, 32730, 37140	norovirus Hu/GII-4/Inba/061099/2006/JP
1861	VP1	BAF95527	1861	6271	10681, 15091, 19501, 23911, 28321, 32731, 37141	norovirus Hu/GII-4/Kimitsu/061146/2006/JP
1862	VP1	BAF95529	1862	6272	10682, 15092, 19502, 23912, 28322, 32732, 37142	norovirus Hu/GII-4/Kashiwa/061256/2006/JP
1863	VP1	BAF95531	1863	6273	10683, 15093, 19503, 23913, 28323, 32733, 37143	norovirus Hu/GII-4/Narashino/061281/2006/JP
1864	VP1	BAG30923	1864	6274	10684, 15094, 19504, 23914, 28324, 32734, 37144	norovirus Hu/OC07138/07/JP
1865	VP1	BAG34630	1865	6275	10685, 15095, 19505, 23915, 28325, 32735, 37145	norovirus Hu/OC97049/1997/JP
1866	VP1	BAG34632	1866	6276	10686, 15096, 19506, 23916, 28326, 32736, 37146	norovirus Hu/OC01243/2001/JP
1867	VP1	BAG34634	1867	6277	10687, 15097, 19507, 23917, 28327, 32737, 37147	norovirus Hu/OC02012/2002/JP
1868	VP1	BAG34636	1868	6278	10688, 15098, 19508, 23918, 28328, 32738, 37148	norovirus Hu/OC02022/2002/JP
1869	VP1	BAG34638	1869	6279	10689, 15099, 19509, 23919, 28329, 32739, 37149	norovirus Hu/OC04038/2004/JP
1870	VP1	BAG34640	1870	6280	10690, 15100, 19510, 23920, 28330, 32740, 37150	norovirus Hu/OC04042/2004/JP
1871	VP1	BAG34642	1871	6281	10691, 15101, 19511, 23921, 28331, 32741, 37151	norovirus Hu/OC04043/2004/JP
1872	VP1	BAG34644	1872	6282	10692, 15102, 19512, 23922, 28332, 32742, 37152	norovirus Hu/OC04056-1/2004/JP
1873	VP1	BAG34646	1873	6283	10693, 15103, 19513, 23923, 28333, 32743, 37153	norovirus Hu/OC04056-2/2004/JP
1874	VP1	BAG34648	1874	6284	10694, 15104, 19514, 23924, 28334, 32744, 37154	norovirus Hu/OC04059/2004/JP
1875	VP1	BAG34650	1875	6285	10695, 15105, 19515, 23925, 28335, 32745, 37155	norovirus Hu/OC04067/2004/JP

1876	VP1	BAG34652	1876	6286	10696, 15106, 19516, 23926, 28336, 32746, 37156	norovirus Hu/OC04071/2004/JP
1877	VP1	BAG34654	1877	6287	10697, 15107, 19517, 23927, 28337, 32747, 37157	norovirus Hu/OC04073/2004/JP
1878	VP1	BAG34656	1878	6288	10698, 15108, 19518, 23928, 28338, 32748, 37158	norovirus Hu/OC04075/2004/JP
1879	VP1	BAG34658	1879	6289	10699, 15109, 19519, 23929, 28339, 32749, 37159	norovirus Hu/OC04076/2004/JP
1880	VP1	BAG34662	1880	6290	10700, 15110, 19520, 23930, 28340, 32750, 37160	norovirus Hu/OC05010/2005/JP
1881	VP1	BAG34664	1881	6291	10701, 15111, 19521, 23931, 28341, 32751, 37161	norovirus Hu/OCS020289/2002/JP
1882	VP1	BAG34666	1882	6292	10702, 15112, 19522, 23932, 28342, 32752, 37162	norovirus Hu/OCS030697/2004/JP
1883	VP1	BAG34668	1883	6293	10703, 15113, 19523, 23933, 28343, 32753, 37163	norovirus Hu/OCS040035/2004/JP
1884	VP1	BAG34670	1884	6294	10704, 15114, 19524, 23934, 28344, 32754, 37164	norovirus Hu/OCS040100/2004/JP
1885	VP1	BAG55289	1885	6295	10705, 15115, 19525, 23935, 28345, 32755, 37165	norovirus Hu/GII.4/Apeldoorn317/2007/NL
1886	VP1	BAG68707	1886	6296	10706, 15116, 19526, 23936, 28346, 32756, 37166	norovirus Hu/GII.2/Coevorden191S/1999/NL
1887	VP1	BAG68708	1887	6297	10707, 15117, 19527, 23937, 28347, 32757, 37167	norovirus Hu/GII.2/DenHaag37/2000/NL
1888	VP1	BAG68709	1888	6298	10708, 15118, 19528, 23938, 28348, 32758, 37168	norovirus Hu/GII.2/Delft48M/2000/NL
1889	VP1	BAG68711	1889	6299	10709, 15119, 19529, 23939, 28349, 32759, 37169	norovirus Hu/GII.2/Zwolle25E/2001/NL
1890	VP1	BAG68712	1890	6300	10710, 15120, 19530, 23940, 28350, 32760, 37170	norovirus Hu/GII.2/Heerlen7E/2002/NL
1891	VP1	BAG68713	1891	6301	10711, 15121, 19531, 23941, 28351, 32761, 37171	norovirus Hu/GII.2/Rotterdam39E/2002/NL
1892	VP1	BAG68714	1892	6302	10712, 15122, 19532, 23942, 28352, 32762, 37172	norovirus Hu/GII.2/Leeuwarden71/2003/NL

1893	VP1	BAG68715	1893	6303	10713, 15123, 19533, 23943, 28353, 32763, 37173	norovirus Hu/GII.2/Goes28/2005/NL
1894	VP1	BAG68716	1894	6304	10714, 15124, 19534, 23944, 28354, 32764, 37174	norovirus Hu/GII.2/Vaals87/2005/NL
1895	VP1	BAG68799	1895	6305	10715, 15125, 19535, 23945, 28355, 32765, 37175	norovirus Hu/GII.3/RotterdamP100/2006/NL
1896	VP1	BAG68800	1896	6306	10716, 15126, 19536, 23946, 28356, 32766, 37176	norovirus Hu/GII.3/RotterdamP1088/2006/NL
1897	VP1	BAG68801	1897	6307	10717, 15127, 19537, 23947, 28357, 32767, 37177	norovirus Hu/GII.4/RotterdamP200/2005/NL
1898	VP1	BAG68802	1898	6308	10718, 15128, 19538, 23948, 28358, 32768, 37178	norovirus Hu/GII.4/RotterdamP20182/2005/NL
1899	VP1	BAG68803	1899	6309	10719, 15129, 19539, 23949, 28359, 32769, 37179	norovirus Hu/GII.4/RotterdamP300/2006/NL
1900	VP1	BAG68804	1900	6310	10720, 15130, 19540, 23950, 28360, 32770, 37180	norovirus Hu/GII.4/RotterdamP3021/2006/NL
1901	VP1	BAG68805	1901	6311	10721, 15131, 19541, 23951, 28361, 32771, 37181	norovirus Hu/GII.4/RotterdamP400/2006/NL
1902	VP1	BAG68806	1902	6312	10722, 15132, 19542, 23952, 28362, 32772, 37182	norovirus Hu/GII.4/RotterdamP4033/2006/NL
1903	VP1	BAG68807	1903	6313	10723, 15133, 19543, 23953, 28363, 32773, 37183	norovirus Hu/GII.3/RotterdamP500/2005/NL
1904	VP1	BAG68808	1904	6314	10724, 15134, 19544, 23954, 28364, 32774, 37184	norovirus Hu/GII.4/RotterdamP5036/2005/NL
1905	VP1	BAG68809	1905	6315	10725, 15135, 19545, 23955, 28365, 32775, 37185	norovirus Hu/GII.4/RotterdamP5051/2005/NL
1906	VP1	BAG68810	1906	6316	10726, 15136, 19546, 23956, 28366, 32776, 37186	norovirus Hu/GII.4/RotterdamP600/2006/NL
1907	VP1	BAG68811	1907	6317	10727, 15137, 19547, 23957, 28367, 32777, 37187	norovirus Hu/GII.4/RotterdamP6033/2006/NL
1908	VP1	BAG68812	1908	6318	10728, 15138, 19548, 23958, 28368, 32778, 37188	norovirus Hu/GII.4/RotterdamP700/2006/NL
1909	VP1	BAG68813	1909	6319	10729, 15139, 19549, 23959, 28369, 32779, 37189	norovirus Hu/GII.4/RotterdamP7011 9/2007/NL

1910	VP1	BAG68814	1910	6320	10730, 15140, 19550, 23960, 28370, 32780, 37190	norovirus Hu/GII.3/RotterdamP8D0/2006/NL
1911	VP1	BAG68815	1911	6321	10731, 15141, 19551, 23961, 28371, 32781, 37191	norovirus Hu/GII.3/RotterdamP8D31/2006/NL
1912	VP1	BAG68816	1912	6322	10732, 15142, 19552, 23962, 28372, 32782, 37192	norovirus Hu/GII.4/RotterdamP8D65/2006/NL
1913	VP1	BAH04374	1913	6323	10733, 15143, 19553, 23963, 28373, 32783, 37193	murine norovirus
1914	VP1	BAH04377	1914	6324	10734, 15144, 19554, 23964, 28374, 32784, 37194	murine norovirus
1915	VP1	BAH29786	1915	6325	10735, 15145, 19555, 23965, 28375, 32785, 37195	norovirus Hu/OC08086/08/JP
1916	VP1	BAH30707	1916	6326	10736, 15146, 19556, 23966, 28376, 32786, 37196	norovirus Hu/GII.4/Stockholm/19865/2008/SE
1917	VP1	BAL40869	1917	6327	10737, 15147, 19557, 23967, 28377, 32787, 37197	norovirus Hu/GII.6/OC08025VLP/2008/JP
1918	VP1	BAL40870	1918	6328	10738, 15148, 19558, 23968, 28378, 32788, 37198	norovirus Hu/GII.6/OH09014VLP/2009/JP
1919	VP1	BAL40871	1919	6329	10739, 15149, 19559, 23969, 28379, 32789, 37199	norovirus Hu/GII.6/OC09015VLP/2009/JP
1920	VP1	BAL40872	1920	6330	10740, 15150, 19560, 23970, 28380, 32790, 37200	norovirus Hu/GII.6/OH05010VLP/2005/JP
1921	VP1	BAL40873	1921	6331	10741, 15151, 19561, 23971, 28381, 32791, 37201	norovirus Hu/GII.6/OC04062VLP/2004/JP
1922	VP1	BAL60900	1922	6332	10742, 15152, 19562, 23972, 28382, 32792, 37202	murine norovirus
1923	VP1	BAQ55211	1923	6333	10743, 15153, 19563, 23973, 28383, 32793, 37203	norovirus Hu/JP/2004/GII.4/Sakai/01-inpatient6-26d
1924	VP1	BAQ55212	1924	6334	10744, 15154, 19564, 23974, 28384, 32794, 37204	norovirus Hu/JP/2004/GII.4/Sakai/01-inpatient8-1d
1925	VP1	BAQ55213	1925	6335	10745, 15155, 19565, 23975, 28385, 32795, 37205	norovirus Hu/JP/2004/GII.4/Sakai/01-inpatient8-29d-1
1926	VP1	BAQ55214	1926	6336	10746, 15156, 19566, 23976, 28386, 32796, 37206	norovirus Hu/JP/2004/GII.4/Sakai/01-inpatient8-29d-2

1927	VP1	BAQ55215	1927	6337	10747, 15157, 19567, 23977, 28387, 32797, 37207	norovirus Hu/JP/2004/GII.4/Sakai/01-inpatient8-29d-3
1928	VP1	BAQ55216	1928	6338	10748, 15158, 19568, 23978, 28388, 32798, 37208	norovirus Hu/JP/2004/GII.4/Sakai/01-inpatient8-29d-4
1929	VP1	BAQ55217	1929	6339	10749, 15159, 19569, 23979, 28389, 32799, 37209	norovirus Hu/JP/2004/GII.4/Sakai/01-inpatient8-54d-1
1930	VP1	BAQ55218	1930	6340	10750, 15160, 19570, 23980, 28390, 32800, 37210	norovirus Hu/JP/2004/GII.4/Sakai/01-inpatient8-54d-2
1931	VP1	BAR47396	1931	6341	10751, 15161, 19571, 23981, 28391, 32801, 37211	norovirus GII/Hu/JP/2007/GII.4/y06-V110-5
1932	VP1	BAR47397	1932	6342	10752, 15162, 19572, 23982, 28392, 32802, 37212	norovirus GII/Hu/JP/2008/GII.4/y07-V179-1
1933	VP1	BAR47398	1933	6343	10753, 15163, 19573, 23983, 28393, 32803, 37213	norovirus GII/Hu/JP/2008/GII.4/y07-V203-1
1934	VP1	BAR47400	1934	6344	10754, 15164, 19574, 23984, 28394, 32804, 37214	norovirus GII/Hu/JP/2008/GII.4/y08-V290-2
1935	VP1	BAR47401	1935	6345	10755, 15165, 19575, 23985, 28395, 32805, 37215	norovirus GII/Hu/JP/2009/GII.4/y08-238-2
1936	VP1	BAR47403	1936	6346	10756, 15166, 19576, 23986, 28396, 32806, 37216	norovirus GII/Hu/JP/2010/GII.4/y09-205-1
1937	VP1	BAR47404	1937	6347	10757, 15167, 19577, 23987, 28397, 32807, 37217	norovirus GII/Hu/JP/2010/GII.4/y10-V475-1
1938	VP1	BAR47405	1938	6348	10758, 15168, 19578, 23988, 28398, 32808, 37218	norovirus GII/Hu/JP/2011/GII.4/y10-V526-8
1939	VP1	BAR47406	1939	6349	10759, 15169, 19579, 23989, 28399, 32809, 37219	norovirus GII/Hu/JP/2011/GII.4/y11-188-1
1940	VP1	BAR47407	1940	6350	10760, 15170, 19580, 23990, 28400, 32810, 37220	norovirus GII/Hu/JP/2012/GII.4/y11-V664-1
1941	VP1	BAR47408	1941	6351	10761, 15171, 19581, 23991, 28401, 32811, 37221	norovirus GII/Hu/JP/2012/GII.4/y11-V689-2
1942	VP1	BAR47410	1942	6352	10762, 15172, 19582, 23992, 28402, 32812, 37222	norovirus GII/Hu/JP/2012/GII.4/y12-V836-3
1943	VP1	BAR47412	1943	6353	10763, 15173, 19583, 23993, 28403, 32813, 37223	norovirus GII/Hu/JP/2011/GII.4/y11-V627-3

1944	VP1	BAR47413	1944	6354	10764, 15174, 19584, 23994, 28404, 32814, 37224	norovirus GII/Hu/JP/2011/GII.4/y11-V633-3
1945	VP1	BAR47414	1945	6355	10765, 15175, 19585, 23995, 28405, 32815, 37225	norovirus GII/Hu/JP/2011/GII.4/y11-V645-27
1946	VP1	BAR47415	1946	6356	10766, 15176, 19586, 23996, 28406, 32816, 37226	norovirus GII/Hu/JP/2011/GII.4/y11-V648-1
1947	VP1	BAR47417	1947	6357	10767, 15177, 19587, 23997, 28407, 32817, 37227	norovirus GII/Hu/JP/2012/GII.4/y12-V762-1
1948	VP1	BAR47418	1948	6358	10768, 15178, 19588, 23998, 28408, 32818, 37228	norovirus GII/Hu/JP/2012/GII.4/y12-V780-1
1949	VP1	BAR47421	1949	6359	10769, 15179, 19589, 23999, 28409, 32819, 37229	norovirus GII/Hu/JP/2013/GII.4/y12-V849-2
1950	VP1	BAR47422	1950	6360	10770, 15180, 19590, 24000, 28410, 32820, 37230	norovirus GII/Hu/JP/2013/GII.4/y13-140-1
1951	VP1	BAR47423	1951	6361	10771, 15181, 19591, 24001, 28411, 32821, 37231	norovirus GII/Hu/JP/2013/GII.4/y13-V938-3
1952	VP1	BAR47424	1952	6362	10772, 15182, 19592, 24002, 28412, 32822, 37232	norovirus GII/Hu/JP/2013/GII.4/y13-166-1
1953	VP1	BAR47426	1953	6363	10773, 15183, 19593, 24003, 28413, 32823, 37233	norovirus GII/Hu/JP/2014/GII.4/y13-V1010-1
1954	VP1	BAS53731	1954	6364	10774, 15184, 19594, 24004, 28414, 32824, 37234	norovirus Hu/GII.4/Wakayama/T158/2010/JP
1955	VP1	BAS53732	1955	6365	10775, 15185, 19595, 24005, 28415, 32825, 37235	norovirus Hu/GII.4/Wakayama/T162/2010/JP
1956	VP1	BAS53733	1956	6366	10776, 15186, 19596, 24006, 28416, 32826, 37236	norovirus Hu/GII.4/Wakayama/T164/2010/JP
1957	VP1	BAS53734	1957	6367	10777, 15187, 19597, 24007, 28417, 32827, 37237	norovirus Hu/GII.4/Wakayama/T169/2010/JP
1958	VP1	BAS53945	1958	6368	10778, 15188, 19598, 24008, 28418, 32828, 37238	norovirus Hu/GII.4/T272/clade 2006b
1959	VP1	CAK22261	1959	6369	10779, 15189, 19599, 24009, 28419, 32829, 37239	norovirus Hu/GI/Babbacombe/1996/GBR
1960	VP1	CAR95870	1960	6370	10780, 15190, 19600, 24010, 28420, 32830, 37240	norovirus Hu/GIV.1/Italy/980/2007/ITA

1961	VP1	ADB27914	1961	6371	10781, 15191, 19601, 24011, 28421, 32831, 37241	norovirus Hu/GII.4/HS194/2009/US
1962	VP1	AD145809	1962	6372	10782, 15192, 19602, 24012, 28422, 32832, 37242	norovirus Hu/GGII.4/Dijon/E3165/2008/FRA
1963	VP1	AD145810	1963	6373	10783, 15193, 19603, 24013, 28423, 32833, 37243	norovirus Hu/GGII.4/Dijon/E3379/2008/FRA
1964	VP1	AD145813	1964	6374	10784, 15194, 19604, 24014, 28424, 32834, 37244	norovirus Hu/GGII.4/Dijon/E3550/2009/FRA
1965	VP1	ADT70684	1965	6375	10785, 15195, 19605, 24015, 28425, 32835, 37245	norovirus Hu/GII.12/HS210/2010/USA
1966	VP1	ADZ24003	1966	6376	10786, 15196, 19606, 24016, 28426, 32836, 37246	norovirus Hu/GII.12/HS207/2010/USA
1967	VP1	AFI08234	1967	6377	10787, 15197, 19607, 24017, 28427, 32837, 37247	norovirus Hu/GII/10002/2009/VNM
1968	VP1	AFI08237	1968	6378	10788, 15198, 19608, 24018, 28428, 32838, 37248	norovirus Hu/GII/10003/2009/VNM
1969	VP1	AFI08243	1969	6379	10789, 15199, 19609, 24019, 28429, 32839, 37249	norovirus Hu/GII/10037/2009/VNM
1970	VP1	AFJ38516	1970	6380	10790, 15200, 19610, 24020, 28430, 32840, 37250	norovirus Hu/GI.1/8FIIa/1968/USA
1971	VP1	AFJ38519	1971	6381	10791, 15201, 19611, 24021, 28431, 32841, 37251	norovirus Hu/GII.4/CHDC5191/1974/USA
1972	VP1	AFW15937	1972	6382	10792, 15202, 19612, 24022, 28432, 32842, 37252	norovirus Hu/GII.4/N8/2008/HuZhou
1973	VP1	AFW15939	1973	6383	10793, 15203, 19613, 24023, 28433, 32843, 37253	norovirus Hu/GII.4/N3/2008/HuZhou
1974	VP1	AFW15942	1974	6384	10794, 15204, 19614, 24024, 28434, 32844, 37254	norovirus Hu/GII.4/N13/2009/HuZhou
1975	VP1	AFW15943	1975	6385	10795, 15205, 19615, 24025, 28435, 32845, 37255	norovirus Hu/GII.4/N76/2010/HuZhou
1976	VP1	AFW15946	1976	6386	10796, 15206, 19616, 24026, 28436, 32846, 37256	norovirus Hu/GII.4/N91/2011/HuZhou
1977	VP1	AFX71656	1977	6387	10797, 15207, 19617, 24027, 28437, 32847, 37257	norovirus Hu/GII.3/HK71/1978/CHN

1978	VP1	AFX71659	1978	6388	10798, 15208, 19618, 24028, 28438, 32848, 37258	norovirus Hu/GII.2/KL109/1978/MYS
1979	VP1	AFX81124	1979	6389	10799, 15209, 19619, 24029, 28439, 32849, 37259	norovirus Hu/Norwalk/10051/2009/VNM
1980	VP1	AFX81133	1980	6390	10800, 15210, 19620, 24030, 28440, 32850, 37260	norovirus Hu/Norwalk/10074/2009/VNM
1981	VP1	AFX81151	1981	6391	10801, 15211, 19621, 24031, 28441, 32851, 37261	norovirus Hu/Norwalk/10116/2009/VNM
1982	VP1	AFX81160	1982	6392	10802, 15212, 19622, 24032, 28442, 32852, 37262	norovirus Hu/Norwalk/10137/2009/VNM
1983	VP1	AFX81175	1983	6393	10803, 15213, 19623, 24033, 28443, 32853, 37263	norovirus Hu/Norwalk/10162/2009/VNM
1984	VP1	AFX81184	1984	6394	10804, 15214, 19624, 24034, 28444, 32854, 37264	norovirus Hu/Norwalk/10173/2009/VNM
1985	VP1	AFX81187	1985	6395	10805, 15215, 19625, 24035, 28445, 32855, 37265	norovirus Hu/Norwalk/10176/2009/VNM
1986	VP1	AFX81217	1986	6396	10806, 15216, 19626, 24036, 28446, 32856, 37266	norovirus Hu/Norwalk/10223/2009/VNM
1987	VP1	AFX81220	1987	6397	10807, 15217, 19627, 24037, 28447, 32857, 37267	norovirus Hu/Norwalk/10235/2009/VNM
1988	VP1	AFX81223	1988	6398	10808, 15218, 19628, 24038, 28448, 32858, 37268	norovirus Hu/Norwalk/10236/2009/VNM
1989	VP1	AFX81235	1989	6399	10809, 15219, 19629, 24039, 28449, 32859, 37269	norovirus Hu/Norwalk/10285/2010/VNM
1990	VP1	AFX81259	1990	6400	10810, 15220, 19630, 24040, 28450, 32860, 37270	norovirus Hu/Norwalk/20008/2009/VNM
1991	VP1	AFX81280	1991	6401	10811, 15221, 19631, 24041, 28451, 32861, 37271	norovirus Hu/Norwalk/20044/2009/VNM
1992	VP1	AFX81286	1992	6402	10812, 15222, 19632, 24042, 28452, 32862, 37272	norovirus Hu/Norwalk/20066/2009/VNM
1993	VP1	AFX81310	1993	6403	10813, 15223, 19633, 24043, 28453, 32863, 37273	norovirus Hu/Norwalk/20123/2009/VNM
1994	VP1	AGE89469	1994	6404	10814, 15224, 19634, 24044, 28454, 32864, 37274	norovirus Hu/GII/20144/2009/VNM

1995	VP1	AGE89484	1995	6405	10815, 15225, 19635, 24045, 28455, 32865, 37275	norovirus Hu/GII/20154/2009/VNM
1996	VP1	AGE89487	1996	6406	10816, 15226, 19636, 24046, 28456, 32866, 37276	norovirus Hu/GII/20156/2009/VNM
1997	VP1	AGE89619	1997	6407	10817, 15227, 19637, 24047, 28457, 32867, 37277	norovirus Hu/GII/20460/2010/VNM
1998	VP1	AGE89670	1998	6408	10818, 15228, 19638, 24048, 28458, 32868, 37278	norovirus Hu/GII/30257/2009/VNM
1999	VP1	AGE99596	1999	6409	10819, 15229, 19639, 24049, 28459, 32869, 37279	norovirus Hu/GII.4/NIHIC4.2/2011/USA
2000	VP1	AGE99599	2000	6410	10820, 15230, 19640, 24050, 28460, 32870, 37280	norovirus Hu/GII.6/S9c/1976/SEN
2001	VP1	AGE99612	2001	6411	10821, 15231, 19641, 24051, 28461, 32871, 37281	norovirus Hu/GII.4/KL45/1978/MYS
2002	VP1	AGI17609	2002	6412	10822, 15232, 19642, 24052, 28462, 32872, 37282	norovirus Hu/GII.3/HK46/1977/CHN
2003	VP1	AGM33211	2003	6413	10823, 15233, 19643, 24053, 28463, 32873, 37283	norovirus Hu/GI.1/CHA6A003_20091031/2009/USA
2004	VP1	AGM33223	2004	6414	10824, 15234, 19644, 24054, 28464, 32874, 37284	norovirus Hu/GI.1/CHA9A004_20110419/2011/USA
2005	VP1	AGT17839	2005	6415	10825, 15235, 19645, 24055, 28465, 32875, 37285	norovirus Hu/GII.4/NIHIC17.5/2012/USA
2006	VP1	AGX85910	2006	6416	10826, 15236, 19646, 24056, 28466, 32876, 37286	norovirus Hu/GII.4/NIHIC1.16/2012/USA
2007	VP1	AHI59162	2007	6417	10827, 15237, 19647, 24057, 28467, 32877, 37287	norovirus Hu/GII.4/HS288/2012/USA
2008	VP1	AHI59165	2008	6418	10828, 15238, 19648, 24058, 28468, 32878, 37288	norovirus Hu/GII.4/HS66/2001/USA
2009	VP1	AHX22044	2009	6419	10829, 15239, 19649, 24059, 28469, 32879, 37289	norovirus Hu/GII/BGIC0317/2011/BGD
2010	VP1	AII02587	2010	6420	10830, 15240, 19650, 24060, 28470, 32880, 37290	norovirus Hu/GII/C2H-18/2011/VNM
2011	VP1	AII02617	2011	6421	10831, 15241, 19651, 24061, 28471, 32881, 37291	norovirus Hu/GII/20419/2010/VNM

2012	VP1	AIS24556	2012	6422	10832, 15242, 19652, 24062, 28472, 32882, 37292	norovirus GII
2013	VP1	BAI49908	2013	6423	10833, 15243, 19653, 24063, 28473, 32883, 37293	norovirus Hu/GII.4/Hiroshima/55/2005/JPN
2014	VP1	BAI49913	2014	6424	10834, 15244, 19654, 24064, 28474, 32884, 37294	norovirus Hu/GII.4/Hiroshima/63/2006/JPN
2015	VP1	BAI49922	2015	6425	10835, 15245, 19655, 24065, 28475, 32885, 37295	norovirus Hu/GII.4/Hiroshima/110/2007/JPN
2016	VP1	BAJ25074	2016	6426	10836, 15246, 19656, 24066, 28476, 32886, 37296	norovirus Hu/OC07118/2007/JP
2017	VP1	BAP33934	2017	6427	10837, 15247, 19657, 24067, 28477, 32887, 37297	norovirus Hu/GII/JP/2014/GII.P17_GII.17/Kawasaki323
2018	VP1	ABQ63283	2018	6428	10838, 15248, 19658, 24068, 28478, 32888, 37298	norovirus Hu/GII.4/Kenepuru/NZ327/2006/NZL
2019	VP1	ABV55634	2019	6429	10839, 15249, 19659, 24069, 28479, 32889, 37299	norovirus Hu/GII.4/Shellharbour/NSW696T/2006/AUS
2020	VP1	ACV41093	2020	6430	10840, 15250, 19660, 24070, 28480, 32890, 37300	norovirus Hu/GII.4/Riviera1635/2008/US
2021	VP1	ACV41096	2021	6431	10841, 15251, 19661, 24071, 28481, 32891, 37301	norovirus Hu/GI.4/1643/2008/US
2022	VP1	ACV88130	2022	6432	10842, 15252, 19662, 24072, 28482, 32892, 37302	norovirus dog/C33/Viseu/2007/PRT
2023	VP1	ACW19927	2023	6433	10843, 15253, 19663, 24073, 28483, 32893, 37303	norovirus Hu/GII.4/Rathmines/NSW287R/2007/AUS
2024	VP1	ACX31885	2024	6434	10844, 15254, 19664, 24074, 28484, 32894, 37304	norovirus Hu/GII.4/Armidale/NSW390I/2008/AU
2025	VP1	ACX31887	2025	6435	10845, 15255, 19665, 24075, 28485, 32895, 37305	norovirus Hu/GII.4/Westmead/NSW3639/2008/AUS
2026	VP1	ACX31891	2026	6436	10846, 15256, 19666, 24076, 28486, 32896, 37306	norovirus Hu/GII.4/Sutherland/NSW505G/2007/AUS
2027	VP1	ACZ37232	2027	6437	10847, 15257, 19667, 24077, 28487, 32897, 37307	norovirus Hu/GII.7/1738/2009/USA
2028	VP1	ADD10375	2028	6438	10848, 15258, 19668, 24078, 28488, 32898, 37308	norovirus Hu/GII.4/New Orleans1805/2009/USA

2029	VP1	ADD85552	2029	6439	10849, 15259, 19669, 24079, 28489, 32899, 37309	norovirus Hu/GII.4/Pecs/HUN4322/2010/HUN
2030	VP1	ADQ43779	2030	6440	10850, 15260, 19670, 24080, 28490, 32900, 37310	norovirus Hu/GII.4/Beecroft/NSW305P/2009/AUS
2031	VP1	ADQ43781	2031	6441	10851, 15261, 19671, 24081, 28491, 32901, 37311	norovirus Hu/GII.4/Teralba/NSW881Z/2009/AUS
2032	VP1	ADQ43783	2032	6442	10852, 15262, 19672, 24082, 28492, 32902, 37312	norovirus Hu/GII.4/Turramurra/NSW892U/2009/AUS
2033	VP1	ADV37805	2033	6443	10853, 15263, 19673, 24083, 28493, 32903, 37313	norovirus Hu/GII.4/Seoul/0389/2009/KOR
2034	VP1	ADV37807	2034	6444	10854, 15264, 19674, 24084, 28494, 32904, 37314	norovirus Hu/GII.4/Seoul/0654/2009/KOR
2035	VP1	ADV37809	2035	6445	10855, 15265, 19675, 24085, 28495, 32905, 37315	norovirus Hu/GII.4/Seoul/0921/2009/KOR
2036	VP1	ADV37813	2036	6446	10856, 15266, 19676, 24086, 28496, 32906, 37316	norovirus Hu/GII.4/Seoul/0952/2010/KOR
2037	VP1	ADV37917	2037	6447	10857, 15267, 19677, 24087, 28497, 32907, 37317	norovirus Hu/GII.4/Seoul/0902/2009/KOR
2038	VP1	ADV37919	2038	6448	10858, 15268, 19678, 24088, 28498, 32908, 37318	norovirus Hu/GII.4/Seoul/0945/2009/KOR
2039	VP1	AEI83469	2039	6449	10859, 15269, 19679, 24089, 28499, 32909, 37319	norovirus Hu/GII.12/Shelby/2009/USA
2040	VP1	AEP04093	2040	6450	10860, 15270, 19680, 24090, 28500, 32910, 37320	norovirus pig/GII/Ch6/China/2009
2041	VP1	AEQ77282	2041	6451	10861, 15271, 19681, 24091, 28501, 32911, 37321	norovirus Hu/GI.7/TCH-060/USA/2003
2042	VP1	AFA55174	2042	6452	10862, 15272, 19682, 24092, 28502, 32912, 37322	norovirus Hu/GII.1/Ascension208/2010/USA
2043	VP1	AFC89656	2043	6453	10863, 15273, 19683, 24093, 28503, 32913, 37323	norovirus Hu/GII.13/VA173/2010/USA
2044	VP1	AFC89659	2044	6454	10864, 15274, 19684, 24094, 28504, 32914, 37324	norovirus Hu/GI.7/Providence191/2010/USA
2045	VP1	AFC89662	2045	6455	10865, 15275, 19685, 24095, 28505, 32915, 37325	norovirus Hu/GII.3/Glastonbury1164/2004/USA

2046	VP1	AFC89665	2046	6456	10866, 15276, 19686, 24096, 28506, 32916, 37326	norovirus Hu/GII.21/Salisbury150/2011/USA
2047	VP1	AFC89667	2047	6457	10867, 15277, 19687, 24097, 28507, 32917, 37327	norovirus Hu/GII.4/Minerva/CS1258/2006/USA
2048	VP1	AFD62272	2048	6458	10868, 15278, 19688, 24098, 28508, 32918, 37328	murine norovirus 3
2049	VP1	AFJ04707	2049	6459	10869, 15279, 19689, 24099, 28509, 32919, 37329	norovirus Hu/GII.4/1997/USA
2050	VP1	AFJ04708	2050	6460	10870, 15280, 19690, 24100, 28510, 32920, 37330	norovirus Hu/GII.4/Farmington Hills/2004/USA
2051	VP1	AFJ04709	2051	6461	10871, 15281, 19691, 24101, 28511, 32921, 37331	norovirus Hu/GII.4/Minerva/2006/USA
2052	VP1	AFP89593	2052	6462	10872, 15282, 19692, 24102, 28512, 32922, 37332	norovirus Hu/GII.4/Ohio/71/2012/USA
2053	VP1	AFU55686	2053	6463	10873, 15283, 19693, 24103, 28513, 32923, 37333	norovirus Hu/GII.4/AlbertaEI131/2004/CA
2054	VP1	AFU55689	2054	6464	10874, 15284, 19694, 24104, 28514, 32924, 37334	norovirus Hu/GII.4/AlbertaEI142/2006/CA
2055	VP1	AFU55692	2055	6465	10875, 15285, 19695, 24105, 28515, 32925, 37335	norovirus Hu/GII.4/AlbertaEI190/2006/CA
2056	VP1	AFU55695	2056	6466	10876, 15286, 19696, 24106, 28516, 32926, 37336	norovirus Hu/GII.4/AlbertaEI438/2006/CA
2057	VP1	AFU55698	2057	6467	10877, 15287, 19697, 24107, 28517, 32927, 37337	norovirus Hu/GII.4/AlbertaEI498/2006/CA
2058	VP1	AFU55701	2058	6468	10878, 15288, 19698, 24108, 28518, 32928, 37338	norovirus Hu/GII.4/AlbertaEI513/2006/CA
2059	VP1	AFU55704	2059	6469	10879, 15289, 19699, 24109, 28519, 32929, 37339	norovirus Hu/GII.4/AlbertaEI603/2006/CA
2060	VP1	AFU55707	2060	6470	10880, 15290, 19700, 24110, 28520, 32930, 37340	norovirus Hu/GII.4/AlbertaEI009/2008/CA
2061	VP1	AFU55710	2061	6471	10881, 15291, 19701, 24111, 28521, 32931, 37341	norovirus Hu/GII.4/AlbertaEI102/2008/CA
2062	VP1	AFU55713	2062	6472	10882, 15292, 19702, 24112, 28522, 32932, 37342	norovirus Hu/GII.4/AlbertaEI210/2008/CA

2063	VP1	AFU55716	2063	6473	10883, 15293, 19703, 24113, 28523, 32933, 37343	norovirus Hu/GII.4/AlbertaEI425/2008/CA
2064	VP1	AFU55719	2064	6474	10884, 15294, 19704, 24114, 28524, 32934, 37344	norovirus Hu/GII.4/AlbertaEI109/2009/CA
2065	VP1	AFU55722	2065	6475	10885, 15295, 19705, 24115, 28525, 32935, 37345	norovirus Hu/GII.4/AlbertaEI045/2010/CA
2066	VP1	AFU55725	2066	6476	10886, 15296, 19706, 24116, 28526, 32936, 37346	norovirus Hu/GII.4/AlbertaEI119/2010/CA
2067	VP1	AFU55728	2067	6477	10887, 15297, 19707, 24117, 28527, 32937, 37347	norovirus Hu/GII.4/AlbertaEI204/2010/CA
2068	VP1	AFU55731	2068	6478	10888, 15298, 19708, 24118, 28528, 32938, 37348	norovirus Hu/GII.4/AlbertaEI065/2011/CA
2069	VP1	AFU55734	2069	6479	10889, 15299, 19709, 24119, 28529, 32939, 37349	norovirus Hu/GII.4/AlbertaEI388/2011/CA
2070	VP1	AFU55737	2070	6480	10890, 15300, 19710, 24120, 28530, 32940, 37350	norovirus Hu/GII.4/AlbertaEI003/2012/CA
2071	VP1	AFU92659	2071	6481	10891, 15301, 19711, 24121, 28531, 32941, 37351	norovirus Hu/GII.4/SG4013-09/2004/SG
2072	VP1	AFU92660	2072	6482	10892, 15302, 19712, 24122, 28532, 32942, 37352	norovirus Hu/GII.4/SG4016-09/2004/SG
2073	VP1	AFU92661	2073	6483	10893, 15303, 19713, 24123, 28533, 32943, 37353	norovirus Hu/GII.4/SG4033-01/2005/SG
2074	VP1	AFU92662	2074	6484	10894, 15304, 19714, 24124, 28534, 32944, 37354	norovirus Hu/GII.4/SG4039-02/2005/SG
2075	VP1	AFU92663	2075	6485	10895, 15305, 19715, 24125, 28535, 32945, 37355	norovirus Hu/GII.4/SG4091-06/2006/SG
2076	VP1	AFU92664	2076	6486	10896, 15306, 19716, 24126, 28536, 32946, 37356	norovirus Hu/GII.4/SG4099-08/2006/SG
2077	VP1	AFU92666	2077	6487	10897, 15307, 19717, 24127, 28537, 32947, 37357	norovirus Hu/GII.4/SG4009-09/2006/SG
2078	VP1	AFU92667	2078	6488	10898, 15308, 19718, 24128, 28538, 32948, 37358	norovirus Hu/GII.4/SG4019-09/2006/SG
2079	VP1	AFU92668	2079	6489	10899, 15309, 19719, 24129, 28539, 32949, 37359	norovirus Hu/GII.4/SG4024-10/2006/SG

2080	VP1	AFU92669	2080	6490	10900, 15310, 19720, 24130, 28540, 32950, 37360	norovirus Hu/GII.4/SG4035-10/2006/SG
2081	VP1	AFU92670	2081	6491	10901, 15311, 19721, 24131, 28541, 32951, 37361	norovirus Hu/GII.4/SG4060-10/2006/SG
2082	VP1	AFU92671	2082	6492	10902, 15312, 19722, 24132, 28542, 32952, 37362	norovirus Hu/GII.4/SG4061-10/2006/SG
2083	VP1	AFU92672	2083	6493	10903, 15313, 19723, 24133, 28543, 32953, 37363	norovirus Hu/GII.4/SG4097-10/2006/SG
2084	VP1	AFU92673	2084	6494	10904, 15314, 19724, 24134, 28544, 32954, 37364	norovirus Hu/GII.4/SG4015-10/2006/SG
2085	VP1	AFU92674	2085	6495	10905, 15315, 19725, 24135, 28545, 32955, 37365	norovirus Hu/GII.4/SG4030-12/2006/SG
2086	VP1	AFU92676	2086	6496	10906, 15316, 19726, 24136, 28546, 32956, 37366	norovirus Hu/GII.4/SG4058-12/2006/SG
2087	VP1	AFU92677	2087	6497	10907, 15317, 19727, 24137, 28547, 32957, 37367	norovirus Hu/GII.4/SG4077-12/2006/SG
2088	VP1	AFU92678	2088	6498	10908, 15318, 19728, 24138, 28548, 32958, 37368	norovirus Hu/GII.4/SG4007-01/2007/SG
2089	VP1	AFU92679	2089	6499	10909, 15319, 19729, 24139, 28549, 32959, 37369	norovirus Hu/GII.4/SG4010-01/2007/SG
2090	VP1	AFU92680	2090	6500	10910, 15320, 19730, 24140, 28550, 32960, 37370	norovirus Hu/GII.4/SG4041-01/2007/SG
2091	VP1	AFU92681	2091	6501	10911, 15321, 19731, 24141, 28551, 32961, 37371	norovirus Hu/GII.4/SG4047-01/2007/SG
2092	VP1	AFU92682	2092	6502	10912, 15322, 19732, 24142, 28552, 32962, 37372	norovirus Hu/GII.4/SG4051-01/2007/SG
2093	VP1	AFU92684	2093	6503	10913, 15323, 19733, 24143, 28553, 32963, 37373	norovirus Hu/GII.4/SG4042-07/2007/SG
2094	VP1	AFU92685	2094	6504	10914, 15324, 19734, 24144, 28554, 32964, 37374	norovirus Hu/GII.4/SG4045-07/2007/SG
2095	VP1	AFU92686	2095	6505	10915, 15325, 19735, 24145, 28555, 32965, 37375	norovirus Hu/GII.4/SG4052-08/2007/SG
2096	VP1	AFU92687	2096	6506	10916, 15326, 19736, 24146, 28556, 32966, 37376	norovirus Hu/GII.4/SG4065-08/2007/SG

2097	VP1	AFU92688	2097	6507	10917, 15327, 19737, 24147, 28557, 32967, 37377	norovirus Hu/GII.4/SG4075-08/2007/SG
2098	VP1	AFU92689	2098	6508	10918, 15328, 19738, 24148, 28558, 32968, 37378	norovirus Hu/GII.4/SG4086-09/2007/SG
2099	VP1	AFU92690	2099	6509	10919, 15329, 19739, 24149, 28559, 32969, 37379	norovirus Hu/GII.4/SG4087-09/2007/SG
2100	VP1	AFU92691	2100	6510	10920, 15330, 19740, 24150, 28560, 32970, 37380	norovirus Hu/GII.4/SG4011-09/2007/SG
2101	VP1	AFU92692	2101	6511	10921, 15331, 19741, 24151, 28561, 32971, 37381	norovirus Hu/GII.4/SG4063-10/2007/SG
2102	VP1	AFU92693	2102	6512	10922, 15332, 19742, 24152, 28562, 32972, 37382	norovirus Hu/GII.4/SG4069-01/2008/SG
2103	VP1	AFU92694	2103	6513	10923, 15333, 19743, 24153, 28563, 32973, 37383	norovirus Hu/GII.4/SG4079-07/2008/SG
2104	VP1	AFU92695	2104	6514	10924, 15334, 19744, 24154, 28564, 32974, 37384	norovirus Hu/GII.4/SG4073-11/2008/SG
2105	VP1	AFU92696	2105	6515	10925, 15335, 19745, 24155, 28565, 32975, 37385	norovirus Hu/GII.4/SG4092-11/2008/SG
2106	VP1	AFU92697	2106	6516	10926, 15336, 19746, 24156, 28566, 32976, 37386	norovirus Hu/GII.4/SG4015-12/2008/SG
2107	VP1	AFU92698	2107	6517	10927, 15337, 19747, 24157, 28567, 32977, 37387	norovirus Hu/GII.4/SG4018-12/2008/SG
2108	VP1	AFU92699	2108	6518	10928, 15338, 19748, 24158, 28568, 32978, 37388	norovirus Hu/GII.4/SG4061-01/2009/SG
2109	VP1	AFU92700	2109	6519	10929, 15339, 19749, 24159, 28569, 32979, 37389	norovirus Hu/GII.4/SG4067-01/2009/SG
2110	VP1	AFU92701	2110	6520	10930, 15340, 19750, 24160, 28570, 32980, 37390	norovirus Hu/GII.4/SG4004-03/2009/SG
2111	VP1	AFU92702	2111	6521	10931, 15341, 19751, 24161, 28571, 32981, 37391	norovirus Hu/GII.4/SG4023-05/2009/SG
2112	VP1	AFU92703	2112	6522	10932, 15342, 19752, 24162, 28572, 32982, 37392	norovirus Hu/GII.4/SG4028-07/2009/SG
2113	VP1	AFU92704	2113	6523	10933, 15343, 19753, 24163, 28573, 32983, 37393	norovirus Hu/GII.4/SG4070-07/2009/SG

2114	VP1	AFU92705	2114	6524	10934, 15344, 19754, 24164, 28574, 32984, 37394	norovirus Hu/GII.4/SG4040-08/2009/SG
2115	VP1	AFU92706	2115	6525	10935, 15345, 19755, 24165, 28575, 32985, 37395	norovirus Hu/GII.4/SG4041-09/2009/SG
2116	VP1	AFU92707	2116	6526	10936, 15346, 19756, 24166, 28576, 32986, 37396	norovirus Hu/GII.4/SG4044-09/2009/SG
2117	VP1	AFU92708	2117	6527	10937, 15347, 19757, 24167, 28577, 32987, 37397	norovirus Hu/GII.4/SG4046-09/2009/SG
2118	VP1	AFU92709	2118	6528	10938, 15348, 19758, 24168, 28578, 32988, 37398	norovirus Hu/GII.4/SG4047-09/2009/SG
2119	VP1	AFU92710	2119	6529	10939, 15349, 19759, 24169, 28579, 32989, 37399	norovirus Hu/GII.4/SG4051-09/2009/SG
2120	VP1	AFU92711	2120	6530	10940, 15350, 19760, 24170, 28580, 32990, 37400	norovirus Hu/GII.4/SG4057-09/2009/SG
2121	VP1	AFU92712	2121	6531	10941, 15351, 19761, 24171, 28581, 32991, 37401	norovirus Hu/GII.4/SG4058-10/2009/SG
2122	VP1	AFU92713	2122	6532	10942, 15352, 19762, 24172, 28582, 32992, 37402	norovirus Hu/GII.4/SG4061-10/2009/SG
2123	VP1	AFU92714	2123	6533	10943, 15353, 19763, 24173, 28583, 32993, 37403	norovirus Hu/GII.4/SG4062-10/2009/SG
2124	VP1	AFU92715	2124	6534	10944, 15354, 19764, 24174, 28584, 32994, 37404	norovirus Hu/GII.4/SG4075-12/2009/SG
2125	VP1	AFU92717	2125	6535	10945, 15355, 19765, 24175, 28585, 32995, 37405	norovirus Hu/GII.4/SG4014-04/2010/SG
2126	VP1	AFU92718	2126	6536	10946, 15356, 19766, 24176, 28586, 32996, 37406	norovirus Hu/GII.4/SG4051-08/2010/SG
2127	VP1	AFU92719	2127	6537	10947, 15357, 19767, 24177, 28587, 32997, 37407	norovirus Hu/GII.4/SG4053-08/2010/SG
2128	VP1	AFU92720	2128	6538	10948, 15358, 19768, 24178, 28588, 32998, 37408	norovirus Hu/GII.4/SG4054-08/2010/SG
2129	VP1	AFU92721	2129	6539	10949, 15359, 19769, 24179, 28589, 32999, 37409	norovirus Hu/GII.4/SG4002-12/2010/SG
2130	VP1	AFU92722	2130	6540	10950, 15360, 19770, 24180, 28590, 33000, 37410	norovirus Hu/GII.4/SG4009-01/2011/SG

2131	VP1	AFU92723	2131	6541	10951, 15361, 19771, 24181, 28591, 33001, 37411	norovirus Hu/GII.4/SG4010-01/2011/SG
2132	VP1	AGD79474	2132	6542	10952, 15362, 19772, 24182, 28592, 33002, 37412	norovirus Hu/GII.3/01-13/477/2001/AU
2133	VP1	AGD79475	2133	6543	10953, 15363, 19773, 24183, 28593, 33003, 37413	norovirus Hu/GII.3/02-13/424cons/2002/AU
2134	VP1	AGD79476	2134	6544	10954, 15364, 19774, 24184, 28594, 33004, 37414	norovirus Hu/GII.3/41/89/2006/AU
2135	VP1	AGD79477	2135	6545	10955, 15365, 19775, 24185, 28595, 33005, 37415	norovirus Hu/GII.3/84/46/2007/AU
2136	VP1	AGD79478	2136	6546	10956, 15366, 19776, 24186, 28596, 33006, 37416	norovirus Hu/GII.3/693/425/2008/AU
2137	VP1	AGD79479	2137	6547	10957, 15367, 19777, 24187, 28597, 33007, 37417	norovirus Hu/GII.3/537/547/2010/AU
2138	VP1	AGH24750	2138	6548	10958, 15368, 19778, 24188, 28598, 33008, 37418	norovirus Hu/GII.4/ITOO/ITA
2139	VP1	AGI37922	2139	6549	10959, 15369, 19779, 24189, 28599, 33009, 37419	norovirus Hu/GII.4/Seoul/1071/2010/KOR
2140	VP1	AGM46344	2140	6550	10960, 15370, 19780, 24190, 28600, 33010, 37420	norovirus Hu/GII/Seoul1055/KOR/2010
2141	VP1	AGM46347	2141	6551	10961, 15371, 19781, 24191, 28601, 33011, 37421	norovirus Hu/GII/Seoul1072/KOR/2010
2142	VP1	AGM46349	2142	6552	10962, 15372, 19782, 24192, 28602, 33012, 37422	norovirus Hu/GII/Seoul1282/KOR/2010
2143	VP1	AGM46355	2143	6553	10963, 15373, 19783, 24193, 28603, 33013, 37423	norovirus Hu/GII/Seoul1488/KOR/2011
2144	VP1	AGM46359	2144	6554	10964, 15374, 19784, 24194, 28604, 33014, 37424	norovirus Hu/GII/Seoul1033/KOR/2010
2145	VP1	AGM46362	2145	6555	10965, 15375, 19785, 24195, 28605, 33015, 37425	norovirus Hu/GII/Seoul1086/KOR/2010
2146	VP1	AGM46366	2146	6556	10966, 15376, 19786, 24196, 28606, 33016, 37426	norovirus Hu/GII/Seoul1391/KOR/2010
2147	VP1	AGM46367	2147	6557	10967, 15377, 19787, 24197, 28607, 33017, 37427	norovirus Hu/GII/Seoul1412/KOR/2010

2148	VP1	AGM46370	2148	6558	10968, 15378, 19788, 24198, 28608, 33018, 37428	norovirus Hu/GII/Seoul1378/KOR/2010
2149	VP1	AGM46375	2149	6559	10969, 15379, 19789, 24199, 28609, 33019, 37429	norovirus Hu/GII/Seoul1388/KOR/2010
2150	VP1	AGM46377	2150	6560	10970, 15380, 19790, 24200, 28610, 33020, 37430	norovirus Hu/GII/Seoul1400/KOR/2010
2151	VP1	AGM46379	2151	6561	10971, 15381, 19791, 24201, 28611, 33021, 37431	norovirus Hu/GII/Seoul1449/KOR/2011
2152	VP1	AGM46384	2152	6562	10972, 15382, 19792, 24202, 28612, 33022, 37432	norovirus Hu/GII/Seoul1456/KOR/2011
2153	VP1	AGM46386	2153	6563	10973, 15383, 19793, 24203, 28613, 33023, 37433	norovirus Hu/GII/Seoul1034/KOR/2010
2154	VP1	AGM46388	2154	6564	10974, 15384, 19794, 24204, 28614, 33024, 37434	norovirus Hu/GII/Seoul1049/KOR/2010
2155	VP1	AGM46392	2155	6565	10975, 15385, 19795, 24205, 28615, 33025, 37435	norovirus Hu/GII/Seoul1121/KOR/2010
2156	VP1	AGM46395	2156	6566	10976, 15386, 19796, 24206, 28616, 33026, 37436	norovirus Hu/GII/Seoul1296/KOR/2010
2157	VP1	AGM46398	2157	6567	10977, 15387, 19797, 24207, 28617, 33027, 37437	norovirus Hu/GII/Seoul1409/KOR/2010
2158	VP1	AGM46401	2158	6568	10978, 15388, 19798, 24208, 28618, 33028, 37438	norovirus Hu/GII/Seoul1444/KOR/2010
2159	VP1	AGM46403	2159	6569	10979, 15389, 19799, 24209, 28619, 33029, 37439	norovirus Hu/GII/Seoul1445/KOR/2010
2160	VP1	AGM46407	2160	6570	10980, 15390, 19800, 24210, 28620, 33030, 37440	norovirus Hu/GII/Seoul1835/KOR/2011
2161	VP1	AGM46409	2161	6571	10981, 15391, 19801, 24211, 28621, 33031, 37441	norovirus Hu/GII/Seoul1032/KOR/2010
2162	VP1	AGM46413	2162	6572	10982, 15392, 19802, 24212, 28622, 33032, 37442	norovirus Hu/GII/Seoul1073/KOR/2010
2163	VP1	AGM46415	2163	6573	10983, 15393, 19803, 24213, 28623, 33033, 37443	norovirus Hu/GII/Seoul1211/KOR/2010
2164	VP1	AGM46419	2164	6574	10984, 15394, 19804, 24214, 28624, 33034, 37444	norovirus Hu/GII/Seoul1259/KOR/2010

2165	VP1	AGM46421	2165	6575	10985, 15395, 19805, 24215, 28625, 33035, 37445	norovirus Hu/GII/Seoul1321/KOR/2010
2166	VP1	AGM46425	2166	6576	10986, 15396, 19806, 24216, 28626, 33036, 37446	norovirus Hu/GII/Seoul1351/KOR/2010
2167	VP1	AGM46427	2167	6577	10987, 15397, 19807, 24217, 28627, 33037, 37447	norovirus Hu/GII/Seoul1431/KOR/2010
2168	VP1	AGM46431	2168	6578	10988, 15398, 19808, 24218, 28628, 33038, 37448	norovirus Hu/GII/Seoul1450/KOR/2011
2169	VP1	AGN11430	2169	6579	10989, 15399, 19809, 24219, 28629, 33039, 37449	norovirus Hu/GIV.1/CCDC GRIII3-59/CHN/2011
2170	VP1	AG064038	2170	6580	10990, 15400, 19810, 24220, 28630, 33040, 37450	norovirus Hu/GII.3/TCH-104/USA/2002
2171	VP1	AG064040	2171	6581	10991, 15401, 19811, 24221, 28631, 33041, 37451	norovirus Hu/GII.7/TCH-134/USA/2003
2172	VP1	AG064042	2172	6582	10992, 15402, 19812, 24222, 28632, 33042, 37452	norovirus Hu/GII.12/Texas/EI3842/USA/2000
2173	VP1	AGS41450	2173	6583	10993, 15403, 19813, 24223, 28633, 33043, 37453	norovirus Hu/GII.4 2006b/092895/2008/USA
2174	VP1	AGT62521	2174	6584	10994, 15404, 19814, 24224, 28634, 33044, 37454	norovirus Hu/GI.6/TCH-099/USA/2003
2175	VP1	AGT62523	2175	6585	10995, 15405, 19815, 24225, 28635, 33045, 37455	norovirus Hu/GII.2/TCH-560/USA/2002
2176	VP1	AGV40221	2176	6586	10996, 15406, 19816, 24226, 28636, 33046, 37456	norovirus Hu/GII.4/JP10909/2012/JPN
2177	VP1	AGV76553	2177	6587	10997, 15407, 19817, 24227, 28637, 33047, 37457	norovirus Hu/GII.4/35444252/AUS/2012
2178	VP1	AGV76554	2178	6588	10998, 15408, 19818, 24228, 28638, 33048, 37458	norovirus Hu/GII.4/30934022/AUS/2012
2179	VP1	AGV76555	2179	6589	10999, 15409, 19819, 24229, 28639, 33049, 37459	norovirus Hu/GII.4/93762261/AUS/2012
2180	VP1	AGV76556	2180	6590	11000, 15410, 19820, 24230, 28640, 33050, 37460	norovirus Hu/GII.4/21859972/AUS/2013
2181	VP1	AGV76557	2181	6591	11001, 15411, 19821, 24231, 28641, 33051, 37461	norovirus Hu/GII.4/21859964/AUS/2012

2182	VP1	AGV76558	2182	6592	11002, 15412, 19822, 24232, 28642, 33052, 37462	norovirus Hu/GII.4/21859969/AUS/2013
2183	VP1	AGV76559	2183	6593	11003, 15413, 19823, 24233, 28643, 33053, 37463	norovirus Hu/GII.4/21859973/AUS/2013
2184	VP1	AGV76560	2184	6594	11004, 15414, 19824, 24234, 28644, 33054, 37464	norovirus Hu/GII.4/21859977/AUS/2013
2185	VP1	AGV76561	2185	6595	11005, 15415, 19825, 24235, 28645, 33055, 37465	norovirus Hu/GII.4/21859978/AUS/2013
2186	VP1	AGV76562	2186	6596	11006, 15416, 19826, 24236, 28646, 33056, 37466	norovirus Hu/GII.4/21859980/AUS/2013
2187	VP1	AGV76563	2187	6597	11007, 15417, 19827, 24237, 28647, 33057, 37467	norovirus Hu/GII.4/33765031/AUS/2012
2188	VP1	AGV76564	2188	6598	11008, 15418, 19828, 24238, 28648, 33058, 37468	norovirus Hu/GII.4/32973745/AUS/2012
2189	VP1	AGV76565	2189	6599	11009, 15419, 19829, 24239, 28649, 33059, 37469	norovirus Hu/GII.4/34760731/AUS/2012
2190	VP1	AGV76566	2190	6600	11010, 15420, 19830, 24240, 28650, 33060, 37470	norovirus Hu/GII.4/30949403/AUS/2012
2191	VP1	AGV76567	2191	6601	11011, 15421, 19831, 24241, 28651, 33061, 37471	norovirus Hu/GII.4/35857786/AUS/2012
2192	VP1	AGV76568	2192	6602	11012, 15422, 19832, 24242, 28652, 33062, 37472	norovirus Hu/GII.4/36126758/AUS/2013
2193	VP1	AGV76569	2193	6603	11013, 15423, 19833, 24243, 28653, 33063, 37473	norovirus Hu/GII.4/36285194/AUS/2012
2194	VP1	AGV76570	2194	6604	11014, 15424, 19834, 24244, 28654, 33064, 37474	norovirus Hu/GII.4/90186710/AUS/2012
2195	VP1	AGV76571	2195	6605	11015, 15425, 19835, 24245, 28655, 33065, 37475	norovirus Hu/GII.4/30996947/AUS/2012
2196	VP1	AGV76572	2196	6606	11016, 15426, 19836, 24246, 28656, 33066, 37476	norovirus Hu/GII.4/35408489/AUS/2012
2197	VP1	AGV76573	2197	6607	11017, 15427, 19837, 24247, 28657, 33067, 37477	norovirus Hu/GII.4/11992339/AUS/2012
2198	VP1	AGV76574	2198	6608	11018, 15428, 19838, 24248, 28658, 33068, 37478	norovirus Hu/GII.4/34506158/AUS/2012

2199	VP1	AGV76575	2199	6609	11019, 15429, 19839, 24249, 28659, 33069, 37479	norovirus Hu/GII.4/34790954/AUS/2013
2200	VP1	AHA44844	2200	6610	11020, 15430, 19840, 24250, 28660, 33070, 37480	norovirus Hu/GII.4/AlbertaEI063/2012/CA
2201	VP1	AHA44847	2201	6611	11021, 15431, 19841, 24251, 28661, 33071, 37481	norovirus Hu/GII.4/AlbertaEI337/2011/CA
2202	VP1	AHB62404	2202	6612	11022, 15432, 19842, 24252, 28662, 33072, 37482	norovirus Hu/GII.4/Jiangsu1/2011/CHN
2203	VP1	AHB62406	2203	6613	11023, 15433, 19843, 24253, 28663, 33073, 37483	norovirus Hu/GII.4/Jiangsu2/2012/CHN
2204	VP1	AID51515	2204	6614	11024, 15434, 19844, 24254, 28664, 33074, 37484	norovirus 12-AS-1/2012/GII.4
2205	VP1	AID51517	2205	6615	11025, 15435, 19845, 24255, 28665, 33075, 37485	norovirus 13-AV-1-6/2012/GII.4
2206	VP1	AID51519	2206	6616	11026, 15436, 19846, 24256, 28666, 33076, 37486	norovirus 13-AV-1-10/2012/GII.4
2207	VP1	AID51522	2207	6617	11027, 15437, 19847, 24257, 28667, 33077, 37487	norovirus 13-BE-4/2012/GII.4
2208	VP1	AID51531	2208	6618	11028, 15438, 19848, 24258, 28668, 33078, 37488	norovirus 12-CG-2-4/2012/GII.4
2209	VP1	AID51534	2209	6619	11029, 15439, 19849, 24259, 28669, 33079, 37489	norovirus 13-Z-2/2012/GII.4
2210	VP1	AIL49840	2210	6620	11030, 15440, 19850, 24260, 28670, 33080, 37490	norovirus JB031230054/Luohu/OB/12/2012/SZ/CHN
2211	VP1	AIL49843	2211	6621	11031, 15441, 19851, 24261, 28671, 33081, 37491	norovirus JB031230049/Nanshan/OB/12/2012/SZ/CHN
2212	VP1	AIV99914	2212	6622	11032, 15442, 19852, 24262, 28672, 33082, 37492	norovirus Hu/GII.4/gg-12-08-04/2012/KR
2213	VP1	AJP13619	2213	6623	11033, 15443, 19853, 24263, 28673, 33083, 37493	norovirus GI.2
2214	VP1	AJP13620	2214	6624	11034, 15444, 19854, 24264, 28674, 33084, 37494	norovirus GI.3
2215	VP1	AJP13621	2215	6625	11035, 15445, 19855, 24265, 28675, 33085, 37495	norovirus GII.3

2216	VP1	AJP13622	2216	6626	11036, 15446, 19856, 24266, 28676, 33086, 37496	norovirus GII.6
2217	VP1	AJP13623	2217	6627	11037, 15447, 19857, 24267, 28677, 33087, 37497	norovirus GII.12
2218	VP1	AJW67354	2218	6628	11038, 15448, 19858, 24268, 28678, 33088, 37498	norovirus Hu/GI.Pb/GI.6/Kaohsiung/14-A-7/2014/TW
2219	VP1	AJW67357	2219	6629	11039, 15449, 19859, 24269, 28679, 33089, 37499	norovirus Hu/GII.P7/GII.6/Hualien/14-AR-1/2014/TW
2220	VP1	AJW67359	2220	6630	11040, 15450, 19860, 24270, 28680, 33090, 37500	norovirus Hu/GII.P7/GII.6/New/Taipei/14-AG-3/2014/TW
2221	VP1	AJW67362	2221	6631	11041, 15451, 19861, 24271, 28681, 33091, 37501	norovirus Hu/GII.P7/GII.6/Kaohsiung/14-Z-2/2014/TW
2222	VP1	AJW67368	2222	6632	11042, 15452, 19862, 24272, 28682, 33092, 37502	norovirus Hu/GII.P22/GII.5/Kaohsiung/12-AV-1/2012/TW
2223	VP1	AJW67371	2223	6633	11043, 15453, 19863, 24273, 28683, 33093, 37503	norovirus Hu/GII.P22/GII.5/Taoyuan/12-BB-4/2012/TW
2224	VP1	AJW67374	2224	6634	11044, 15454, 19864, 24274, 28684, 33094, 37504	norovirus Hu/GII.P16/GII.13/New/Taipei/13-BA-1/2013/TW
2225	VP1	AJW67377	2225	6635	11045, 15455, 19865, 24275, 28685, 33095, 37505	norovirus 14-H-2/2014/GI.P4/GI.4
2226	VP1	AJX18190	2226	6636	11046, 15456, 19866, 24276, 28686, 33096, 37506	norovirus 07-AF-1/2007/GII.P22/GII.5
2227	VP1	AJX18193	2227	6637	11047, 15457, 19867, 24277, 28687, 33097, 37507	norovirus 11-FM-1/2011/GII.P22/GII.5
2228	VP1	AJZ77004	2228	6638	11048, 15458, 19868, 24278, 28688, 33098, 37508	norovirus 06-AM-11/2006/GII.4/Yerseke/2006a
2229	VP1	AJZ77010	2229	6639	11049, 15459, 19869, 24279, 28689, 33099, 37509	norovirus 08-F-2/2008/GII.4/DenHaag/2006b
2230	VP1	AJZ77013	2230	6640	11050, 15460, 19870, 24280, 28690, 33100, 37510	norovirus 08-W-1/2008/GII.4/Apeldoorn/2007
2231	VP1	AJZ77015	2231	6641	11051, 15461, 19871, 24281, 28691, 33101, 37511	norovirus 09-BI-2/2009/GII.4/NewOrleans/2009
2232	VP1	AJZ77019	2232	6642	11052, 15462, 19872, 24282, 28692, 33102, 37512	norovirus 09-N-1/2009/GII.4/DenHaag/2006b

2233	VP1	AJZ77022	2233	6643	11053, 15463, 19873, 24283, 28693, 33103, 37513	norovirus 13-Z-2/2013/GII.Pe/GII.4/Sydney
2234	VP1	AJZ77027	2234	6644	11054, 15464, 19874, 24284, 28694, 33104, 37514	norovirus 12-BA-1/2012/GII.Pe/GII.4/Sydney
2235	VP1	AJZ77030	2235	6645	11055, 15465, 19875, 24285, 28695, 33105, 37515	norovirus 12-CG-2-4/2012/GII.Pe/GII.4/Sydney
2236	VP1	AJZ77033	2236	6646	11056, 15466, 19876, 24286, 28696, 33106, 37516	norovirus 12-AY-1/2012/GII.4/NewOrleans/2009
2237	VP1	AJZ77036	2237	6647	11057, 15467, 19877, 24287, 28697, 33107, 37517	norovirus 12-AY-2/2012/GII.4/NewOrleans/2009
2238	VP1	AKE31849	2238	6648	11058, 15468, 19878, 24288, 28698, 33108, 37518	norovirus Hu/GII.4/PR6876/2010/ITA
2239	VP1	AKE31852	2239	6649	11059, 15469, 19879, 24289, 28699, 33109, 37519	norovirus Hu/GII.4/PR11471/2011/ITA
2240	VP1	AKE31855	2240	6650	11060, 15470, 19880, 24290, 28700, 33110, 37520	norovirus Hu/GII.4/PR7841/2011/ITA
2241	VP1	AKE31858	2241	6651	11061, 15471, 19881, 24291, 28701, 33111, 37521	norovirus Hu/GII.4/PR9474/2011/ITA
2242	VP1	AKE31861	2242	6652	11062, 15472, 19882, 24292, 28702, 33112, 37522	norovirus Hu/GII.4/PR328/2013/ITA
2243	VP1	AKE31864	2243	6653	11063, 15473, 19883, 24293, 28703, 33113, 37523	norovirus Hu/GII.4/PA288/2011/ITA
2244	VP1	AKE31867	2244	6654	11064, 15474, 19884, 24294, 28704, 33114, 37524	norovirus Hu/GII.4/PA278/2011/ITA
2245	VP1	AKE31870	2245	6655	11065, 15475, 19885, 24295, 28705, 33115, 37525	norovirus Hu/GII.4/PA330/2011/ITA
2246	VP1	AKE31873	2246	6656	11066, 15476, 19886, 24296, 28706, 33116, 37526	norovirus Hu/GII.4/PA59/2012/ITA
2247	VP1	AKE31876	2247	6657	11067, 15477, 19887, 24297, 28707, 33117, 37527	norovirus Hu/GII.4/PA99/2012/ITA
2248	VP1	AKF02368	2248	6658	11068, 15478, 19888, 24298, 28708, 33118, 37528	norovirus GII
2249	VP1	AKF42429	2249	6659	11069, 15479, 19889, 24299, 28709, 33119, 37529	norovirus GII

2250	VP1	AKF42434	2250	6660	11070, 15480, 19890, 24300, 28710, 33120, 37530	norovirus GII
2251	VP1	AKF42437	2251	6661	11071, 15481, 19891, 24301, 28711, 33121, 37531	norovirus GII
2252	VP1	ALA27427	2252	6662	11072, 15482, 19892, 24302, 28712, 33122, 37532	norovirus Hu/GII.P4_GII.4/Minerva/2006/USA
2253	VP1	ALD09618	2253	6663	11073, 15483, 19893, 24303, 28713, 33123, 37533	norovirus Hu/GII.P17_GII.17/PR668/2015/ITA
2254	VP1	ALM96644	2254	6664	11074, 15484, 19894, 24304, 28714, 33124, 37534	norovirus Hu/GII.4/SPHC2048/2012/CHN
2255	VP1	ALM96645	2255	6665	11075, 15485, 19895, 24305, 28715, 33125, 37535	norovirus Hu/GII.4/SPHC2715/2012/CHN
2256	VP1	ALM96646	2256	6666	11076, 15486, 19896, 24306, 28716, 33126, 37536	norovirus Hu/GII.4/SPHC1134/2012/CHN
2257	VP1	ALM96647	2257	6667	11077, 15487, 19897, 24307, 28717, 33127, 37537	norovirus Hu/GII.4/SPHC1183/2012/CHN
2258	VP1	ALM98891	2258	6668	11078, 15488, 19898, 24308, 28718, 33128, 37538	norovirus GII
2259	VP1	ALM98892	2259	6669	11079, 15489, 19899, 24309, 28719, 33129, 37539	norovirus GII
2260	VP1	ALM98893	2260	6670	11080, 15490, 19900, 24310, 28720, 33130, 37540	norovirus GII
2261	VP1	ALM98894	2261	6671	11081, 15491, 19901, 24311, 28721, 33131, 37541	norovirus GII
2262	VP1	ALM98895	2262	6672	11082, 15492, 19902, 24312, 28722, 33132, 37542	norovirus GII
2263	VP1	ALM98896	2263	6673	11083, 15493, 19903, 24313, 28723, 33133, 37543	norovirus GII
2264	VP1	ALM98897	2264	6674	11084, 15494, 19904, 24314, 28724, 33134, 37544	norovirus GII
2265	VP1	ALM98899	2265	6675	11085, 15495, 19905, 24315, 28725, 33135, 37545	norovirus GII
2266	VP1	ALM98901	2266	6676	11086, 15496, 19906, 24316, 28726, 33136, 37546	norovirus GII

2267	VP1	ALM98907	2267	6677	11087, 15497, 19907, 24317, 28727, 33137, 37547	norovirus GII
2268	VP1	ALM98910	2268	6678	11088, 15498, 19908, 24318, 28728, 33138, 37548	norovirus GII
2269	VP1	ALM98913	2269	6679	11089, 15499, 19909, 24319, 28729, 33139, 37549	norovirus GII
2270	VP1	ALM98916	2270	6680	11090, 15500, 19910, 24320, 28730, 33140, 37550	norovirus GII
2271	VP1	ALT54478	2271	6681	11091, 15501, 19911, 24321, 28731, 33141, 37551	norovirus Hu/GII.4/AlbertaEI350/2014/CA
2272	VP1	ALT54488	2272	6682	11092, 15502, 19912, 24322, 28732, 33142, 37552	norovirus Hu/GI.7/AlbertaEI404/2012/CA
2273	VP1	ALT54491	2273	6683	11093, 15503, 19913, 24323, 28733, 33143, 37553	norovirus Hu/GII.4/AlbertaSP1/2012/CA
2274	VP1	ALT54494	2274	6684	11094, 15504, 19914, 24324, 28734, 33144, 37554	norovirus Hu/GII.4/AlbertaSP1/2013/CA
2275	VP1	BAM65003	2275	6685	11095, 15505, 19915, 24325, 28735, 33145, 37555	norovirus Hu/GI.7/2009/Miyagi/JP
2276	VP1	BAM65005	2276	6686	11096, 15506, 19916, 24326, 28736, 33146, 37556	norovirus Hu/GII.3/2009/Miyagi/JP
2277	VP1	BAM65007	2277	6687	11097, 15507, 19917, 24327, 28737, 33147, 37557	norovirus Hu/GII.6/2009/Miyagi/JP
2278	VP1	CCX28604	2278	6688	11098, 15508, 19918, 24328, 28738, 33148, 37558	norovirus Hu/GII.4/C00006631/2011/UK
2279	VP1	CCX28607	2279	6689	11099, 15509, 19919, 24329, 28739, 33149, 37559	norovirus Hu/GII.4/C00007876/2011/UK
2280	VP1	CCX28619	2280	6690	11100, 15510, 19920, 24330, 28740, 33150, 37560	norovirus Hu/GII.4/C00007892/2011/UK
2281	VP1	CCX28622	2281	6691	11101, 15511, 19921, 24331, 28741, 33151, 37561	norovirus Hu/GII.4/C00007893/2011/UK
2282	VP1	CCX28625	2282	6692	11102, 15512, 19922, 24332, 28742, 33152, 37562	norovirus Hu/GII.4/C00007904/2011/UK
2283	VP1	CCX28628	2283	6693	11103, 15513, 19923, 24333, 28743, 33153, 37563	norovirus Hu/GII.4/C00007905/2011/UK

2284	VP1	CCX28631	2284	6694	11104, 15514, 19924, 24334, 28744, 33154, 37564	norovirus Hu/GII.4/C00007915/2010/UK
2285	VP1	CCX28634	2285	6695	11105, 15515, 19925, 24335, 28745, 33155, 37565	norovirus Hu/GII.4/C00007916/2011/UK
2286	VP1	CCX28637	2286	6696	11106, 15516, 19926, 24336, 28746, 33156, 37566	norovirus Hu/GII.4/C00007918/2011/UK
2287	VP1	CCX28640	2287	6697	11107, 15517, 19927, 24337, 28747, 33157, 37567	norovirus Hu/GII.4/C00007927/2010/UK
2288	VP1	CCX28643	2288	6698	11108, 15518, 19928, 24338, 28748, 33158, 37568	norovirus Hu/GII.4/C00007928/2011/UK
2289	VP1	CCX28646	2289	6699	11109, 15519, 19929, 24339, 28749, 33159, 37569	norovirus Hu/GII.4/C00007934/2010/UK
2290	VP1	CCX28649	2290	6700	11110, 15520, 19930, 24340, 28750, 33160, 37570	norovirus Hu/GII.4/C00007941/2011/UK
2291	VP1	CCX28652	2291	6701	11111, 15521, 19931, 24341, 28751, 33161, 37571	norovirus Hu/GII.4/C00007952/2011/UK
2292	VP1	AEE10000	2292	6702	11112, 15522, 19932, 24342, 28752, 33162, 37572	murine norovirus GV/NIH-2409/2005/USA
2293	VP1	AEE10012	2293	6703	11113, 15523, 19933, 24343, 28753, 33163, 37573	murine norovirus GV/NIH-2750/2005/USA
2294	VP1	AGJ52172	2294	6704	11114, 15524, 19934, 24344, 28754, 33164, 37574	norovirus Hu/GII.4/Huzhou121/2012/CHN
2295	VP1	AGJ52173	2295	6705	11115, 15525, 19935, 24345, 28755, 33165, 37575	norovirus Hu/GII.4/Huzhou122/2012/CHN
2296	VP1	AGJ52174	2296	6706	11116, 15526, 19936, 24346, 28756, 33166, 37576	norovirus Hu/GII.4/Huzhou128/2012/CHN
2297	VP1	AGJ52176	2297	6707	11117, 15527, 19937, 24347, 28757, 33167, 37577	norovirus Hu/GI/HuzhouN10/2008/CHN
2298	VP1	AD085555	2298	6708	11118, 15528, 19938, 24348, 28758, 33168, 37578	norovirus Hu/GIIg-GIII2/Velence/HUN4417/2010/HUN
2299	VP1	AF084035	2299	6709	11119, 15529, 19939, 24349, 28759, 33169, 37579	murine norovirus
2300	VP1	AFN09918	2300	6710	11120, 15530, 19940, 24350, 28760, 33170, 37580	norovirus Hu/GII-4/CGMH01/2006/TW

2301	VP1	AFN09921	2301	6711	11121, 15531, 19941, 24351, 28761, 33171, 37581	norovirus Hu/GII-4/CGMH02/2006/TW
2302	VP1	AFN09924	2302	6712	11122, 15532, 19942, 24352, 28762, 33172, 37582	norovirus Hu/GII-4/CGMH03/2006/TW
2303	VP1	AFN09927	2303	6713	11123, 15533, 19943, 24353, 28763, 33173, 37583	norovirus Hu/GII-4/CGMH04/2006/TW
2304	VP1	AFN09930	2304	6714	11124, 15534, 19944, 24354, 28764, 33174, 37584	norovirus Hu/GII-4/CGMH05/2006/TW
2305	VP1	AFN09933	2305	6715	11125, 15535, 19945, 24355, 28765, 33175, 37585	norovirus Hu/GII-4/CGMH06/2006/TW
2306	VP1	AFN09936	2306	6716	11126, 15536, 19946, 24356, 28766, 33176, 37586	norovirus Hu/GII-4/CGMH07/2006/TW
2307	VP1	AFN09939	2307	6717	11127, 15537, 19947, 24357, 28767, 33177, 37587	norovirus Hu/GII-4/CGMH08/2006/TW
2308	VP1	AFN09942	2308	6718	11128, 15538, 19948, 24358, 28768, 33178, 37588	norovirus Hu/GII-4/CGMH09/2006/TW
2309	VP1	AFN09945	2309	6719	11129, 15539, 19949, 24359, 28769, 33179, 37589	norovirus Hu/GII-4/CGMH10/2006/TW
2310	VP1	AFN09948	2310	6720	11130, 15540, 19950, 24360, 28770, 33180, 37590	norovirus Hu/GII-4/CGMH11/2006/TW
2311	VP1	AFN09951	2311	6721	11131, 15541, 19951, 24361, 28771, 33181, 37591	norovirus Hu/GII-4/CGMH12/2007/TW
2312	VP1	AFN09954	2312	6722	11132, 15542, 19952, 24362, 28772, 33182, 37592	norovirus Hu/GII-4/CGMH13/2007/TW
2313	VP1	AFN09957	2313	6723	11133, 15543, 19953, 24363, 28773, 33183, 37593	norovirus Hu/GII-4/CGMH14/2007/TW
2314	VP1	AFN09960	2314	6724	11134, 15544, 19954, 24364, 28774, 33184, 37594	norovirus Hu/GII-4/CGMH15/2007/TW
2315	VP1	AFN09963	2315	6725	11135, 15545, 19955, 24365, 28775, 33185, 37595	norovirus Hu/GII-4/CGMH16/2007/TW
2316	VP1	AFN09966	2316	6726	11136, 15546, 19956, 24366, 28776, 33186, 37596	norovirus Hu/GII-4/CGMH17/2007/TW
2317	VP1	AFN09969	2317	6727	11137, 15547, 19957, 24367, 28777, 33187, 37597	norovirus Hu/GII-4/CGMH18/2008/TW

2318	VP1	AFN09972	2318	6728	11138, 15548, 19958, 24368, 28778, 33188, 37598	norovirus Hu/GII-4/CGMH19/2009/TW
2319	VP1	AFN09975	2319	6729	11139, 15549, 19959, 24369, 28779, 33189, 37599	norovirus Hu/GII-4/CGMH20/2009/TW
2320	VP1	AFN09978	2320	6730	11140, 15550, 19960, 24370, 28780, 33190, 37600	norovirus Hu/GII-4/CGMH21/2010/TW
2321	VP1	AFN09981	2321	6731	11141, 15551, 19961, 24371, 28781, 33191, 37601	norovirus Hu/GII-4/CGMH22/2010/TW
2322	VP1	AFN09984	2322	6732	11142, 15552, 19962, 24372, 28782, 33192, 37602	norovirus Hu/GII-4/CGMH23/2010/TW
2323	VP1	AFN09987	2323	6733	11143, 15553, 19963, 24373, 28783, 33193, 37603	norovirus Hu/GII-4/CGMH24/2010/TW
2324	VP1	AFN09990	2324	6734	11144, 15554, 19964, 24374, 28784, 33194, 37604	norovirus Hu/GII-4/CGMH25/2010/TW
2325	VP1	AFN09993	2325	6735	11145, 15555, 19965, 24375, 28785, 33195, 37605	norovirus Hu/GII-4/CGMH26/2010/TW
2326	VP1	AFN09996	2326	6736	11146, 15556, 19966, 24376, 28786, 33196, 37606	norovirus Hu/GII-4/CGMH27/2010/TW
2327	VP1	AFN09999	2327	6737	11147, 15557, 19967, 24377, 28787, 33197, 37607	norovirus Hu/GII-4/CGMH28/2010/TW
2328	VP1	AGC96529	2328	6738	11148, 15558, 19968, 24378, 28788, 33198, 37608	norovirus Hu/GII.4/GZ2010-L26/Guangzhou/CHN/2010
2329	VP1	AGC96532	2329	6739	11149, 15559, 19969, 24379, 28789, 33199, 37609	norovirus Hu/GII.4/GZ2010-L87/Guangzhou/CHN/2011
2330	VP1	AGC96535	2330	6740	11150, 15560, 19970, 24380, 28790, 33200, 37610	norovirus Hu/GII.6/GZ2010-L96/Guangzhou/CHN/2011
2331	VP1	AGS16690	2331	6741	11151, 15561, 19971, 24381, 28791, 33201, 37611	norovirus Hu/GII.4/Guangzhou/GZ2010-L88/CHN/2011
2332	VP1	AGS16693	2332	6742	11152, 15562, 19972, 24382, 28792, 33202, 37612	norovirus Hu/GII.4/Guangzhou/GZ2010-L91/CHN/2011
2333	VP1	ALM98919	2333	6743	11153, 15563, 19973, 24383, 28793, 33203, 37613	norovirus GII
2334	VP1	ALM98922	2334	6744	11154, 15564, 19974, 24384, 28794, 33204, 37614	norovirus GII

2335	VP1	ALM98928	2335	6745	11155, 15565, 19975, 24385, 28795, 33205, 37615	norovirus GII
2336	VP1	ALM98931	2336	6746	11156, 15566, 19976, 24386, 28796, 33206, 37616	norovirus GII
2337	VP1	ALM98934	2337	6747	11157, 15567, 19977, 24387, 28797, 33207, 37617	norovirus GII
2338	VP1	ALM98940	2338	6748	11158, 15568, 19978, 24388, 28798, 33208, 37618	norovirus GII
2339	VP1	ALM98943	2339	6749	11159, 15569, 19979, 24389, 28799, 33209, 37619	norovirus GII
2340	VP1	ABD73936	2340	6750	11160, 15570, 19980, 24390, 28800, 33210, 37620	norovirus Hu/GII/Carlow/2002/Ire
2341	VP1	ABY67257	2341	6751	11161, 15571, 19981, 24391, 28801, 33211, 37621	norovirus Bo/GIII.1/Aba-Z5/2002/HUN
2342	VP1	AHA91656	2342	6752	11162, 15572, 19982, 24392, 28802, 33212, 37622	norovirus GI.9
2343	VP1	BAL60747	2343	6753	11163, 15573, 19983, 24393, 28803, 33213, 37623	norovirus Hu/GII.2/OC05041/2005/JP
2344	VP1	BAL60751	2344	6754	11164, 15574, 19984, 24394, 28804, 33214, 37624	norovirus Hu/GII.2/OC05143/2005/JP
2345	VP1	BAL60763	2345	6755	11165, 15575, 19985, 24395, 28805, 33215, 37625	norovirus Hu/GII.2/OC07107/2007/JP
2346	VP1	BAL60765	2346	6756	11166, 15576, 19986, 24396, 28806, 33216, 37626	norovirus Hu/GII.2/OC08079/2008/JP
2347	VP1	BAL60787	2347	6757	11167, 15577, 19987, 24397, 28807, 33217, 37627	norovirus Hu/GII.2/OC09072/2009/JP
2348	VP1	BAL60789	2348	6758	11168, 15578, 19988, 24398, 28808, 33218, 37628	norovirus Hu/GII.2/OC09094/2009/JP
2349	VP1	BAL60807	2349	6759	11169, 15579, 19989, 24399, 28809, 33219, 37629	norovirus Hu/GII.2/OC10058/2010/JP
2350	VP1	ACL14997	2350	6760	11170, 15580, 19990, 24400, 28810, 33220, 37630	norovirus Hu/GII/2005/6675/Chelyabinsk/RUS
2351	VP1	ACB56490	2351	6761	11171, 15581, 19991, 24401, 28811, 33221, 37631	norovirus Hu/GII-4/Beijing151/2007/China

2352	VP1	ACF77106	2352	6762	11172, 15582, 19992, 24402, 28812, 33222, 37632	norovirus Hu/GII.4/BJ222/2008/CHN
2353	VP1	ACF77107	2353	6763	11173, 15583, 19993, 24403, 28813, 33223, 37633	norovirus Hu/GII.4/BJ225/2008/CHN
2354	VP1	ACU28807	2354	6764	11174, 15584, 19994, 24404, 28814, 33224, 37634	norovirus Hu/GII.4/HK/CU09N7/2009/CHN
2355	VP1	ACU28808	2355	6765	11175, 15585, 19995, 24405, 28815, 33225, 37635	norovirus Hu/GII.4/HK/CU09N8/2009/CHN
2356	VP1	ACV03476	2356	6766	11176, 15586, 19996, 24406, 28816, 33226, 37636	norovirus Hu/GII.4/Tianjin/75/2008/CHN
2357	VP1	ACV03479	2357	6767	11177, 15587, 19997, 24407, 28817, 33227, 37637	norovirus Hu/GII/Tianjin/510/2009/CHN
2358	VP1	AFN70960.1	2358	6768	11178, 39717, 15588, 19998, 24408, 28818, 33228, 37638	norovirus Hu/GII.4/031693/USA/2003
2359	VP1	X81879	2359	6769	11179, 15589, 19999, 24409, 28819, 33229, 37639	human calicivirus strain Melksham
2360	VP1	FJ875027	2360	6770	11180, 15590, 20000, 24410, 28820, 33230, 37640	norovirus dog/GVI.1/Bari/91/2007/ITA
2361	VP1	JF939046	2361	6771	11181, 15591, 20001, 24411, 28821, 33231, 37641	norovirus dog/FD210/2007/Ita
2362	VP1	JF930689	2362	6772	11182, 15592, 20002, 24412, 28822, 33232, 37642	norovirus dog/FD53/2007/Ita
2363	VP1	GQ443611	2363	6773	11183, 15593, 20003, 24413, 28823, 33233, 37643	norovirus dog/C33/Viseu/2007/PRT
2364	VP1	EU224456	2364	6774	11184, 15594, 20004, 24414, 28824, 33234, 37644	norovirus dog/170/07/Ita
2365	VP1	EF450827	2365	6775	11185, 15595, 20005, 24415, 28825, 33235, 37645	norovirus lion/GIV.2/Pistoia/387/06/ITA
2366	VP1	JF781268	2366	6776	11186, 15596, 20006, 24416, 28826, 33236, 37646	norovirus cat/GIV.2/CU081210E/USA/2010
2367	VP1	KT245136	2367	6777	11187, 15597, 20007, 24417, 28827, 33237, 37647	norovirus cat/GVI.2/TE/77-13/ITA
2368	VP1	AJ844470	2368	6778	11188, 15598, 20008, 24418, 28828, 33238, 37648	Norwalk virus Hu/NV/Chiba/040502/2004/JP

2369	VP1	KJ196291	2369	6779	11189, 15599, 20009, 24419, 28829, 33239, 37649	norovirus GII/Hu/JP/2011/GII/Yuzawa/Gira2HS
2370	VP1	KU870455	2370	6780	11190, 15600, 20010, 24420, 28830, 33240, 37650	norovirus GII.6
2371	VP1	AF414408	2371	6781	11191, 15601, 20011, 24421, 28831, 33241, 37651	Norwalk-like virus NLV/Baltimore/274/1993/US
2372	VP1	AB084071	2372	6782	11192, 15602, 20012, 24422, 28832, 33242, 37652	Norwalk-like virus
2373	VP1	AF414407	2373	6783	11193, 15603, 20013, 24423, 28833, 33243, 37653	Norwalk-like virus NLV/Florida/269/1993/US
2374	VP1	AB039777	2374	6784	11194, 15604, 20014, 24424, 28834, 33244, 37654	Norwalk-like virus
2375	VP1	AB078337	2375	6785	11195, 15605, 20015, 24425, 28835, 33245, 37655	Norwalk-like virus
2376	VP1	AB039776	2376	6786	11196, 15606, 20016, 24426, 28836, 33246, 37656	Norwalk-like virus
2377	VP1	KT030674	2377	6787	11197, 15607, 20017, 24427, 28837, 33247, 37657	norovirus GIV.1
2378	VP1	DQ093067	2378	6788	11198, 15608, 20018, 24428, 28838, 33248, 37658	Norwalk virus
2379	VP1	AF195847	2379	6789	11199, 15609, 20019, 24429, 28839, 33249, 37659	human norovirus - Alphatron
2380	VP1	JQ970479	2380	6790	11200, 15610, 20020, 24430, 28840, 33250, 37660	norovirus Hu/GIV.1/Ahrenshoop246/DEU/2012
2381	VP1	FM865412	2381	6791	11201, 15611, 20021, 24431, 28841, 33251, 37661	norovirus Hu/GIV.1/Italy/980/2007/ITA
2382	VP1	AF414426	2382	6792	11202, 15612, 20022, 24432, 28842, 33252, 37662	Norwalk-like virus NLV/Fort Lauderdale/560/1998/US
2383	VP1	AF414427	2383	6793	11203, 15613, 20023, 24433, 28843, 33253, 37663	Norwalk-like virus NLV/Saint Cloud/624/1998/US
2384	VP1	JQ613567	2384	6794	11204, 15614, 20024, 24434, 28844, 33254, 37664	norovirus Hu/GIV.1/LakeMacquarie/NSW2680/2010/AU
2385	VP1	KC894731	2385	6795	11205, 15615, 20025, 24435, 28845, 33255, 37665	norovirus Hu/GIV.1/CCDC GRIII3-59/CHN/2011

2386	VP1	AF427118	2386	6796	11206, 15616, 20026, 24436, 28846, 33256, 37666	human calicivirus NLV/Erfurt/546/00/DE
2387	VP1	AY237415	2387	6797	11207, 15617, 20027, 24437, 28847, 33257, 37667	human calicivirus strain Mc37
2388	VP1	AF504671	2388	6798	11208, 15618, 20028, 24438, 28848, 33258, 37668	Norwalk virus
2389	VP1	KJ194504	2389	6799	11209, 15619, 20029, 24439, 28849, 33259, 37669	norovirus Hu/GII/Amsterdam/1994
2390	VP1	KJ194500	2390	6800	11210, 15620, 20030, 24440, 28850, 33260, 37670	norovirus Hu/GII/Amsterdam/1/1995
2391	VP1	DQ093063	2391	6801	11211, 15621, 20031, 24441, 28851, 33261, 37671	Norwalk virus
2392	VP1	AY030313	2392	6802	11212, 15622, 20032, 24442, 28852, 33262, 37672	human calicivirus Hu/NLV/GII/MD134-10/1987/US
2393	VP1	U02030	2393	6803	11213, 15623, 20033, 24443, 28853, 33263, 37673	minireovirus
2394	VP1	AB039782	2394	6804	11214, 15624, 20034, 24444, 28854, 33264, 37674	Norwalk-like virus
2395	VP1	U46039	2395	6805	11215, 15625, 20035, 24445, 28855, 33265, 37675	small round structured virus
2396	VP1	DQ093066	2396	6806	11216, 15626, 20036, 24446, 28856, 33266, 37676	Norwalk virus
2397	VP1	DQ093062	2397	6807	11217, 15627, 20037, 24447, 28857, 33267, 37677	Norwalk virus
2398	VP1	GU930737	2398	6808	11218, 15628, 20038, 24448, 28858, 33268, 37678	Norwalk-like virus
2399	VP1	AF414412	2399	6809	11219, 15629, 20039, 24449, 28859, 33269, 37679	Norwalk-like virus NLV/New Orleans/279/1994/US
2400	VP1	AB039781	2400	6810	11220, 15630, 20040, 24450, 28860, 33270, 37680	Norwalk-like virus
2401	VP1	LC035073	2401	6811	11221, 15631, 20041, 24451, 28861, 33271, 37681	norovirus Hu/GII/14-2523/Tokyo/2014/JPN
2402	VP1	AF539440	2402	6812	11222, 15632, 20042, 24452, 28862, 33272, 37682	human calicivirus NLV/Oberhausen 455/01/DE

2403	VP1	AF414414	2403	6813	11223, 15633, 20043, 24453, 28863, 33273, 37683	Norwalk-like virus NLV/Towson/313/1994/US
2404	VP1	AB190457	2404	6814	11224, 15634, 20044, 24454, 28864, 33274, 37684	Norwalk virus
2405	VP1	AF425768	2405	6815	11225, 15635, 20045, 24455, 28865, 33275, 37685	human calicivirus NLV/Oberhausen 455/01/DE
2406	VP1	AF414415	2406	6816	11226, 15636, 20046, 24456, 28866, 33276, 37686	Norwalk-like virus NLV/Brattleboro/321/1995/US
2407	VP1	KT779557	2407	6817	11227, 15637, 20047, 24457, 28867, 33277, 37687	norovirus GII
2408	VP1	AY247432	2408	6818	11228, 15638, 20048, 24458, 28868, 33278, 37688	human calicivirus NLV/2004-00/SWE
2409	VP1	AF414411	2409	6819	11229, 15639, 20049, 24459, 28869, 33279, 37689	Norwalk-like virus NLV/Lionville/247/1993/US
2410	VP1	AJ277617	2410	6820	11230, 15640, 20050, 24460, 28870, 33280, 37690	human calicivirus HU/NLV/Rbh/93/UK
2411	VP1	LC036561	2411	6821	11231, 15641, 20051, 24461, 28871, 33281, 37691	norovirus Hu/GII/14-3170/Tokyo/2014/JPN
2412	VP1	KT732274	2412	6822	11232, 15642, 20052, 24462, 28872, 33282, 37692	norovirus GII.3
2413	VP1	AY247439	2413	6823	11233, 15643, 20053, 24463, 28873, 33283, 37693	human calicivirus NLV/1157-01/SWE
2414	VP1	AF539439	2414	6824	11234, 15644, 20054, 24464, 28874, 33284, 37694	human calicivirus NLV/Herzberg 385/01/DE
2415	VP1	AF414413	2415	6825	11235, 15645, 20055, 24465, 28875, 33285, 37695	Norwalk-like virus NLV/Montgomery/312/1994/US
2416	VP1	AF427112	2416	6826	11236, 15646, 20056, 24466, 28876, 33286, 37696	human calicivirus Hu/NLV/Bitburg/289/01/DE
2417	VP1	AF190817	2417	6827	11237, 15647, 20057, 24467, 28877, 33287, 37697	human calicivirus strain Arg320
2418	VP1	LC035072	2418	6828	11238, 15648, 20058, 24468, 28878, 33288, 37698	norovirus Hu/GII/14-2397/Tokyo/2014/JPN
2419	VP1	DQ093064	2419	6829	11239, 15649, 20059, 24469, 28879, 33289, 37699	Norwalk virus

2420	VP1	L23830	2420	6830	11240, 15650, 20060, 24470, 28880, 33290, 37700	Norwalk virus
2421	VP1	KX907728	2421	6831	11241, 15651, 20061, 24471, 28881, 33291, 37701	norovirus Hu/USA/2016/GIV.3/WI7002
2422	VP1	AB039779	2422	6832	11242, 15652, 20062, 24472, 28882, 33292, 37702	Norwalk-like virus
2423	VP1	AB039778	2423	6833	11243, 15653, 20063, 24473, 28883, 33293, 37703	Norwalk-like virus
2424	VP1	KY424345	2424	6834	11244, 15654, 20064, 24474, 28884, 33294, 37704	norovirus GII.6
2425	VP1	HQ169542	2425	6835	11245, 15655, 20065, 24475, 28885, 33295, 37705	norovirus Hu/GII.6/186/2005/USA
2426	VP1	KX228762	2426	6836	11246, 15656, 20066, 24476, 28886, 33296, 37706	norovirus sp.
2427	VP1	AF414410	2427	6837	11247, 15657, 20067, 24477, 28887, 33297, 37707	Norwalk-like virus NLV/Miami/292/1994/US
2428	VP1	KU935739	2428	6838	11248, 15658, 20068, 24478, 28888, 33298, 37708	norovirus GII
2429	VP1	KX268709	2429	6839	11249, 15659, 20069, 24479, 28889, 33299, 37709	norovirus Hu/GII.P7_GII.6/Maryland/2014/USA
2430	VP1	KX158282	2430	6840	11250, 15660, 20070, 24480, 28890, 33300, 37710	norovirus GII
2431	VP1	AB126320	2431	6841	11251, 15661, 20071, 24481, 28891, 33301, 37711	Norwalk-like virus
2432	VP1	AY077644	2432	6842	11252, 15662, 20072, 24482, 28892, 33302, 37712	Norwalk-like virus Sw/NLV/VA34/1998/NL
2433	VP1	AY823306	2433	6843	11253, 15663, 20073, 24483, 28893, 33303, 37713	norovirus swine/GII/OH-QW170/03/US
2434	VP1	KF586508	2434	6844	11254, 15664, 20074, 24484, 28894, 33304, 37714	norovirus GI.9
2435	VP1	HQ637267	2435	6845	11255, 15665, 20075, 24485, 28895, 33305, 37715	norovirus Hu/GI/Vancouver730/2004/CAN
2436	VP1	AY134748	2436	6846	11256, 15666, 20076, 24486, 28896, 33306, 37716	snow mountain virus

2437	VP1	AY054300	2437	6847	11257, 15667, 20077, 24487, 28897, 33307, 37717	human calicivirus NLV/Chesterfield/434/1997/US
2438	VP1	KY485125	2438	6848	11258, 15668, 20078, 24488, 28898, 33308, 37718	norovirus 16F2149_GII.2_Guangdong_CHN_2016
2439	VP1	KY485123	2439	6849	11259, 15669, 20079, 24489, 28899, 33309, 37719	norovirus 16SF2134_GII.2_Guangdong_CHN_2016
2440	VP1	KY485126	2440	6850	11260, 15670, 20080, 24490, 28900, 33310, 37720	norovirus 16F2161_GII.2_Guangdong_CHN_2016
2441	VP1	U70059	2441	6851	11261, 15671, 20081, 24491, 28901, 33311, 37721	snow mountain virus
2442	VP1	LC145808	2442	6852	11262, 15672, 20082, 24492, 28902, 33312, 37722	norovirus Hu/GII.2/Ehime5_2014_JP
2443	VP1	LC145795	2443	6853	11263, 15673, 20083, 24493, 28903, 33313, 37723	norovirus Hu/GII.2/Hiroshimacity1_2012_JP
2444	VP1	AB629941	2444	6854	11264, 15674, 20084, 24494, 28904, 33314, 37724	norovirus Hu/Tokyo/10-14/2010/JPN
2445	VP1	LC145792	2445	6855	11265, 15675, 20085, 24495, 28905, 33315, 37725	norovirus Hu/GII.2/Saitama5_2012_JP
2446	VP1	LC145786	2446	6856	11266, 15676, 20086, 24496, 28906, 33316, 37726	norovirus Hu/GII.2/Akita8_2012_JP
2447	VP1	LC145793	2447	6857	11267, 15677, 20087, 24497, 28907, 33317, 37727	norovirus Hu/GII.2/Osakacity5_2012_JP
2448	VP1	LC145791	2448	6858	11268, 15678, 20088, 24498, 28908, 33318, 37728	norovirus Hu/GII.2/Saitama4_2012_JP
2449	VP1	LC145788	2449	6859	11269, 15679, 20089, 24499, 28909, 33319, 37729	norovirus Hu/GII.2/Niigata5_2012_JP
2450	VP1	LC145803	2450	6860	11270, 15680, 20090, 24500, 28910, 33320, 37730	norovirus Hu/GII.2/Osaka5_2014_JP
2451	VP1	LC145804	2451	6861	11271, 15681, 20091, 24501, 28911, 33321, 37731	norovirus Hu/GII.2/Hiroshima6_2014_JP
2452	VP1	LC145801	2452	6862	11272, 15682, 20092, 24502, 28912, 33322, 37732	norovirus Hu/GII.2/Miyagi2_2014_JP
2453	VP1	LC145802	2453	6863	11273, 15683, 20093, 24503, 28913, 33323, 37733	norovirus Hu/GII.2/Osaka4_2014_JP

2454	VP1	LC145805	2454	6864	11274, 15684, 20094, 24504, 28914, 33324, 37734	norovirus Hu/GII.2/Hiroshimacity5_2014_JP
2455	VP1	LC145797	2455	6865	11275, 15685, 20095, 24505, 28915, 33325, 37735	norovirus Hu/GII.2/Ehime2_2012_JP
2456	VP1	LC145806	2456	6866	11276, 15686, 20096, 24506, 28916, 33326, 37736	norovirus Hu/GII.2/Hiroshimacity6_2014_JP
2457	VP1	KU306738	2457	6867	11277, 15687, 20097, 24507, 28917, 33327, 37737	norovirus GII
2458	VP1	KM036380	2458	6868	11278, 15688, 20098, 24508, 28918, 33328, 37738	norovirus Hu/GII.P16/GII.13/New/Taipei/13-BA-1/2013/TW
2459	VP1	AY113106	2459	6869	11279, 15689, 20099, 24509, 28919, 33329, 37739	Norwalk-like virus
2460	VP1	AB078334	2460	6870	11280, 15690, 20100, 24510, 28920, 33330, 37740	Norwalk-like virus
2461	VP1	KM289172	2461	6871	11281, 15691, 20101, 24511, 28921, 33331, 37741	norovirus Hu/PV_Voelk0018/2013/DEU
2462	VP1	AY130762	2462	6872	11282, 15692, 20102, 24512, 28922, 33332, 37742	human calicivirus NLV/J23/1999/US
2463	VP1	KJ196290	2463	6873	11283, 15693, 20103, 24513, 28923, 33333, 37743	norovirus GII/Hu/JP/2007/GII.P15_GII.15/Sapporo/HK299
2464	VP1	GQ856474	2464	6874	11284, 15694, 20104, 24514, 28924, 33334, 37744	norovirus Hu/GII.4/Beijing/55161/2008/CHN
2465	VP1	LC145787	2465	6875	11285, 15695, 20105, 24515, 28925, 33335, 37745	norovirus Hu/GII.2/Miyagi1_2012_JP
2466	VP1	AB629946	2466	6876	11286, 15696, 20106, 24516, 28926, 33336, 37746	norovirus Hu/Tokyo/10-4320/2011/JPN
2467	VP1	KT962983	2467	6877	11287, 15697, 20107, 24517, 28927, 33337, 37747	norovirus GII.2
2468	VP1	AB083780	2468	6878	11288, 15698, 20108, 24518, 28928, 33338, 37748	Norwalk-like virus
2469	VP1	KX987840	2469	6879	11289, 15699, 20109, 24519, 28929, 33339, 37749	murine norovirus
2470	VP1	KR349276	2470	6880	11290, 15700, 20110, 24520, 28930, 33340, 37750	murine norovirus

2471	VP1	KM102449	2471	6881	11291, 15701, 20111, 24521, 28931, 33341, 37751	murine norovirus GV/WU20/2005/USA
2472	VP1	KC792553	2472	6882	11292, 15702, 20112, 24522, 28932, 33342, 37752	murine norovirus 3
2473	VP1	AB809991	2473	6883	11293, 15703, 20113, 24523, 28933, 33343, 37753	norovirus Hu/GII.13/09N3698/2009/NP
2474	VP1	AB809990	2474	6884	11294, 15704, 20114, 24524, 28934, 33344, 37754	norovirus Hu/GII.13/09N3688/2009/NP
2475	VP1	AB809977	2475	6885	11295, 15705, 20115, 24525, 28935, 33345, 37755	norovirus Hu/GII.13/09N3180/2009/NP
2476	VP1	AB809987	2476	6886	11296, 15706, 20116, 24526, 28936, 33346, 37756	norovirus Hu/GII.13/09N3617/2009/NP
2477	VP1	AJ844469	2477	6887	11297, 15707, 20117, 24527, 28937, 33347, 37757	Norwalk virus Hu/NV/Chiba/030100/2003/JP
2478	VP1	AY675555	2478	6888	11298, 15708, 20118, 24528, 28938, 33348, 37758	norovirus NLV/IF2036/2003/Iraq
2479	VP1	EU085479	2479	6889	11299, 15709, 20119, 24529, 28939, 33349, 37759	norovirus Hu/GII/P1.Confectionary2004/ Gothenburg/Sweden
2480	VP1	AF542090	2480	6890	11300, 15710, 20120, 24530, 28940, 33350, 37760	human calicivirus NLV/Mex7076/1999
2481	VP1	KM386680	2481	6891	11301, 15711, 20121, 24531, 28941, 33351, 37761	norovirus 07-AF-1/2007/GII.P22/GII.5
2482	VP1	AF397156	2482	6892	11302, 15712, 20122, 24532, 28942, 33352, 37762	human calicivirus NLV/MOH/99
2483	VP1	AF414422	2483	6893	11303, 15713, 20123, 24533, 28943, 33353, 37763	Norwalk-like virus NLV/New Orleans/306/1994/US
2484	VP1	AF414423	2484	6894	11304, 15714, 20124, 24534, 28944, 33354, 37764	Norwalk-like virus NLV/White River/290/1994/US
2485	VP1	GQ856476	2485	6895	11305, 15715, 20125, 24535, 28945, 33355, 37765	norovirus Hu/GII.4/Beijing/55171/2008/CHN
2486	VP1	AJ277607	2486	6896	11306, 15716, 20126, 24536, 28946, 33356, 37766	human calicivirus HU/NLV/Hillingdon/90/UK
2487	VP1	AY772730	2487	6897	11307, 15717, 20127, 24537, 28947, 33357, 37767	norovirus Hu/NLV/GII/Neustrelitz260/2000/DE

2488	VP1	KT315718	2488	6898	11308, 15718, 20128, 24538, 28948, 33358, 37768	norovirus Hu/GII.17/CUHK-NS-670/HKG/2015
2489	VP1	KT315708	2489	6899	11309, 15719, 20129, 24539, 28949, 33359, 37769	norovirus Hu/GII.17/CUHK-NS-649/HKG/2015
2490	VP1	KT315697	2490	6900	11310, 15720, 20130, 24540, 28950, 33360, 37770	norovirus Hu/GII.17/CUHK-NS-619/HKG/2015
2491	VP1	KT315689	2491	6901	11311, 15721, 20131, 24541, 28951, 33361, 37771	norovirus Hu/GII.17/CUHK-NS-600/HKG/2015
2492	VP1	KX216805	2492	6902	11312, 15722, 20132, 24542, 28952, 33362, 37772	norovirus GII
2493	VP1	KU557859	2493	6903	11313, 15723, 20133, 24543, 28953, 33363, 37773	norovirus Hu/GII.17/34-0576/GD-DG/2015-03-27
2494	VP1	KU557828	2494	6904	11314, 15724, 20134, 24544, 28954, 33364, 37774	norovirus Hu/GII.17/20-1695/GD-JM/2014-12-25
2495	VP1	KT315692	2495	6905	11315, 15725, 20135, 24545, 28955, 33365, 37775	norovirus Hu/GII.17/CUHK-NS-604/HKG/2015
2496	VP1	KX168437	2496	6906	11316, 15726, 20136, 24546, 28956, 33366, 37776	norovirus GII.17
2497	VP1	KX168440	2497	6907	11317, 15727, 20137, 24547, 28957, 33367, 37777	norovirus GII.17
2498	VP1	KX216793	2498	6908	11318, 15728, 20138, 24548, 28958, 33368, 37778	norovirus GII
2499	VP1	KU557881	2499	6909	11319, 15729, 20139, 24549, 28959, 33369, 37779	norovirus Hu/GII.17/5-0032/GD-ZH/2015-01-10
2500	VP1	KY424350	2500	6910	11320, 15730, 20140, 24550, 28960, 33370, 37780	norovirus GII.17
2501	VP1	KU557884	2501	6911	11321, 15731, 20141, 24551, 28961, 33371, 37781	norovirus Hu/GII.17/52-1819/GD-GZ/2015-11-09
2502	VP1	KU561253	2502	6912	11322, 15732, 20142, 24552, 28962, 33372, 37782	norovirus GII.17
2503	VP1	KP902588	2503	6913	11323, 15733, 20143, 24553, 28963, 33373, 37783	norovirus Hu/GII.17/HKG/2015/CUHK-NS-565
2504	VP1	KX168456	2504	6914	11324, 15734, 20144, 24554, 28964, 33374, 37784	norovirus GII.17

2505	VP1	KX168444	2505	6915	11325, 15735, 20145, 24555, 28965, 33375, 37785	norovirus GII.17
2506	VP1	KX216806	2506	6916	11326, 15736, 20146, 24556, 28966, 33376, 37786	norovirus GII
2507	VP1	KX216794	2507	6917	11327, 15737, 20147, 24557, 28967, 33377, 37787	norovirus GII
2508	VP1	KX420895	2508	6918	11328, 15738, 20148, 24558, 28968, 33378, 37788	norovirus GII.17
2509	VP1	KT591501	2509	6919	11329, 15739, 20149, 24559, 28969, 33379, 37789	norovirus GII/Hu/SI/2015/GII.17/Ljubljana1662
2510	VP1	KT315714	2510	6920	11330, 15740, 20150, 24560, 28970, 33380, 37790	norovirus Hu/GII.17/CUHK-NS-658/HKG/2015
2511	VP1	KT315673	2511	6921	11331, 15741, 20151, 24561, 28971, 33381, 37791	norovirus Hu/GII.17/CUHK-NS-486/HKG/2014
2512	VP1	KX216792	2512	6922	11332, 15742, 20152, 24562, 28972, 33382, 37792	norovirus GII
2513	VP1	KU953398	2513	6923	11333, 15743, 20153, 24563, 28973, 33383, 37793	norovirus GII.17
2514	VP1	KU557888	2514	6924	11334, 15744, 20154, 24564, 28974, 33384, 37794	norovirus Hu/GII.17/7-0057/GD-ZH/2015-01-05
2515	VP1	KU557808	2515	6925	11335, 15745, 20155, 24565, 28975, 33385, 37795	norovirus Hu/GII.17/15-1650/GD-QY/2014-12-18
2516	VP1	KU557807	2516	6926	11336, 15746, 20156, 24566, 28976, 33386, 37796	norovirus Hu/GII.17/15-1649/GD-QY/2014-12-19
2517	VP1	KX371111	2517	6927	11337, 15747, 20157, 24567, 28977, 33387, 37797	norovirus GII.17
2518	VP1	KX371110	2518	6928	11338, 15748, 20158, 24568, 28978, 33388, 37798	norovirus GII.17
2519	VP1	KX134669	2519	6929	11339, 15749, 20159, 24569, 28979, 33389, 37799	norovirus GII.17
2520	VP1	KU557871	2520	6930	11340, 15750, 20160, 24570, 28980, 33390, 37800	norovirus Hu/GII.17/4-0019/GD-HZ/2015-01-09
2521	VP1	KX371108	2521	6931	11341, 15751, 20161, 24571, 28981, 33391, 37801	norovirus GII.17

2522	VP1	KU557829	2522	6932	11342, 15752, 20162, 24572, 28982, 33392, 37802	norovirus Hu/GII.17/20-1711/GD-JM/2014-12-26
2523	VP1	KX168452	2523	6933	11343, 15753, 20163, 24573, 28983, 33393, 37803	norovirus GII.17
2524	VP1	KU953393	2524	6934	11344, 15754, 20164, 24574, 28984, 33394, 37804	norovirus GII.17
2525	VP1	KR052020	2525	6935	11345, 15755, 20165, 24575, 28985, 33395, 37805	norovirus Hu/GII.17/Changhua/15-AH-1/2015/TW
2526	VP1	KT315687	2526	6936	11346, 15756, 20166, 24576, 28986, 33396, 37806	norovirus Hu/GII.17/CUHK-NS-593/HKG/2015
2527	VP1	KX356908	2527	6937	11347, 15757, 20167, 24577, 28987, 33397, 37807	norovirus GII.17
2528	VP1	KX024652	2528	6938	11348, 15758, 20168, 24578, 28988, 33398, 37808	norovirus GII.17
2529	VP1	KT315706	2529	6939	11349, 15759, 20169, 24579, 28989, 33399, 37809	norovirus Hu/GII.17/CUHK-NS-647/HKG/2015
2530	VP1	KX134670	2530	6940	11350, 15760, 20170, 24580, 28990, 33400, 37810	norovirus GII.17
2531	VP1	KT780399	2531	6941	11351, 15761, 20171, 24581, 28991, 33401, 37811	norovirus Hu/GII.17/CUHK-NS-502/HKG/2014
2532	VP1	KP902577	2532	6942	11352, 15762, 20172, 24582, 28992, 33402, 37812	norovirus Hu/GII.17/HKG/2014/CUHK-NS-502
2533	VP1	KU587628	2533	6943	11353, 15763, 20173, 24583, 28993, 33403, 37813	norovirus GII.17
2534	VP1	AF414409	2534	6944	11354, 15764, 20174, 24584, 28994, 33404, 37814	Norwalk-like virus NLV/Gwynedd/273/1994/US
2535	VP1	KT943504	2535	6945	11355, 15765, 20175, 24585, 28995, 33405, 37815	norovirus TF3/USA/2008
2536	VP1	KT943505	2536	6946	11356, 15766, 20176, 24586, 28996, 33406, 37816	norovirus TF4/USA/2008
2537	VP1	KT962982	2537	6947	11357, 15767, 20177, 24587, 28997, 33407, 37817	norovirus GII.21
2538	VP1	KX079488	2538	6948	11358, 15768, 20178, 24588, 28998, 33408, 37818	norovirus GII.21

2539	VP1	KR921938	2539	6949	11359, 15769, 20179, 24589, 28999, 33409, 37819	norovirus Hu/GII.21/CUHK-NS-591/HKG/2015
2540	VP1	KR921940	2540	6950	11360, 15770, 20180, 24590, 29000, 33410, 37820	norovirus Hu/GII.21/CUHK-NS-609/HKG/2015
2541	VP1	DQ358209	2541	6951	11361, 15771, 20181, 24591, 29001, 33411, 37821	synthetic construct
2542	VP1	KP784694	2542	6952	11362, 15772, 20182, 24592, 29002, 33412, 37822	norovirus GII/Hu/ZAF/2012/GII.P4_GII.4/Empangeni/8604
2543	VP1	KX354064	2543	6953	11363, 15773, 20183, 24593, 29003, 33413, 37823	norovirus GII.4
2544	VP1	LC177658	2544	6954	11364, 15774, 20184, 24594, 29004, 33414, 37824	norovirus GII.4
2545	VP1	KX514232	2545	6955	11365, 15775, 20185, 24595, 29005, 33415, 37825	norovirus GII.4
2546	VP1	LC145787	2546	6956	11366, 15776, 20186, 24596, 29006, 33416, 37826	norovirus Hu/GII.2/Miyagi1_2012_JP
2547	VP1	KT962983	2547	6957	11367, 15777, 20187, 24597, 29007, 33417, 37827	norovirus GII.2
2548	VP1	AB629946	2548	6958	11368, 15778, 20188, 24598, 29008, 33418, 37828	norovirus Hu/Tokyo/10-4320/2011/JPN
2549	VP1	AB809993	2549	6959	11369, 15779, 20189, 24599, 29009, 33419, 37829	norovirus Hu/GII.13/09N3751/2009/NP
2550	VP1	JQ743330	2550	6960	11370, 15780, 20190, 24600, 29010, 33420, 37830	norovirus Hu/GI.3/1999
2551	VP1	AF439267	2551	6961	11371, 15781, 20191, 24601, 29011, 33421, 37831	human calicivirus NLV/Potsdam 196/2000/DE
2552	VP1	EF547393	2552	6962	11372, 15782, 20192, 24602, 29012, 33422, 37832	norovirus Hu/Osaka/010314/2001/JP/3634
2553	VP1	AF145709	2553	6963	11373, 15783, 20193, 24603, 29013, 33423, 37833	human calicivirus NLV/Stav/95/Nor
2554	VP1	FJ711163	2554	6964	11374, 15784, 20194, 24604, 29014, 33424, 37834	norovirus Hu/GI.3/JKPG_881/SWE/2007
2555	VP1	FJ711164	2555	6965	11375, 15785, 20195, 24605, 29015, 33425, 37835	norovirus Hu/GI.3/JKPG_883/SWE/2007

2556	VP1	AF414405	2556	6966	11376, 15786, 20196, 24606, 29016, 33426, 37836	Norwalk-like virus NLV/Little Rock/316/1994/US
2557	VP1	AB022679	2557	6967	11377, 15787, 20197, 24607, 29017, 33427, 37837	chiba virus
2558	VP1	AF414403	2558	6968	11378, 15788, 20198, 24608, 29018, 33428, 37838	Norwalk-like virus NLV/Honolulu/219/1992/US
2559	VP1	LC101821	2559	6969	11379, 15789, 20199, 24609, 29019, 33429, 37839	norovirus GI/Hu/Jp/2013/GI.4/s130149
2560	VP1	AY038598	2560	6970	11380, 15790, 20200, 24610, 29020, 33430, 37840	human calicivirus NLV/VA98115/1998
2561	VP1	KJ196292	2561	6971	11381, 15791, 20201, 24611, 29021, 33431, 37841	norovirus GI/Hu/JP/2007/GI.P3_GI.3/Shimizu/KK2866
2562	VP1	JQ743331	2562	6972	11382, 15792, 20202, 24612, 29022, 33432, 37842	norovirus Hu/GI.4/2000
2563	VP1	EF547394	2563	6973	11383, 15793, 20203, 24613, 29023, 33433, 37843	norovirus Hu/Saga/000313/2000/JP/2876
2564	VP1	AF394960	2564	6974	11384, 15794, 20204, 24614, 29024, 33434, 37844	human calicivirus HU/NLV/Koblenz/433/2000/DE
2565	VP1	AJ277616	2565	6975	11385, 15795, 20205, 24615, 29025, 33435, 37845	human calicivirus HU/NLV/Valetta/95/Malta
2566	VP1	GQ413970	2566	6976	11386, 15796, 20206, 24616, 29026, 33436, 37846	norovirus Hu/GI.4/1643/2008/US
2567	VP1	KT732281	2567	6977	11387, 15797, 20207, 24617, 29027, 33437, 37847	norovirus GI.4
2568	VP1	AF414404	2568	6978	11388, 15798, 20208, 24618, 29028, 33438, 37848	Norwalk-like virus NLV/Baltimore/277/1993/US
2569	VP1	AF414402	2569	6979	11389, 15799, 20209, 24619, 29029, 33439, 37849	Norwalk-like virus NLV/New Orleans/266/1993/US
2570	VP1	AJ313030	2570	6980	11390, 15800, 20210, 24620, 29030, 33440, 37850	human calicivirus Hu/NLV/Queen's Arms/Leeds/92/UK
2571	VP1	KM036381	2571	6981	11391, 15801, 20211, 24621, 29031, 33441, 37851	norovirus 14-H-2/2014/GI.P4/GI.4
2572	VP1	LN854563	2572	6982	11392, 15802, 20212, 24622, 29032, 33442, 37852	norovirus GI/Hu/NL/2011/GI.4/Groningen

2573	VP1	AB042808	2573	6983	11393, 15803, 20213, 24623, 29033, 33443, 37853	chiba virus
2574	VP1	EU004679	2574	6984	11394, 15804, 20214, 24624, 29034, 33444, 37854	murine norovirus GV/CR11/2005/USA
2575	VP1	EU004678	2575	6985	11395, 15805, 20215, 24625, 29035, 33445, 37855	murine norovirus GV/CR10/2005/USA
2576	VP1	AB281085	2576	6986	11396, 15806, 20216, 24626, 29036, 33446, 37856	norovirus Hu/GII.2/Zwolle25E/2001/NL
2577	VP1	AB662868	2577	6987	11397, 15807, 20217, 24627, 29037, 33447, 37857	norovirus Hu/GII.2/OH08020/2008/JP
2578	VP1	AB662861	2578	6988	11398, 15808, 20218, 24628, 29038, 33448, 37858	norovirus Hu/GII.2/OC08154/2008/JP
2579	VP1	LC145791	2579	6989	11399, 15809, 20219, 24629, 29039, 33449, 37859	norovirus Hu/GII.2/Saitama4_2012_JP
2580	VP1	LC145790	2580	6990	11400, 15810, 20220, 24630, 29040, 33450, 37860	norovirus Hu/GII.2/Fukui2_2012_JP
2581	VP1	LC145793	2581	6991	11401, 15811, 20221, 24631, 29041, 33451, 37861	norovirus Hu/GII.2/Osakacity5_2012_JP
2582	VP1	LC145792	2582	6992	11402, 15812, 20222, 24632, 29042, 33452, 37862	norovirus Hu/GII.2/Saitama5_2012_JP
2583	VP1	LC145797	2583	6993	11403, 15813, 20223, 24633, 29043, 33453, 37863	norovirus Hu/GII.2/Ehime2_2012_JP
2584	VP1	LC145808	2584	6994	11404, 15814, 20224, 24634, 29044, 33454, 37864	norovirus Hu/GII.2/Ehime5_2014_JP
2585	VP1	LC145801	2585	6995	11405, 15815, 20225, 24635, 29045, 33455, 37865	norovirus Hu/GII.2/Miyagi2_2014_JP
2586	VP1	AB662884	2586	6996	11406, 15816, 20226, 24636, 29046, 33456, 37866	norovirus Hu/GII.2/OH09032/2009/JP
2587	VP1	LC145802	2587	6997	11407, 15817, 20227, 24637, 29047, 33457, 37867	norovirus Hu/GII.2/Osaka4_2014_JP
2588	VP1	AB662897	2588	6998	11408, 15818, 20228, 24638, 29048, 33458, 37868	norovirus Hu/GII.2/OH10021/2010/JP
2589	VP1	AB662899	2589	6999	11409, 15819, 20229, 24639, 29049, 33459, 37869	norovirus Hu/GII.2/OH10025/2010/JP

2590	VP1	AB662894	2590	7000	11410, 15820, 20230, 24640, 29050, 33460, 37870	norovirus Hu/GII.2/OH10013/2010/JP
2591	VP1	LC145803	2591	7001	11411, 15821, 20231, 24641, 29051, 33461, 37871	norovirus Hu/GII.2/Osaka5_2014_JP
2592	VP1	AB662889	2592	7002	11412, 15822, 20232, 24642, 29052, 33462, 37872	norovirus Hu/GII.2/OH10006/2010/JP
2593	VP1	AB662876	2593	7003	11413, 15823, 20233, 24643, 29053, 33463, 37873	norovirus Hu/GII.2/OC10012-2/2010/JP
2594	VP1	KU555841	2594	7004	11414, 15824, 20234, 24644, 29054, 33464, 37874	norovirus Hu/GII.17/CUHK-NS-864/HKG/2016
2595	VP1	GQ856468	2595	7005	11415, 15825, 20235, 24645, 29055, 33465, 37875	norovirus Hu/GII.4/Beijing/55185/2008/CHN
2596	VP1	AB684681	2596	7006	11416, 15826, 20236, 24646, 29056, 33466, 37876	norovirus Hu/GII/27-3/Tokyo/1976/JPN
2597	VP1	AB809988	2597	7007	11417, 15827, 20237, 24647, 29057, 33467, 37877	norovirus Hu/GII.13/09N3645/2009/NP
2598	VP1	AB810011	2598	7008	11418, 15828, 20238, 24648, 29058, 33468, 37878	norovirus Hu/GII.13/10N4489/2010/NP
2599	VP1	AB809994	2599	7009	11419, 15829, 20239, 24649, 29059, 33469, 37879	norovirus Hu/GII.13/09N3758/2009/NP
2600	VP1	KX767083	2600	7010	11420, 15830, 20240, 24650, 29060, 33470, 37880	norovirus Hu/GII.4/Melbourne6623/2016/AUS
2601	VP1	LN854565	2601	7011	11421, 15831, 20241, 24651, 29061, 33471, 37881	norovirus GII/Hu/NL/2012/GII.4/Groningen
2602	VP1	KX354071	2602	7012	11422, 15832, 20242, 24652, 29062, 33472, 37882	norovirus GII.4
2603	VP1	AB933688	2603	7013	11423, 15833, 20243, 24653, 29063, 33473, 37883	norovirus Hu/GII.4/Shimane5/2010/JP
2604	VP1	GQ845337	2604	7014	11424, 15834, 20244, 24654, 29064, 33474, 37884	norovirus Hu/GII.4/NSW536S/2008/AU
2605	VP1	JX155747	2605	7015	11425, 15835, 20245, 24655, 29065, 33475, 37885	norovirus Hu/GII.4/Xi'an/C6/2010/CHN
2606	VP1	JX155737	2606	7016	11426, 15836, 20246, 24656, 29066, 33476, 37886	norovirus Hu/GII.4/Xi'an/P19/2010/CHN

2607	VP1	KX354055	2607	7017	11427, 15837, 20247, 24657, 29067, 33477, 37887	norovirus GII.4
2608	VP1	KX353957	2608	7018	11428, 15838, 20248, 24658, 29068, 33478, 37888	norovirus GII.4
2609	VP1	KF509947	2609	7019	11429, 15839, 20249, 24659, 29069, 33479, 37889	norovirus Hu/GII.4/AlbertaEI337/2011/CA
2610	VP1	AB504326	2610	7020	11430, 15840, 20250, 24660, 29070, 33480, 37890	norovirus Hu/GII.4/Hiroshima/129/2007/JPN
2611	VP1	KX354056	2611	7021	11431, 15841, 20251, 24661, 29071, 33481, 37891	norovirus GII.4
2612	VP1	AB541255	2612	7022	11432, 15842, 20252, 24662, 29072, 33482, 37892	norovirus Hu/GII-4/Hiroshima3/2007/JP
2613	VP1	KP784696	2613	7023	11433, 15843, 20253, 24663, 29073, 33483, 37893	norovirus GII/Hu/ZAF/2012/GII.P4_GII.4/CapeTown/9772
2614	VP1	KX354042	2614	7024	11434, 15844, 20254, 24664, 29074, 33484, 37894	norovirus GII.4
2615	VP1	KX354007	2615	7025	11435, 15845, 20255, 24665, 29075, 33485, 37895	norovirus GII.4
2616	VP1	KT780393	2616	7026	11436, 15846, 20256, 24666, 29076, 33486, 37896	norovirus Hu/GII.4/CUHK-NS-663/HKG/2015
2617	VP1	KX354043	2617	7027	11437, 15847, 20257, 24667, 29077, 33487, 37897	norovirus GII.4
2618	VP1	KX354008	2618	7028	11438, 15848, 20258, 24668, 29078, 33488, 37898	norovirus GII.4
2619	VP1	KR904217	2619	7029	11439, 15849, 20259, 24669, 29079, 33489, 37899	norovirus GII
2620	VP1	KJ685412	2620	7030	11440, 15850, 20260, 24670, 29080, 33490, 37900	norovirus Hu/GII/BGIC0405/2012/BGD
2621	VP1	KF008240	2621	7031	11441, 15851, 20261, 24671, 29081, 33491, 37901	norovirus Hu/GII.4/variant Sydney 2012/FRA
2622	VP1	KX354125	2622	7032	11442, 15852, 20262, 24672, 29082, 33492, 37902	norovirus GII.4
2623	VP1	KX354094	2623	7033	11443, 15853, 20263, 24673, 29083, 33493, 37903	norovirus GII.4

2624	VP1	KX354058	2624	7034	11444, 15854, 20264, 24674, 29084, 33494, 37904	norovirus GII.4
2625	VP1	KX354057	2625	7035	11445, 15855, 20265, 24675, 29085, 33495, 37905	norovirus GII.4
2626	VP1	KX354034	2626	7036	11446, 15856, 20266, 24676, 29086, 33496, 37906	norovirus GII.4
2627	VP1	KX354027	2627	7037	11447, 15857, 20267, 24677, 29087, 33497, 37907	norovirus GII.4
2628	VP1	KX354025	2628	7038	11448, 15858, 20268, 24678, 29088, 33498, 37908	norovirus GII.4
2629	VP1	KJ685406	2629	7039	11449, 15859, 20269, 24679, 29089, 33499, 37909	norovirus Hu/GII/BGIC0391/2012/BGD
2630	VP1	KF008241	2630	7040	11450, 15860, 20270, 24680, 29090, 33500, 37910	norovirus Hu/GII.4/variant Sydney 2012/FRA
2631	VP1	AB504327	2631	7041	11451, 15861, 20271, 24681, 29091, 33501, 37911	norovirus Hu/GII.4/Hiroshima/134/2007/JPN
2632	VP1	KY424329	2632	7042	11452, 15862, 20272, 24682, 29092, 33502, 37912	norovirus GII.4
2633	VP1	KT780389	2633	7043	11453, 15863, 20273, 24683, 29093, 33503, 37913	norovirus Hu/GII.4/CUHK-NS-651/HKG/2015
2634	VP1	KX354134	2634	7044	11454, 15864, 20274, 24684, 29094, 33504, 37914	norovirus GII.4
2635	VP1	KX354126	2635	7045	11455, 15865, 20275, 24685, 29095, 33505, 37915	norovirus GII.4
2636	VP1	KR904237	2636	7046	11456, 15866, 20276, 24686, 29096, 33506, 37916	norovirus GII
2637	VP1	KP241911	2637	7047	11457, 15867, 20277, 24687, 29097, 33507, 37917	norovirus GII.4
2638	VP1	KJ685411	2638	7048	11458, 15868, 20278, 24688, 29098, 33508, 37918	norovirus Hu/GII/BGIC0398/2012/BGD
2639	VP1	KF008242	2639	7049	11459, 15869, 20279, 24689, 29099, 33509, 37919	norovirus Hu/GII.4/variant Sydney 2012/FRA
2640	VP1	KF060112	2640	7050	11460, 15870, 20280, 24690, 29100, 33510, 37920	norovirus Hu/GII.4/NSW8632/2012/AU

2641	VP1	JX126912	2641	7051	11461, 15871, 20281, 24691, 29101, 33511, 37921	norovirus Hu/GII.4/Ohio/71/2012/USA
2642	VP1	KX354143	2642	7052	11462, 15872, 20282, 24692, 29102, 33512, 37922	norovirus GII.4
2643	VP1	KU985164	2643	7053	11463, 15873, 20283, 24693, 29103, 33513, 37923	norovirus GII.4
2644	VP1	KX950760	2644	7054	11464, 15874, 20284, 24694, 29104, 33514, 37924	norovirus Hu/GII.4/CUHK-NS-1064/HKG/2016
2645	VP1	KJ685402	2645	7055	11465, 15875, 20285, 24695, 29105, 33515, 37925	norovirus Hu/GII/BGIC0434/2012/BGD
2646	VP1	KF060140	2646	7056	11466, 15876, 20286, 24696, 29106, 33516, 37926	norovirus Hu/GII.4/NLV-12-672/2012/NZ
2647	VP1	KX354132	2647	7057	11467, 15877, 20287, 24697, 29107, 33517, 37927	norovirus GII.4
2648	VP1	KX354006	2648	7058	11468, 15878, 20288, 24698, 29108, 33518, 37928	norovirus GII.4
2649	VP1	KX354145	2649	7059	11469, 15879, 20289, 24699, 29109, 33519, 37929	norovirus GII.4
2650	VP1	KX354140	2650	7060	11470, 15880, 20290, 24700, 29110, 33520, 37930	norovirus GII.4
2651	VP1	KX354119	2651	7061	11471, 15881, 20291, 24701, 29111, 33521, 37931	norovirus GII.4
2652	VP1	KX354018	2652	7062	11472, 15882, 20292, 24702, 29112, 33522, 37932	norovirus GII.4
2653	VP1	AB972499	2653	7063	11473, 15883, 20293, 24703, 29113, 33523, 37933	norovirus Hu/GII.4/GII4-HK01/2011/JP
2654	VP1	KF060142	2654	7064	11474, 15884, 20294, 24704, 29114, 33524, 37934	norovirus Hu/GII.4/NLV-12-723/2012/NZ
2655	VP1	KF060138	2655	7065	11475, 15885, 20295, 24705, 29115, 33525, 37935	norovirus Hu/GII.4/NLV-12-65/2012/NZ
2656	VP1	KP784697	2656	7066	11476, 15886, 20296, 24706, 29116, 33526, 37936	norovirus GII/Hu/ZAF/2012/GII.P4_GII.4/CapeTown/10105
2657	VP1	KF060111	2657	7067	11477, 15887, 20297, 24707, 29117, 33527, 37937	norovirus Hu/GII.4/NSW862G/2012/AU

2658	VP1	KF060089	2658	7068	11478, 15888, 20298, 24708, 29118, 33528, 37938	norovirus Hu/GII.4/NSW684S/2012/AU
2659	VP1	KP096333	2659	7069	11479, 15889, 20299, 24709, 29119, 33529, 37939	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-383
2660	VP1	KF060153	2660	7070	11480, 15890, 20300, 24710, 29120, 33530, 37940	norovirus Hu/GII.4/NLV-12-934/2012/NZ
2661	VP1	KF060125	2661	7071	11481, 15891, 20301, 24711, 29121, 33531, 37941	norovirus Hu/GII.4/NLV-12-1034/2012/NZ
2662	VP1	KX354135	2662	7072	11482, 15892, 20302, 24712, 29122, 33532, 37942	norovirus GII.4
2663	VP1	KX354045	2663	7073	11483, 15893, 20303, 24713, 29123, 33533, 37943	norovirus GII.4
2664	VP1	LC153121	2664	7074	11484, 15894, 20304, 24714, 29124, 33534, 37944	norovirus GII/Hu/JP/2016/GII.P16_GII.4_Sydney2012/OH16002
2665	VP1	KF668568	2665	7075	11485, 15895, 20305, 24715, 29125, 33535, 37945	norovirus Hu/GII.4/PA48/2012/ITA
2666	VP1	KF668567	2666	7076	11486, 15896, 20306, 24716, 29126, 33536, 37946	norovirus Hu/GII.4/PA363/2011/ITA
2667	VP1	KR904210	2667	7077	11487, 15897, 20307, 24717, 29127, 33537, 37947	norovirus GII
2668	VP1	JX459907	2668	7078	11488, 15898, 20308, 24718, 29128, 33538, 37948	norovirus Hu/GII.4/Woonona/NSW3309/2012/AU
2669	VP1	KF060062	2669	7079	11489, 15899, 20309, 24719, 29129, 33539, 37949	norovirus Hu/GII.4/NSW558V/2012/AU
2670	VP1	KF060080	2670	7080	11490, 15900, 20310, 24720, 29130, 33540, 37950	norovirus Hu/GII.4/NSW628G/2012/AU
2671	VP1	KF378731	2671	7081	11491, 15901, 20311, 24721, 29131, 33541, 37951	norovirus PA13/2013/ITA
2672	VP1	AB933731	2672	7082	11492, 15902, 20312, 24722, 29132, 33542, 37952	norovirus Hu/GII.4/Hokkaidol/2009/JP
2673	VP1	AB933749	2673	7083	11493, 15903, 20313, 24723, 29133, 33543, 37953	norovirus Hu/GII.4/Sakai5/2009/JP
2674	VP1	KC517370	2674	7084	11494, 15904, 20314, 24724, 29134, 33544, 37954	norovirus Hu/GII-4/Taoyuan/CGMH60/2012/TW

2675	VP1	EF547396	2675	7085	11495, 15905, 20315, 24725, 29135, 33545, 37955	norovirus Hu/Akabane/991130/1999/JP/2258
2676	VP1	JN699047	2676	7086	11496, 15906, 20316, 24726, 29136, 33546, 37956	norovirus Hu/GI/E8/UG/1976
2677	VP1	KT781411	2677	7087	11497, 15907, 20317, 24727, 29137, 33547, 37957	norovirus GI.3
2678	VP1	U04469	2678	7088	11498, 15908, 20318, 24728, 29138, 33548, 37958	desert shield virus
2679	VP1	JN699049	2679	7089	11499, 15909, 20319, 24729, 29139, 33549, 37959	norovirus Hu/GI.3/C9/GF/1978
2680	VP1	GQ856473	2680	7090	11500, 15910, 20320, 24730, 29140, 33550, 37960	norovirus Hu/GII.4/Beijing/55042/2007/CHN
2681	VP1	JN699050	2681	7091	11501, 15911, 20321, 24731, 29141, 33551, 37961	norovirus Hu/GI.3/B8/CF/1977
2682	VP1	GQ856472	2682	7092	11502, 15912, 20322, 24732, 29142, 33552, 37962	norovirus Hu/GII.4/Beijing/54660/2007/CHN
2683	VP1	GQ856471	2683	7093	11503, 15913, 20323, 24733, 29143, 33553, 37963	norovirus Hu/GII.4/Beijing/54114/2007/CHN
2684	VP1	JQ911594	2684	7094	11504, 15914, 20324, 24734, 29144, 33554, 37964	norovirus Hu/GI/10360/2010/VNM
2685	VP1	GU296356	2685	7095	11505, 15915, 20325, 24735, 29145, 33555, 37965	norovirus Hu/GI/Lilla Edet/p2/SWE/2008
2686	VP1	KM461693	2686	7096	11506, 15916, 20326, 24736, 29146, 33556, 37966	norovirus II-FJ-3/2011/GII.P7/GII.6
2687	VP1	LC145789	2687	7097	11507, 15917, 20327, 24737, 29147, 33557, 37967	norovirus Hu/GII.2/Fukui1_2012_JP
2688	VP1	KX171417	2688	7098	11508, 15918, 20328, 24738, 29148, 33558, 37968	norovirus GII.17
2689	VP1	KX171412	2689	7099	11509, 15919, 20329, 24739, 29149, 33559, 37969	norovirus GII.17
2690	VP1	KU557839	2690	7100	11510, 15920, 20330, 24740, 29150, 33560, 37970	norovirus Hu/GII.17/2238/GD-JM/2013-08-30
2691	VP1	KP902564	2691	7101	11511, 15921, 20331, 24741, 29151, 33561, 37971	norovirus Hu/GII.17/HKG/2014/CUHK-NS-276

2692	VP1	KU587625	2692	7102	11512, 15922, 20332, 24742, 29152, 33562, 37972	norovirus GII.17
2693	VP1	KX171413	2693	7103	11513, 15923, 20333, 24743, 29153, 33563, 37973	norovirus GII.17
2694	VP1	KP902565	2694	7104	11514, 15924, 20334, 24744, 29154, 33564, 37974	norovirus Hu/GII.17/HKG/2014/CUHK-NS-360
2695	VP1	KX171416	2695	7105	11515, 15925, 20335, 24745, 29155, 33565, 37975	norovirus GII.17
2696	VP1	KU561250	2696	7106	11516, 15926, 20336, 24746, 29156, 33566, 37976	norovirus GII.17
2697	VP1	KU561251	2697	7107	11517, 15927, 20337, 24747, 29157, 33567, 37977	norovirus GII.17
2698	VP1	AB810014	2698	7108	11518, 15928, 20338, 24748, 29158, 33568, 37978	norovirus Hu/GII.13/10N4598/2010/NP
2699	VP1	AB809985	2699	7109	11519, 15929, 20339, 24749, 29159, 33569, 37979	norovirus Hu/GII.13/09N3564/2009/NP
2700	VP1	AB810003	2700	7110	11520, 15930, 20340, 24750, 29160, 33570, 37980	norovirus Hu/GII.13/10N4254/2010/NP
2701	VP1	AB809975	2701	7111	11521, 15931, 20341, 24751, 29161, 33571, 37981	norovirus Hu/GII.13/09N3120/2009/NP
2702	VP1	JX401280	2702	7112	11522, 15932, 20342, 24752, 29162, 33572, 37982	norovirus Hu/GII/KL45/MY/1978
2703	VP1	KC962462	2703	7113	11523, 15933, 20343, 24753, 29163, 33573, 37983	norovirus GII
2704	VP1	KX353974	2704	7114	11524, 15934, 20344, 24754, 29164, 33574, 37984	norovirus GII.4
2705	VP1	KF060122	2705	7115	11525, 15935, 20345, 24755, 29165, 33575, 37985	norovirus Hu/GII.4/NLV-10-603/2010/NZ
2706	VP1	KR904234	2706	7116	11526, 15936, 20346, 24756, 29166, 33576, 37986	norovirus GII
2707	VP1	KR131769	2707	7117	11527, 15937, 20347, 24757, 29167, 33577, 37987	norovirus GII/Hu/IN/2009/GII.Pe_GII.4_ Osaka2007/Pune-092434
2708	VP1	KR131764	2708	7118	11528, 15938, 20348, 24758, 29168, 33578, 37988	norovirus GII/Hu/IN/2007/GII.Pe_GII.4_ Osaka2007/Pune-0713603

2709	VP1	GU390901	2709	7119	11529, 15939, 20349, 24759, 29169, 33579, 37989	norovirus Hu/GII.4/Chungnam(12-107)/2008/Kor
2710	VP1	EU078408	2710	7120	11530, 15940, 20350, 24760, 29170, 33580, 37990	norovirus Hu/Lonaconing/2001/USA
2711	VP1	AB933676	2711	7121	11531, 15941, 20351, 24761, 29171, 33581, 37991	norovirus Hu/GII.4/Niigata2/2010/JP
2712	VP1	KX354082	2712	7122	11532, 15942, 20352, 24762, 29172, 33582, 37992	norovirus GII.4
2713	VP1	KJ407076	2713	7123	11533, 15943, 20353, 24763, 29173, 33583, 37993	norovirus Hu/GII.4/HS66/2001/USA
2714	VP1	JX459636	2714	7124	11534, 15944, 20354, 24764, 29174, 33584, 37994	norovirus Hu/GII.4/SG4067-01/2009/SG
2715	VP1	JX445161	2715	7125	11535, 15945, 20355, 24765, 29175, 33585, 37995	norovirus Hu/GII.4/AlbertaEI210/2008/CA
2716	VP1	EU876888	2716	7126	11536, 15946, 20356, 24766, 29176, 33586, 37996	norovirus Hu/GGII.4/Cairo8/2007/EGY
2717	VP1	EU839584	2717	7127	11537, 15947, 20357, 24767, 29177, 33587, 37997	norovirus Hu/GII/Beijing/221/2005/CHN
2718	VP1	KX354090	2718	7128	11538, 15948, 20358, 24768, 29178, 33588, 37998	norovirus GII.4
2719	VP1	KF060124	2719	7129	11539, 15949, 20359, 24769, 29179, 33589, 37999	norovirus Hu/GII.4/NLV-10-640/2010/NZ
2720	VP1	JX439826	2720	7130	11540, 15950, 20360, 24770, 29180, 33590, 38000	norovirus Hu/GII/Seoul1400/KOR/2010
2721	VP1	JX439815	2721	7131	11541, 15951, 20361, 24771, 29181, 33591, 38001	norovirus Hu/GII/Seoul1055/KOR/2010
2722	VP1	KC576912	2722	7132	11542, 15952, 20362, 24772, 29182, 33592, 38002	norovirus Hu/GII.4/NIHIC4.1/2011/USA
2723	VP1	GQ845368	2723	7133	11543, 15953, 20363, 24773, 29183, 33593, 38003	norovirus Hu/GII.4/Sutherland/NSW505G/2007/AUS
2724	VP1	AB541249	2724	7134	11544, 15954, 20364, 24774, 29184, 33594, 38004	norovirus Hu/GII-4/Fukui5/2007/JP
2725	VP1	EU078412	2725	7135	11545, 15955, 20365, 24775, 29185, 33595, 38005	norovirus Hu/FL04/2004/USA

2726	VP1	AB445395	2726	7136	11546, 15956, 20366, 24776, 29186, 33596, 38006	norovirus Hu/GII.4/Apeldoorn317/2007/NL
2727	VP1	AB933655	2727	7137	11547, 15957, 20367, 24777, 29187, 33597, 38007	norovirus Hu/GII.4/Shimane2/2009/JP
2728	VP1	KM245072	2728	7138	11548, 15958, 20368, 24778, 29188, 33598, 38008	norovirus 08-W-1/2008/GII.4/Apeldoorn/2007
2729	VP1	AB541282	2729	7139	11549, 15959, 20369, 24779, 29189, 33599, 38009	norovirus Hu/GII-4/Miyagi2/2007/JP
2730	VP1	AB541202	2730	7140	11550, 15960, 20370, 24780, 29190, 33600, 38010	norovirus Hu/GII-4/Aichi1/2008/JP
2731	VP1	FJ514242	2731	7141	11551, 15961, 20371, 24781, 29191, 33601, 38011	norovirus Hu/GII-4/CUK-3/2008/KR
2732	VP1	KX353976	2732	7142	11552, 15962, 20372, 24782, 29192, 33602, 38012	norovirus GII.4
2733	VP1	KX353952	2733	7143	11553, 15963, 20373, 24783, 29193, 33603, 38013	norovirus GII.4
2734	VP1	KR131771	2734	7144	11554, 15964, 20374, 24784, 29194, 33604, 38014	norovirus GII/Hu/IN/2008/GII.Pe_GII.4_Osaka2007/Pune-084093
2735	VP1	AB933729	2735	7145	11555, 15965, 20375, 24785, 29195, 33605, 38015	norovirus Hu/GII.4/Fukui5/2009/JP
2736	VP1	AB933646	2736	7146	11556, 15966, 20376, 24786, 29196, 33606, 38016	norovirus Hu/GII.4/Shimane1/2009/JP
2737	VP1	JX155742	2737	7147	11557, 15967, 20377, 24787, 29197, 33607, 38017	norovirus Hu/GII.4/Xi'an/P143/2010/CHN
2738	VP1	JN400614	2738	7148	11558, 15968, 20378, 24788, 29198, 33608, 38018	norovirus Hu/GII-4/CGMH16/2007/TW
2739	VP1	JN400601	2739	7149	11559, 15969, 20379, 24789, 29199, 33609, 38019	norovirus Hu/GII-4/CGMH03/2006/TW
2740	VP1	JQ613538	2740	7150	11560, 15970, 20380, 24790, 29200, 33610, 38020	norovirus Hu/GII.4/NSW452P/2009/AU
2741	VP1	HM802543	2741	7151	11561, 15971, 20381, 24791, 29201, 33611, 38021	norovirus Hu/GII.4/Hong Kong/CUOS0106/2005/CHN
2742	VP1	AB541337	2742	7152	11562, 15972, 20382, 24792, 29202, 33612, 38022	norovirus Hu/GII-4/Saga5/2007/JP

2743	VP1	AB541252	2743	7153	11563, 15973, 20383, 24793, 29203, 33613, 38023	norovirus Hu/GII-4/Hiroshima1/2008/JP
2744	VP1	GU270580	2744	7154	11564, 15974, 20384, 24794, 29204, 33614, 38024	norovirus Hu/GII.4/New Orleans1500/2008/USA
2745	VP1	EU876882	2745	7155	11565, 15975, 20385, 24795, 29205, 33615, 38025	norovirus Hu/GGII.4/Cairo2/2006/EGY
2746	VP1	AB933649	2746	7156	11566, 15976, 20386, 24796, 29206, 33616, 38026	norovirus Hu/GII.4/Hiroshimacity3/2009/JP
2747	VP1	JX439816	2747	7157	11567, 15977, 20387, 24797, 29207, 33617, 38027	norovirus Hu/GII/Seoul1072/KOR/2010
2748	VP1	JX155739	2748	7158	11568, 15978, 20388, 24798, 29208, 33618, 38028	norovirus Hu/GII.4/Xi'an/P49/2010/CHN
2749	VP1	HQ456338	2749	7159	11569, 15979, 20389, 24799, 29209, 33619, 38029	norovirus Hu/GII.4/08-N-1(2008a)/2008/TW
2750	VP1	AB541359	2750	7160	11570, 15980, 20390, 24800, 29210, 33620, 38030	norovirus Hu/GII-4/Toyama4/2007/JP
2751	VP1	AB541280	2751	7161	11571, 15981, 20391, 24801, 29211, 33621, 38031	norovirus Hu/GII-4/Kumamoto4/2007/JP
2752	VP1	AB541244	2752	7162	11572, 15982, 20392, 24802, 29212, 33622, 38032	norovirus Hu/GII-4/Fukui1/2008/JP
2753	VP1	AB541203	2753	7163	11573, 15983, 20393, 24803, 29213, 33623, 38033	norovirus Hu/GII-4/Aichi2/2007/JP
2754	VP1	GQ850882	2754	7164	11574, 15984, 20394, 24804, 29214, 33624, 38034	norovirus Hu/GII.4/Riviera1590/2008/US
2755	VP1	KR131772	2755	7165	11575, 15985, 20395, 24805, 29215, 33625, 38035	norovirus GII/Hu/IN/2008/GII.P4_GII.4_Apeldoorn2007/Pune-086619
2756	VP1	KR904215	2756	7166	11576, 15986, 20396, 24806, 29216, 33626, 38036	norovirus GII
2757	VP1	AB933715	2757	7167	11577, 15987, 20397, 24807, 29217, 33627, 38037	norovirus Hu/GII.4/Iwate4/2011/JP
2758	VP1	AB933695	2758	7168	11578, 15988, 20398, 24808, 29218, 33628, 38038	norovirus Hu/GII.4/Sakai10/2011/JP
2759	VP1	AB933681	2759	7169	11579, 15989, 20399, 24809, 29219, 33629, 38039	norovirus Hu/GII.4/Fukui4/2010/JP

2760	VP1	AB933675	2760	7170	11580, 15990, 20400, 24810, 29220, 33630, 38040	norovirus Hu/GII.4/Hokkaido4/2010/JP
2761	VP1	AB933652	2761	7171	11581, 15991, 20401, 24811, 29221, 33631, 38041	norovirus Hu/GII.4/Iwate2/2009/JP
2762	VP1	KF429762	2762	7172	11582, 15992, 20402, 24812, 29222, 33632, 38042	norovirus Hu/GII.4/NIHIC17.7/2012/USA
2763	VP1	JX644027	2763	7173	11583, 15993, 20403, 24813, 29223, 33633, 38043	norovirus Hu/GII.4/N3/2008/HuZhou
2764	VP1	JN400617	2764	7174	11584, 15994, 20404, 24814, 29224, 33634, 38044	norovirus Hu/GII-4/CGMH19/2009/TW
2765	VP1	JQ613519	2765	7175	11585, 15995, 20405, 24815, 29225, 33635, 38045	norovirus Hu/GII.4/NSW3912/2008/AU
2766	VP1	HQ456341	2766	7176	11586, 15996, 20406, 24816, 29226, 33636, 38046	norovirus Hu/GII.4/08-W-1(2008b)/2008/TW
2767	VP1	HM802540	2767	7177	11587, 15997, 20407, 24817, 29227, 33637, 38047	norovirus Hu/GII.4/Hong Kong/CU050141/2005/CHN
2768	VP1	AB541257	2768	7178	11588, 15998, 20408, 24818, 29228, 33638, 38048	norovirus Hu/GII-4/Hiroshima4/2007/JP
2769	VP1	AB541242	2769	7179	11589, 15999, 20409, 24819, 29229, 33639, 38049	norovirus Hu/GII-4/Ehime4/2008/JP
2770	VP1	AB541225	2770	7180	11590, 16000, 20410, 24820, 29230, 33640, 38050	norovirus Hu/GII-4/Aomori4/2008/JP
2771	VP1	AB541190	2771	7181	11591, 16001, 20411, 24821, 29231, 33641, 38051	norovirus Hu/GII-4/2007a_ORF2-3/JP
2772	VP1	AB492092	2772	7182	11592, 16002, 20412, 24822, 29232, 33642, 38052	norovirus Hu/GII.4/Stockholm/19865/2008/SE
2773	VP1	EU916956	2773	7183	11593, 16003, 20413, 24823, 29233, 33643, 38053	norovirus Hu/Monastir 8655/2007/TUN
2774	VP1	EF126962	2774	7184	11594, 16004, 20414, 24824, 29234, 33644, 38054	norovirus Hu/GII.4/DenHaag54/2006/NL
2775	VP1	AB663687	2775	7185	11595, 16005, 20415, 24825, 29235, 33645, 38055	norovirus Hu/GII.4/Wakayama/T169/2010/JP
2776	VP1	AB933759	2776	7186	11596, 16006, 20416, 24826, 29236, 33646, 38056	norovirus Hu/GII.4/Nagano26/2011/JP

2777	VP1	AB933755	2777	7187	11597, 16007, 20417, 24827, 29237, 33647, 38057	norovirus Hu/GII.4/Saga2/2009/JP
2778	VP1	AB933677	2778	7188	11598, 16008, 20418, 24828, 29238, 33648, 38058	norovirus Hu/GII.4/Niigata3/2010/JP
2779	VP1	AB933650	2779	7189	11599, 16009, 20419, 24829, 29239, 33649, 38059	norovirus Hu/GII.4/Hiroshimacity4/2009/JP
2780	VP1	KM245071	2780	7190	11600, 16010, 20420, 24830, 29240, 33650, 38060	norovirus 08-F-2/2008/GII.4/DenHaag/2006b
2781	VP1	KF712497	2781	7191	11601, 16011, 20421, 24831, 29241, 33651, 38061	norovirus Hu/GII.4/NIHIC27.2/2012/USA
2782	VP1	KC990829	2782	7192	11602, 16012, 20422, 24832, 29242, 33652, 38062	norovirus Hu/GII.4 2006b/092895/2008/USA
2783	VP1	JX439843	2783	7193	11603, 16013, 20423, 24833, 29243, 33653, 38063	norovirus Hu/GII/Seoul1431/KOR/2010
2784	VP1	JX439841	2784	7194	11604, 16014, 20424, 24834, 29244, 33654, 38064	norovirus Hu/GII/Seoul1321/KOR/2010
2785	VP1	JX439830	2785	7195	11605, 16015, 20425, 24835, 29245, 33655, 38065	norovirus Hu/GII/Seoul1049/KOR/2010
2786	VP1	JX439828	2786	7196	11606, 16016, 20426, 24836, 29246, 33656, 38066	norovirus Hu/GII/Seoul1456/KOR/2011
2787	VP1	JX445153	2787	7197	11607, 16017, 20427, 24837, 29247, 33657, 38067	norovirus Hu/GII.4/AlbertaEII42/2006/CA
2788	VP1	JX155754	2788	7198	11608, 16018, 20428, 24838, 29248, 33658, 38068	norovirus Hu/GII.4/Xi'an/C45/2010/CHN
2789	VP1	JN400608	2789	7199	11609, 16019, 20429, 24839, 29249, 33659, 38069	norovirus Hu/GII-4/CGMH10/2006/TW
2790	VP1	EF187497	2790	7200	11610, 16020, 20430, 24840, 29250, 33660, 38070	norovirus Hu/GII.4/Kenepuru/NZ327/2006/NZL
2791	VP1	AB668028	2791	7201	11611, 16021, 20431, 24841, 29251, 33661, 38071	norovirus sewage/GII/Influent/Nov2006/JPN
2792	VP1	HM802542	2792	7202	11612, 16022, 20432, 24842, 29252, 33662, 38072	norovirus Hu/GII.4/Hong Kong/CUOS0140/2005/CHN
2793	VP1	HQ009513	2793	7203	11613, 16023, 20433, 24843, 29253, 33663, 38073	norovirus Hu/GII.4/JB-15/KOR/2008

2794	VP1	AB541322	2794	7204	11614, 16024, 20434, 24844, 29254, 33664, 38074	norovirus Hu/GII-4/Osaka2/2008/JP
2795	VP1	AB541321	2795	7205	11615, 16025, 20435, 24845, 29255, 33665, 38075	norovirus Hu/GII-4/Osaka2/2007/JP
2796	VP1	AB541253	2796	7206	11616, 16026, 20436, 24846, 29256, 33666, 38076	norovirus Hu/GII-4/Hiroshima2/2007/JP
2797	VP1	AB541250	2797	7207	11617, 16027, 20437, 24847, 29257, 33667, 38077	norovirus Hu/GII-4/Fukui5/2008/JP
2798	VP1	AB541211	2798	7208	11618, 16028, 20438, 24848, 29258, 33668, 38078	norovirus Hu/GII-4/Akita1/2007/JP
2799	VP1	GQ246797	2799	7209	11619, 16029, 20439, 24849, 29259, 33669, 38079	norovirus Hu/GII.4/Dijon/E3642/2008/FRA
2800	VP1	GQ246794	2800	7210	11620, 16030, 20440, 24850, 29260, 33670, 38080	norovirus Hu/GII.4/Dijon/E3436/2008/FRA
2801	VP1	EU876884	2801	7211	11621, 16031, 20441, 24851, 29261, 33671, 38081	norovirus Hu/GII.4/Cairo4/2006/EGY
2802	VP1	FJ411170	2802	7212	11622, 16032, 20442, 24852, 29262, 33672, 38082	norovirus Hu/GII.4/Henry/2000/USA
2803	VP1	EU839589	2803	7213	11623, 16033, 20443, 24853, 29263, 33673, 38083	norovirus Hu/GII/Beijing/34/2006/CHN
2804	VP1	KX353961	2804	7214	11624, 16034, 20444, 24854, 29264, 33674, 38084	norovirus GII.4
2805	VP1	AB933757	2805	7215	11625, 16035, 20445, 24855, 29265, 33675, 38085	norovirus Hu/GII.4/Saga4/2009/JP
2806	VP1	KM245074	2806	7216	11626, 16036, 20446, 24856, 29266, 33676, 38086	norovirus 09-N-1/2009/GII.4/DenHaag/2006b
2807	VP1	EU921368	2807	7217	11627, 16037, 20447, 24857, 29267, 33677, 38087	norovirus GII/Hu/IN/2007/GII.P4_GII.4_Hunter2004/Pune-PC31
2808	VP1	EU921338	2808	7218	11628, 16038, 20448, 24858, 29268, 33678, 38088	norovirus GII/Hu/IN/2005/GII.P4_GII.4_Hunter2004/Pune-PC09
2809	VP1	LC005708	2809	7219	11629, 16039, 20449, 24859, 29269, 33679, 38089	norovirus GII/Hu/JP/2008/GII.4/y08-207-2
2810	VP1	LC005704	2810	7220	11630, 16040, 20450, 24860, 29270, 33680, 38090	norovirus GII/Hu/JP/2007/GII.4/y06-V82-2

2811	VP1	KF429777	2811	7221	11631, 16041, 20451, 24861, 29271, 33681, 38091	norovirus Hu/GII.4/NIHIC27.1/2012/USA
2812	VP1	JX439840	2812	7222	11632, 16042, 20452, 24862, 29272, 33682, 38092	norovirus Hu/GII/Seoul1259/KOR/2010
2813	VP1	JX644026	2813	7223	11633, 16043, 20453, 24863, 29273, 33683, 38093	norovirus Hu/GII.4/N2/2008/HuZhou
2814	VP1	JX459906	2814	7224	11634, 16044, 20454, 24864, 29274, 33684, 38094	norovirus Hu/GII.4/Miranda/NSW850K/2011/AU
2815	VP1	JX459597	2815	7225	11635, 16045, 20455, 24865, 29275, 33685, 38095	norovirus Hu/GII.4/SG4033-01/2005/SG
2816	VP1	HQ456334	2816	7226	11636, 16046, 20456, 24866, 29276, 33686, 38096	norovirus Hu/GII.4/08-D-1(2008a)/2008/TW
2817	VP1	HM802553	2817	7227	11637, 16047, 20457, 24867, 29277, 33687, 38097	norovirus Hu/GII.4/Hong Kong/CU051013/2005/CHN
2818	VP1	HQ008055	2818	7228	11638, 16048, 20458, 24868, 29278, 33688, 38098	norovirus Hu/GII.4/8483/2008/ZAF
2819	VP1	AB541360	2819	7229	11639, 16049, 20459, 24869, 29279, 33689, 38099	norovirus Hu/GII-4/Toyama4/2008/JP
2820	VP1	AB541262	2820	7230	11640, 16050, 20460, 24870, 29280, 33690, 38100	norovirus Hu/GII-4/Hokkaido2/2007/JP
2821	VP1	AB541231	2821	7231	11641, 16051, 20461, 24871, 29281, 33691, 38101	norovirus Hu/GII-4/Chiba2/2008/JP
2822	VP1	GQ246792	2822	7232	11642, 16052, 20462, 24872, 29282, 33692, 38102	norovirus Hu/GGII.4/Dijon/E3165/2008/FRA
2823	VP1	AB504329	2823	7233	11643, 16053, 20463, 24873, 29283, 33693, 38103	norovirus Hu/GII.4/Hiroshima/151/2008/JPN
2824	VP1	AB504306	2824	7234	11644, 16054, 20464, 24874, 29284, 33694, 38104	norovirus Hu/GII.4/Hiroshima/19/2001/JPN
2825	VP1	GQ303445	2825	7235	11645, 16055, 20465, 24875, 29285, 33695, 38105	norovirus Hu/Mannheim131/2009/DE
2826	VP1	EU839588	2826	7236	11646, 16056, 20466, 24876, 29286, 33696, 38106	norovirus Hu/GII/Beijing/07/2006/CHN
2827	VP1	DQ364459	2827	7237	11647, 16057, 20467, 24877, 29287, 33697, 38107	norovirus GII

2828	VP1	KY628449	2828	7238	11648, 16058, 20468, 24878, 29288, 33698, 38108	norovirus GII.4
2829	VP1	KX371608	2829	7239	11649, 16059, 20469, 24879, 29289, 33699, 38109	norovirus GII.4
2830	VP1	KX354089	2830	7240	11650, 16060, 20470, 24880, 29290, 33700, 38110	norovirus GII.4
2831	VP1	KX354001	2831	7241	11651, 16061, 20471, 24881, 29291, 33701, 38111	norovirus GII.4
2832	VP1	KX353971	2832	7242	11652, 16062, 20472, 24882, 29292, 33702, 38112	norovirus GII.4
2833	VP1	KR131766	2833	7243	11653, 16063, 20473, 24883, 29293, 33703, 38113	norovirus GII/Hu/IN/2008/GII.Pe_GII.4_Osaka2007/Pune-084097
2834	VP1	AB663685	2834	7244	11654, 16064, 20474, 24884, 29294, 33704, 38114	norovirus Hu/GII.4/Wakayama/T162/2010/JP
2835	VP1	AB933746	2835	7245	11655, 16065, 20475, 24885, 29295, 33705, 38115	norovirus Hu/GII.4/Osaka1/2009/JP
2836	VP1	AB933701	2836	7246	11656, 16066, 20476, 24886, 29296, 33706, 38116	norovirus Hu/GII.4/Akita3/2011/JP
2837	VP1	AB933686	2837	7247	11657, 16067, 20477, 24887, 29297, 33707, 38117	norovirus Hu/GII.4/Ehime5/2010/JP
2838	VP1	AB933680	2838	7248	11658, 16068, 20478, 24888, 29298, 33708, 38118	norovirus Hu/GII.4/Fukui3/2010/JP
2839	VP1	AB933672	2839	7249	11659, 16069, 20479, 24889, 29299, 33709, 38119	norovirus Hu/GII.4/Hiroshima4/2010/JP
2840	VP1	AB933664	2840	7250	11660, 16070, 20480, 24890, 29300, 33710, 38120	norovirus Hu/GII.4/Nagano1/2010/JP
2841	VP1	AB933662	2841	7251	11661, 16071, 20481, 24891, 29301, 33711, 38121	norovirus Hu/GII.4/Chiba3/2010/JP
2842	VP1	AB933656	2842	7252	11662, 16072, 20482, 24892, 29302, 33712, 38122	norovirus Hu/GII.4/Miyazaki1/2009/JP
2843	VP1	EU921340	2843	7253	11663, 16073, 20483, 24893, 29303, 33713, 38123	norovirus GII/Hu/IN/2006/GII.P4_GII.4_Yerseke2006a/Pune-PC11
2844	VP1	KC962453	2844	7254	11664, 16074, 20484, 24894, 29304, 33714, 38124	norovirus GII

2845	VP1	KF712501	2845	7255	11665, 16075, 20485, 24895, 29305, 33715, 38125	norovirus Hu/GII.4/NIHIC17.6/2012/USA
2846	VP1	JX459903	2846	7256	11666, 16076, 20486, 24896, 29306, 33716, 38126	norovirus Hu/GII.4/Jannali/NSW774M/2011/AU
2847	VP1	JX459629	2847	7257	11667, 16077, 20487, 24897, 29307, 33717, 38127	norovirus Hu/GII.4/SG4069-01/2008/SG
2848	VP1	JX445165	2848	7258	11668, 16078, 20488, 24898, 29308, 33718, 38128	norovirus Hu/GII.4/AlbertaE1119/2010/CA
2849	VP1	HM635156	2849	7259	11669, 16079, 20489, 24899, 29309, 33719, 38129	norovirus Hu/GII.4/Seoul/0945/2009/KOR
2850	VP1	JQ622197	2850	7260	11670, 16080, 20490, 24900, 29310, 33720, 38130	norovirus Hu/GII-4/CBNU2/2007/KR
2851	VP1	JQ613520	2851	7261	11671, 16081, 20491, 24901, 29311, 33721, 38131	norovirus Hu/GII.4/NSW0416/2008/AU
2852	VP1	HQ456320	2852	7262	11672, 16082, 20492, 24902, 29312, 33722, 38132	norovirus Hu/GII.4/04R-2/2004/TW
2853	VP1	AB541353	2853	7263	11673, 16083, 20493, 24903, 29313, 33723, 38133	norovirus Hu/GII-4/Shimane5/2008/JP
2854	VP1	AB541348	2854	7264	11674, 16084, 20494, 24904, 29314, 33724, 38134	norovirus Hu/GII-4/Shimane2/2008/JP
2855	VP1	AB541339	2855	7265	11675, 16085, 20495, 24905, 29315, 33725, 38135	norovirus Hu/GII-4/Sakai1/2007/JP
2856	VP1	AB541303	2856	7266	11676, 16086, 20496, 24906, 29316, 33726, 38136	norovirus Hu/GII-4/Nagano2/2007/JP
2857	VP1	GQ246799	2857	7267	11677, 16087, 20497, 24907, 29317, 33727, 38137	norovirus Hu/GGII.4/Dijon/E3808/2009/FRA
2858	VP1	EU876886	2858	7268	11678, 16088, 20498, 24908, 29318, 33728, 38138	norovirus Hu/GGII.4/Cairo6/2006/EGY
2859	VP1	AB385630	2859	7269	11679, 16089, 20499, 24909, 29319, 33729, 38139	norovirus Hu/GII.4/RotterdamP300/2006/NL
2860	VP1	KU182483	2860	7270	11680, 16090, 20500, 24910, 29320, 33730, 38140	norovirus GII.4
2861	VP1	AB665364	2861	7271	11681, 16091, 20501, 24911, 29321, 33731, 38141	norovirus Hu/GII.4/Osaka/NV2210/2007/JP

2862	VP1	AB663686	2862	7272	11682, 16092, 20502, 24912, 29322, 33732, 38142	norovirus Hu/GII.4/Wakayama/T164/2010/JP
2863	VP1	AB933702	2863	7273	11683, 16093, 20503, 24913, 29323, 33733, 38143	norovirus Hu/GII.4/Osaka3/2011/JP
2864	VP1	AB933685	2864	7274	11684, 16094, 20504, 24914, 29324, 33734, 38144	norovirus Hu/GII.4/Ehime3/2010/JP
2865	VP1	AB933645	2865	7275	11685, 16095, 20505, 24915, 29325, 33735, 38145	norovirus Hu/GII.4/Toyama4/2009/JP
2866	VP1	LC005706	2866	7276	11686, 16096, 20506, 24916, 29326, 33736, 38146	norovirus GII/Hu/JP/2008/GII.4/y07-V179-1
2867	VP1	KM198562	2867	7277	11687, 16097, 20507, 24917, 29327, 33737, 38147	norovirus Hu/GII/C2H-55/2011/VNM
2868	VP1	KC409311	2868	7278	11688, 16098, 20508, 24918, 29328, 33738, 38148	norovirus Hu/GII/30199/2009/VNM
2869	VP1	KC409263	2869	7279	11689, 16099, 20509, 24919, 29329, 33739, 38149	norovirus Hu/GII/20173/2009/VNM
2870	VP1	JX459900	2870	7280	11690, 16100, 20510, 24920, 29330, 33740, 38150	norovirus Hu/GII.4/Randwick/NSW882J/2011/AU
2871	VP1	JX459617	2871	7281	11691, 16101, 20511, 24921, 29331, 33741, 38151	norovirus Hu/GII.4/SG4047-01/2007/SG
2872	VP1	GQ845366	2872	7282	11692, 16102, 20512, 24922, 29332, 33742, 38152	norovirus Hu/GII.4/Westmead/NSW3639/2008/AUS
2873	VP1	GQ845345	2873	7283	11693, 16103, 20513, 24923, 29333, 33743, 38153	norovirus Hu/GII.4/NSW806J/2008/AU
2874	VP1	GQ845341	2874	7284	11694, 16104, 20514, 24924, 29334, 33744, 38154	norovirus Hu/GII.4/NSW587V/2007/AU
2875	VP1	HQ005292	2875	7285	11695, 16105, 20515, 24925, 29335, 33745, 38155	norovirus Hu/II.4/2221223/HK/2009
2876	VP1	HQ456321	2876	7286	11696, 16106, 20516, 24926, 29336, 33746, 38156	norovirus Hu/GII.4/05R-2/2005/TW
2877	VP1	AB541326	2877	7287	11697, 16107, 20517, 24927, 29337, 33747, 38157	norovirus Hu/GII-4/Osaka4/2008/JP
2878	VP1	AB541251	2878	7288	11698, 16108, 20518, 24928, 29338, 33748, 38158	norovirus Hu/GII-4/Hiroshima1/2007/JP

2879	VP1	AB541241	2879	7289	11699, 16109, 20519, 24929, 29339, 33749, 38159	norovirus Hu/GII-4/Ehime4/2007/JP
2880	VP1	AB541216	2880	7290	11700, 16110, 20520, 24930, 29340, 33750, 38160	norovirus Hu/GII-4/Akita4/2008/JP
2881	VP1	EU876885	2881	7291	11701, 16111, 20521, 24931, 29341, 33751, 38161	norovirus Hu/GGII.4/Cairo5/2006/EGY
2882	VP1	AB447435	2882	7292	11702, 16112, 20522, 24932, 29342, 33752, 38162	norovirus Hu/GII-4/Aomori5/2006/JP
2883	VP1	KX354073	2883	7293	11703, 16113, 20523, 24933, 29343, 33753, 38163	norovirus GII.4
2884	VP1	KX353981	2884	7294	11704, 16114, 20524, 24934, 29344, 33754, 38164	norovirus GII.4
2885	VP1	KU182479	2885	7295	11705, 16115, 20525, 24935, 29345, 33755, 38165	norovirus GII.4
2886	VP1	KU182478	2886	7296	11706, 16116, 20526, 24936, 29346, 33756, 38166	norovirus GII.4
2887	VP1	AB972501	2887	7297	11707, 16117, 20527, 24937, 29347, 33757, 38167	norovirus Hu/GII.4/GII4-HK03/2011/JP
2888	VP1	KR904214	2888	7298	11708, 16118, 20528, 24938, 29348, 33758, 38168	norovirus GII
2889	VP1	AB933758	2889	7299	11709, 16119, 20529, 24939, 29349, 33759, 38169	norovirus Hu/GII.4/Chiba6/2011/JP
2890	VP1	AB933698	2890	7300	11710, 16120, 20530, 24940, 29350, 33760, 38170	norovirus Hu/GII.4/Hiroshimacity2/2011/JP
2891	VP1	KJ678141	2891	7301	11711, 16121, 20531, 24941, 29351, 33761, 38171	norovirus Hu/GII.4/Beijing/PKUPH-02-08/inpatient/2013/CHN
2892	VP1	EU921347	2892	7302	11712, 16122, 20532, 24942, 29352, 33762, 38172	norovirus GII/Hu/IN/2006/GII.P4_GII.4_Yerseke2006a/Pune-PC18
2893	VP1	JX459628	2893	7303	11713, 16123, 20533, 24943, 29353, 33763, 38173	norovirus Hu/GII.4/SG4063-10/2007/SG
2894	VP1	JQ613564	2894	7304	11714, 16124, 20534, 24944, 29354, 33764, 38174	norovirus Hu/GII.4/NSW944J/2010/AU
2895	VP1	GQ845332	2895	7305	11715, 16125, 20535, 24945, 29355, 33765, 38175	norovirus Hu/GII.4/NSW618P/2008/AU

2896	VP1	GQ856461	2896	7306	11716, 16126, 20536, 24946, 29356, 33766, 38176	norovirus Hu/GII.4/Beijing/54667/2007/CHN
2897	VP1	AB541245	2897	7307	11717, 16127, 20537, 24947, 29357, 33767, 38177	norovirus Hu/GII-4/Fukui2/2007/JP
2898	VP1	AB541229	2898	7308	11718, 16128, 20538, 24948, 29358, 33768, 38178	norovirus Hu/GII-4/Chiba1/2008/JP
2899	VP1	AB541226	2899	7309	11719, 16129, 20539, 24949, 29359, 33769, 38179	norovirus Hu/GII-4/Aomori5/2007/JP
2900	VP1	DQ078814	2900	7310	11720, 16130, 20540, 24950, 29360, 33770, 38180	norovirus Hu/GII.4/Hunter5040/040/AU
2901	VP1	EU078416	2901	7311	11721, 16131, 20541, 24951, 29361, 33771, 38181	norovirus Hu/Billings/2006/USA
2902	VP1	EU839590	2902	7312	11722, 16132, 20542, 24952, 29362, 33772, 38182	norovirus Hu/GII/Beijing/116/2007/CHN
2903	VP1	AB294783	2903	7313	11723, 16133, 20543, 24953, 29363, 33773, 38183	norovirus Hu/GII-4/Katori/041008/2004/JP
2904	VP1	AB303941	2904	7314	11724, 16134, 20544, 24954, 29364, 33774, 38184	norovirus Hu/GGII.4/Nijmegen083/2004/NL
2905	VP1	EF126961	2905	7315	11725, 16135, 20545, 24955, 29365, 33775, 38185	norovirus Hu/GII.4/Dongen46/2006/NL
2906	VP1	LC153749	2906	7316	11726, 16136, 20546, 24956, 29366, 33776, 38186	norovirus Hu/GII.4/Tokyo-TCN/2010/JP
2907	VP1	KX371610	2907	7317	11727, 16137, 20547, 24957, 29367, 33777, 38187	norovirus GII.4
2908	VP1	KX354031	2908	7318	11728, 16138, 20548, 24958, 29368, 33778, 38188	norovirus GII.4
2909	VP1	KX353990	2909	7319	11729, 16139, 20549, 24959, 29369, 33779, 38189	norovirus GII.4
2910	VP1	KX353972	2910	7320	11730, 16140, 20550, 24960, 29370, 33780, 38190	norovirus GII.4
2911	VP1	KX353968	2911	7321	11731, 16141, 20551, 24961, 29371, 33781, 38191	norovirus GII.4
2912	VP1	KX353967	2912	7322	11732, 16142, 20552, 24962, 29372, 33782, 38192	norovirus GII.4

2913	VP1	KX353966	2913	7323	11733, 16143, 20553, 24963, 29373, 33783, 38193	norovirus GII.4
2914	VP1	AB663684	2914	7324	11734, 16144, 20554, 24964, 29374, 33784, 38194	norovirus Hu/GII.4/Wakayama/T158/2010/JP
2915	VP1	KR904209	2915	7325	11735, 16145, 20555, 24965, 29375, 33785, 38195	norovirus GII
2916	VP1	AB933716	2916	7326	11736, 16146, 20556, 24966, 29376, 33786, 38196	norovirus Hu/GII.4/Iwate5/2011/JP
2917	VP1	AB933666	2917	7327	11737, 16147, 20557, 24967, 29377, 33787, 38197	norovirus Hu/GII.4/Osaka2/2010/JP
2918	VP1	EU921349	2918	7328	11738, 16148, 20558, 24968, 29378, 33788, 38198	norovirus GII/Hu/IN/2006/GII.P4_GII.4_ Yerseke2006a/Pune-PC20
2919	VP1	EU921348	2919	7329	11739, 16149, 20559, 24969, 29379, 33789, 38199	norovirus GII/Hu/IN/2006/GII.P4_GII.4_ Yerseke2006a/Pune-PC19
2920	VP1	EU921345	2920	7330	11740, 16150, 20560, 24970, 29380, 33790, 38200	norovirus GII/Hu/IN/2006/GII.P4_GII.4_ Yerseke2006a/Pune-PC16
2921	VP1	KP698924	2921	7331	11741, 16151, 20561, 24971, 29381, 33791, 38201	norovirus GII.4
2922	VP1	LC005707	2922	7332	11742, 16152, 20562, 24972, 29382, 33792, 38202	norovirus GII/Hu/JP/2008/GII.4/y07-V203-1
2923	VP1	KJ541743	2923	7333	11743, 16153, 20563, 24973, 29383, 33793, 38203	norovirus Hu/GII.4/SGU-110421/KOR/2011
2924	VP1	KF177443	2924	7334	11744, 16154, 20564, 24974, 29384, 33794, 38204	norovirus Hu/GII.4/35857786/AUS/2012
2925	VP1	JX439842	2925	7335	11745, 16155, 20565, 24975, 29385, 33795, 38205	norovirus Hu/GII/Seoul1351/KOR/2010
2926	VP1	HF952135	2926	7336	11746, 16156, 20566, 24976, 29386, 33796, 38206	norovirus Hu/GII.4/C00007952/2011/UK
2927	VP1	JX459598	2927	7337	11747, 16157, 20567, 24977, 29387, 33797, 38207	norovirus Hu/GII.4/SG4039-02/2005/SG
2928	VP1	JX445162	2928	7338	11748, 16158, 20568, 24978, 29388, 33798, 38208	norovirus Hu/GII.4/AlbertaEI425/2008/CA
2929	VP1	JX445154	2929	7339	11749, 16159, 20569, 24979, 29389, 33799, 38209	norovirus Hu/GII.4/AlbertaEI190/2006/CA

2930	VP1	JX155752	2930	7340	11750, 16160, 20570, 24980, 29390, 33800, 38210	norovirus Hu/GII.4/Xi'an/C31/2010/CHN
2931	VP1	HM748971	2931	7341	11751, 16161, 20571, 24981, 29391, 33801, 38211	norovirus Hu/GII.4/Beecroft/NSW305P/2009/AUS
2932	VP1	GQ845367	2932	7342	11752, 16162, 20572, 24982, 29392, 33802, 38212	norovirus Hu/GII.4/Orange/NSW001P/2008/AU
2933	VP1	GQ856455	2933	7343	11753, 16163, 20573, 24983, 29393, 33803, 38213	norovirus Hu/GII.4/Beijing/55058/2007/CHN
2934	VP1	GQ856447	2934	7344	11754, 16164, 20574, 24984, 29394, 33804, 38214	norovirus Hu/GII.4/Beijing/54091/2007/CHN
2935	VP1	AB541318	2935	7345	11755, 16165, 20575, 24985, 29395, 33805, 38215	norovirus Hu/GII-4/Niigata5/2008/JP
2936	VP1	AB541307	2936	7346	11756, 16166, 20576, 24986, 29396, 33806, 38216	norovirus Hu/GII-4/Nagano4/2008/JP
2937	VP1	AB541254	2937	7347	11757, 16167, 20577, 24987, 29397, 33807, 38217	norovirus Hu/GII-4/Hiroshima2/2008/JP
2938	VP1	AB541243	2938	7348	11758, 16168, 20578, 24988, 29398, 33808, 38218	norovirus Hu/GII-4/Ehime5/2008/JP
2939	VP1	AB541232	2939	7349	11759, 16169, 20579, 24989, 29399, 33809, 38219	norovirus Hu/GII-4/Chiba4/2007/JP
2940	VP1	GQ246800	2940	7350	11760, 16170, 20580, 24990, 29400, 33810, 38220	norovirus Hu/GGII.4/Dijon/E3880/2009/FRA
2941	VP1	GU390900	2941	7351	11761, 16171, 20581, 24991, 29401, 33811, 38221	norovirus Hu/GII.4/Chungnam(II-94)/2008/Kor
2942	VP1	AB504328	2942	7352	11762, 16172, 20582, 24992, 29402, 33812, 38222	norovirus Hu/GII.4/Hiroshima/139/2007/JPN
2943	VP1	AB447434	2943	7353	11763, 16173, 20583, 24993, 29403, 33813, 38223	norovirus Hu/GII-4/Aomori4/2006/JP
2944	VP1	EU839591	2944	7354	11764, 16174, 20584, 24994, 29404, 33814, 38224	norovirus Hu/GII/Beijing/125/2007/CHN
2945	VP1	AB291542	2945	7355	11765, 16175, 20585, 24995, 29405, 33815, 38225	norovirus Hu/GII.4/Kobe034/2006/JP
2946	VP1	KX354123	2946	7356	11766, 16176, 20586, 24996, 29406, 33816, 38226	norovirus GII.4

2947	VP1	KX354050	2947	7357	11767, 16177, 20587, 24997, 29407, 33817, 38227	norovirus GII.4
2948	VP1	AB933717	2948	7358	11768, 16178, 20588, 24998, 29408, 33818, 38228	norovirus Hu/GII.4/Toyama5/2011/JP
2949	VP1	AB933707	2949	7359	11769, 16179, 20589, 24999, 29409, 33819, 38229	norovirus Hu/GII.4/Saga2/2011/JP
2950	VP1	AB933705	2950	7360	11770, 16180, 20590, 25000, 29410, 33820, 38230	norovirus Hu/GII.4/Ehime2/2011/JP
2951	VP1	AB933704	2951	7361	11771, 16181, 20591, 25001, 29411, 33821, 38231	norovirus Hu/GII.4/Ehime1/2011/JP
2952	VP1	AB933699	2952	7362	11772, 16182, 20592, 25002, 29412, 33822, 38232	norovirus Hu/GII.4/Akita2/2011/JP
2953	VP1	AB933679	2953	7363	11773, 16183, 20593, 25003, 29413, 33823, 38233	norovirus Hu/GII.4/Fukui2/2010/JP
2954	VP1	AB933661	2954	7364	11774, 16184, 20594, 25004, 29414, 33824, 38234	norovirus Hu/GII.4/Chibal/2010/JP
2955	VP1	KT152148	2955	7365	11775, 16185, 20595, 25005, 29415, 33825, 38235	norovirus Hu/GII.P4_GII.4/Minerva/2006/USA
2956	VP1	EU921393	2956	7366	11776, 16186, 20596, 25006, 29416, 33826, 38236	norovirus GII/Hu/IN/2007/GII.P4_GII.4_ DenHaag2006b/Pune-PC56
2957	VP1	KM396961	2957	7367	11777, 16187, 20597, 25007, 29417, 33827, 38237	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-339
2958	VP1	KM198485	2958	7368	11778, 16188, 20598, 25008, 29418, 33828, 38238	norovirus Hu/GII/10148/2009/VNM
2959	VP1	KF306214	2959	7369	11779, 16189, 20599, 25009, 29419, 33829, 38239	norovirus Hu/GII.4/Jingzhou/2013403/CHN
2960	VP1	JX439831	2960	7370	11780, 16190, 20600, 25010, 29420, 33830, 38240	norovirus Hu/GII/SeoulII21/KOR/2010
2961	VP1	KC409281	2961	7371	11781, 16191, 20601, 25011, 29421, 33831, 38241	norovirus Hu/GII/20229/2009/VNM
2962	VP1	JX459639	2962	7372	11782, 16192, 20602, 25012, 29422, 33832, 38242	norovirus Hu/GII.4/SG4028-07/2009/SG
2963	VP1	JX459609	2963	7373	11783, 16193, 20603, 25013, 29423, 33833, 38243	norovirus Hu/GII.4/SG4015-10/2006/SG

2964	VP1	JN400599	2964	7374	11784, 16194, 20604, 25014, 29424, 33834, 38244	norovirus Hu/GII-4/CGMH01/2006/TW
2965	VP1	JQ613539	2965	7375	11785, 16195, 20605, 25015, 29425, 33835, 38245	norovirus Hu/GII.4/NSW447T/2009/AU
2966	VP1	HQ456329	2966	7376	11786, 16196, 20606, 25016, 29426, 33836, 38246	norovirus Hu/GII.4/07-B-1/2006/TW
2967	VP1	HM802536	2967	7377	11787, 16197, 20607, 25017, 29427, 33837, 38247	norovirus Hu/GII.4/Hong Kong/CU060039/2006/CHN
2968	VP1	HM802532	2968	7378	11788, 16198, 20608, 25018, 29428, 33838, 38248	norovirus Hu/GII.4/Hong Kong/CU060030/2006/CHN
2969	VP1	AB541341	2969	7379	11789, 16199, 20609, 25019, 29429, 33839, 38249	norovirus Hu/GII-4/Sakai2/2007/JP
2970	VP1	AB541264	2970	7380	11790, 16200, 20610, 25020, 29430, 33840, 38250	norovirus Hu/GII-4/Hokkaido3/2008/JP
2971	VP1	AB541236	2971	7381	11791, 16201, 20611, 25021, 29431, 33841, 38251	norovirus Hu/GII-4/Ehime1/2007/JP
2972	VP1	AB541208	2972	7382	11792, 16202, 20612, 25022, 29432, 33842, 38252	norovirus Hu/GII-4/Aichi4/2008/JP
2973	VP1	EU876890	2973	7383	11793, 16203, 20613, 25023, 29433, 33843, 38253	norovirus Hu/GGII.4/Dijon-E1057/2002/FRA
2974	VP1	AB385638	2974	7384	11794, 16204, 20614, 25024, 29434, 33844, 38254	norovirus Hu/GII.4/RotterdamP6D33/2006/NL
2975	VP1	AB385635	2975	7385	11795, 16205, 20615, 25025, 29435, 33845, 38255	norovirus Hu/GII.4/RotterdamP5D36/2005/NL
2976	VP1	EU366113	2976	7386	11796, 16206, 20616, 25026, 29436, 33846, 38256	norovirus Hu/Duan/Beijing/2006/China
2977	VP1	KX354097	2977	7387	11797, 16207, 20617, 25027, 29437, 33847, 38257	norovirus GII.4
2978	VP1	AB933727	2978	7388	11798, 16208, 20618, 25028, 29438, 33848, 38258	norovirus Hu/GII.4/Chiba10/2011/JP
2979	VP1	AB933726	2979	7389	11799, 16209, 20619, 25029, 29439, 33849, 38259	norovirus Hu/GII.4/Ehime4/2011/JP
2980	VP1	AB933720	2980	7390	11800, 16210, 20620, 25030, 29440, 33850, 38260	norovirus Hu/GII.4/Hiroshima2/2011/JP

2981	VP1	AB933691	2981	7391	11801, 16211, 20621, 25031, 29441, 33851, 38261	norovirus Hu/GII.4/Miyazaki5/2010/JP
2982	VP1	AB933682	2982	7392	11802, 16212, 20622, 25032, 29442, 33852, 38262	norovirus Hu/GII.4/Nagano3/2010/JP
2983	VP1	KM245069	2983	7393	11803, 16213, 20623, 25033, 29443, 33853, 38263	norovirus 06-AM-11/2006/GII.4/Yerseke/2006a
2984	VP1	LC005717	2984	7394	11804, 16214, 20624, 25034, 29444, 33854, 38264	norovirus GII/Hu/JP/2012/GII.4/y11-V689-2
2985	VP1	LC005705	2985	7395	11805, 16215, 20625, 25035, 29445, 33855, 38265	norovirus GII/Hu/JP/2007/GII.4/y06-V110-5
2986	VP1	KC894943	2986	7396	11806, 16216, 20626, 25036, 29446, 33856, 38266	norovirus Hu/GII.4/Guangzhou/GZ2010-L91/CHN/2011
2987	VP1	KF060023	2987	7397	11807, 16217, 20627, 25037, 29447, 33857, 38267	norovirus Hu/GII.4/NSW2586/2012/AU
2988	VP1	KC409310	2988	7398	11808, 16218, 20628, 25038, 29448, 33858, 38268	norovirus Hu/GII/30129/2009/VNM
2989	VP1	JX989073	2989	7399	11809, 16219, 20629, 25039, 29449, 33859, 38269	norovirus Hu/GII.4/GZ2010-L26/Guangzhou/CHN/2010
2990	VP1	JX459902	2990	7400	11810, 16220, 20630, 25040, 29450, 33860, 38270	norovirus Hu/GII.4/Berowra/NSW767L/2012/AU
2991	VP1	JX459644	2991	7401	11811, 16221, 20631, 25041, 29451, 33861, 38271	norovirus Hu/GII.4/SG4046-09/2009/SG
2992	VP1	JX459610	2992	7402	11812, 16222, 20632, 25042, 29452, 33862, 38272	norovirus Hu/GII.4/SG4030-12/2006/SG
2993	VP1	JX459606	2993	7403	11813, 16223, 20633, 25043, 29453, 33863, 38273	norovirus Hu/GII.4/SG4060-10/2006/SG
2994	VP1	JX445159	2994	7404	11814, 16224, 20634, 25044, 29454, 33864, 38274	norovirus Hu/GII.4/AlbertaE1009/2008/CA
2995	VP1	JN400606	2995	7405	11815, 16225, 20635, 25045, 29455, 33865, 38275	norovirus Hu/GII-4/CGMH08/2006/TW
2996	VP1	JQ613562	2996	7406	11816, 16226, 20636, 25046, 29456, 33866, 38276	norovirus Hu/GII.4/NSW827D/2010/AU
2997	VP1	HQ456343	2997	7407	11817, 16227, 20637, 25047, 29457, 33867, 38277	norovirus Hu/GII.4/09-L-4(2009a)/2009/TW

2998	VP1	HQ456342	2998	7408	11818, 16228, 20638, 25048, 29458, 33868, 38278	norovirus Hu/GII.4/08-AA(2008b)/2008/TW
2999	VP1	HQ456340	2999	7409	11819, 16229, 20639, 25049, 29459, 33869, 38279	norovirus Hu/GII.4/08-U-2(2008a)/2008/TW
3000	VP1	HQ456326	3000	7410	11820, 16230, 20640, 25050, 29460, 33870, 38280	norovirus Hu/GII.4/06-CJ-1/2006/TW
3001	VP1	HM802527	3001	7411	11821, 16231, 20641, 25051, 29461, 33871, 38281	norovirus Hu/GII.4/Hong Kong/CU060012/2006/CHN
3002	VP1	GQ856448	3002	7412	11822, 16232, 20642, 25052, 29462, 33872, 38282	norovirus Hu/GII.4/Beijing/54116/2007/CHN
3003	VP1	AB541347	3003	7413	11823, 16233, 20643, 25053, 29463, 33873, 38283	norovirus Hu/GII-4/Shimane2/2007/JP
3004	VP1	AB541298	3004	7414	11824, 16234, 20644, 25054, 29464, 33874, 38284	norovirus Hu/GII-4/Miyazaki7/2008/JP
3005	VP1	AB541270	3005	7415	11825, 16235, 20645, 25055, 29465, 33875, 38285	norovirus Hu/GII-4/Iwate2/2007/JP
3006	VP1	AB541263	3006	7416	11826, 16236, 20646, 25056, 29466, 33876, 38286	norovirus Hu/GII-4/Hokkaido2/2008/JP
3007	VP1	AB541256	3007	7417	11827, 16237, 20647, 25057, 29467, 33877, 38287	norovirus Hu/GII-4/Hiroshima3/2008/JP
3008	VP1	AB541240	3008	7418	11828, 16238, 20648, 25058, 29468, 33878, 38288	norovirus Hu/GII-4/Ehime3/2008/JP
3009	VP1	AB541233	3009	7419	11829, 16239, 20649, 25059, 29469, 33879, 38289	norovirus Hu/GII-4/Chiba4/2008/JP
3010	VP1	AB541215	3010	7420	11830, 16240, 20650, 25060, 29470, 33880, 38290	norovirus Hu/GII-4/Akita3/2008/JP
3011	VP1	AB541201	3011	7421	11831, 16241, 20651, 25061, 29471, 33881, 38291	norovirus Hu/GII-4/Aichi1/2007/JP
3012	VP1	FJ411172	3012	7422	11832, 16242, 20652, 25062, 29472, 33882, 38292	norovirus Hu/GII.4/RIS/2006/USA
3013	VP1	AB447449	3013	7423	11833, 16243, 20653, 25063, 29473, 33883, 38293	norovirus Hu/GII-4/Sakai3/2006/JP
3014	VP1	AB447431	3014	7424	11834, 16244, 20654, 25064, 29474, 33884, 38294	norovirus Hu/GII-4/Hokkaido5/2006/JP

3015	VP1	EU078415	3015	7425	11835, 16245, 20655, 25065, 29475, 33885, 38295	norovirus Hu/Ryndam/2005/USA
3016	VP1	AB385643	3016	7426	11836, 16246, 20656, 25066, 29476, 33886, 38296	norovirus Hu/GII.4/RotterdamP8065/2006/NL
3017	VP1	AB385636	3017	7427	11837, 16247, 20657, 25067, 29477, 33887, 38297	norovirus Hu/GII.4/RotterdamP5051/2005/NL
3018	VP1	AB385629	3018	7428	11838, 16248, 20658, 25068, 29478, 33888, 38298	norovirus Hu/GII.4/RotterdamP20182/2005/NL
3019	VP1	EU839586	3019	7429	11839, 16249, 20659, 25069, 29479, 33889, 38299	norovirus Hu/GII/Beijing/484/2005/CHN
3020	VP1	EU310927	3020	7430	11840, 16250, 20660, 25070, 29480, 33890, 38300	norovirus Hu/Houston/TCH186/2002/US
3021	VP1	AB294787	3021	7431	11841, 16251, 20661, 25071, 29481, 33891, 38301	norovirus Hu/GII-4/Ichikawa/050701/2005/JP
3022	VP1	AY587987	3022	7432	11842, 16252, 20662, 25072, 29482, 33892, 38302	norovirus Hu/NLV/Oxford/B4S7/2002/UK
3023	VP1	AY502019	3023	7433	11843, 16253, 20663, 25073, 29483, 33893, 38303	norovirus GII
3024	VP1	LC177653	3024	7434	11844, 16254, 20664, 25074, 29484, 33894, 38304	norovirus GII.4
3025	VP1	AB972486	3025	7435	11845, 16255, 20665, 25075, 29485, 33895, 38305	norovirus Hu/GII.4/OsakaCity4/2012/JP
3026	VP1	KR904235	3026	7436	11846, 16256, 20666, 25076, 29486, 33896, 38306	norovirus GII
3027	VP1	AB933753	3027	7437	11847, 16257, 20667, 25077, 29487, 33897, 38307	norovirus Hu/GII.4/Ehime4/2009/JP
3028	VP1	AB933721	3028	7438	11848, 16258, 20668, 25078, 29488, 33898, 38308	norovirus Hu/GII.4/Hiroshima4/2011/JP
3029	VP1	AB933706	3029	7439	11849, 16259, 20669, 25079, 29489, 33899, 38309	norovirus Hu/GII.4/Sagal/2011/JP
3030	VP1	AB933669	3030	7440	11850, 16260, 20670, 25080, 29490, 33900, 38310	norovirus Hu/GII.4/Sakai1/2010/JP
3031	VP1	EU921350	3031	7441	11851, 16261, 20671, 25081, 29491, 33901, 38311	norovirus GII/Hu/IN/2006/GII.P4_GII.4_Yerseke2006a/Pune-PC21

3032	VP1	LC005712	3032	7442	11852, 16262, 20672, 25082, 29492, 33902, 38312	norovirus GII/Hu/JP/2010/GII.4/y09-205-1
3033	VP1	LC018707	3033	7443	11853, 16263, 20673, 25083, 29493, 33903, 38313	norovirus Hu/GII.4/AichiNishio7-14/2014
3034	VP1	KM982955	3034	7444	11854, 16264, 20674, 25084, 29494, 33904, 38314	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-369
3035	VP1	KM982949	3035	7445	11855, 16265, 20675, 25085, 29495, 33905, 38315	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-361
3036	VP1	KM406485	3036	7446	11856, 16266, 20676, 25086, 29496, 33906, 38316	norovirus Hu/GII.4/variant Sydney 2012/FRA
3037	VP1	KM198574	3037	7447	11857, 16267, 20677, 25087, 29497, 33907, 38317	norovirus Hu/GII/10183/2009/VNM
3038	VP1	KM198517	3038	7448	11858, 16268, 20678, 25088, 29498, 33908, 38318	norovirus Hu/GII/30399/2010/VNM
3039	VP1	JX439839	3039	7449	11859, 16269, 20679, 25089, 29499, 33909, 38319	norovirus Hu/GII/Seoul1211/KOR/2010
3040	VP1	JX439837	3040	7450	11860, 16270, 20680, 25090, 29500, 33910, 38320	norovirus Hu/GII/Seoul1032/KOR/2010
3041	VP1	KC631815	3041	7451	11861, 16271, 20681, 25091, 29501, 33911, 38321	norovirus Hu/GII.4/MI002/2011/USA
3042	VP1	KC409315	3042	7452	11862, 16272, 20682, 25092, 29502, 33912, 38322	norovirus Hu/GII/30211/2009/VNM
3043	VP1	KC409289	3043	7453	11863, 16273, 20683, 25093, 29503, 33913, 38323	norovirus Hu/GII/20302/2009/VNM
3044	VP1	KC409278	3044	7454	11864, 16274, 20684, 25094, 29504, 33914, 38324	norovirus Hu/GII/20208/2009/VNM
3045	VP1	KC175402	3045	7455	11865, 16275, 20685, 25095, 29505, 33915, 38325	norovirus Hu/Norwalk/20094/2009/VNM
3046	VP1	JX459616	3046	7456	11866, 16276, 20686, 25096, 29506, 33916, 38326	norovirus Hu/GII.4/SG4041-01/2007/SG
3047	VP1	JX459599	3047	7457	11867, 16277, 20687, 25097, 29507, 33917, 38327	norovirus Hu/GII.4/SG4091-06/2006/SG
3048	VP1	JN400603	3048	7458	11868, 16278, 20688, 25098, 29508, 33918, 38328	norovirus Hu/GII-4/CGMH05/2006/TW

3049	VP1	JQ613572	3049	7459	11869, 16279, 20689, 25099, 29509, 33919, 38329	norovirus Hu/GII.4/StVincents/NSW2171/2010/AU
3050	VP1	JQ613525	3050	7460	11870, 16280, 20690, 25100, 29510, 33920, 38330	norovirus Hu/GII.4/NSW8190/2009/AU
3051	VP1	JQ613510	3051	7461	11871, 16281, 20691, 25101, 29511, 33921, 38331	norovirus Hu/GII.4/NSW833M/2007/AU
3052	VP1	GQ856450	3052	7462	11872, 16282, 20692, 25102, 29512, 33922, 38332	norovirus Hu/GII.4/Beijing/54135/2007/CHN
3053	VP1	AB541296	3053	7463	11873, 16283, 20693, 25103, 29513, 33923, 38333	norovirus Hu/GII-4/Miyazaki5/2007/JP
3054	VP1	AB541212	3054	7464	11874, 16284, 20694, 25104, 29514, 33924, 38334	norovirus Hu/GII-4/Akita1/2008/JP
3055	VP1	AB504321	3055	7465	11875, 16285, 20695, 25105, 29515, 33925, 38335	norovirus Hu/GII.4/Hiroshima/92/2006/JPN
3056	VP1	AB294785	3056	7466	11876, 16286, 20696, 25106, 29516, 33926, 38336	norovirus Hu/GII-4/Inba/050590/2005/JP
3057	VP1	AB294780	3057	7467	11877, 16287, 20697, 25107, 29517, 33927, 38337	norovirus Hu/GII-4/Chiba/040095/2003/JP
3058	VP1	AB303933	3058	7468	11878, 16288, 20698, 25108, 29518, 33928, 38338	norovirus Hu/GGII.4/Haarlem457/2003/NL
3059	VP1	AY587988	3059	7469	11879, 16289, 20699, 25109, 29519, 33929, 38339	norovirus Hu/NLV/Oxford/B4S1/2002/UK
3060	VP1	KX354103	3060	7470	11880, 16290, 20700, 25110, 29520, 33930, 38340	norovirus GII.4
3061	VP1	KX354048	3061	7471	11881, 16291, 20701, 25111, 29521, 33931, 38341	norovirus GII.4
3062	VP1	KX354047	3062	7472	11882, 16292, 20702, 25112, 29522, 33932, 38342	norovirus GII.4
3063	VP1	KU985161	3063	7473	11883, 16293, 20703, 25113, 29523, 33933, 38343	norovirus GII.4
3064	VP1	AB972517	3064	7474	11884, 16294, 20704, 25114, 29524, 33934, 38344	norovirus Hu/GII.4/Aichi3/2012/JP
3065	VP1	AB972494	3065	7475	11885, 16295, 20705, 25115, 29525, 33935, 38345	norovirus Hu/GII.4/Hiroshima4/2012/JP

3066	VP1	KU311163	3066	7476	11886, 16296, 20706, 25116, 29526, 33936, 38346	norovirus Hu/GII.4/AlbertaSP1/2013/CA
3067	VP1	KR904236	3067	7477	11887, 16297, 20707, 25117, 29527, 33937, 38347	norovirus GII
3068	VP1	KR904225	3068	7478	11888, 16298, 20708, 25118, 29528, 33938, 38348	norovirus GII
3069	VP1	LC005710	3069	7479	11889, 16299, 20709, 25119, 29529, 33939, 38349	norovirus GII/Hu/JP/2009/GII.4/y08-238-2
3070	VP1	LC018709	3070	7480	11890, 16300, 20710, 25120, 29530, 33940, 38350	norovirus Hu/GII.4/Aichi352-14/2014
3071	VP1	KM198587	3071	7481	11891, 16301, 20711, 25121, 29531, 33941, 38351	norovirus Hu/GII/20153/2009/VNM
3072	VP1	KM198560	3072	7482	11892, 16302, 20712, 25122, 29532, 33942, 38352	norovirus Hu/GII/C2H-50/2011/VNM
3073	VP1	KM198521	3073	7483	11893, 16303, 20713, 25123, 29533, 33943, 38353	norovirus Hu/GII/10176/2009/VNM
3074	VP1	KM198490	3074	7484	11894, 16304, 20714, 25124, 29534, 33944, 38354	norovirus Hu/GII/10002/2009/VNM
3075	VP1	KC409241	3075	7485	11895, 16305, 20715, 25125, 29535, 33945, 38355	norovirus Hu/GII/10405/2010/VNM
3076	VP1	JX459625	3076	7486	11896, 16306, 20716, 25126, 29536, 33946, 38356	norovirus Hu/GII.4/SG4086-09/2007/SG
3077	VP1	JX459613	3077	7487	11897, 16307, 20717, 25127, 29537, 33947, 38357	norovirus Hu/GII.4/SG4077-12/2006/SG
3078	VP1	JX459600	3078	7488	11898, 16308, 20718, 25128, 29538, 33948, 38358	norovirus Hu/GII.4/SG4099-08/2006/SG
3079	VP1	JX459596	3079	7489	11899, 16309, 20719, 25129, 29539, 33949, 38359	norovirus Hu/GII.4/SG4016-09/2004/SG
3080	VP1	JX155749	3080	7490	11900, 16310, 20720, 25130, 29540, 33950, 38360	norovirus Hu/GII.4/Xi'an/C15/2010/CHN
3081	VP1	JQ613511	3081	7491	11901, 16311, 20721, 25131, 29541, 33951, 38361	norovirus Hu/GII.4/WA223N/2007/AU
3082	VP1	HM802547	3082	7492	11902, 16312, 20722, 25132, 29542, 33952, 38362	norovirus Hu/GII.4/Hong Kong/CU041225/2004/CHN

3083	VP1	HM802544	3083	7493	11903, 16313, 20723, 25133, 29543, 33953, 38363	norovirus Hu/GII.4/Hong Kong/CU051146/2005/CHN
3084	VP1	GQ856456	3084	7494	11904, 16314, 20724, 25134, 29544, 33954, 38364	norovirus Hu/GII.4/Beijing/55065/2007/CHN
3085	VP1	AB541332	3085	7495	11905, 16315, 20725, 25135, 29545, 33955, 38365	norovirus Hu/GII-4/Saga2/2007/JP
3086	VP1	AB541316	3086	7496	11906, 16316, 20726, 25136, 29546, 33956, 38366	norovirus Hu/GII-4/Niigata4/2008/JP
3087	VP1	AB541238	3087	7497	11907, 16317, 20727, 25137, 29547, 33957, 38367	norovirus Hu/GII-4/Ehime2/2007/JP
3088	VP1	AB535750	3088	7498	11908, 16318, 20728, 25138, 29548, 33958, 38368	norovirus Hu/GII.4/OC090053/2009/JPN
3089	VP1	FJ538900	3089	7499	11909, 16319, 20729, 25139, 29549, 33959, 38369	norovirus Hu/GII.4/Dijon/E872/2002/FRA
3090	VP1	EU876889	3090	7500	11910, 16320, 20730, 25140, 29550, 33960, 38370	norovirus Hu/GGII.4/Cairo9/2007/EGY
3091	VP1	EU876887	3091	7501	11911, 16321, 20731, 25141, 29551, 33961, 38371	norovirus Hu/GGII.4/Cairo7/2007/EGY
3092	VP1	FJ411171	3092	7502	11912, 16322, 20732, 25142, 29552, 33962, 38372	norovirus Hu/GII.4/SSCS/2005/USA
3093	VP1	AB447460	3093	7503	11913, 16323, 20733, 25143, 29553, 33963, 38373	norovirus Hu/GII-4/Kumamoto2/2006/JP
3094	VP1	AB447454	3094	7504	11914, 16324, 20734, 25144, 29554, 33964, 38374	norovirus Hu/GII-4/Ehime2/2006/JP
3095	VP1	AB447443	3095	7505	11915, 16325, 20735, 25145, 29555, 33965, 38375	norovirus Hu/GII-4/Toyama1/2006/JP
3096	VP1	AB447430	3096	7506	11916, 16326, 20736, 25146, 29556, 33966, 38376	norovirus Hu/GII-4/Hokkaido4/2006/JP
3097	VP1	EU078420	3097	7507	11917, 16327, 20737, 25147, 29557, 33967, 38377	norovirus Hu/MT01/2006/USA
3098	VP1	AB385637	3098	7508	11918, 16328, 20738, 25148, 29558, 33968, 38378	norovirus Hu/GII.4/RotterdamP600/2006/NL
3099	VP1	EF202568	3099	7509	11919, 16329, 20739, 25149, 29559, 33969, 38379	norovirus Hu/GII/Toronto/SK/2005/CAN

3100	VP1	AB294781	3100	7510	11920, 16330, 20740, 25150, 29560, 33970, 38380	norovirus Hu/GII-4/Awa/040354/2004/JP
3101	VP1	AB303940	3101	7511	11921, 16331, 20741, 25151, 29561, 33971, 38381	norovirus Hu/GGII.4/Tilburg059/2004/NL
3102	VP1	DQ415279	3102	7512	11922, 16332, 20742, 25152, 29562, 33972, 38382	norovirus Hu/GII/Carlow/2002/Ire
3103	VP1	DQ078794	3103	7513	11923, 16333, 20743, 25153, 29563, 33973, 38383	norovirus Hu/GII.4/Hunter 284E/040/AU
3104	VP1	KP784691	3104	7514	11924, 16334, 20744, 25154, 29564, 33974, 38384	norovirus GII/Hu/ZAF/2009/GII.P4_GII.4/ Johannesburg/4175
3105	VP1	KX907727	3105	7515	11925, 16335, 20745, 25155, 29565, 33975, 38385	norovirus Hu/USA/2015/GII.P16_GII.4_Sydney/CA3477
3106	VP1	KX354049	3106	7516	11926, 16336, 20746, 25156, 29566, 33976, 38386	norovirus GII.4
3107	VP1	KX354024	3107	7517	11927, 16337, 20747, 25157, 29567, 33977, 38387	norovirus GII.4
3108	VP1	KX353955	3108	7518	11928, 16338, 20748, 25158, 29568, 33978, 38388	norovirus GII.4
3109	VP1	AB972518	3109	7519	11929, 16339, 20749, 25159, 29569, 33979, 38389	norovirus Hu/GII.4/Aichi4/2012/JP
3110	VP1	AB933744	3110	7520	11930, 16340, 20750, 25160, 29570, 33980, 38390	norovirus Hu/GII.4/Nagano5/2009/JP
3111	VP1	AB933673	3111	7521	11931, 16341, 20751, 25161, 29571, 33981, 38391	norovirus Hu/GII.4/Miyazaki2/2010/JP
3112	VP1	KM245070	3112	7522	11932, 16342, 20752, 25162, 29572, 33982, 38392	norovirus 07-B-1/2007/GII.4/DenHaag/2006b
3113	VP1	EU921382	3113	7523	11933, 16343, 20753, 25163, 29573, 33983, 38393	norovirus GII/Hu/IN/2007/GII.P4_GII.4_ DenHaag2006b/Pune-PC45
3114	VP1	KP293589	3114	7524	11934, 16344, 20754, 25164, 29574, 33984, 38394	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-461
3115	VP1	KP241908	3115	7525	11935, 16345, 20755, 25165, 29575, 33985, 38395	norovirus GII.4
3116	VP1	KJ451059	3116	7526	11936, 16346, 20756, 25166, 29576, 33986, 38396	norovirus 13-BE-4/2012/GII.4

3117	VP1	KM198570	3117	7527	11937, 16347, 20757, 25167, 29577, 33987, 38397	norovirus Hu/GII/20146/2009/VNM
3118	VP1	KM198558	3118	7528	11938, 16348, 20758, 25168, 29578, 33988, 38398	norovirus Hu/GII/30257/2009/VNM
3119	VP1	AB447456	3119	7529	11939, 16349, 20759, 25169, 29579, 33989, 38399	norovirus Hu/GII-4/Sagal/2006/JP
3120	VP1	KF177444	3120	7530	11940, 16350, 20760, 25170, 29580, 33990, 38400	norovirus Hu/GII.4/36126758/AUS/2013
3121	VP1	KF429776	3121	7531	11941, 16351, 20761, 25171, 29581, 33991, 38401	norovirus Hu/GII.4/NIHIC17.1/2012/USA
3122	VP1	KC243078	3122	7532	11942, 16352, 20762, 25172, 29582, 33992, 38402	norovirus Hu/GII.4/Taichung/12-BA-1/2012/TW
3123	VP1	KC409280	3123	7533	11943, 16353, 20763, 25173, 29583, 33993, 38403	norovirus Hu/GII/20217/2009/VNM
3124	VP1	KC175357	3124	7534	11944, 16354, 20764, 25174, 29584, 33994, 38404	norovirus Hu/Norwalk/10148/2009/VNM
3125	VP1	JX459621	3125	7535	11945, 16355, 20765, 25175, 29585, 33995, 38405	norovirus Hu/GII.4/SG4045-07/2007/SG
3126	VP1	JQ613541	3126	7536	11946, 16356, 20766, 25176, 29586, 33996, 38406	norovirus Hu/GII.4/NSW131L/2009/AU
3127	VP1	JQ613527	3127	7537	11947, 16357, 20767, 25177, 29587, 33997, 38407	norovirus Hu/GII.4/NSW821J/2009/AU
3128	VP1	JF827296	3128	7538	11948, 16358, 20768, 25178, 29588, 33998, 38408	norovirus Hu/GII.4/Houston/TCH492/2005/US
3129	VP1	JF713050	3129	7539	11949, 16359, 20769, 25179, 29589, 33999, 38409	norovirus Hu/GII.4/Hong Kong/CUB001/2010/CHN
3130	VP1	HM802548	3130	7540	11950, 16360, 20770, 25180, 29590, 34000, 38410	norovirus Hu/GII.4/Hong Kong/CU050128/2005/CHN
3131	VP1	GQ856459	3131	7541	11951, 16361, 20771, 25181, 29591, 34001, 38411	norovirus Hu/GII.4/Beijing/55176/2008/CHN
3132	VP1	AB541308	3132	7542	11952, 16362, 20772, 25182, 29592, 34002, 38412	norovirus Hu/GII-4/Nagano5/2007/JP
3133	VP1	AB541276	3133	7543	11953, 16363, 20773, 25183, 29593, 34003, 38413	norovirus Hu/GII-4/Iwate5/2008/JP

3134	VP1	AB541224	3134	7544	11954, 16364, 20774, 25184, 29594, 34004, 38414	norovirus Hu/GII-4/Aomori4/2007/JP
3135	VP1	AB504330	3135	7545	11955, 16365, 20775, 25185, 29595, 34005, 38415	norovirus Hu/GII.4/Hiroshima/154/2008/JPN
3136	VP1	AB447445	3136	7546	11956, 16366, 20776, 25186, 29596, 34006, 38416	norovirus Hu/GII-4/Toyama5/2006/JP
3137	VP1	AB294793	3137	7547	11957, 16367, 20777, 25187, 29597, 34007, 38417	norovirus Hu/GII-4/Kashiwa/061256/2006/JP
3138	VP1	AB303934	3138	7548	11958, 16368, 20778, 25188, 29598, 34008, 38418	norovirus Hu/GGII.4/DenHelder003/2004/NL
3139	VP1	KU678205	3139	7549	11959, 16369, 20779, 25189, 29599, 34009, 38419	norovirus 16-J-1/2016/GII.Pe/GII.4 Sydney_2012
3140	VP1	LC177657	3140	7550	11960, 16370, 20780, 25190, 29600, 34010, 38420	norovirus GII.4
3141	VP1	LC177656	3141	7551	11961, 16371, 20781, 25191, 29601, 34011, 38421	norovirus GII.4
3142	VP1	KX354136	3142	7552	11962, 16372, 20782, 25192, 29602, 34012, 38422	norovirus GII.4
3143	VP1	KX354121	3143	7553	11963, 16373, 20783, 25193, 29603, 34013, 38423	norovirus GII.4
3144	VP1	KX354110	3144	7554	11964, 16374, 20784, 25194, 29604, 34014, 38424	norovirus GII.4
3145	VP1	KX354107	3145	7555	11965, 16375, 20785, 25195, 29605, 34015, 38425	norovirus GII.4
3146	VP1	KX353991	3146	7556	11966, 16376, 20786, 25196, 29606, 34016, 38426	norovirus GII.4
3147	VP1	KU985162	3147	7557	11967, 16377, 20787, 25197, 29607, 34017, 38427	norovirus GII.4
3148	VP1	AB972476	3148	7558	11968, 16378, 20788, 25198, 29608, 34018, 38428	norovirus Hu/GII.4/Toyama2/2012/JP
3149	VP1	KU311162	3149	7559	11969, 16379, 20789, 25199, 29609, 34019, 38429	norovirus Hu/GII.4/AlbertaSPI/2012/CA
3150	VP1	KR904212	3150	7560	11970, 16380, 20790, 25200, 29610, 34020, 38430	norovirus GII

3151	VP1	AB933678	3151	7561	11971, 16381, 20791, 25201, 29611, 34021, 38431	norovirus Hu/GII.4/Niigata4/2010/JP
3152	VP1	AB933648	3152	7562	11972, 16382, 20792, 25202, 29612, 34022, 38432	norovirus Hu/GII.4/Aomori2/2009/JP
3153	VP1	LN854571	3153	7563	11973, 16383, 20793, 25203, 29613, 34023, 38433	norovirus GII/Hu/NL/2012/GII.4/Nijmegen01
3154	VP1	EU921384	3154	7564	11974, 16384, 20794, 25204, 29614, 34024, 38434	norovirus GII/Hu/IN/2007/GII.P4_GII.4_DenHaag2006b/Pune-PC47
3155	VP1	LC005716	3155	7565	11975, 16385, 20795, 25205, 29615, 34025, 38435	norovirus GII/Hu/JP/2012/GII.4/yII-V664-1
3156	VP1	KP241914	3156	7566	11976, 16386, 20796, 25206, 29616, 34026, 38436	norovirus GII.4
3157	VP1	KJ433968	3157	7567	11977, 16387, 20797, 25207, 29617, 34027, 38437	norovirus 12-AS-1/2012/GII.4
3158	VP1	KP176409	3158	7568	11978, 16388, 20798, 25208, 29618, 34028, 38438	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-430
3159	VP1	KM514064	3159	7569	11979, 16389, 20799, 25209, 29619, 34029, 38439	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-319
3160	VP1	KJ649703	3160	7570	11980, 16390, 20800, 25210, 29620, 34030, 38440	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-246
3161	VP1	KF177447	3161	7571	11981, 16391, 20801, 25211, 29621, 34031, 38441	norovirus Hu/GII.4/30996947/AUS/2012
3162	VP1	JX439820	3162	7572	11982, 16392, 20802, 25212, 29622, 34032, 38442	norovirus Hu/GII/Seoul1033/KOR/2010
3163	VP1	HF952120	3163	7573	11983, 16393, 20803, 25213, 29623, 34033, 38443	norovirus Hu/GII.4/C00007876/2011/UK
3164	VP1	KC517369	3164	7574	11984, 16394, 20804, 25214, 29624, 34034, 38444	norovirus Hu/GII-4/Taoyuan/CGMH59/2012/TW
3165	VP1	KC409293	3165	7575	11985, 16395, 20805, 25215, 29625, 34035, 38445	norovirus Hu/GII/20365/2010/VNM
3166	VP1	JX984951	3166	7576	11986, 16396, 20806, 25216, 29626, 34036, 38446	norovirus Hu/GII.4/GZ2010-L88/Guangzhou/CHN/2011
3167	VP1	JX459612	3167	7577	11987, 16397, 20807, 25217, 29627, 34037, 38447	norovirus Hu/GII.4/SG4058-12/2006/SG

3168	VP1	JX459604	3168	7578	11988, 16398, 20808, 25218, 29628, 34038, 38448	norovirus Hu/GII.4/SG4024-10/2006/SG
3169	VP1	JX155745	3169	7579	11989, 16399, 20809, 25219, 29629, 34039, 38449	norovirus Hu/GII.4/Xi'an/P158/2010/CHN
3170	VP1	HM635155	3170	7580	11990, 16400, 20810, 25220, 29630, 34040, 38450	norovirus Hu/GII.4/Seoul/0902/2009/KOR
3171	VP1	JN400620	3171	7581	11991, 16401, 20811, 25221, 29631, 34041, 38451	norovirus Hu/GII-4/CGMH22/2010/TW
3172	VP1	JQ613573	3172	7582	11992, 16402, 20812, 25222, 29632, 34042, 38452	norovirus Hu/GII.4/Helensburgh/NSW295E/2010/AU
3173	VP1	JQ478408	3173	7583	11993, 16403, 20813, 25223, 29633, 34043, 38453	norovirus Hu/GII.4/Farmington Hills/2004/USA
3174	VP1	EF684915	3174	7584	11994, 16404, 20814, 25224, 29634, 34044, 38454	norovirus Hu/GII.4/Shellharbour/NSW696T/2006/AUS
3175	VP1	HQ456331	3175	7585	11995, 16405, 20815, 25225, 29635, 34045, 38455	norovirus Hu/GII.4/07-H-3/2006/TW
3176	VP1	HQ456322	3176	7586	11996, 16406, 20816, 25226, 29636, 34046, 38456	norovirus Hu/GII.4/06-AM-2/2006/TW
3177	VP1	HM802551	3177	7587	11997, 16407, 20817, 25227, 29637, 34047, 38457	norovirus Hu/GII.4/Hong Kong/CU041222/2004/CHN
3178	VP1	HM802546	3178	7588	11998, 16408, 20818, 25228, 29638, 34048, 38458	norovirus Hu/GII.4/Hong Kong/CU041206/2004/CHN
3179	VP1	GQ856453	3179	7589	11999, 16409, 20819, 25229, 29639, 34049, 38459	norovirus Hu/GII.4/Beijing/55047/2007/CHN
3180	VP1	GQ856445	3180	7590	12000, 16410, 20820, 25230, 29640, 34050, 38460	norovirus Hu/GII.4/Beijing/53952/2007/CHN
3181	VP1	AB541358	3181	7591	12001, 16411, 20821, 25231, 29641, 34051, 38461	norovirus Hu/GII-4/Toyama3/2008/JP
3182	VP1	AB541349	3182	7592	12002, 16412, 20822, 25232, 29642, 34052, 38462	norovirus Hu/GII-4/Shimane3/2007/JP
3183	VP1	AB541342	3183	7593	12003, 16413, 20823, 25233, 29643, 34053, 38463	norovirus Hu/GII-4/Sakai3/2007/JP
3184	VP1	AB541248	3184	7594	12004, 16414, 20824, 25234, 29644, 34054, 38464	norovirus Hu/GII-4/Fukui4/2008/JP

3185	VP1	GQ246798	3185	7595	12005, 16415, 20825, 25235, 29645, 34055, 38465	norovirus Hu/GGII.4/Dijon/E3743/2009/FRA
3186	VP1	GQ246791	3186	7596	12006, 16416, 20826, 25236, 29646, 34056, 38466	norovirus Hu/GGII.4/Dijon/E3020/2008/FRA
3187	VP1	GU350225	3187	7597	12007, 16417, 20827, 25237, 29647, 34057, 38467	norovirus Hu/GII-4/Beijing/hl/2005/CHN
3188	VP1	AB504319	3188	7598	12008, 16418, 20828, 25238, 29648, 34058, 38468	norovirus Hu/GII.4/Hiroshima/74/2006/JPN
3189	VP1	AB447458	3189	7599	12009, 16419, 20829, 25239, 29649, 34059, 38469	norovirus Hu/GII-4/Saga5/2006/JP
3190	VP1	AB385640	3190	7600	12010, 16420, 20830, 25240, 29650, 34060, 38470	norovirus Hu/GII.4/RotterdamP70119/2007/NL
3191	VP1	AB385633	3191	7601	12011, 16421, 20831, 25241, 29651, 34061, 38471	norovirus Hu/GII.4/RotterdamP4033/2006/NL
3192	VP1	DQ658413	3192	7602	12012, 16422, 20832, 25242, 29652, 34062, 38472	norovirus Hu/GII.4/MD-2004/2004/US
3193	VP1	AB220923	3193	7603	12013, 16423, 20833, 25243, 29653, 34063, 38473	norovirus Hu/Ehime/05-30/2005/JP
3194	VP1	AY588016	3194	7604	12014, 16424, 20834, 25244, 29654, 34064, 38474	norovirus Hu/NLV/Oxford/B5S9/2002/UK
3195	VP1	AY502022	3195	7605	12015, 16425, 20835, 25245, 29655, 34065, 38475	norovirus GII
3196	VP1	KX158280	3196	7606	12016, 16426, 20836, 25246, 29656, 34066, 38476	norovirus GII
3197	VP1	KX371606	3197	7607	12017, 16427, 20837, 25247, 29657, 34067, 38477	norovirus GII.4
3198	VP1	KX371605	3198	7608	12018, 16428, 20838, 25248, 29658, 34068, 38478	norovirus GII.4
3199	VP1	KX354128	3199	7609	12019, 16429, 20839, 25249, 29659, 34069, 38479	norovirus GII.4
3200	VP1	KX354099	3200	7610	12020, 16430, 20840, 25250, 29660, 34070, 38480	norovirus GII.4
3201	VP1	KX354087	3201	7611	12021, 16431, 20841, 25251, 29661, 34071, 38481	norovirus GII.4

3202	VP1	KX354009	3202	7612	12022, 16432, 20842, 25252, 29662, 34072, 38482	norovirus GII.4
3203	VP1	KR131784	3203	7613	12023, 16433, 20843, 25253, 29663, 34073, 38483	norovirus GII/Hu/IN/2013/GII.Pe_GII.4_Sydney2012/Pune-136935
3204	VP1	AB972527	3204	7614	12024, 16434, 20844, 25254, 29664, 34074, 38484	norovirus Hu/GII.4/OsakaCity3/2012/JP
3205	VP1	AB972525	3205	7615	12025, 16435, 20845, 25255, 29665, 34075, 38485	norovirus Hu/GII.4/Toyama4/2012/JP
3206	VP1	KT780388	3206	7616	12026, 16436, 20846, 25256, 29666, 34076, 38486	norovirus Hu/GII.4/CUHK-NS-618/HKG/2015
3207	VP1	KT780373	3207	7617	12027, 16437, 20847, 25257, 29667, 34077, 38487	norovirus Hu/GII.4/CUHK-NS-516/HKG/2015
3208	VP1	AB933723	3208	7618	12028, 16438, 20848, 25258, 29668, 34078, 38488	norovirus Hu/GII.4/Saga3/2011/JP
3209	VP1	AB933708	3209	7619	12029, 16439, 20849, 25259, 29669, 34079, 38489	norovirus Hu/GII.4/Hiroshimacity3/2011/JP
3210	VP1	LC066046	3210	7620	12030, 16440, 20850, 25260, 29670, 34080, 38490	norovirus Hu/GII/JP/2015/GII.Pe_GII.4/Osaka/OSF78
3211	VP1	KJ678140	3211	7621	12031, 16441, 20851, 25261, 29671, 34081, 38491	norovirus Hu/GII.4/Beijing/PKUPH-02-07/inpatient/2013/CHN
3212	VP1	KJ678139	3212	7622	12032, 16442, 20852, 25262, 29672, 34082, 38492	norovirus Hu/GII.4/Beijing/PKUPH-02-06/inpatient/2013/CHN
3213	VP1	EU921383	3213	7623	12033, 16443, 20853, 25263, 29673, 34083, 38493	norovirus GII/Hu/IN/2007/GII.P4_GII.4_DenHaag2006b/Pune-PC46
3214	VP1	KP176405	3214	7624	12034, 16444, 20854, 25264, 29674, 34084, 38494	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-418
3215	VP1	KP176403	3215	7625	12035, 16445, 20855, 25265, 29675, 34085, 38495	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-416
3216	VP1	KP096343	3216	7626	12036, 16446, 20856, 25266, 29676, 34086, 38496	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-397
3217	VP1	KM268101	3217	7627	12037, 16447, 20857, 25267, 29677, 34087, 38497	norovirus GII.4

3218	VP1	KM198568	3218	7628	12038, 16448, 20858, 25268, 29678, 34088, 38498	norovirus Hu/GII/C2H-62/2011/VNM
3219	VP1	KM198532	3219	7629	12039, 16449, 20859, 25269, 29679, 34089, 38499	norovirus Hu/GII/10108/2009/VNM
3220	VP1	KM198527	3220	7630	12040, 16450, 20860, 25270, 29680, 34090, 38500	norovirus Hu/GII/10074/2009/VNM
3221	VP1	KF177448	3221	7631	12041, 16451, 20861, 25271, 29681, 34091, 38501	norovirus Hu/GII.4/35408489/AUS/2012
3222	VP1	KF008244	3222	7632	12042, 16452, 20862, 25272, 29682, 34092, 38502	norovirus Hu/GII.4/variant Sydney 2012/FRA
3223	VP1	KF060103	3223	7633	12043, 16453, 20863, 25273, 29683, 34093, 38503	norovirus Hu/GII.4/NSW811G/2011/AU
3224	VP1	KC960615	3224	7634	12044, 16454, 20864, 25274, 29684, 34094, 38504	norovirus Hu/GII.4/20199/2009/VNM
3225	VP1	KC517373	3225	7635	12045, 16455, 20865, 25275, 29685, 34095, 38505	norovirus Hu/GII-4/Taoyuan/CGMH63/2012/TW
3226	VP1	JX459615	3226	7636	12046, 16456, 20866, 25276, 29686, 34096, 38506	norovirus Hu/GII.4/SG4010-01/2007/SG
3227	VP1	JX459603	3227	7637	12047, 16457, 20867, 25277, 29687, 34097, 38507	norovirus Hu/GII.4/SG4019-09/2006/SG
3228	VP1	JX155746	3228	7638	12048, 16458, 20868, 25278, 29688, 34098, 38508	norovirus Hu/GII.4/Xi'an/P185/2010/CHN
3229	VP1	AB541333	3229	7639	12049, 16459, 20869, 25279, 29689, 34099, 38509	norovirus Hu/GII-4/Saga2/2008/JP
3230	VP1	AB541220	3230	7640	12050, 16460, 20870, 25280, 29690, 34100, 38510	norovirus Hu/GII-4/Aomori2/2007/JP
3231	VP1	AB504312	3231	7641	12051, 16461, 20871, 25281, 29691, 34101, 38511	norovirus Hu/GII.4/Hiroshima/57/2005/JPN
3232	VP1	GQ849126	3232	7642	12052, 16462, 20872, 25282, 29692, 34102, 38512	norovirus Hu/GII.4/NSW023C/2008/AUS
3233	VP1	AB447459	3233	7643	12053, 16463, 20873, 25283, 29693, 34103, 38513	norovirus Hu/GII-4/Kumamoto1/2006/JP

3234	VP1	EU078413	3234	7644	12054, 16464, 20874, 25284, 29694, 34104, 38514	norovirus Hu/GA04/2004/USA
3235	VP1	EU078411	3235	7645	12055, 16465, 20875, 25285, 29695, 34105, 38515	norovirus Hu/OM2-CS/2004/USA
3236	VP1	AB385632	3236	7646	12056, 16466, 20876, 25286, 29696, 34106, 38516	norovirus Hu/GII.4/RotterdamP400/2006/NL
3237	VP1	EU839595	3237	7647	12057, 16467, 20877, 25287, 29697, 34107, 38517	norovirus Hu/GII/Beijing/362/2007/CHN
3238	VP1	AB294788	3238	7648	12058, 16468, 20878, 25288, 29698, 34108, 38518	norovirus Hu/GII-4/Sanbu/050878/2006/JP
3239	VP1	AB303936	3239	7649	12059, 16469, 20879, 25289, 29699, 34109, 38519	norovirus Hu/GGII.4/Elsloo012/2004/NL
3240	VP1	AB303935	3240	7650	12060, 16470, 20880, 25290, 29700, 34110, 38520	norovirus Hu/GGII.4/Middelburg007/2004/NL
3241	VP1	AY588018	3241	7651	12061, 16471, 20881, 25291, 29701, 34111, 38521	norovirus Hu/NLV/Oxford/B5S13/2002/UK
3242	VP1	KU678203	3242	7652	12062, 16472, 20882, 25292, 29702, 34112, 38522	norovirus 15-J0-2/2016/GII.Pe/GII.4 Sydney_2012
3243	VP1	KP176410	3243	7653	12063, 16473, 20883, 25293, 29703, 34113, 38523	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-431
3244	VP1	KX371609	3244	7654	12064, 16474, 20884, 25294, 29704, 34114, 38524	norovirus GII.4
3245	VP1	KX354130	3245	7655	12065, 16475, 20885, 25295, 29705, 34115, 38525	norovirus GII.4
3246	VP1	KX354120	3246	7656	12066, 16476, 20886, 25296, 29706, 34116, 38526	norovirus GII.4
3247	VP1	KX354113	3247	7657	12067, 16477, 20887, 25297, 29707, 34117, 38527	norovirus GII.4
3248	VP1	KX354105	3248	7658	12068, 16478, 20888, 25298, 29708, 34118, 38528	norovirus GII.4
3249	VP1	KX354077	3249	7659	12069, 16479, 20889, 25299, 29709, 34119, 38529	norovirus GII.4

3250	VP1	KR131785	3250	7660	12070, 16480, 20890, 25300, 29710, 34120, 38530	norovirus GII/Hu/IN/2013/GII.Pe_GII.4_Sydney2012/Pune-1324318
3251	VP1	AB972530	3251	7661	12071, 16481, 20891, 25301, 29711, 34121, 38531	norovirus Hu/GII.4/Hiroshima3/2012/JP
3252	VP1	AB972526	3252	7662	12072, 16482, 20892, 25302, 29712, 34122, 38532	norovirus Hu/GII.4/Fukui5/2012/JP
3253	VP1	AB972522	3253	7663	12073, 16483, 20893, 25303, 29713, 34123, 38533	norovirus Hu/GII.4/Niigata2/2012/JP
3254	VP1	AB972514	3254	7664	12074, 16484, 20894, 25304, 29714, 34124, 38534	norovirus Hu/GII.4/Iwate1/2012/JP
3255	VP1	AB972505	3255	7665	12075, 16485, 20895, 25305, 29715, 34125, 38535	norovirus Hu/GII.4/GII4-NGI365/2011/JP
3256	VP1	AB972473	3256	7666	12076, 16486, 20896, 25306, 29716, 34126, 38536	norovirus Hu/GII.4/Iwate5/2012/JP
3257	VP1	KT780381	3257	7667	12077, 16487, 20897, 25307, 29717, 34127, 38537	norovirus Hu/GII.4/CUHK-NS-554/HKG/2015
3258	VP1	KT780372	3258	7668	12078, 16488, 20898, 25308, 29718, 34128, 38538	norovirus Hu/GII.4/CUHK-NS-515/HKG/2015
3259	VP1	KT202797	3259	7669	12079, 16489, 20899, 25309, 29719, 34129, 38539	norovirus GII
3260	VP1	KR904226	3260	7670	12080, 16490, 20900, 25310, 29720, 34130, 38540	norovirus GII
3261	VP1	KR904208	3261	7671	12081, 16491, 20901, 25311, 29721, 34131, 38541	norovirus GII
3262	VP1	AB933709	3262	7672	12082, 16492, 20902, 25312, 29722, 34132, 38542	norovirus Hu/GII.4/Hokkaido1/2011/JP
3263	VP1	EU921352	3263	7673	12083, 16493, 20903, 25313, 29723, 34133, 38543	norovirus GII/Hu/IN/2006/GII.P4_GII.4_Yerseke2006a/Pune-PC23
3264	VP1	LC005735	3264	7674	12084, 16494, 20904, 25314, 29724, 34134, 38544	norovirus GII/Hu/JP/2014/GII.4/y13-V1010-1
3265	VP1	KP241909	3265	7675	12085, 16495, 20905, 25315, 29725, 34135, 38545	norovirus GII.4

3266	VP1	KJ533132	3266	7676	12086, 16496, 20906, 25316, 29726, 34136, 38546	norovirus 12-BA-1/2012/GII.4
3267	VP1	KP176407	3267	7677	12087, 16497, 20907, 25317, 29727, 34137, 38547	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-421
3268	VP1	KP176406	3268	7678	12088, 16498, 20908, 25318, 29728, 34138, 38548	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-420
3269	VP1	KP123606	3269	7679	12089, 16499, 20909, 25319, 29729, 34139, 38549	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-426
3270	VP1	KP096335	3270	7680	12090, 16500, 20910, 25320, 29730, 34140, 38550	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-385
3271	VP1	KM268095	3271	7681	12091, 16501, 20911, 25321, 29731, 34141, 38551	norovirus GII.4
3272	VP1	KM268094	3272	7682	12092, 16502, 20912, 25322, 29732, 34142, 38552	norovirus GII.4
3273	VP1	KM268093	3273	7683	12093, 16503, 20913, 25323, 29733, 34143, 38553	norovirus GII.4
3274	VP1	KM198591	3274	7684	12094, 16504, 20914, 25324, 29734, 34144, 38554	norovirus Hu/GII/20122/2009/VNM
3275	VP1	KM198589	3275	7685	12095, 16505, 20915, 25325, 29735, 34145, 38555	norovirus Hu/GII/20144/2009/VNM
3276	VP1	KM198576	3276	7686	12096, 16506, 20916, 25326, 29736, 34146, 38556	norovirus Hu/GII/C2H-43/2011/VNM
3277	VP1	KM198564	3277	7687	12097, 16507, 20917, 25327, 29737, 34147, 38557	norovirus Hu/GII/C2H-44/2011/VNM
3278	VP1	KJ716355	3278	7688	12098, 16508, 20918, 25328, 29738, 34148, 38558	norovirus Hu/GII.4/Beijing
3279	VP1	KJ685408	3279	7689	12099, 16509, 20919, 25329, 29739, 34149, 38559	norovirus Hu/GII/BGIC0066/2011/BGD
3280	VP1	KJ144999	3280	7690	12100, 16510, 20920, 25330, 29740, 34150, 38560	norovirus GII.4
3281	VP1	KF060016	3281	7691	12101, 16511, 20921, 25331, 29741, 34151, 38561	norovirus Hu/GII.4/NSW1749/2011/AU
3282	VP1	KC517367	3282	7692	12102, 16512, 20922, 25332, 29742, 34152, 38562	norovirus Hu/GII-4/Taoyuan/CGMH57/2012/TW

3283	VP1	KC517366	3283	7693	12103, 16513, 20923, 25333, 29743, 34153, 38563	norovirus Hu/GII-4/New Taipei/CGMH56/2012/TW
3284	VP1	KC517359	3284	7694	12104, 16514, 20924, 25334, 29744, 34154, 38564	norovirus Hu/GII-4/New Taipei/CGMH49/2011/TW
3285	VP1	KC409303	3285	7695	12105, 16515, 20925, 25335, 29745, 34155, 38565	norovirus Hu/GII/20478/2010/VNM
3286	VP1	JX459608	3286	7696	12106, 16516, 20926, 25336, 29746, 34156, 38566	norovirus Hu/GII.4/SG4097-10/2006/SG
3287	VP1	JQ320073	3287	7697	12107, 16517, 20927, 25337, 29747, 34157, 38567	norovirus Hu/GII.4/NF2003/USA/2003
3288	VP1	HM802552	3288	7698	12108, 16518, 20928, 25338, 29748, 34158, 38568	norovirus Hu/GII.4/Hong Kong/CU050852/2005/CHN
3289	VP1	AB541320	3289	7699	12109, 16519, 20929, 25339, 29749, 34159, 38569	norovirus Hu/GII-4/Osakal/2008/JP
3290	VP1	AB541227	3290	7700	12110, 16520, 20930, 25340, 29750, 34160, 38570	norovirus Hu/GII-4/Aomori5/2008/JP
3291	VP1	AB504318	3291	7701	12111, 16521, 20931, 25341, 29751, 34161, 38571	norovirus Hu/GII.4/Hiroshima/69/2006/JPN
3292	VP1	AB504311	3292	7702	12112, 16522, 20932, 25342, 29752, 34162, 38572	norovirus Hu/GII.4/Hiroshima/56/2005/JPN
3293	VP1	FJ537135	3293	7703	12113, 16523, 20933, 25343, 29753, 34163, 38573	norovirus Hu/GII.4/CHDC2094/1974/US
3294	VP1	GQ413969	3294	7704	12114, 16524, 20934, 25344, 29754, 34164, 38574	norovirus Hu/GII.4/Riviera1635/2008/US
3295	VP1	EU839592	3295	7705	12115, 16525, 20935, 25345, 29755, 34165, 38575	norovirus Hu/GII/Beijing/127/2007/CHN
3296	VP1	EU839587	3296	7706	12116, 16526, 20936, 25346, 29756, 34166, 38576	norovirus Hu/GII/Beijing/493/2005/CHN
3297	VP1	EU839583	3297	7707	12117, 16527, 20937, 25347, 29757, 34167, 38577	norovirus Hu/GII/Beijing/79/2004/CHN
3298	VP1	AB303931	3298	7708	12118, 16528, 20938, 25348, 29758, 34168, 38578	norovirus Hu/GII.4/Apeldoorn023/2003/NL
3299	VP1	KY341923	3299	7709	12119, 16529, 20939, 25349, 29759, 34169, 38579	norovirus GII.4

3300	VP1	KX514317	3300	7710	12120, 16530, 20940, 25350, 29760, 34170, 38580	norovirus GII.4
3301	VP1	KU678204	3301	7711	12121, 16531, 20941, 25351, 29761, 34171, 38581	norovirus 16-C-2/2016/GII.Pe/GII.4 Sydney_2012
3302	VP1	KX158283	3302	7712	12122, 16532, 20942, 25352, 29762, 34172, 38582	norovirus GII
3303	VP1	KX354088	3303	7713	12123, 16533, 20943, 25353, 29763, 34173, 38583	norovirus GII.4
3304	VP1	KX354032	3304	7714	12124, 16534, 20944, 25354, 29764, 34174, 38584	norovirus GII.4
3305	VP1	KX354015	3305	7715	12125, 16535, 20945, 25355, 29765, 34175, 38585	norovirus GII.4
3306	VP1	KX353999	3306	7716	12126, 16536, 20946, 25356, 29766, 34176, 38586	norovirus GII.4
3307	VP1	KX353987	3307	7717	12127, 16537, 20947, 25357, 29767, 34177, 38587	norovirus GII.4
3308	VP1	KX353970	3308	7718	12128, 16538, 20948, 25358, 29768, 34178, 38588	norovirus GII.4
3309	VP1	KU985156	3309	7719	12129, 16539, 20949, 25359, 29769, 34179, 38589	norovirus GII.4
3310	VP1	KU985155	3310	7720	12130, 16540, 20950, 25360, 29770, 34180, 38590	norovirus GII.4
3311	VP1	KM514075	3311	7721	12131, 16541, 20951, 25361, 29771, 34181, 38591	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-332
3312	VP1	AB972484	3312	7722	12132, 16542, 20952, 25362, 29772, 34182, 38592	norovirus Hu/GII.4/OsakaCity1/2012/JP
3313	VP1	KT780391	3313	7723	12133, 16543, 20953, 25363, 29773, 34183, 38593	norovirus Hu/GII.4/CUHK-NS-660/HKG/2015
3314	VP1	KT780390	3314	7724	12134, 16544, 20954, 25364, 29774, 34184, 38594	norovirus Hu/GII.4/CUHK-NS-652/HKG/2015
3315	VP1	KT780376	3315	7725	12135, 16545, 20955, 25365, 29775, 34185, 38595	norovirus Hu/GII.4/CUHK-NS-526/HKG/2015
3316	VP1	KT780375	3316	7726	12136, 16546, 20956, 25366, 29776, 34186, 38596	norovirus Hu/GII.4/CUHK-NS-525/HKG/2015

3317	VP1	LC016607	3317	7727	12137, 16547, 20957, 25367, 29777, 34187, 38597	norovirus Hu/JP/2004/GII.4/Sakai/01-inpatient8-54d-2
3318	VP1	KP241915	3318	7728	12138, 16548, 20958, 25368, 29778, 34188, 38598	norovirus GII.4
3319	VP1	KM514065	3319	7729	12139, 16549, 20959, 25369, 29779, 34189, 38599	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-320
3320	VP1	KM268097	3320	7730	12140, 16550, 20960, 25370, 29780, 34190, 38600	norovirus GII.4
3321	VP1	KM268084	3321	7731	12141, 16551, 20961, 25371, 29781, 34191, 38601	norovirus GII.4
3322	VP1	KJ649704	3322	7732	12142, 16552, 20962, 25372, 29782, 34192, 38602	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-250
3323	VP1	KC577174	3323	7733	12143, 16553, 20963, 25373, 29783, 34193, 38603	norovirus Hu/GII.4/Jiangsu1/2011/CHN
3324	VP1	KF177451	3324	7734	12144, 16554, 20964, 25374, 29784, 34194, 38604	norovirus Hu/GII.4/34790954/AUS/2013
3325	VP1	KF177429	3325	7735	12145, 16555, 20965, 25375, 29785, 34195, 38605	norovirus Hu/GII.4/35444252/AUS/2012
3326	VP1	KF060005	3326	7736	12146, 16556, 20966, 25376, 29786, 34196, 38606	norovirus Hu/GII.4/NSW0979/2012/AU
3327	VP1	JX439821	3327	7737	12147, 16557, 20967, 25377, 29787, 34197, 38607	norovirus Hu/GII/Seoul1086/KOR/2010
3328	VP1	KC517361	3328	7738	12148, 16558, 20968, 25378, 29788, 34198, 38608	norovirus Hu/GII-4/Taoyuan/CGMH51/2012/TW
3329	VP1	KC175378	3329	7739	12149, 16559, 20969, 25379, 29789, 34199, 38609	norovirus Hu/Norwalk/10247/2009/VNM
3330	VP1	JX459648	3330	7740	12150, 16560, 20970, 25380, 29790, 34200, 38610	norovirus Hu/GII.4/SG4058-10/2009/SG
3331	VP1	JX459635	3331	7741	12151, 16561, 20971, 25381, 29791, 34201, 38611	norovirus Hu/GII.4/SG4061-01/2009/SG
3332	VP1	JX459624	3332	7742	12152, 16562, 20972, 25382, 29792, 34202, 38612	norovirus Hu/GII.4/SG4075-08/2007/SG
3333	VP1	JX459614	3333	7743	12153, 16563, 20973, 25383, 29793, 34203, 38613	norovirus Hu/GII.4/SG4007-01/2007/SG

3334	VP1	HM635103	3334	7744	12154, 16564, 20974, 25384, 29794, 34204, 38614	norovirus Hu/GII.4/Seoul/0952/2010/KOR
3335	VP1	JQ613522	3335	7745	12155, 16565, 20975, 25385, 29795, 34205, 38615	norovirus Hu/GII.4/NSW7640/2008/AU
3336	VP1	AB629942	3336	7746	12156, 16566, 20976, 25386, 29796, 34206, 38616	norovirus Hu/Tokyo/10-20/2010/JPN
3337	VP1	GQ856457	3337	7747	12157, 16567, 20977, 25387, 29797, 34207, 38617	norovirus Hu/GII.4/Beijing/55150/2008/CHN
3338	VP1	EU876883	3338	7748	12158, 16568, 20978, 25388, 29798, 34208, 38618	norovirus Hu/GGII.4/Cairo3/2006/EGY
3339	VP1	AB447455	3339	7749	12159, 16569, 20979, 25389, 29799, 34209, 38619	norovirus Hu/GII-4/Ehime5/2006/JP
3340	VP1	EU078409	3340	7750	12160, 16570, 20980, 25390, 29800, 34210, 38620	norovirus Hu/Warren/2002/USA
3341	VP1	AB303928	3341	7751	12161, 16571, 20981, 25391, 29801, 34211, 38621	norovirus Hu/GGII.4/WeertE022/2002/NL
3342	VP1	AY502023	3342	7752	12162, 16572, 20982, 25392, 29802, 34212, 38622	norovirus GII
3343	VP1	KU678202	3343	7753	12163, 16573, 20983, 25393, 29803, 34213, 38623	norovirus 15-IZ-1/2015/GII.Pe/GII.4 Sydney_2012
3344	VP1	KX371607	3344	7754	12164, 16574, 20984, 25394, 29804, 34214, 38624	norovirus GII.4
3345	VP1	KX354112	3345	7755	12165, 16575, 20985, 25395, 29805, 34215, 38625	norovirus GII.4
3346	VP1	KX353993	3346	7756	12166, 16576, 20986, 25396, 29806, 34216, 38626	norovirus GII.4
3347	VP1	KR131762	3347	7757	12167, 16577, 20987, 25397, 29807, 34217, 38627	norovirus GII/Hu/IN/2007/GII.P4_GII.4_ DenHaag2006b/Pune-0716584
3348	VP1	AB972519	3348	7758	12168, 16578, 20988, 25398, 29808, 34218, 38628	norovirus Hu/GII.4/Aichi5/2012/JP
3349	VP1	AB972498	3349	7759	12169, 16579, 20989, 25399, 29809, 34219, 38629	norovirus Hu/GII.4/Ehime3/2012/JP
3350	VP1	AB972488	3350	7760	12170, 16580, 20990, 25400, 29810, 34220, 38630	norovirus Hu/GII.4/Sakai2/2012/JP

3351	VP1	AB972483	3351	7761	12171, 16581, 20991, 25401, 29811, 34221, 38631	norovirus Hu/GII.4/Ehime5/2012/JP
3352	VP1	KP864106	3352	7762	12172, 16582, 20992, 25402, 29812, 34222, 38632	norovirus GII.4
3353	VP1	KR904216	3353	7763	12173, 16583, 20993, 25403, 29813, 34223, 38633	norovirus GII
3354	VP1	AB933771	3354	7764	12174, 16584, 20994, 25404, 29814, 34224, 38634	norovirus Hu/GII.4/Hiroshimacity1/2011/JP
3355	VP1	LC005732	3355	7765	12175, 16585, 20995, 25405, 29815, 34225, 38635	norovirus GII/Hu/JP/2013/GII.4/y13-V938-3
3356	VP1	KP293591	3356	7766	12176, 16586, 20996, 25406, 29816, 34226, 38636	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-464
3357	VP1	KP176396	3357	7767	12177, 16587, 20997, 25407, 29817, 34227, 38637	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-356
3358	VP1	KP176394	3358	7768	12178, 16588, 20998, 25408, 29818, 34228, 38638	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-346
3359	VP1	KP096348	3359	7769	12179, 16589, 20999, 25409, 29819, 34229, 38639	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-406
3360	VP1	KP096344	3360	7770	12180, 16590, 21000, 25410, 29820, 34230, 38640	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-398
3361	VP1	KM982946	3361	7771	12181, 16591, 21001, 25411, 29821, 34231, 38641	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-357
3362	VP1	KM514070	3362	7772	12182, 16592, 21002, 25412, 29822, 34232, 38642	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-327
3363	VP1	KM514061	3363	7773	12183, 16593, 21003, 25413, 29823, 34233, 38643	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-316
3364	VP1	KM514060	3364	7774	12184, 16594, 21004, 25414, 29824, 34234, 38644	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-315
3365	VP1	KM268079	3365	7775	12185, 16595, 21005, 25415, 29825, 34235, 38645	norovirus GII.4
3366	VP1	KJ710247	3366	7776	12186, 16596, 21006, 25416, 29826, 34236, 38646	norovirus GII/Hu/ZA/2012/GII.Pe_GII.4 Sydney 2012/Johannesburg9814
3367	VP1	KJ685405	3367	7777	12187, 16597, 21007, 25417, 29827, 34237, 38647	norovirus Hu/GII/BGICO282/2011/BGD

3368	VP1	KF429766	3368	7778	12188, 16598, 21008, 25418, 29828, 34238, 38648	norovirus Hu/GII.4/NIHIC13/2011/USA
3369	VP1	KF060009	3369	7779	12189, 16599, 21009, 25419, 29829, 34239, 38649	norovirus Hu/GII.4/NSW114H/2012/AU
3370	VP1	KF059996	3370	7780	12190, 16600, 21010, 25420, 29830, 34240, 38650	norovirus Hu/GII.4/ACT0675/2012/AU
3371	VP1	HF952130	3371	7781	12191, 16601, 21011, 25421, 29831, 34241, 38651	norovirus Hu/GII.4/C00007918/2011/UK
3372	VP1	KC409302	3372	7782	12192, 16602, 21012, 25422, 29832, 34242, 38652	norovirus Hu/GII/20477/2010/VNM
3373	VP1	JX459908	3373	7783	12193, 16603, 21013, 25423, 29833, 34243, 38653	norovirus Hu/GII.4/Sydney/NSW0514/2012/AU
3374	VP1	JX445166	3374	7784	12194, 16604, 21014, 25424, 29834, 34244, 38654	norovirus Hu/GII.4/AlbertaEI204/2010/CA
3375	VP1	HQ693090	3375	7785	12195, 16605, 21015, 25425, 29835, 34245, 38655	norovirus Hu/GII.4/TH-S597/THA/2006
3376	VP1	JN400611	3376	7786	12196, 16606, 21016, 25426, 29836, 34246, 38656	norovirus Hu/GII-4/CGMH13/2007/TW
3377	VP1	JN400609	3377	7787	12197, 16607, 21017, 25427, 29837, 34247, 38657	norovirus Hu/GII-4/CGMH11/2006/TW
3378	VP1	JQ613517	3378	7788	12198, 16608, 21018, 25428, 29838, 34248, 38658	norovirus Hu/GII.4/WA210Z/2007/AU
3379	VP1	JQ478409	3379	7789	12199, 16609, 21019, 25429, 29839, 34249, 38659	norovirus Hu/GII.4/Minerva/2006/USA
3380	VP1	GQ856460	3380	7790	12200, 16610, 21020, 25430, 29840, 34250, 38660	norovirus Hu/GII.4/Beijing/55184/2008/CHN
3381	VP1	GQ856449	3381	7791	12201, 16611, 21021, 25431, 29841, 34251, 38661	norovirus Hu/GII.4/Beijing/54125/2007/CHN
3382	VP1	EU921344	3382	7792	12202, 16612, 21022, 25432, 29842, 34252, 38662	norovirus Hu/Pune/PC15/2006/India
3383	VP1	AB541290	3383	7793	12203, 16613, 21023, 25433, 29843, 34253, 38663	norovirus Hu/GII-4/Miyazaki2/2007/JP
3384	VP1	GQ845322	3384	7794	12204, 16614, 21024, 25434, 29844, 34254, 38664	norovirus Hu/GII.4/VIC3863/2007/AU

3385	VP1	AB220921	3385	7795	12205, 16615, 21025, 25435, 29845, 34255, 38665	norovirus Hu/Chiba/04-1050/2005/JP
3386	VP1	KX514221	3386	7796	12206, 16616, 21026, 25436, 29846, 34256, 38666	norovirus GII.4
3387	VP1	KY486271	3387	7797	12207, 16617, 21027, 25437, 29847, 34257, 38667	norovirus GII
3388	VP1	KP784692	3388	7798	12208, 16618, 21028, 25438, 29848, 34258, 38668	norovirus GII/Hu/ZAF/2011/GII.P4_GII.4/ Johannesburg/7028
3389	VP1	KX371604	3389	7799	12209, 16619, 21029, 25439, 29849, 34259, 38669	norovirus GII.4
3390	VP1	KX354079	3390	7800	12210, 16620, 21030, 25440, 29850, 34260, 38670	norovirus GII.4
3391	VP1	KX354028	3391	7801	12211, 16621, 21031, 25441, 29851, 34261, 38671	norovirus GII.4
3392	VP1	KX353983	3392	7802	12212, 16622, 21032, 25442, 29852, 34262, 38672	norovirus GII.4
3393	VP1	AB972511	3393	7803	12213, 16623, 21033, 25443, 29853, 34263, 38673	norovirus Hu/GII.4/Akita1/2012/JP
3394	VP1	AB972478	3394	7804	12214, 16624, 21034, 25444, 29854, 34264, 38674	norovirus Hu/GII.4/Fukui3/2012/JP
3395	VP1	KT780382	3395	7805	12215, 16625, 21035, 25445, 29855, 34265, 38675	norovirus Hu/GII.4/CUHK-NS-555/HKG/2015
3396	VP1	KT033905	3396	7806	12216, 16626, 21036, 25446, 29856, 34266, 38676	norovirus Hu/GII.4/SPHCII83/2012/CHN
3397	VP1	KR904207	3397	7807	12217, 16627, 21037, 25447, 29857, 34267, 38677	norovirus GII
3398	VP1	KJ678151	3398	7808	12218, 16628, 21038, 25448, 29858, 34268, 38678	norovirus Hu/GII.4/Beijing/PKUPH-07-02/inpatient/2013/CHN
3399	VP1	KJ678143	3399	7809	12219, 16629, 21039, 25449, 29859, 34269, 38679	norovirus Hu/GII.4/Beijing/PKUPH-05-01/inpatient/2013/CHN
3400	VP1	KP698927	3400	7810	12220, 16630, 21040, 25450, 29860, 34270, 38680	norovirus GII.4
3401	VP1	LC005730	3401	7811	12221, 16631, 21041, 25451, 29861, 34271, 38681	norovirus GII/Hu/JP/2013/GII.4/y12-V849-2

3402	VP1	LC005714	3402	7812	12222, 16632, 21042, 25452, 29862, 34272, 38682	norovirus GII/Hu/JP/2011/GII.4/y10-V526-8
3403	VP1	KP241906	3403	7813	12223, 16633, 21043, 25453, 29863, 34273, 38683	norovirus GII.4
3404	VP1	KM982938	3404	7814	12224, 16634, 21044, 25454, 29864, 34274, 38684	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-345
3405	VP1	KM514058	3405	7815	12225, 16635, 21045, 25455, 29865, 34275, 38685	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-312
3406	VP1	KM198580	3406	7816	12226, 16636, 21046, 25456, 29866, 34276, 38686	norovirus Hu/GII/10223/2009/VNM
3407	VP1	KM198537	3407	7817	12227, 16637, 21047, 25457, 29867, 34277, 38687	norovirus Hu/GII/10137/2009/VNM
3408	VP1	KF177450	3408	7818	12228, 16638, 21048, 25458, 29868, 34278, 38688	norovirus Hu/GII.4/34506158/AUS/2012
3409	VP1	KF008243	3409	7819	12229, 16639, 21049, 25459, 29869, 34279, 38689	norovirus Hu/GII.4/variant Sydney 2012/FRA
3410	VP1	KF429782	3410	7820	12230, 16640, 21050, 25460, 29870, 34280, 38690	norovirus Hu/GII.4/NIHICI.3/2010/USA
3411	VP1	KF060101	3411	7821	12231, 16641, 21051, 25461, 29871, 34281, 38691	norovirus Hu/GII.4/NSW797K/2012/AU
3412	VP1	KF060096	3412	7822	12232, 16642, 21052, 25462, 29872, 34282, 38692	norovirus Hu/GII.4/NSW746S/2012/AU
3413	VP1	KF060071	3413	7823	12233, 16643, 21053, 25463, 29873, 34283, 38693	norovirus Hu/GII.4/NSW590J/2012/AU
3414	VP1	KF060056	3414	7824	12234, 16644, 21054, 25464, 29874, 34284, 38694	norovirus Hu/GII.4/NSW489T/2012/AU
3415	VP1	JX439836	3415	7825	12235, 16645, 21055, 25465, 29875, 34285, 38695	norovirus Hu/GII/Seoul1835/KOR/2011
3416	VP1	HF952129	3416	7826	12236, 16646, 21056, 25466, 29876, 34286, 38696	norovirus Hu/GII.4/C00007916/2011/UK
3417	VP1	KC409273	3417	7827	12237, 16647, 21057, 25467, 29877, 34287, 38697	norovirus Hu/GII/20196/2009/VNM
3418	VP1	KC409242	3418	7828	12238, 16648, 21058, 25468, 29878, 34288, 38698	norovirus Hu/GII/10406/2010/VNM

3419	VP1	JX445167	3419	7829	12239, 16649, 21059, 25469, 29879, 34289, 38699	norovirus Hu/GII.4/AlbertaEI065/2011/CA
3420	VP1	JX445156	3420	7830	12240, 16650, 21060, 25470, 29880, 34290, 38700	norovirus Hu/GII.4/AlbertaEI498/2006/CA
3421	VP1	GQ856458	3421	7831	12241, 16651, 21061, 25471, 29881, 34291, 38701	norovirus Hu/GII.4/Beijing/55162/2008/CHN
3422	VP1	AB541299	3422	7832	12242, 16652, 21062, 25472, 29882, 34292, 38702	norovirus Hu/GII-4/Miyazaki8/2008/JP
3423	VP1	AB541195	3423	7833	12243, 16653, 21063, 25473, 29883, 34293, 38703	norovirus Hu/GII-4/2008a_ORF2-3/JP
3424	VP1	AB504322	3424	7834	12244, 16654, 21064, 25474, 29884, 34294, 38704	norovirus Hu/GII.4/Hiroshima/108/2007/JPN
3425	VP1	EU876892	3425	7835	12245, 16655, 21065, 25475, 29885, 34295, 38705	norovirus Hu/GGII.4/Cairo1/2006/EGY
3426	VP1	EU876891	3426	7836	12246, 16656, 21066, 25476, 29886, 34296, 38706	norovirus Hu/GGII.4/Dijon-E2703/2008/FRA
3427	VP1	AB294792	3427	7837	12247, 16657, 21067, 25477, 29887, 34297, 38707	norovirus Hu/GII-4/Kimitsu/061146/2006/JP
3428	VP1	AB303932	3428	7838	12248, 16658, 21068, 25478, 29888, 34298, 38708	norovirus Hu/GGII.4/DenHaag001/2003/NL
3429	VP1	LC177660	3429	7839	12249, 16659, 21069, 25479, 29889, 34299, 38709	norovirus GII.4
3430	VP1	KX608866	3430	7840	12250, 16660, 21070, 25480, 29890, 34300, 38710	norovirus GII.4
3431	VP1	KX371603	3431	7841	12251, 16661, 21071, 25481, 29891, 34301, 38711	norovirus GII.4
3432	VP1	KX354086	3432	7842	12252, 16662, 21072, 25482, 29892, 34302, 38712	norovirus GII.4
3433	VP1	KX354080	3433	7843	12253, 16663, 21073, 25483, 29893, 34303, 38713	norovirus GII.4
3434	VP1	KX354054	3434	7844	12254, 16664, 21074, 25484, 29894, 34304, 38714	norovirus GII.4
3435	VP1	KX354041	3435	7845	12255, 16665, 21075, 25485, 29895, 34305, 38715	norovirus GII.4

3436	VP1	KX354029	3436	7846	12256, 16666, 21076, 25486, 29896, 34306, 38716	norovirus GII.4
3437	VP1	KX353977	3437	7847	12257, 16667, 21077, 25487, 29897, 34307, 38717	norovirus GII.4
3438	VP1	KX353965	3438	7848	12258, 16668, 21078, 25488, 29898, 34308, 38718	norovirus GII.4
3439	VP1	KU311158	3439	7849	12259, 16669, 21079, 25489, 29899, 34309, 38719	norovirus Hu/GII.4/AlbertaEI350/2014/CA
3440	VP1	AB974408	3440	7850	12260, 16670, 21080, 25490, 29900, 34310, 38720	norovirus Hu/GII.4/T272/clade 2006b
3441	VP1	KR904221	3441	7851	12261, 16671, 21081, 25491, 29901, 34311, 38721	norovirus GII
3442	VP1	AB933765	3442	7852	12262, 16672, 21082, 25492, 29902, 34312, 38722	norovirus Hu/GII.4/Aichi5/2011/JP
3443	VP1	AB933761	3443	7853	12263, 16673, 21083, 25493, 29903, 34313, 38723	norovirus Hu/GII.4/Osaka4/2011/JP
3444	VP1	AB933748	3444	7854	12264, 16674, 21084, 25494, 29904, 34314, 38724	norovirus Hu/GII.4/Ehime5/2011/JP
3445	VP1	EU921386	3445	7855	12265, 16675, 21085, 25495, 29905, 34315, 38725	norovirus GII/Hu/IN/2007/GII.P4_GII.4_DenHaag2006b/Pune-PC49
3446	VP1	KP244321	3446	7856	12266, 16676, 21086, 25496, 29906, 34316, 38726	norovirus Hu/GII.4/PA59/2012/ITA
3447	VP1	KP698923	3447	7857	12267, 16677, 21087, 25497, 29907, 34317, 38727	norovirus GII.4
3448	VP1	KP241905	3448	7858	12268, 16678, 21088, 25498, 29908, 34318, 38728	norovirus GII.4
3449	VP1	KP176393	3449	7859	12269, 16679, 21089, 25499, 29909, 34319, 38729	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-341
3450	VP1	KP096330	3450	7860	12270, 16680, 21090, 25500, 29910, 34320, 38730	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-377
3451	VP1	KM982953	3451	7861	12271, 16681, 21091, 25501, 29911, 34321, 38731	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-365
3452	VP1	KM982936	3452	7862	12272, 16682, 21092, 25502, 29912, 34322, 38732	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-340

3453	VP1	KM514073	3453	7863	12273, 16683, 21093, 25503, 29913, 34323, 38733	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-330
3454	VP1	KM268086	3454	7864	12274, 16684, 21094, 25504, 29914, 34324, 38734	norovirus GII.4
3455	VP1	KM198552	3455	7865	12275, 16685, 21095, 25505, 29915, 34325, 38735	norovirus Hu/GII/20154/2009/VNM
3456	VP1	KJ716358	3456	7866	12276, 16686, 21096, 25506, 29916, 34326, 38736	norovirus Hu/GII.4/Beijing
3457	VP1	KJ649702	3457	7867	12277, 16687, 21097, 25507, 29917, 34327, 38737	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-244
3458	VP1	KF429778	3458	7868	12278, 16688, 21098, 25508, 29918, 34328, 38738	norovirus Hu/GII.4/NIHIC18.1/2012/USA
3459	VP1	KF060113	3459	7869	12279, 16689, 21099, 25509, 29919, 34329, 38739	norovirus Hu/GII.4/NSW8681/2012/AU
3460	VP1	KF060106	3460	7870	12280, 16690, 21100, 25510, 29920, 34330, 38740	norovirus Hu/GII.4/NSW826F/2011/AU
3461	VP1	KF060100	3461	7871	12281, 16691, 21101, 25511, 29921, 34331, 38741	norovirus Hu/GII.4/NSW783R/2011/AU
3462	VP1	KF060069	3462	7872	12282, 16692, 21102, 25512, 29922, 34332, 38742	norovirus Hu/GII.4/NSW584J/2011/AU
3463	VP1	KF060055	3463	7873	12283, 16693, 21103, 25513, 29923, 34333, 38743	norovirus Hu/GII.4/NSW468J/2011/AU
3464	VP1	KF060028	3464	7874	12284, 16694, 21104, 25514, 29924, 34334, 38744	norovirus Hu/GII.4/NSW295G/2012/AU
3465	VP1	KF060022	3465	7875	12285, 16695, 21105, 25515, 29925, 34335, 38745	norovirus Hu/GII.4/NSW2317/2011/AU
3466	VP1	KC517376	3466	7876	12286, 16696, 21106, 25516, 29926, 34336, 38746	norovirus Hu/GII-4/Taoyuan/CGMH66/2012/TW
3467	VP1	KC517374	3467	7877	12287, 16697, 21107, 25517, 29927, 34337, 38747	norovirus Hu/GII-4/Taoyuan/CGMH64/2012/TW
3468	VP1	KC409308	3468	7878	12288, 16698, 21108, 25518, 29928, 34338, 38748	norovirus Hu/GII/30112/2009/VNM
3469	VP1	KC175393	3469	7879	12289, 16699, 21109, 25519, 29929, 34339, 38749	norovirus Hu/Norwalk/20033/2009/VNM

3470	VP1	JX459623	3470	7880	12290, 16700, 21110, 25520, 29930, 34340, 38750	norovirus Hu/GII.4/SG4065-08/2007/SG
3471	VP1	JQ798158	3471	7881	12291, 16701, 21111, 25521, 29931, 34341, 38751	norovirus Hu/GII.4/SM/USA/2004
3472	VP1	JQ613566	3472	7882	12292, 16702, 21112, 25522, 29932, 34342, 38752	norovirus Hu/GII.4/NSW567H/2010/AU
3473	VP1	AB541287	3473	7883	12293, 16703, 21113, 25523, 29933, 34343, 38753	norovirus Hu/GII-4/Miyazaki13/2008/JP
3474	VP1	AB504320	3474	7884	12294, 16704, 21114, 25524, 29934, 34344, 38754	norovirus Hu/GII.4/Hiroshima/91/2006/JPN
3475	VP1	KU683739	3475	7885	12295, 16705, 21115, 25525, 29935, 34345, 38755	norovirus GII.4
3476	VP1	KX354146	3476	7886	12296, 16706, 21116, 25526, 29936, 34346, 38756	norovirus GII.4
3477	VP1	KX354075	3477	7887	12297, 16707, 21117, 25527, 29937, 34347, 38757	norovirus GII.4
3478	VP1	KX354072	3478	7888	12298, 16708, 21118, 25528, 29938, 34348, 38758	norovirus GII.4
3479	VP1	KX354060	3479	7889	12299, 16709, 21119, 25529, 29939, 34349, 38759	norovirus GII.4
3480	VP1	KX353959	3480	7890	12300, 16710, 21120, 25530, 29940, 34350, 38760	norovirus GII.4
3481	VP1	KX353954	3481	7891	12301, 16711, 21121, 25531, 29941, 34351, 38761	norovirus GII.4
3482	VP1	AB972529	3482	7892	12302, 16712, 21122, 25532, 29942, 34352, 38762	norovirus Hu/GII.4/Hiroshima2/2012/JP
3483	VP1	AB972504	3483	7893	12303, 16713, 21123, 25533, 29943, 34353, 38763	norovirus Hu/GII.4/GII4-NGI343/2011/JP
3484	VP1	AB972503	3484	7894	12304, 16714, 21124, 25534, 29944, 34354, 38764	norovirus Hu/GII.4/GII4-NGI315/2011/JP
3485	VP1	KP244322	3485	7895	12305, 16715, 21125, 25535, 29945, 34355, 38765	norovirus Hu/GII.4/PA99/2012/ITA
3486	VP1	LC018706	3486	7896	12306, 16716, 21126, 25536, 29946, 34356, 38766	norovirus Hu/GII.4/Aichi368-14/2014

3487	VP1	KP096345	3487	7897	12307, 16717, 21127, 25537, 29947, 34357, 38767	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-399
3488	VP1	KM982939	3488	7898	12308, 16718, 21128, 25538, 29948, 34358, 38768	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-347
3489	VP1	KM198588	3489	7899	12309, 16719, 21129, 25539, 29949, 34359, 38769	norovirus Hu/GII/10037/2009/VNM
3490	VP1	KM198544	3490	7900	12310, 16720, 21130, 25540, 29950, 34360, 38770	norovirus Hu/GII/C2418/2010/VNM
3491	VP1	KM198522	3491	7901	12311, 16721, 21131, 25541, 29951, 34361, 38771	norovirus Hu/GII/20150/2009/VNM
3492	VP1	KM198508	3492	7902	12312, 16722, 21132, 25542, 29952, 34362, 38772	norovirus Hu/GII/20066/2009/VNM
3493	VP1	KJ716367	3493	7903	12313, 16723, 21133, 25543, 29953, 34363, 38773	norovirus Hu/GII.4/Beijing
3494	VP1	KF177440	3494	7904	12314, 16724, 21134, 25544, 29954, 34364, 38774	norovirus Hu/GII.4/32973745/AUS/2012
3495	VP1	KF060117	3495	7905	12315, 16725, 21135, 25545, 29955, 34365, 38775	norovirus Hu/GII.4/NSW9171/2012/AU
3496	VP1	KF060104	3496	7906	12316, 16726, 21136, 25546, 29956, 34366, 38776	norovirus Hu/GII.4/NSW820J/2011/AU
3497	VP1	KF060095	3497	7907	12317, 16727, 21137, 25547, 29957, 34367, 38777	norovirus Hu/GII.4/NSW7188/2012/AU
3498	VP1	KF060084	3498	7908	12318, 16728, 21138, 25548, 29958, 34368, 38778	norovirus Hu/GII.4/NSW660C/2011/AU
3499	VP1	KF060082	3499	7909	12319, 16729, 21139, 25549, 29959, 34369, 38779	norovirus Hu/GII.4/NSW6360/2012/AU
3500	VP1	KF060079	3500	7910	12320, 16730, 21140, 25550, 29960, 34370, 38780	norovirus Hu/GII.4/NSW623B/2011/AU
3501	VP1	KF060058	3501	7911	12321, 16731, 21141, 25551, 29961, 34371, 38781	norovirus Hu/GII.4/NSW5047/2011/AU
3502	VP1	KF060039	3502	7912	12322, 16732, 21142, 25552, 29962, 34372, 38782	norovirus Hu/GII.4/NSW3522/2012/AU
3503	VP1	KF060030	3503	7913	12323, 16733, 21143, 25553, 29963, 34373, 38783	norovirus Hu/GII.4/Sutherland/NSW311A/2012/AU

3504	VP1	JX439829	3504	7914	12324, 16734, 21144, 25554, 29964, 34374, 38784	norovirus Hu/GII/Seoul1034/KOR/2010
3505	VP1	KC409282	3505	7915	12325, 16735, 21145, 25555, 29965, 34375, 38785	norovirus Hu/GII/20230/2009/VNM
3506	VP1	KC409259	3506	7916	12326, 16736, 21146, 25556, 29966, 34376, 38786	norovirus Hu/GII/20162/2009/VNM
3507	VP1	JX459659	3507	7917	12327, 16737, 21147, 25557, 29967, 34377, 38787	norovirus Hu/GII.4/SG4010-01/2011/SG
3508	VP1	JX459658	3508	7918	12328, 16738, 21148, 25558, 29968, 34378, 38788	norovirus Hu/GII.4/SG4009-01/2011/SG
3509	VP1	JX459595	3509	7919	12329, 16739, 21149, 25559, 29969, 34379, 38789	norovirus Hu/GII.4/SG4013-09/2004/SG
3510	VP1	JQ613560	3510	7920	12330, 16740, 21150, 25560, 29970, 34380, 38790	norovirus Hu/GII.4/NSW445E/2010/AU
3511	VP1	JQ613545	3511	7921	12331, 16741, 21151, 25561, 29971, 34381, 38791	norovirus Hu/GII.4/NSW673P/2010/AU
3512	VP1	AB541288	3512	7922	12332, 16742, 21152, 25562, 29972, 34382, 38792	norovirus Hu/GII-4/Miyazaki1/2007/JP
3513	VP1	AB541247	3513	7923	12333, 16743, 21153, 25563, 29973, 34383, 38793	norovirus Hu/GII-4/Fukui4/2007/JP
3514	VP1	EU839585	3514	7924	12334, 16744, 21154, 25564, 29974, 34384, 38794	norovirus Hu/GII/Beijing/274/2005/CHN
3515	VP1	AY588021	3515	7925	12335, 16745, 21155, 25565, 29975, 34385, 38795	norovirus Hu/NLV/Oxford/B6S6/2003/UK
3516	VP1	KX514188	3516	7926	12336, 16746, 21156, 25566, 29976, 34386, 38796	norovirus GII.4
3517	VP1	KX354101	3517	7927	12337, 16747, 21157, 25567, 29977, 34387, 38797	norovirus GII.4
3518	VP1	KX354023	3518	7928	12338, 16748, 21158, 25568, 29978, 34388, 38798	norovirus GII.4
3519	VP1	KX353979	3519	7929	12339, 16749, 21159, 25569, 29979, 34389, 38799	norovirus GII.4
3520	VP1	AB972491	3520	7930	12340, 16750, 21160, 25570, 29980, 34390, 38800	norovirus Hu/GII.4/Sakai5/2012/JP

3521	VP1	AB972469	3521	7931	12341, 16751, 21161, 25571, 29981, 34391, 38801	norovirus Hu/GII.4/Aomori5/2012/JP
3522	VP1	LC101819	3522	7932	12342, 16752, 21162, 25572, 29982, 34392, 38802	norovirus GII/Hu/Jp/2012/GII.4/sl20153
3523	VP1	KT202795	3523	7933	12343, 16753, 21163, 25573, 29983, 34393, 38803	norovirus GII
3524	VP1	AB933742	3524	7934	12344, 16754, 21164, 25574, 29984, 34394, 38804	norovirus Hu/GII.4/Nagano2/2009/JP
3525	VP1	AB933722	3525	7935	12345, 16755, 21165, 25575, 29985, 34395, 38805	norovirus Hu/GII.4/Ehime3/2011/JP
3526	VP1	KJ678138	3526	7936	12346, 16756, 21166, 25576, 29986, 34396, 38806	norovirus Hu/GII.4/Beijing/PKUPH-02-05/inpatient/2013/CHN
3527	VP1	KP244317	3527	7937	12347, 16757, 21167, 25577, 29987, 34397, 38807	norovirus Hu/GII.4/PR328/2013/ITA
3528	VP1	KP698925	3528	7938	12348, 16758, 21168, 25578, 29988, 34398, 38808	norovirus GII.4
3529	VP1	LC005727	3529	7939	12349, 16759, 21169, 25579, 29989, 34399, 38809	norovirus GII/Hu/JP/2012/GII.4/y12-V780-1
3530	VP1	LC016603	3530	7940	12350, 16760, 21170, 25580, 29990, 34400, 38810	norovirus Hu/JP/2004/GII.4/Sakai/01-inpatient8-29d-2
3531	VP1	LC016599	3531	7941	12351, 16761, 21171, 25581, 29991, 34401, 38811	norovirus Hu/JP/2004/GII.4/Sakai/01-inpatient6-2d
3532	VP1	KP293587	3532	7942	12352, 16762, 21172, 25582, 29992, 34402, 38812	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-457
3533	VP1	KP176402	3533	7943	12353, 16763, 21173, 25583, 29993, 34403, 38813	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-415
3534	VP1	KJ196287	3534	7944	12354, 16764, 21174, 25584, 29994, 34404, 38814	norovirus GII/Hu/JP/2010/GII.P4_GII.4/Shimada/ASC96
3535	VP1	KM198480	3535	7945	12355, 16765, 21175, 25585, 29995, 34405, 38815	norovirus Hu/GII/10116/2009/VNM
3536	VP1	KJ716357	3536	7946	12356, 16766, 21176, 25586, 29996, 34406, 38816	norovirus Hu/GII.4/Beijing
3537	VP1	KJ716354	3537	7947	12357, 16767, 21177, 25587, 29997, 34407, 38817	norovirus Hu/GII.4/Beijing

3538	VP1	KJ685403	3538	7948	12358, 16768, 21178, 25588, 29998, 34408, 38818	norovirus Hu/GII/BGICD204/2011/BGD
3539	VP1	KF060108	3539	7949	12359, 16769, 21179, 25589, 29999, 34409, 38819	norovirus Hu/GII.4/NSW8381/2012/AU
3540	VP1	KF060099	3540	7950	12360, 16770, 21180, 25590, 30000, 34410, 38820	norovirus Hu/GII.4/NSW7831/2011/AU
3541	VP1	KF060004	3541	7951	12361, 16771, 21181, 25591, 30001, 34411, 38821	norovirus Hu/GII.4/NSW078G/2012/AU
3542	VP1	KF060006	3542	7952	12362, 16772, 21182, 25592, 30002, 34412, 38822	norovirus Hu/GII.4/NSW097K/2012/AU
3543	VP1	KC517371	3543	7953	12363, 16773, 21183, 25593, 30003, 34413, 38823	norovirus Hu/GII-4/New Taipei/CGMH61/2012/TW
3544	VP1	JX459657	3544	7954	12364, 16774, 21184, 25594, 30004, 34414, 38824	norovirus Hu/GII.4/SG4002-12/2010/SG
3545	VP1	JX459656	3545	7955	12365, 16775, 21185, 25595, 30005, 34415, 38825	norovirus Hu/GII.4/SG4054-08/2010/SG
3546	VP1	JX445152	3546	7956	12366, 16776, 21186, 25596, 30006, 34416, 38826	norovirus Hu/GII.4/AlbertaEI131/2004/CA
3547	VP1	JQ613553	3547	7957	12367, 16777, 21187, 25597, 30007, 34417, 38827	norovirus Hu/GII.4/NSW186M/2010/AU
3548	VP1	JQ613521	3548	7958	12368, 16778, 21188, 25598, 30008, 34418, 38828	norovirus Hu/GII.4/NSW3110/2008/AU
3549	VP1	HQ005298	3549	7959	12369, 16779, 21189, 25599, 30009, 34419, 38829	norovirus Hu/II.4/2849738/HK/2009
3550	VP1	HQ005296	3550	7960	12370, 16780, 21190, 25600, 30010, 34420, 38830	norovirus Hu/II.4/2856357/HK/2009
3551	VP1	HM802555	3551	7961	12371, 16781, 21191, 25601, 30011, 34421, 38831	norovirus Hu/GII.4/Hong Kong/CUOS0130/2005/CHN
3552	VP1	GQ246801	3552	7962	12372, 16782, 21192, 25602, 30012, 34422, 38832	norovirus Hu/GGII.4/Dijon/E4032/2009/FRA
3553	VP1	AB504308	3553	7963	12373, 16783, 21193, 25603, 30013, 34423, 38833	norovirus Hu/GII.4/Hiroshima/44/2004/JPN
3554	VP1	DQ369797	3554	7964	12374, 16784, 21194, 25604, 30014, 34424, 38834	norovirus Hu/Guangzhou/NVgz01/CHN

3555	VP1	LC177661	3555	7965	12375, 16785, 21195, 25605, 30015, 34425, 38835	norovirus GII.4
3556	VP1	LC175468	3556	7966	12376, 16786, 21196, 25606, 30016, 34426, 38836	norovirus Hu/GII/JP/2016/GII.P16_GII.4_Sydney2012/Kawasaki194
3557	VP1	KX354137	3557	7967	12377, 16787, 21197, 25607, 30017, 34427, 38837	norovirus GII.4
3558	VP1	KX354036	3558	7968	12378, 16788, 21198, 25608, 30018, 34428, 38838	norovirus GII.4
3559	VP1	KX354011	3559	7969	12379, 16789, 21199, 25609, 30019, 34429, 38839	norovirus GII.4
3560	VP1	LC153122	3560	7970	12380, 16790, 21200, 25610, 30020, 34430, 38840	norovirus GII/Hu/JP/2016/GII.P16_GII.4_Sydney2012/OC16023
3561	VP1	KR131777	3561	7971	12381, 16791, 21201, 25611, 30021, 34431, 38841	norovirus GII/Hu/IN/2011/GII.P4_GII.4_NewOrleans2009/Pune-112370
3562	VP1	AB933764	3562	7972	12382, 16792, 21202, 25612, 30022, 34432, 38842	norovirus Hu/GII.4/Osakal/2011/JP
3563	VP1	LC016600	3563	7973	12383, 16793, 21203, 25613, 30023, 34433, 38843	norovirus Hu/JP/2004/GII.4/Sakai/01-inpatient6-26d
3564	VP1	KJ433970	3564	7974	12384, 16794, 21204, 25614, 30024, 34434, 38844	norovirus 13-AV-1-10/2012/GII.4
3565	VP1	KP176395	3565	7975	12385, 16795, 21205, 25615, 30025, 34435, 38845	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-352
3566	VP1	KM982947	3566	7976	12386, 16796, 21206, 25616, 30026, 34436, 38846	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-358
3567	VP1	KJ685414	3567	7977	12387, 16797, 21207, 25617, 30027, 34437, 38847	norovirus Hu/GII/BGIC0004/2010/BGD
3568	VP1	KF060093	3568	7978	12388, 16798, 21208, 25618, 30028, 34438, 38848	norovirus Hu/GII.4/NSW7117/2012/AU
3569	VP1	KC456070	3569	7979	12389, 16799, 21209, 25619, 30029, 34439, 38849	norovirus Hu/GII.4/VP1172/Shanghai/2012/CHN
3570	VP1	KC409299	3570	7980	12390, 16800, 21210, 25620, 30030, 34440, 38850	norovirus Hu/GII/20457/2010/VNM
3571	VP1	JX984947	3571	7981	12391, 16801, 21211, 25621, 30031, 34441, 38851	norovirus Hu/GII.4/GZ2010-L32/Guangzhou/CHN/2010

3572	VP1	KC175385	3572	7982	12392, 16802, 21212, 25622, 30032, 34442, 38852	norovirus Hu/Norwalk/10368/2010/VNM
3573	VP1	JQ613563	3573	7983	12393, 16803, 21213, 25623, 30033, 34443, 38853	norovirus Hu/GII.4/NSW9039/2010/AU
3574	VP1	JQ613558	3574	7984	12394, 16804, 21214, 25624, 30034, 34444, 38854	norovirus Hu/GII.4/NSW6811/2010/AU
3575	VP1	GQ856451	3575	7985	12395, 16805, 21215, 25625, 30035, 34445, 38855	norovirus Hu/GII.4/Beijing/54651/2007/CHN
3576	VP1	DQ419908	3576	7986	12396, 16806, 21216, 25626, 30036, 34446, 38856	norovirus Hu/Beijing/CR2932/2004/CHN
3577	VP1	KX514354	3577	7987	12397, 16807, 21217, 25627, 30037, 34447, 38857	norovirus GII.4
3578	VP1	KX354062	3578	7988	12398, 16808, 21218, 25628, 30038, 34448, 38858	norovirus GII.4
3579	VP1	AB972532	3579	7989	12399, 16809, 21219, 25629, 30039, 34449, 38859	norovirus Hu/GII.4/Shimane2/2012/JP
3580	VP1	KT202796	3580	7990	12400, 16810, 21220, 25630, 30040, 34450, 38860	norovirus GII
3581	VP1	AB933751	3581	7991	12401, 16811, 21221, 25631, 30041, 34451, 38861	norovirus Hu/GII.4/Hiroshima5/2009/JP
3582	VP1	KM514078	3582	7992	12402, 16812, 21222, 25632, 30042, 34452, 38862	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-335
3583	VP1	KM198569	3583	7993	12403, 16813, 21223, 25633, 30043, 34453, 38863	norovirus Hu/GII/10235/2009/VNM
3584	VP1	KF768522	3584	7994	12404, 16814, 21224, 25634, 30044, 34454, 38864	norovirus Hu/GII.4/P63/2012/Gothenburg/Sweden
3585	VP1	KF060120	3585	7995	12405, 16815, 21225, 25635, 30045, 34455, 38865	norovirus Hu/GII.4/NSW959S/2012/AU
3586	VP1	KF060102	3586	7996	12406, 16816, 21226, 25636, 30046, 34456, 38866	norovirus Hu/GII.4/NSW811C/2012/AU
3587	VP1	KF060088	3587	7997	12407, 16817, 21227, 25637, 30047, 34457, 38867	norovirus Hu/GII.4/NSW6790/2011/AU
3588	VP1	KF060025	3588	7998	12408, 16818, 21228, 25638, 30048, 34458, 38868	norovirus Hu/GII.4/NSW270F/2012/AU

3589	VP1	KC517378	3589	7999	12409, 16819, 21229, 25639, 30049, 34459, 38869	norovirus Hu/GII-4/New Taipei/CGMH68/2012/TW
3590	VP1	JX459640	3590	8000	12410, 16820, 21230, 25640, 30050, 34460, 38870	norovirus Hu/GII.4/SG4070-07/2009/SG
3591	VP1	JQ613512	3591	8001	12411, 16821, 21231, 25641, 30051, 34461, 38871	norovirus Hu/GII.4/WA145Y/2007/AU
3592	VP1	HQ005299	3592	8002	12412, 16822, 21232, 25642, 30052, 34462, 38872	norovirus Hu/II.4/2201480/HK/2010
3593	VP1	AB541312	3593	8003	12413, 16823, 21233, 25643, 30053, 34463, 38873	norovirus Hu/GII-4/Niigata2/2008/JP
3594	VP1	AB541275	3594	8004	12414, 16824, 21234, 25644, 30054, 34464, 38874	norovirus Hu/GII-4/Iwate5/2007/JP
3595	VP1	AB303930	3595	8005	12415, 16825, 21235, 25645, 30055, 34465, 38875	norovirus Hu/GGII.4/Heerlen003/2003/NL
3596	VP1	AY485642	3596	8006	12416, 16826, 21236, 25646, 30056, 34466, 38876	human calicivirus NLV/GII/Langen1061/2002/DE
3597	VP1	KX514343	3597	8007	12417, 16827, 21237, 25647, 30057, 34467, 38877	norovirus GII.4
3598	VP1	KX514274	3598	8008	12418, 16828, 21238, 25648, 30058, 34468, 38878	norovirus GII.4
3599	VP1	KX514175	3599	8009	12419, 16829, 21239, 25649, 30059, 34469, 38879	norovirus GII.4
3600	VP1	KX354093	3600	8010	12420, 16830, 21240, 25650, 30060, 34470, 38880	norovirus GII.4
3601	VP1	KX354003	3601	8011	12421, 16831, 21241, 25651, 30061, 34471, 38881	norovirus GII.4
3602	VP1	KR131778	3602	8012	12422, 16832, 21242, 25652, 30062, 34472, 38882	norovirus GII/Hu/IN/2011/GII.P4_GII.4_ NewOrleans2009/Pune-116686
3603	VP1	AB972468	3603	8013	12423, 16833, 21243, 25653, 30063, 34473, 38883	norovirus Hu/GII.4/Aomori3/2012/JP
3604	VP1	KR904222	3604	8014	12424, 16834, 21244, 25654, 30064, 34474, 38884	norovirus GII
3605	VP1	KP244320	3605	8015	12425, 16835, 21245, 25655, 30065, 34475, 38885	norovirus Hu/GII.4/PA330/2011/ITA

3606	VP1	KP244315	3606	8016	12426, 16836, 21246, 25656, 30066, 34476, 38886	norovirus Hu/GII.4/PR7841/2011/ITA
3607	VP1	KP244314	3607	8017	12427, 16837, 21247, 25657, 30067, 34477, 38887	norovirus Hu/GII.4/PR11471/2011/ITA
3608	VP1	KM268078	3608	8018	12428, 16838, 21248, 25658, 30068, 34478, 38888	norovirus GII.4
3609	VP1	KM198555	3609	8019	12429, 16839, 21249, 25659, 30069, 34479, 38889	norovirus Hu/GII/C2035/2010/VNM
3610	VP1	KF060115	3610	8020	12430, 16840, 21250, 25660, 30070, 34480, 38890	norovirus Hu/GII.4/NSW906P/2012/AU
3611	VP1	KF060018	3611	8021	12431, 16841, 21251, 25661, 30071, 34481, 38891	norovirus Hu/GII.4/NSW2024/2012/AU
3612	VP1	KC517365	3612	8022	12432, 16842, 21252, 25662, 30072, 34482, 38892	norovirus Hu/GII-4/Taoyuan/CGMH55/2012/TW
3613	VP1	KC517360	3613	8023	12433, 16843, 21253, 25663, 30073, 34483, 38893	norovirus Hu/GII-4/New Taipei/CGMH50/2011/TW
3614	VP1	JX846928	3614	8024	12434, 16844, 21254, 25664, 30074, 34484, 38894	norovirus Hu/GII.4/NIHIC9/2011/USA
3615	VP1	JX459904	3615	8025	12435, 16845, 21255, 25665, 30075, 34485, 38895	norovirus Hu/GII.4/Doonside/NSW5361/2011/AU
3616	VP1	JX459649	3616	8026	12436, 16846, 21256, 25666, 30076, 34486, 38896	norovirus Hu/GII.4/SG4061-10/2009/SG
3617	VP1	JX459643	3617	8027	12437, 16847, 21257, 25667, 30077, 34487, 38897	norovirus Hu/GII.4/SG4044-09/2009/SG
3618	VP1	JX459602	3618	8028	12438, 16848, 21258, 25668, 30078, 34488, 38898	norovirus Hu/GII.4/SG4009-09/2006/SG
3619	VP1	LC177655	3619	8029	12439, 16849, 21259, 25669, 30079, 34489, 38899	norovirus GII.4
3620	VP1	KP784698	3620	8030	12440, 16850, 21260, 25670, 30080, 34490, 38900	norovirus GII/Hu/ZAF/2012/GII.P4_GII.4/Johannesburg/BW
3621	VP1	KX354104	3621	8031	12441, 16851, 21261, 25671, 30081, 34491, 38901	norovirus GII.4
3622	VP1	KR904211	3622	8032	12442, 16852, 21262, 25672, 30082, 34492, 38902	norovirus GII

3623	VP1	AB933743	3623	8033	12443, 16853, 21263, 25673, 30083, 34493, 38903	norovirus Hu/GII.4/Nagano4/2009/JP
3624	VP1	LN854572	3624	8034	12444, 16854, 21264, 25674, 30084, 34494, 38904	norovirus GII/Hu/NL/2012/GII.4/Nijmegen02
3625	VP1	KP244319	3625	8035	12445, 16855, 21265, 25675, 30085, 34495, 38905	norovirus Hu/GII.4/PA278/2011/ITA
3626	VP1	KF768470	3626	8036	12446, 16856, 21266, 25676, 30086, 34496, 38906	norovirus Hu/GII.4/P2/2012/Gothenburg/Sweden
3627	VP1	KC456073	3627	8037	12447, 16857, 21267, 25677, 30087, 34497, 38907	norovirus Hu/GII.4/VP1451/Shanghai/2012/CHN
3628	VP1	KC456072	3628	8038	12448, 16858, 21268, 25678, 30088, 34498, 38908	norovirus Hu/GII.4/VP1281/Shanghai/2012/CHN
3629	VP1	JX459622	3629	8039	12449, 16859, 21269, 25679, 30089, 34499, 38909	norovirus Hu/GII.4/SG4052-08/2007/SG
3630	VP1	KX514290	3630	8040	12450, 16860, 21270, 25680, 30090, 34500, 38910	norovirus GII.4
3631	VP1	KP784695	3631	8041	12451, 16861, 21271, 25681, 30091, 34501, 38911	norovirus GII/Hu/ZAF/2012/GII.P4_GII.4/Empangeni/9693
3632	VP1	KX608865	3632	8042	12452, 16862, 21272, 25682, 30092, 34502, 38912	norovirus GII.4
3633	VP1	AB972500	3633	8043	12453, 16863, 21273, 25683, 30093, 34503, 38913	norovirus Hu/GII.4/GII4-HK02/2011/JP
3634	VP1	KT033902	3634	8044	12454, 16864, 21274, 25684, 30094, 34504, 38914	norovirus Hu/GII.4/SPHC2048/2012/CHN
3635	VP1	KR904220	3635	8045	12455, 16865, 21275, 25685, 30095, 34505, 38915	norovirus GII
3636	VP1	LN854566	3636	8046	12456, 16866, 21276, 25686, 30096, 34506, 38916	norovirus GII/Hu/NL/2014/GII.4/Groningen01
3637	VP1	KP244313	3637	8047	12457, 16867, 21277, 25687, 30097, 34507, 38917	norovirus Hu/GII.4/PR6876/2010/ITA
3638	VP1	KP096342	3638	8048	12458, 16868, 21278, 25688, 30098, 34508, 38918	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-396
3639	VP1	KM514067	3639	8049	12459, 16869, 21279, 25689, 30099, 34509, 38919	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-322

3640	VP1	KF060049	3640	8050	12460, 16870, 21280, 25690, 30100, 34510, 38920	norovirus Hu/GII.4/NSW4310/2011/AU
3641	VP1	KF059998	3641	8051	12461, 16871, 21281, 25691, 30101, 34511, 38921	norovirus Hu/GII.4/NSW0066/2012/AU
3642	VP1	JX439833	3642	8052	12462, 16872, 21282, 25692, 30102, 34512, 38922	norovirus Hu/GII/Seoul1409/KOR/2010
3643	VP1	JQ613548	3643	8053	12463, 16873, 21283, 25693, 30103, 34513, 38923	norovirus Hu/GII.4/NSW0396/2010/AU
3644	VP1	JN595867	3644	8054	12464, 16874, 21284, 25694, 30104, 34514, 38924	norovirus Hu/GII.4/New Orleans/2010/USA
3645	VP1	AB629944	3645	8055	12465, 16875, 21285, 25695, 30105, 34515, 38925	norovirus Hu/Tokyo/10-1443/2010/JPN
3646	VP1	AB541192	3646	8056	12466, 16876, 21286, 25696, 30106, 34516, 38926	norovirus Hu/GII-4/2007b_ORF2-3/JP
3647	VP1	AB504314	3647	8057	12467, 16877, 21287, 25697, 30107, 34517, 38927	norovirus Hu/GII.4/Hiroshima/59/2005/JPN
3648	VP1	KX514350	3648	8058	12468, 16878, 21288, 25698, 30108, 34518, 38928	norovirus GII.4
3649	VP1	KX514342	3649	8059	12469, 16879, 21289, 25699, 30109, 34519, 38929	norovirus GII.4
3650	VP1	KX514280	3650	8060	12470, 16880, 21290, 25700, 30110, 34520, 38930	norovirus GII.4
3651	VP1	LC177654	3651	8061	12471, 16881, 21291, 25701, 30111, 34521, 38931	norovirus GII.4
3652	VP1	KX354026	3652	8062	12472, 16882, 21292, 25702, 30112, 34522, 38932	norovirus GII.4
3653	VP1	KR904218	3653	8063	12473, 16883, 21293, 25703, 30113, 34523, 38933	norovirus GII
3654	VP1	KJ678150	3654	8064	12474, 16884, 21294, 25704, 30114, 34524, 38934	norovirus Hu/GII.4/Beijing/PKUPH-07-01/inpatient/2013/CHN
3655	VP1	KJ678148	3655	8065	12475, 16885, 21295, 25705, 30115, 34525, 38935	norovirus Hu/GII.4/Beijing/PKUPH-05-06/inpatient/2013/CHN
3656	VP1	KP244316	3656	8066	12476, 16886, 21296, 25706, 30116, 34526, 38936	norovirus Hu/GII.4/PR9474/2011/ITA

3657	VP1	KF060072	3657	8067	12477, 16887, 21297, 25707, 30117, 34527, 38937	norovirus Hu/GII.4/NSW596M/2011/AU
3658	VP1	JX439822	3658	8068	12478, 16888, 21298, 25708, 30118, 34528, 38938	norovirus Hu/GII/Seoul1391/KOR/2010
3659	VP1	KC463910	3659	8069	12479, 16889, 21299, 25709, 30119, 34529, 38939	norovirus Hu/GII.4/Ohio/684/USA
3660	VP1	JX459651	3660	8070	12480, 16890, 21300, 25710, 30120, 34530, 38940	norovirus Hu/GII.4/SG4075-12/2009/SG
3661	VP1	AB541314	3661	8071	12481, 16891, 21301, 25711, 30121, 34531, 38941	norovirus Hu/GII-4/Niigata3/2008/JP
3662	VP1	AB504323	3662	8072	12482, 16892, 21302, 25712, 30122, 34532, 38942	norovirus Hu/GII.4/Hiroshima/109/2007/JPN
3663	VP1	KX353963	3663	8073	12483, 16893, 21303, 25713, 30123, 34533, 38943	norovirus GII.4
3664	VP1	KR904213	3664	8074	12484, 16894, 21304, 25714, 30124, 34534, 38944	norovirus GII
3665	VP1	AB933745	3665	8075	12485, 16895, 21305, 25715, 30125, 34535, 38945	norovirus Hu/GII.4/Aichi3/2010/JP
3666	VP1	KP096341	3666	8076	12486, 16896, 21306, 25716, 30126, 34536, 38946	norovirus Hu/GII/HKG/2014/GII.4/CUHK-NS-395
3667	VP1	KM114291	3667	8077	12487, 16897, 21307, 25717, 30127, 34537, 38947	norovirus Hu/GII.4/SJTUH1/CHN/2014
3668	VP1	KF060105	3668	8078	12488, 16898, 21308, 25718, 30128, 34538, 38948	norovirus Hu/GII.4/NSW824F/2012/AU
3669	VP1	KF060081	3669	8079	12489, 16899, 21309, 25719, 30129, 34539, 38949	norovirus Hu/GII.4/NSW628T/2012/AU
3670	VP1	KF059999	3670	8080	12490, 16900, 21310, 25720, 30130, 34540, 38950	norovirus Hu/GII.4/NSW007P/2012/AU
3671	VP1	JX644036	3671	8081	12491, 16901, 21311, 25721, 30131, 34541, 38951	norovirus Hu/GII.4/N94/2011/HuZhou
3672	VP1	JX459654	3672	8082	12492, 16902, 21312, 25722, 30132, 34542, 38952	norovirus Hu/GII.4/SG4051-08/2010/SG
3673	VP1	JN400621	3673	8083	12493, 16903, 21313, 25723, 30133, 34543, 38953	norovirus Hu/GII-4/CGMH23/2010/TW

3674	VP1	AB541260	3674	8084	12494, 16904, 21314, 25724, 30134, 34544, 38954	norovirus Hu/GII-4/Hokkaidol/2007/JP
3675	VP1	KX514341	3675	8085	12495, 16905, 21315, 25725, 30135, 34545, 38955	norovirus GII.4
3676	VP1	KX514253	3676	8086	12496, 16906, 21316, 25726, 30136, 34546, 38956	norovirus GII.4
3677	VP1	KX514195	3677	8087	12497, 16907, 21317, 25727, 30137, 34547, 38957	norovirus GII.4
3678	VP1	KX354016	3678	8088	12498, 16908, 21318, 25728, 30138, 34548, 38958	norovirus GII.4
3679	VP1	KM245073	3679	8089	12499, 16909, 21319, 25729, 30139, 34549, 38959	norovirus 09-BI-2/2009/GII.4/NewOrleans/2009
3680	VP1	LN854567	3680	8090	12500, 16910, 21320, 25730, 30140, 34550, 38960	norovirus GII/Hu/NL/2014/GII.4/Groningen02
3681	VP1	JN400619	3681	8091	12501, 16911, 21321, 25731, 30141, 34551, 38961	norovirus Hu/GII-4/CGMH21/2010/TW
3682	VP1	KF060052	3682	8092	12502, 16912, 21322, 25732, 30142, 34552, 38962	norovirus Hu/GII.4/NSW4512/2012/AU
3683	VP1	KF060014	3683	8093	12503, 16913, 21323, 25733, 30143, 34553, 38963	norovirus Hu/GII.4/NSW1627/2012/AU
3684	VP1	KC517375	3684	8094	12504, 16914, 21324, 25734, 30144, 34554, 38964	norovirus Hu/GII-4/Taoyuan/CGMH65/2012/TW
3685	VP1	JX644039	3685	8095	12505, 16915, 21325, 25735, 30145, 34555, 38965	norovirus Hu/GII.4/N101/2011/HuZhou
3686	VP1	JX644031	3686	8096	12506, 16916, 21326, 25736, 30146, 34556, 38966	norovirus Hu/GII.4/N76/2010/HuZhou
3687	VP1	HM191773	3687	8097	12507, 16917, 21327, 25737, 30147, 34557, 38967	norovirus Hu/II.4/2200661/HK/2010
3688	VP1	AB504309	3688	8098	12508, 16918, 21328, 25738, 30148, 34558, 38968	norovirus Hu/GII.4/Hiroshima/48/2004/JPN
3689	VP1	KX514216	3689	8099	12509, 16919, 21329, 25739, 30149, 34559, 38969	norovirus GII.4
3690	VP1	KX514212	3690	8100	12510, 16920, 21330, 25740, 30150, 34560, 38970	norovirus GII.4

3691	VP1	KX354138	3691	8101	12511, 16921, 21331, 25741, 30151, 34561, 38971	norovirus GII.4
3692	VP1	AB933747	3692	8102	12512, 16922, 21332, 25742, 30152, 34562, 38972	norovirus Hu/GII.4/Osaka5/2009/JP
3693	VP1	KJ955493	3693	8103	12513, 16923, 21333, 25743, 30153, 34563, 38973	norovirus JB031230049/Nanshan/08/12/2012/SZ/CHN
3694	VP1	KJ678153	3694	8104	12514, 16924, 21334, 25744, 30154, 34564, 38974	norovirus Hu/GII.4/Beijing/PKUPH-07-04/inpatient/2013/CHN
3695	VP1	KC456071	3695	8105	12515, 16925, 21335, 25745, 30155, 34565, 38975	norovirus Hu/GII.4/VP1214/Shanghai/2012/CHN
3696	VP1	KC175384	3696	8106	12516, 16926, 21336, 25746, 30156, 34566, 38976	norovirus Hu/Norwalk/10328/2010/VNM
3697	VP1	JQ613561	3697	8107	12517, 16927, 21337, 25747, 30157, 34567, 38977	norovirus Hu/GII.4/NSW2340/2010/AU
3698	VP1	KJ678145	3698	8108	12518, 16928, 21338, 25748, 30158, 34568, 38978	norovirus Hu/GII.4/Beijing/PKUPH-05-03/inpatient/2013/CHN
3699	VP1	KF060116	3699	8109	12519, 16929, 21339, 25749, 30159, 34569, 38979	norovirus Hu/GII.4/NSW9166/2012/AU
3700	VP1	KC517362	3700	8110	12520, 16930, 21340, 25750, 30160, 34570, 38980	norovirus Hu/GII-4/Taoyuan/CGMH52/2012/TW
3701	VP1	JX644038	3701	8111	12521, 16931, 21341, 25751, 30161, 34571, 38981	norovirus Hu/GII.4/N100/2011/HuZhou
3702	VP1	AB504313	3702	8112	12522, 16932, 21342, 25752, 30162, 34572, 38982	norovirus Hu/GII.4/Hiroshima/58/2005/JPN
3703	VP1	KX514361	3703	8113	12523, 16933, 21343, 25753, 30163, 34573, 38983	norovirus GII.4
3704	VP1	KX514336	3704	8114	12524, 16934, 21344, 25754, 30164, 34574, 38984	norovirus GII.4
3705	VP1	KX514203	3705	8115	12525, 16935, 21345, 25755, 30165, 34575, 38985	norovirus GII.4
3706	VP1	KP784693	3706	8116	12526, 16936, 21346, 25756, 30166, 34576, 38986	norovirus GII/Hu/ZAF/2011/GII.P4_GII.4/Empangeni/8501
3707	VP1	AB933734	3707	8117	12527, 16937, 21347, 25757, 30167, 34577, 38987	norovirus Hu/GII.4/Aomori5/2009/JP

3708	VP1	KF060041	3708	8118	12528, 16938, 21348, 25758, 30168, 34578, 38988	norovirus Hu/GII.4/NSW369N/2012/AU
3709	VP1	JX989074	3709	8119	12529, 16939, 21349, 25759, 30169, 34579, 38989	norovirus Hu/GII.4/GZ2010-L87/Guangzhou/CHN/2011
3710	VP1	JN400624	3710	8120	12530, 16940, 21350, 25760, 30170, 34580, 38990	norovirus Hu/GII-4/CGMH26/2010/TW
3711	VP1	EU876894	3711	8121	12531, 16941, 21351, 25761, 30171, 34581, 38991	norovirus Hu/GGII.4/Dijon-EI501/2006/FRA
3712	VP1	KX514173	3712	8122	12532, 16942, 21352, 25762, 30172, 34582, 38992	norovirus GII.4
3713	VP1	KX353989	3713	8123	12533, 16943, 21353, 25763, 30173, 34583, 38993	norovirus GII.4
3714	VP1	KX353962	3714	8124	12534, 16944, 21354, 25764, 30174, 34584, 38994	norovirus GII.4
3715	VP1	AB972515	3715	8125	12535, 16945, 21355, 25765, 30175, 34585, 38995	norovirus Hu/GII.4/Iwate2/2012/JP
3716	VP1	KT033904	3716	8126	12536, 16946, 21356, 25766, 30176, 34586, 38996	norovirus Hu/GII.4/SPHC1134/2012/CHN
3717	VP1	KM982942	3717	8127	12537, 16947, 21357, 25767, 30177, 34587, 38997	norovirus GII/Hu/HKG/2014/GII.4/CUHK-NS-350
3718	VP1	KJ685417	3718	8128	12538, 16948, 21358, 25768, 30178, 34588, 38998	norovirus Hu/GII/BGIC0270/2011/BGD
3719	VP1	KC907392	3719	8129	12539, 16949, 21359, 25769, 30179, 34589, 38999	synthetic construct
3720	VP1	KC517377	3720	8130	12540, 16950, 21360, 25770, 30180, 34590, 39000	norovirus Hu/GII-4/Taoyuan/CGMH67/2012/TW
3721	VP1	KC517368	3721	8131	12541, 16951, 21361, 25771, 30181, 34591, 39001	norovirus Hu/GII-4/New Taipei/CGMH58/2012/TW
3722	VP1	AB541310	3722	8132	12542, 16952, 21362, 25772, 30182, 34592, 39002	norovirus Hu/GII-4/Niigata1/2008/JP
3723	VP1	EF535854	3723	8133	12543, 16953, 21363, 25773, 30183, 34593, 39003	norovirus Hu/Guangzhou/NV-VP1/2006/China
3724	VP1	KX514368	3724	8134	12544, 16954, 21364, 25774, 30184, 34594, 39004	norovirus GII.4

3725	VP1	KX514351	3725	8135	12545, 16955, 21365, 25775, 30185, 34595, 39005	norovirus GII.4
3726	VP1	KC517372	3726	8136	12546, 16956, 21366, 25776, 30186, 34596, 39006	norovirus Hu/GII-4/New Taipei/CGMH62/2012/TW
3727	VP1	JN400613	3727	8137	12547, 16957, 21367, 25777, 30187, 34597, 39007	norovirus Hu/GII-4/CGMH15/2007/TW
3728	VP1	KX514291	3728	8138	12548, 16958, 21368, 25778, 30188, 34598, 39008	norovirus GII.4
3729	VP1	KX514219	3729	8139	12549, 16959, 21369, 25779, 30189, 34599, 39009	norovirus GII.4
3730	VP1	AB933668	3730	8140	12550, 16960, 21370, 25780, 30190, 34600, 39010	norovirus Hu/GII.4/Osaka4/2010/JP
3731	VP1	KJ678149	3731	8141	12551, 16961, 21371, 25781, 30191, 34601, 39011	norovirus Hu/GII.4/Beijing/PKUPH-05-07/inpatient/2013/CHN
3732	VP1	KP244318	3732	8142	12552, 16962, 21372, 25782, 30192, 34602, 39012	norovirus Hu/GII.4/PA288/2011/ITA
3733	VP1	KX514362	3733	8143	12553, 16963, 21373, 25783, 30193, 34603, 39013	norovirus GII.4
3734	VP1	KX514329	3734	8144	12554, 16964, 21374, 25784, 30194, 34604, 39014	norovirus GII.4
3735	VP1	KJ678152	3735	8145	12555, 16965, 21375, 25785, 30195, 34605, 39015	norovirus Hu/GII.4/Beijing/PKUPH-07-03/inpatient/2013/CHN
3736	VP1	KX514352	3736	8146	12556, 16966, 21376, 25786, 30196, 34606, 39016	norovirus GII.4
3737	VP1	KX514339	3737	8147	12557, 16967, 21377, 25787, 30197, 34607, 39017	norovirus GII.4
3738	VP1	KR904238	3738	8148	12558, 16968, 21378, 25788, 30198, 34608, 39018	norovirus GII
3739	VP1	KJ710245	3739	8149	12559, 16969, 21379, 25789, 30199, 34609, 39019	norovirus GII
3740	VP1	KX514298	3740	8150	12560, 16970, 21380, 25790, 30200, 34610, 39020	norovirus GII.4
3741	VP1	KX514269	3741	8151	12561, 16971, 21381, 25791, 30201, 34611, 39021	norovirus GII.4

3742	VP1	KX514179	3742	8152	12562, 16972, 21382, 25792, 30202, 34612, 39022	norovirus GII.4
3743	VP1	KX514289	3743	8153	12563, 16973, 21383, 25793, 30203, 34613, 39023	norovirus GII.4
3744	VP1	KX514288	3744	8154	12564, 16974, 21384, 25794, 30204, 34614, 39024	norovirus GII.4
3745	VP1	KX514268	3745	8155	12565, 16975, 21385, 25795, 30205, 34615, 39025	norovirus GII.4
3746	VP1	JX459653	3746	8156	12566, 16976, 21386, 25796, 30206, 34616, 39026	norovirus Hu/GII.4/SG4014-04/2010/SG
3747	VP1	KX514359	3747	8157	12567, 16977, 21387, 25797, 30207, 34617, 39027	norovirus GII.4
3748	VP1	KX514296	3748	8158	12568, 16978, 21388, 25798, 30208, 34618, 39028	norovirus GII.4
3749	VP1	KX514284	3749	8159	12569, 16979, 21389, 25799, 30209, 34619, 39029	norovirus GII.4
3750	VP1	KX514245	3750	8160	12570, 16980, 21390, 25800, 30210, 34620, 39030	norovirus GII.4
3751	VP1	KX514327	3751	8161	12571, 16981, 21391, 25801, 30211, 34621, 39031	norovirus GII.4
3752	VP1	KX514301	3752	8162	12572, 16982, 21392, 25802, 30212, 34622, 39032	norovirus GII.4
3753	VP1	KX514299	3753	8163	12573, 16983, 21393, 25803, 30213, 34623, 39033	norovirus GII.4
3754	VP1	KX514277	3754	8164	12574, 16984, 21394, 25804, 30214, 34624, 39034	norovirus GII.4
3755	VP1	KX514213	3755	8165	12575, 16985, 21395, 25805, 30215, 34625, 39035	norovirus GII.4
3756	VP1	KT033903	3756	8166	12576, 16986, 21396, 25806, 30216, 34626, 39036	norovirus Hu/GII.4/SPHC2715/2012/CHN
3757	VP1	HM625866	3757	8167	12577, 16987, 21397, 25807, 30217, 34627, 39037	norovirus Hu/GII.4/Pecs/HUN4322/2010/HUN
3758	VP1	KX514319	3758	8168	12578, 16988, 21398, 25808, 30218, 34628, 39038	norovirus GII.4

3759	VP1	KX514311	3759	8169	12579, 16989, 21399, 25809, 30219, 34629, 39039	norovirus GII.4
3760	VP1	KX514266	3760	8170	12580, 16990, 21400, 25810, 30220, 34630, 39040	norovirus GII.4
3761	VP1	KX514235	3761	8171	12581, 16991, 21401, 25811, 30221, 34631, 39041	norovirus GII.4
3762	VP1	KX354115	3762	8172	12582, 16992, 21402, 25812, 30222, 34632, 39042	norovirus GII.4
3763	VP1	KM272334	3763	8173	12583, 16993, 21403, 25813, 30223, 34633, 39043	norovirus Hu/GII.4/gg-12-08-04/2012/KR
3764	VP1	KX354116	3764	8174	12584, 16994, 21404, 25814, 30224, 34634, 39044	norovirus GII.4
3765	VP1	KX514172	3765	8175	12585, 16995, 21405, 25815, 30225, 34635, 39045	norovirus GII.4
3766	VP1	KX354114	3766	8176	12586, 16996, 21406, 25816, 30226, 34636, 39046	norovirus GII.4
3767	VP1	KX514295	3767	8177	12587, 16997, 21407, 25817, 30227, 34637, 39047	norovirus GII.4
3768	VP1	KX514242	3768	8178	12588, 16998, 21408, 25818, 30228, 34638, 39048	norovirus GII.4
3769	VP1	KX514224	3769	8179	12589, 16999, 21409, 25819, 30229, 34639, 39049	norovirus GII.4
3770	VP1	KX514262	3770	8180	12590, 17000, 21410, 25820, 30230, 34640, 39050	norovirus GII.4
3771	VP1	KX354139	3771	8181	12591, 17001, 21411, 25821, 30231, 34641, 39051	norovirus GII.4
3772	VP1	KX514215	3772	8182	12592, 17002, 21412, 25822, 30232, 34642, 39052	norovirus GII.4
3773	VP1	KX514367	3773	8183	12593, 17003, 21413, 25823, 30233, 34643, 39053	norovirus GII.4
3774	VP1	KX514243	3774	8184	12594, 17004, 21414, 25824, 30234, 34644, 39054	norovirus GII.4
3775	VP1	KX353996	3775	8185	12595, 17005, 21415, 25825, 30235, 34645, 39055	norovirus GII.4

3776	VP1	DQ078820	3776	8186	12596, 17006, 21416, 25826, 30236, 34646, 39056	norovirus Hu/GII.4/Sydney917J/020/AU
3777	VP1	AB933738	3777	8187	12597, 17007, 21417, 25827, 30237, 34647, 39057	norovirus Hu/GII.4/Niigata5/2009/JP
3778	VP1	EU780734	3778	8188	12598, 17008, 21418, 25828, 30238, 34648, 39058	norovirus Hu/GGII.4/Valencia/2004/ES
3779	VP1	KP064096	3779	8189	12599, 17009, 21419, 25829, 30239, 34649, 39059	norovirus GI.3
3780	VP1	KC473548	3780	8190	12600, 17010, 21420, 25830, 30240, 34650, 39060	norovirus Hu/GI/HuzhouN10/2008/CHN
3781	VP1	AB684698	3781	8191	12601, 17011, 21421, 25831, 30241, 34651, 39061	norovirus Hu/GI/46-2/Tokyo/1977/JPN
3782	VP1	AF538679	3782	8192	12602, 17012, 21422, 25832, 30242, 34652, 39062	human calicivirus NLV/Boxer/2001/US
3783	VP1	JQ743332	3783	8193	12603, 17013, 21423, 25833, 30243, 34653, 39063	norovirus Hu/GI.2/1999
3784	VP1	GQ856470	3784	8194	12604, 17014, 21424, 25834, 30244, 34654, 39064	norovirus Hu/GII.4/Beijing/54108/2007/CHN
3785	VP1	JN603244	3785	8195	12605, 17015, 21425, 25835, 30245, 34655, 39065	norovirus Hu/GI.3/S29/2008/Lilla Edet/Sweden
3786	VP1	AB078335	3786	8196	12606, 17016, 21426, 25836, 30246, 34656, 39066	Norwalk-like virus
3787	VP1	GU299761	3787	8197	12607, 17017, 21427, 25837, 30247, 34657, 39067	norovirus Hu/GI.8/200889032I/2008/US
3788	VP1	AJ277610	3788	8198	12608, 17018, 21428, 25838, 30248, 34658, 39068	human calicivirus HU/NLV/Whiterose/96/UK
3789	VP1	GQ856462	3789	8199	12609, 17019, 21429, 25839, 30249, 34659, 39069	norovirus Hu/GII.4/Beijing/53671/2007/CHN
3790	VP1	AF435807	3790	8200	12610, 17020, 21430, 25840, 30250, 34660, 39070	human calicivirus NLV/C59/99
3791	VP1	KX396056	3791	8201	12611, 17021, 21431, 25841, 30251, 34661, 39071	primate norovirus
3792	VP1	AB187514	3792	8202	12612, 17022, 21432, 25842, 30252, 34662, 39072	norovirus Hu/GI/Otofuke/1979/JP

3793	VP1	L07418	3793	8203	12613, 17023, 21433, 25843, 30253, 34663, 39073	southampton virus
3794	VP1	FJ515294	3794	8204	12614, 17024, 21434, 25844, 30254, 34664, 39074	norovirus Hu/GI.2/Leuven/2003/BEL
3795	VP1	KJ790198	3795	8205	12615, 17025, 21435, 25845, 30255, 34665, 39075	bat norovirus
3796	VP1	KF306212	3796	8206	12616, 17026, 21436, 25846, 30256, 34666, 39076	norovirus Hu/GI.2/Jingzhou/2013401/CHN
3797	VP1	KM461694	3797	8207	12617, 17027, 21437, 25847, 30257, 34667, 39077	norovirus II-FJ-5/2011/GII.P7/GII.6
3798	VP1	AB039780	3798	8208	12618, 17028, 21438, 25848, 30258, 34668, 39078	Norwalk-like virus
3799	VP1	AY038599	3799	8209	12619, 17029, 21439, 25849, 30259, 34669, 39079	human calicivirus NLV/VA97207/1997
3800	VP1	AY054299	3800	8210	12620, 17030, 21440, 25850, 30260, 34670, 39080	human calicivirus NLV/Idaho Falls/378/1996/US
3801	VP1	AF195848	3801	8211	12621, 17031, 21441, 25851, 30261, 34671, 39081	human calicivirus strain Hu/NLV/Amsterdam/98-18/1998/NET
3802	VP1	AB303927	3802	8212	12622, 17032, 21442, 25852, 30262, 34672, 39082	norovirus Hu/GII.4/Utrecht058/2001/NL
3803	VP1	AY038600	3803	8213	12623, 17033, 21443, 25853, 30263, 34673, 39083	human calicivirus NLV/VA98387/1998
3804	VP1	AF080554	3804	8214	12624, 17034, 21444, 25854, 30264, 34674, 39084	Norwalk-like virus sp.
3805	VP1	AB294778	3805	8215	12625, 17035, 21445, 25855, 30265, 34675, 39085	norovirus Hu/GII-4/Matsudo/021071/2002/JP
3806	VP1	AB303922	3806	8216	12626, 17036, 21446, 25856, 30266, 34676, 39086	norovirus Hu/GII.4/Tiel001/1995/NL
3807	VP1	AY532128	3807	8217	12627, 17037, 21447, 25857, 30267, 34677, 39087	norovirus Hamburg048/1997/GE
3808	VP1	AY532113	3808	8218	12628, 17038, 21448, 25858, 30268, 34678, 39088	norovirus Freiburg253/1998/GE
3809	VP1	EU078406	3809	8219	12629, 17039, 21449, 25859, 30269, 34679, 39089	norovirus Hu/Richmond/1994/USA

3810	VP1	AF472623	3810	8220	12630, 17040, 21450, 25860, 30270, 34680, 39090	human calicivirus NLV/DIJON171/96
3811	VP1	AF427114	3811	8221	12631, 17041, 21451, 25861, 30271, 34681, 39091	human calicivirus NLV/Frankfurt(Oder)/170/99/DE
3812	VP1	AY532114	3812	8222	12632, 17042, 21452, 25862, 30272, 34682, 39092	norovirus Erlangen195/1997/GE
3813	VP1	KF806505	3813	8223	12633, 17043, 21453, 25863, 30273, 34683, 39093	norovirus Hu/GII.4/patient_C/2010/USA
3814	VP1	JQ478407	3814	8224	12634, 17044, 21454, 25864, 30274, 34684, 39094	norovirus Hu/GII.4/1997/USA
3815	VP1	AB303923	3815	8225	12635, 17045, 21455, 25865, 30275, 34685, 39095	norovirus Hu/GGII.4/DenHaag015/2000/NL
3816	VP1	AF427120	3816	8226	12636, 17046, 21456, 25866, 30276, 34686, 39096	human calicivirus NLV/Beeskow/124/00/DE
3817	VP1	AY532134	3817	8227	12637, 17047, 21457, 25867, 30277, 34687, 39097	norovirus Hamburg236/1997/GE
3818	VP1	AY532116	3818	8228	12638, 17048, 21458, 25868, 30278, 34688, 39098	norovirus Dresden245/1997/GE
3819	VP1	AY532112	3819	8229	12639, 17049, 21459, 25869, 30279, 34689, 39099	norovirus Freiburg024/1997/GE
3820	VP1	KX514275	3820	8230	12640, 17050, 21460, 25870, 30280, 34690, 39100	norovirus GII.4
3821	VP1	KF806510	3821	8231	12641, 17051, 21461, 25871, 30281, 34691, 39101	norovirus Hu/GII.4/patient_C/2010/USA
3822	VP1	EU078410	3822	8232	12642, 17052, 21462, 25872, 30282, 34692, 39102	norovirus Hu/GCanyon/2002/USA
3823	VP1	AF427123	3823	8233	12643, 17053, 21463, 25873, 30283, 34693, 39103	human calicivirus NLV/Berlin/495/00/DE
3824	VP1	AY532135	3824	8234	12644, 17054, 21464, 25874, 30284, 34694, 39104	norovirus Hamburg316/1998/GE
3825	VP1	AY532125	3825	8235	12645, 17055, 21465, 25875, 30285, 34695, 39105	norovirus Bochum224/1998/GE
3826	VP1	AJ277619	3826	8236	12646, 17056, 21466, 25876, 30286, 34696, 39106	human calicivirus HU/NLV/Symgreen/95/UK

3827	VP1	AF080556	3827	8237	12647, 17057, 21467, 25877, 30287, 34697, 39107	Norwalk-like virus sp.
3828	VP1	AF080550	3828	8238	12648, 17058, 21468, 25878, 30288, 34698, 39108	Norwalk-like virus sp.
3829	VP1	EU078407	3829	8239	12649, 17059, 21469, 25879, 30289, 34699, 39109	norovirus Hu/Houston/1995/USA
3830	VP1	AB083781	3830	8240	12650, 17060, 21470, 25880, 30290, 34700, 39110	Norwalk-like virus
3831	VP1	AF427122	3831	8241	12651, 17061, 21471, 25881, 30291, 34701, 39111	human calicivirus NLV/Berlin/491/00/DE
3832	VP1	AY532133	3832	8242	12652, 17062, 21472, 25882, 30292, 34702, 39112	norovirus Hamburg189/1997/GE
3833	VP1	AY532131	3833	8243	12653, 17063, 21473, 25883, 30293, 34703, 39113	norovirus Hamburg139/1997/GE
3834	VP1	AY532121	3834	8244	12654, 17064, 21474, 25884, 30294, 34704, 39114	norovirus Bochum031/1997/GE
3835	VP1	AY532115	3835	8245	12655, 17065, 21475, 25885, 30295, 34705, 39115	norovirus Dresden153/1997/GE
3836	VP1	KF806530	3836	8246	12656, 17066, 21476, 25886, 30296, 34706, 39116	norovirus Hu/GII.4/patient_B/2010/USA
3837	VP1	KF806513	3837	8247	12657, 17067, 21477, 25887, 30297, 34707, 39117	norovirus Hu/GII.4/patient_C/2010/USA
3838	VP1	AY741811	3838	8248	12658, 17068, 21478, 25888, 30298, 34708, 39118	norovirus Hu/NLV/Dresden174/pUS-NorII/1997/GE
3839	VP1	AY532122	3839	8249	12659, 17069, 21479, 25889, 30299, 34709, 39119	norovirus Bochum108/1997/GE
3840	VP1	AY532120	3840	8250	12660, 17070, 21480, 25890, 30300, 34710, 39120	norovirus Bochum026/1997/GE
3841	VP1	AY532111	3841	8251	12661, 17071, 21481, 25891, 30301, 34711, 39121	norovirus Freiburg057/1997/GE
3842	VP1	AF080558	3842	8252	12662, 17072, 21482, 25892, 30302, 34712, 39122	Norwalk-like virus sp.
3843	VP1	KF806508	3843	8253	12663, 17073, 21483, 25893, 30303, 34713, 39123	norovirus Hu/GII.4/patient_C/2010/USA

3844	VP1	AF425766	3844	8254	12664, 17074, 21484, 25894, 30304, 34714, 39124	human calicivirus NLV/Dillingen 259/01/DE
3845	VP1	AJ583672	3845	8255	12665, 17075, 21485, 25895, 30305, 34715, 39125	Norwalk virus
3846	VP1	AY532119	3846	8256	12666, 17076, 21486, 25896, 30306, 34716, 39126	norovirus Bochum024/1998/GE
3847	VP1	AF080552	3847	8257	12667, 17077, 21487, 25897, 30307, 34717, 39127	Norwalk-like virus sp.
3848	VP1	KX514177	3848	8258	12668, 17078, 21488, 25898, 30308, 34718, 39128	norovirus GII.4
3849	VP1	KF806514	3849	8259	12669, 17079, 21489, 25899, 30309, 34719, 39129	norovirus Hu/GII.4/patient_C/2010/USA
3850	VP1	AB303925	3850	8260	12670, 17080, 21490, 25900, 30310, 34720, 39130	norovirus Hu/GGII.4/Leeuwarden043/2000/NL
3851	VP1	KF806534	3851	8261	12671, 17081, 21491, 25901, 30311, 34721, 39131	norovirus Hu/GII.4/patient_B/2010/USA
3852	VP1	KF806519	3852	8262	12672, 17082, 21492, 25902, 30312, 34722, 39132	norovirus Hu/GII.4/patient_A+5mo/2010/USA
3853	VP1	AB303924	3853	8263	12673, 17083, 21493, 25903, 30313, 34723, 39133	norovirus Hu/GGII.4/WaddinxveenO16/2000/NL
3854	VP1	DQ975270	3854	8264	12674, 17084, 21494, 25904, 30314, 34724, 39134	norovirus Hu/GII-4/Osaka/1998/JPN
3855	VP1	AF414424	3855	8265	12675, 17085, 21495, 25905, 30315, 34725, 39135	Norwalk-like virus NLV/Miami Beach/326/1995/US
3856	VP1	LC048964	3856	8266	12676, 17086, 21496, 25906, 30316, 34726, 39136	norovirus Hu/GII/3-215/Tokyo/1995/JPN
3857	VP1	AB684705	3857	8267	12677, 17087, 21497, 25907, 30317, 34727, 39137	norovirus Hu/GII/53-1/Tokyo/1980/JPN
3858	VP1	KF806523	3858	8268	12678, 17088, 21498, 25908, 30318, 34728, 39138	norovirus Hu/GII.4/patient_A+5mo/2010/USA
3859	VP1	AY532129	3859	8269	12679, 17089, 21499, 25909, 30319, 34729, 39139	norovirus HamburgI35/1998/GE
3860	VP1	AY532124	3860	8270	12680, 17090, 21500, 25910, 30320, 34730, 39140	norovirus Bochum220/1997/GE

3861	VP1	KX514309	3861	8271	12681, 17091, 21501, 25911, 30321, 34731, 39141	norovirus GII.4
3862	VP1	KX514308	3862	8272	12682, 17092, 21502, 25912, 30322, 34732, 39142	norovirus GII.4
3863	VP1	KX514283	3863	8273	12683, 17093, 21503, 25913, 30323, 34733, 39143	norovirus GII.4
3864	VP1	KX514194	3864	8274	12684, 17094, 21504, 25914, 30324, 34734, 39144	norovirus GII.4
3865	VP1	KY424340	3865	8275	12685, 17095, 21505, 25915, 30325, 34735, 39145	norovirus GII.4
3866	VP1	LC016606	3866	8276	12686, 17096, 21506, 25916, 30326, 34736, 39146	norovirus Hu/JP/2004/GII.4/Sakai/01-inpatient8-54d-1
3867	VP1	FJ537136	3867	8277	12687, 17097, 21507, 25917, 30327, 34737, 39147	norovirus Hu/GII.4/CHDC3967/1988/US
3868	VP1	AY532117	3868	8278	12688, 17098, 21508, 25918, 30328, 34738, 39148	norovirus Dresden267/1997/GE
3869	VP1	KX514279	3869	8279	12689, 17099, 21509, 25919, 30329, 34739, 39149	norovirus GII.4
3870	VP1	LC016602	3870	8280	12690, 17100, 21510, 25920, 30330, 34740, 39150	norovirus Hu/JP/2004/GII.4/Sakai/01-inpatient8-29d-1
3871	VP1	AF145896	3871	8281	12691, 17101, 21511, 25921, 30331, 34741, 39151	camberwell virus
3872	VP1	AB684704	3872	8282	12692, 17102, 21512, 25922, 30332, 34742, 39152	norovirus Hu/GII/52-2/Tokyo/1980/JPN
3873	VP1	JX401279	3873	8283	12693, 17103, 21513, 25923, 30333, 34743, 39153	norovirus Hu/GII.4/C127/GF/1978
3874	VP1	GQ389627	3874	8284	12694, 17104, 21514, 25924, 30334, 34744, 39154	synthetic construct
3875	VP1	AF425763	3875	8285	12695, 17105, 21515, 25925, 30335, 34745, 39155	human calicivirus NLV/Berlin/159/98/DE
3876	VP1	AY532127	3876	8286	12696, 17106, 21516, 25926, 30336, 34746, 39156	norovirus Bochum339/1997/GE
3877	VP1	AY532118	3877	8287	12697, 17107, 21517, 25927, 30337, 34747, 39157	norovirus Dresden319/1997/GE

3878	VP1	KX514326	3878	8288	12698, 17108, 21518, 25928, 30338, 34748, 39158	norovirus GII.4
3879	VP1	KX514264	3879	8289	12699, 17109, 21519, 25929, 30339, 34749, 39159	norovirus GII.4
3880	VP1	KX514171	3880	8290	12700, 17110, 21520, 25930, 30340, 34750, 39160	norovirus GII.4
3881	VP1	KX514170	3881	8291	12701, 17111, 21521, 25931, 30341, 34751, 39161	norovirus GII.4
3882	VP1	KF806533	3882	8292	12702, 17112, 21522, 25932, 30342, 34752, 39162	norovirus Hu/GII.4/patient_B/2010/USA
3883	VP1	KF806528	3883	8293	12703, 17113, 21523, 25933, 30343, 34753, 39163	norovirus Hu/GII.4/patient_B/2010/USA
3884	VP1	KF806527	3884	8294	12704, 17114, 21524, 25934, 30344, 34754, 39164	norovirus Hu/GII.4/patient_B/2010/USA
3885	VP1	KX514261	3885	8295	12705, 17115, 21525, 25935, 30345, 34755, 39165	norovirus GII.4
3886	VP1	AB684720	3886	8296	12706, 17116, 21526, 25936, 30346, 34756, 39166	norovirus Hu/GII/64-3/Tokyo/1983/JPN
3887	VP1	LC016605	3887	8297	12707, 17117, 21527, 25937, 30347, 34757, 39167	norovirus Hu/JP/2004/GII.4/Sakai/01-inpatient8-29d-4
3888	VP1	KF806529	3888	8298	12708, 17118, 21528, 25938, 30348, 34758, 39168	norovirus Hu/GII.4/patient_B/2010/USA
3889	VP1	JX023286	3889	8299	12709, 17119, 21529, 25939, 30349, 34759, 39169	norovirus Hu/GII.4/CHDC5191/1974/USA
3890	VP1	FJ537137	3890	8300	12710, 17120, 21530, 25940, 30350, 34760, 39170	norovirus Hu/GII.4/CHDC4108/1987/US
3891	VP1	X76716	3891	8301	12711, 17121, 21531, 25941, 30351, 34761, 39171	caliciviridae
3892	VP1	KX514328	3892	8302	12712, 17122, 21532, 25942, 30352, 34762, 39172	norovirus GII.4
3893	VP1	KX514201	3893	8303	12713, 17123, 21533, 25943, 30353, 34763, 39173	norovirus GII.4
3894	VP1	AB985442	3894	8304	12714, 17124, 21534, 25944, 30354, 34764, 39174	norovirus Hu/GII/2-46/Tokyo/1987/JPN

3895	VP1	LC016604	3895	8305	12715, 17125, 21535, 25945, 30355, 34765, 39175	norovirus Hu/JP/2004/GII.4/Sakai/01-inpatient8-29d-3
3896	VP1	KF806532	3896	8306	12716, 17126, 21536, 25946, 30356, 34766, 39176	norovirus Hu/GII.4/patient_B/2010/USA
3897	VP1	FJ537138	3897	8307	12717, 17127, 21537, 25947, 30357, 34767, 39177	norovirus Hu/GII.4/CHDC4871/1977/US
3898	VP1	AY030098	3898	8308	12718, 17128, 21538, 25948, 30358, 34768, 39178	human calicivirus Hu/NLV/GII/MD134-7/1987/US
3899	VP1	AY532130	3899	8309	12719, 17129, 21539, 25949, 30359, 34769, 39179	norovirus Hamburg137/1997/GE
3900	VP1	KX514286	3900	8310	12720, 17130, 21540, 25950, 30360, 34770, 39180	norovirus GII.4
3901	VP1	KX514202	3901	8311	12721, 17131, 21541, 25951, 30361, 34771, 39181	norovirus GII.4
3902	VP1	DQ358208	3902	8312	12722, 17132, 21542, 25952, 30362, 34772, 39182	synthetic construct
3903	VP1	AF414425	3903	8313	12723, 17133, 21543, 25953, 30363, 34773, 39183	Norwalk-like virus NLV/Burwash Landing/331/1995/US
3904	VP1	KX514348	3904	8314	12724, 17134, 21544, 25954, 30364, 34774, 39184	norovirus GII.4
3905	VP1	KX514287	3905	8315	12725, 17135, 21545, 25955, 30365, 34775, 39185	norovirus GII.4
3906	VP1	KX514183	3906	8316	12726, 17136, 21546, 25956, 30366, 34776, 39186	norovirus GII.4
3907	VP1	KX514174	3907	8317	12727, 17137, 21547, 25957, 30367, 34777, 39187	norovirus GII.4
3908	VP1	KF429791	3908	8318	12728, 17138, 21548, 25958, 30368, 34778, 39188	norovirus Hu/GII.4/NIHIC1.5/2011/USA
3909	VP1	AF427115	3909	8319	12729, 17139, 21549, 25959, 30369, 34779, 39189	human calicivirus NLV/Ludwigslust/218/99/DE
3910	VP1	KX514314	3910	8320	12730, 17140, 21550, 25960, 30370, 34780, 39190	norovirus GII.4
3911	VP1	KX514208	3911	8321	12731, 17141, 21551, 25961, 30371, 34781, 39191	norovirus GII.4

3912	VP1	KX514206	3912	8322	12732, 17142, 21552, 25962, 30372, 34782, 39192	norovirus GII.4
3913	VP1	KX514198	3913	8323	12733, 17143, 21553, 25963, 30373, 34783, 39193	norovirus GII.4
3914	VP1	KX514191	3914	8324	12734, 17144, 21554, 25964, 30374, 34784, 39194	norovirus GII.4
3915	VP1	KX514187	3915	8325	12735, 17145, 21555, 25965, 30375, 34785, 39195	norovirus GII.4
3916	VP1	KX514180	3916	8326	12736, 17146, 21556, 25966, 30376, 34786, 39196	norovirus GII.4
3917	VP1	GU598213	3917	8327	12737, 17147, 21557, 25967, 30377, 34787, 39197	synthetic construct
3918	VP1	KX514365	3918	8328	12738, 17148, 21558, 25968, 30378, 34788, 39198	norovirus GII.4
3919	VP1	KX514304	3919	8329	12739, 17149, 21559, 25969, 30379, 34789, 39199	norovirus GII.4
3920	VP1	KX514302	3920	8330	12740, 17150, 21560, 25970, 30380, 34790, 39200	norovirus GII.4
3921	VP1	KX514207	3921	8331	12741, 17151, 21561, 25971, 30381, 34791, 39201	norovirus GII.4
3922	VP1	KX514192	3922	8332	12742, 17152, 21562, 25972, 30382, 34792, 39202	norovirus GII.4
3923	VP1	KF806525	3923	8333	12743, 17153, 21563, 25973, 30383, 34793, 39203	norovirus Hu/GII.4/patient_B/2010/USA
3924	VP1	KC462195	3924	8334	12744, 17154, 21564, 25974, 30384, 34794, 39204	norovirus Hu/GII.4/ITOO/ITA
3925	VP1	AF427116	3925	8335	12745, 17155, 21565, 25975, 30385, 34795, 39205	human calicivirus NLV/Ludwigslust/221/99/DE
3926	VP1	KX514337	3926	8336	12746, 17156, 21566, 25976, 30386, 34796, 39206	norovirus GII.4
3927	VP1	KX514255	3927	8337	12747, 17157, 21567, 25977, 30387, 34797, 39207	norovirus GII.4
3928	VP1	KX514210	3928	8338	12748, 17158, 21568, 25978, 30388, 34798, 39208	norovirus GII.4

3929	VP1	KX514182	3929	8339	12749, 17159, 21569, 25979, 30389, 34799, 39209	norovirus GII.4
3930	VP1	AF425764	3930	8340	12750, 17160, 21570, 25980, 30390, 34800, 39210	human calicivirus NLV/Berlin/238/98/DE
3931	VP1	KX514355	3931	8341	12751, 17161, 21571, 25981, 30391, 34801, 39211	norovirus GII.4
3932	VP1	KX514345	3932	8342	12752, 17162, 21572, 25982, 30392, 34802, 39212	norovirus GII.4
3933	VP1	KX514204	3933	8343	12753, 17163, 21573, 25983, 30393, 34803, 39213	norovirus GII.4
3934	VP1	KF712492	3934	8344	12754, 17164, 21574, 25984, 30394, 34804, 39214	norovirus Hu/GII.4/NIHIC1.8/2012/USA
3935	VP1	DQ078829	3935	8345	12755, 17165, 21575, 25985, 30395, 34805, 39215	norovirus Hu/GII.4/Sydney348/970/AU
3936	VP1	KX514370	3936	8346	12756, 17166, 21576, 25986, 30396, 34806, 39216	norovirus GII.4
3937	VP1	KX514332	3937	8347	12757, 17167, 21577, 25987, 30397, 34807, 39217	norovirus GII.4
3938	VP1	KX514276	3938	8348	12758, 17168, 21578, 25988, 30398, 34808, 39218	norovirus GII.4
3939	VP1	KX514256	3939	8349	12759, 17169, 21579, 25989, 30399, 34809, 39219	norovirus GII.4
3940	VP1	KX514209	3940	8350	12760, 17170, 21580, 25990, 30400, 34810, 39220	norovirus GII.4
3941	VP1	KX514205	3941	8351	12761, 17171, 21581, 25991, 30401, 34811, 39221	norovirus GII.4
3942	VP1	KX514200	3942	8352	12762, 17172, 21582, 25992, 30402, 34812, 39222	norovirus GII.4
3943	VP1	KX514196	3943	8353	12763, 17173, 21583, 25993, 30403, 34813, 39223	norovirus GII.4
3944	VP1	AB985437	3944	8354	12764, 17174, 21584, 25994, 30404, 34814, 39224	norovirus Hu/GII/2-37/Tokyo/1987/JPN
3945	VP1	KF712494	3945	8355	12765, 17175, 21585, 25995, 30405, 34815, 39225	norovirus Hu/GII.4/NIHIC1.7/2012/USA

3946	VP1	KX514315	3946	8356	12766, 17176, 21586, 25996, 30406, 34816, 39226	norovirus GII.4
3947	VP1	KX514199	3947	8357	12767, 17177, 21587, 25997, 30407, 34817, 39227	norovirus GII.4
3948	VP1	KX514176	3948	8358	12768, 17178, 21588, 25998, 30408, 34818, 39228	norovirus GII.4
3949	VP1	KX514360	3949	8359	12769, 17179, 21589, 25999, 30409, 34819, 39229	norovirus GII.4
3950	VP1	KX514347	3950	8360	12770, 17180, 21590, 26000, 30410, 34820, 39230	norovirus GII.4
3951	VP1	AB684675	3951	8361	12771, 17181, 21591, 26001, 30411, 34821, 39231	norovirus Hu/GII/21-5/Tokyo/1975/JPN
3952	VP1	KX514369	3952	8362	12772, 17182, 21592, 26002, 30412, 34822, 39232	norovirus GII.4
3953	VP1	KX514310	3953	8363	12773, 17183, 21593, 26003, 30413, 34823, 39233	norovirus GII.4
3954	VP1	KX514185	3954	8364	12774, 17184, 21594, 26004, 30414, 34824, 39234	norovirus GII.4
3955	VP1	KX514181	3955	8365	12775, 17185, 21595, 26005, 30415, 34825, 39235	norovirus GII.4
3956	VP1	KF712493	3956	8366	12776, 17186, 21596, 26006, 30416, 34826, 39236	norovirus Hu/GII.4/NIHIC1.10/2012/USA
3957	VP1	FJ411169	3957	8367	12777, 17187, 21597, 26007, 30417, 34827, 39237	norovirus Hu/GII.4/Wellington/1995/USA
3958	VP1	AF427121	3958	8368	12778, 17188, 21598, 26008, 30418, 34828, 39238	human calicivirus NLV/Koenigswusterhausen/130/00/DE
3959	VP1	KF429787	3959	8369	12779, 17189, 21599, 26009, 30419, 34829, 39239	norovirus Hu/GII.4/NIHIC28.5/2012/USA
3960	VP1	AB933728	3960	8370	12780, 17190, 21600, 26010, 30420, 34830, 39240	norovirus Hu/GII.4/Akita5/2009/JP
3961	VP1	KX514346	3961	8371	12781, 17191, 21601, 26011, 30421, 34831, 39241	norovirus GII.4
3962	VP1	KX514249	3962	8372	12782, 17192, 21602, 26012, 30422, 34832, 39242	norovirus GII.4

3963	VP1	KF429760	3963	8373	12783, 17193, 21603, 26013, 30423, 34833, 39243	norovirus Hu/GII.4/NIHIC28.4/2012/USA
3964	VP1	AB303929	3964	8374	12784, 17194, 21604, 26014, 30424, 34834, 39244	norovirus Hu/GGII.4/EmmenE006/2002/NL
3965	VP1	KX514363	3965	8375	12785, 17195, 21605, 26015, 30425, 34835, 39245	norovirus GII.4
3966	VP1	KX514357	3966	8376	12786, 17196, 21606, 26016, 30426, 34836, 39246	norovirus GII.4
3967	VP1	KX514240	3967	8377	12787, 17197, 21607, 26017, 30427, 34837, 39247	norovirus GII.4
3968	VP1	AF414417	3968	8378	12788, 17198, 21608, 26018, 30428, 34838, 39248	Norwalk-like virus NLV/UK3-17/12700/1992/GB
3969	VP1	KX514303	3969	8379	12789, 17199, 21609, 26019, 30429, 34839, 39249	norovirus GII.4
3970	VP1	KX514273	3970	8380	12790, 17200, 21610, 26020, 30430, 34840, 39250	norovirus GII.4
3971	VP1	KX514323	3971	8381	12791, 17201, 21611, 26021, 30431, 34841, 39251	norovirus GII.4
3972	VP1	KX514364	3972	8382	12792, 17202, 21612, 26022, 30432, 34842, 39252	norovirus GII.4
3973	VP1	KX514338	3973	8383	12793, 17203, 21613, 26023, 30433, 34843, 39253	norovirus GII.4
3974	VP1	KX514316	3974	8384	12794, 17204, 21614, 26024, 30434, 34844, 39254	norovirus GII.4
3975	VP1	KX514356	3975	8385	12795, 17205, 21615, 26025, 30435, 34845, 39255	norovirus GII.4
3976	VP1	KX514349	3976	8386	12796, 17206, 21616, 26026, 30436, 34846, 39256	norovirus GII.4
3977	VP1	KX514217	3977	8387	12797, 17207, 21617, 26027, 30437, 34847, 39257	norovirus GII.4
3978	VP1	KX514324	3978	8388	12798, 17208, 21618, 26028, 30438, 34848, 39258	norovirus GII.4
3979	VP1	KX514306	3979	8389	12799, 17209, 21619, 26029, 30439, 34849, 39259	norovirus GII.4

3980	VP1	AB186063	3980	8390	12800, 17210, 21620, 26030, 30440, 34850, 39260	norovirus Hu/OC02198/2002/JP
3981	VP1	AF406793	3981	8391	12801, 17211, 21621, 26031, 30441, 34851, 39261	norovirus GII
3982	VP1	KX514223	3982	8392	12802, 17212, 21622, 26032, 30442, 34852, 39262	norovirus GII.4
3983	VP1	KX514318	3983	8393	12803, 17213, 21623, 26033, 30443, 34853, 39263	norovirus GII.4
3984	VP1	AB186065	3984	8394	12804, 17214, 21624, 26034, 30444, 34854, 39264	norovirus Hu/OC02202/2002/JP
3985	VP1	KX514307	3985	8395	12805, 17215, 21625, 26035, 30445, 34855, 39265	norovirus GII.4
3986	VP1	LC048948	3986	8396	12806, 17216, 21626, 26036, 30446, 34856, 39266	norovirus Hu/GII/3-157/Tokyo/1994/JPN
3987	VP1	LC048908	3987	8397	12807, 17217, 21627, 26037, 30447, 34857, 39267	norovirus Hu/GII/3-64/Tokyo/1993/JPN
3988	VP1	KX514312	3988	8398	12808, 17218, 21628, 26038, 30448, 34858, 39268	norovirus GII.4
3989	VP1	KX514237	3989	8399	12809, 17219, 21629, 26039, 30449, 34859, 39269	norovirus GII.4
3990	VP1	DQ419907	3990	8400	12810, 17220, 21630, 26040, 30450, 34860, 39270	norovirus Hu/Beijing/CR2905/2004/CHN
3991	VP1	JN975543	3991	8401	12811, 17221, 21631, 26041, 30451, 34861, 39271	murine norovirus
3992	VP1	JN975541	3992	8402	12812, 17222, 21632, 26042, 30452, 34862, 39272	murine norovirus
3993	VP1	KF113526	3993	8403	12813, 17223, 21633, 26043, 30453, 34863, 39273	murine norovirus
3994	VP1	KF113527	3994	8404	12814, 17224, 21634, 26044, 30454, 34864, 39274	murine norovirus
3995	VP1	KM458057	3995	8405	12815, 17225, 21635, 26045, 30455, 34865, 39275	murine norovirus
3996	VP1	AB662855	3996	8406	12816, 17226, 21636, 26046, 30456, 34866, 39276	norovirus Hu/GII.2/OC06008-3/2006/JP

3997	VP1	AB809997	3997	8407	12817, 17227, 21637, 26047, 30457, 34867, 39277	norovirus Hu/GII.13/09N3798/2009/NP
3998	VP1	AB810001	3998	8408	12818, 17228, 21638, 26048, 30458, 34868, 39278	norovirus Hu/GII.13/10N3922/2010/NP
3999	VP1	AB809992	3999	8409	12819, 17229, 21639, 26049, 30459, 34869, 39279	norovirus Hu/GII.13/09N3721/2009/NP
4000	VP1	AY130761	4000	8410	12820, 17230, 21640, 26050, 30460, 34870, 39280	human calicivirus NLV/M7/1999/US
4001	VP1	KF806495	4001	8411	12821, 17231, 21641, 26051, 30461, 34871, 39281	norovirus Hu/GII.4/patient_A/2010/USA
4002	VP1	KF806503	4002	8412	12822, 17232, 21642, 26052, 30462, 34872, 39282	norovirus Hu/GII.4/patient_A/2010/USA
4003	VP1	KF712506	4003	8413	12823, 17233, 21643, 26053, 30463, 34873, 39283	norovirus Hu/GII.4/NIHIC1.12/2012/USA
4004	VP1	KF712507	4004	8414	12824, 17234, 21644, 26054, 30464, 34874, 39284	norovirus Hu/GII.4/NIHIC1.11/2012/USA
4005	VP1	JX401281	4005	8415	12825, 17235, 21645, 26055, 30465, 34875, 39285	norovirus Hu/GII/T091/TN/1976
4006	VP1	KF806526	4006	8416	12826, 17236, 21646, 26056, 30466, 34876, 39286	norovirus Hu/GII.4/patient_B/2010/USA
4007	VP1	KF806500	4007	8417	12827, 17237, 21647, 26057, 30467, 34877, 39287	norovirus Hu/GII.4/patient_A/2010/USA
4008	VP1	KF806498	4008	8418	12828, 17238, 21648, 26058, 30468, 34878, 39288	norovirus Hu/GII.4/patient_A/2010/USA
4009	VP1	KF429768	4009	8419	12829, 17239, 21649, 26059, 30469, 34879, 39289	norovirus Hu/GII.4/NIHIC1.13/2012/USA
4010	VP1	KF806496	4010	8420	12830, 17240, 21650, 26060, 30470, 34880, 39290	norovirus Hu/GII.4/patient_A/2010/USA
4011	VP1	KF806499	4011	8421	12831, 17241, 21651, 26061, 30471, 34881, 39291	norovirus Hu/GII.4/patient_A/2010/USA
4012	VP1	KF806497	4012	8422	12832, 17242, 21652, 26062, 30472, 34882, 39292	norovirus Hu/GII.4/patient_A/2010/USA
4013	VP1	JN699046	4013	8423	12833, 17243, 21653, 26063, 30473, 34883, 39293	norovirus Hu/GI.5/E57/UG/1975

4014	VP1	AM263418	4014	8424	12834, 17244, 21654, 26064, 30474, 34884, 39294	norovirus Hu/GI/Babbacombe/1996/GBR
4015	VP1	KT732278	4015	8425	12835, 17245, 21655, 26065, 30475, 34885, 39295	norovirus GI.5
4016	VP1	KT732277	4016	8426	12836, 17246, 21656, 26066, 30476, 34886, 39296	norovirus GI.5
4017	VP1	KJ402295	4017	8427	12837, 17247, 21657, 26067, 30477, 34887, 39297	norovirus Hu/GI.5/Siklos-HUN5407/2013/HUN
4018	VP1	AF414406	4018	8428	12838, 17248, 21658, 26068, 30478, 34888, 39298	Norwalk-like virus NLV/Appalachicola Bay/318/1995/US
4019	VP1	AB039774	4019	8429	12839, 17249, 21659, 26069, 30479, 34889, 39299	Norwalk-like virus
4020	VP1	KP064095	4020	8430	12840, 17250, 21660, 26070, 30480, 34890, 39300	norovirus GI.2
4021	VP1	AB045603	4021	8431	12841, 17251, 21661, 26071, 30481, 34891, 39301	Norwalk-like virus
4022	VP1	AF397905	4022	8432	12842, 17252, 21662, 26072, 30482, 34892, 39302	human calicivirus NLV/Schwerin 003/00/DE
4023	VP1	AF414420	4023	8433	12843, 17253, 21663, 26073, 30483, 34893, 39303	Norwalk-like virus NLV/Honolulu/314/1994/US
4024	VP1	AF427119	4024	8434	12844, 17254, 21664, 26074, 30484, 34894, 39304	human calicivirus NLV/Pirna/110/00/DE
4025	VP1	AB044366	4025	8435	12845, 17255, 21665, 26075, 30485, 34895, 39305	Norwalk-like virus
4026	VP1	AB032758	4026	8436	12846, 17256, 21666, 26076, 30486, 34896, 39306	chitta virus
4027	VP1	AB039775	4027	8437	12847, 17257, 21667, 26077, 30487, 34897, 39307	Norwalk-like virus
4028	VP1	AF414418	4028	8438	12848, 17258, 21668, 26078, 30488, 34898, 39308	Norwalk-like virus NLV/Westover/302/1994/US
4029	VP1	AF425769	4029	8439	12849, 17259, 21669, 26079, 30489, 34899, 39309	human calicivirus NLV/Wiesbaden 294/01/DE
4030	VP1	AF414421	4030	8440	12850, 17260, 21670, 26080, 30490, 34900, 39310	Norwalk-like virus NLV/Port Canaveral/301/1994/US

4031	VP1	AF414416	4031	8441	12851, 17261, 21671, 26081, 30491, 34901, 39311	Norwalk-like virus NLV/Miami/81/1986/US
4032	VP1	AF414419	4032	8442	12852, 17262, 21672, 26082, 30492, 34902, 39312	Norwalk-like virus NLV/Richmond/283/1994/US
4033	VP1	AF425767	4033	8443	12853, 17263, 21673, 26083, 30493, 34903, 39313	human calicivirus NLV/Dillingen 391/01/DE
4034	VP1	DQ093065	4034	8444	12854, 17264, 21674, 26084, 30494, 34904, 39314	Norwalk virus
4035	VP1	KJ194507	4035	8445	12855, 17265, 21675, 26085, 30495, 34905, 39315	norovirus Hu/GII/Amsterdam/3/1995
4036	VP1	KP064099	4036	8446	12856, 17266, 21676, 26086, 30496, 34906, 39316	norovirus GII.12
4037	VP1	AB303926	4037	8447	12857, 17267, 21677, 26087, 30497, 34907, 39317	norovirus Hu/GGII.4/Schiedam018/2001/NL
4038	VP1	KU985166	4038	8448	12858, 17268, 21678, 26088, 30498, 34908, 39318	norovirus GII.4
4039	VP1	JN699045	4039	8449	12859, 17269, 21679, 26089, 30499, 34909, 39319	norovirus Hu/GI.6/HK60/CN/1977
4040	VP1	EF547395	4040	8450	12860, 17270, 21680, 26090, 30500, 34910, 39320	norovirus Hu/Osaka/000321/2000/JP/3006
4041	VP1	AY502008	4041	8451	12861, 17271, 21681, 26091, 30501, 34911, 39321	norovirus GI
4042	VP1	AY502007	4042	8452	12862, 17272, 21682, 26092, 30502, 34912, 39322	norovirus GI
4043	VP1	KC998959	4043	8453	12863, 17273, 21683, 26093, 30503, 34913, 39323	norovirus Hu/GI.6/TCH-099/USA/2003
4044	VP1	GQ856464	4044	8454	12864, 17274, 21684, 26094, 30504, 34914, 39324	norovirus Hu/GII.4/Beijing/55063/2007/CHN
4045	VP1	GQ856463	4045	8455	12865, 17275, 21685, 26095, 30505, 34915, 39325	norovirus Hu/GII.4/Beijing/53997/2007/CHN
4046	VP1	KM036372	4046	8456	12866, 17276, 21686, 26096, 30506, 34916, 39326	norovirus Hu/GI.Pb/GI.6/Kaohsiung/14-A-7/2014/TW
4047	VP1	AF538678	4047	8457	12867, 17277, 21687, 26097, 30507, 34917, 39327	human calicivirus NLV/VA497/1999/US

4048	VP1	KC294198	4048	8458	12868, 17278, 21688, 26098, 30508, 34918, 39328	norovirus rat/GI/KS12/1305/DNK
4049	VP1	KT732280	4049	8459	12869, 17279, 21689, 26099, 30509, 34919, 39329	norovirus GI.6
4050	VP1	LC101822	4050	8460	12870, 17280, 21690, 26100, 30510, 34920, 39330	norovirus GI/Hu/Jp/2013/GI.6/s130147
4051	VP1	KP407451	4051	8461	12871, 17281, 21691, 26101, 30511, 34921, 39331	norovirus GI
4052	VP1	LN854564	4052	8462	12872, 17282, 21692, 26102, 30512, 34922, 39332	norovirus GI/Hu/NL/2012/GI.6/Groningen
4053	VP1	JQ388274	4053	8463	12873, 17283, 21693, 26103, 30513, 34923, 39333	norovirus Hu/GI.6/Kingston/ACT1600/2010/AU
4054	VP1	KP027330	4054	8464	12874, 17284, 21694, 26104, 30514, 34924, 39334	norovirus Hu/GI.P6/GI.6/Changhua/14-BC-1/2014/TW
4055	VP1	AF093797	4055	8465	12875, 17285, 21695, 26105, 30515, 34925, 39335	Norwalk virus
4056	VP1	AB810006	4056	8466	12876, 17286, 21696, 26106, 30516, 34926, 39336	norovirus Hu/GII.13/10N444I/2010/NP
4057	VP1	LC101825	4057	8467	12877, 17287, 21697, 26107, 30517, 34927, 39337	norovirus GI/Hu/Jp/2002/GI.5/OC020180
4058	VP1	AB081723	4058	8468	12878, 17288, 21698, 26108, 30518, 34928, 39338	Norwalk-like virus
4059	VP1	JN005886	4059	8469	12879, 17289, 21699, 26109, 30519, 34929, 39339	norovirus Hu/GI.7/TCH-060/USA/2003
4060	VP1	AB758449	4060	8470	12880, 17290, 21700, 26110, 30520, 34930, 39340	norovirus Hu/GI.7/2009/Miyagi/JP
4061	VP1	KX907729	4061	8471	12881, 17291, 21701, 26111, 30521, 34931, 39341	norovirus Hu/USA/2011/GI.P7_GI.7/CS5567
4062	VP1	JN899243	4062	8472	12882, 17292, 21702, 26112, 30522, 34932, 39342	norovirus Hu/GI.7/Providence191/2010/USA
4063	VP1	AB810004	4063	8473	12883, 17293, 21703, 26113, 30523, 34933, 39343	norovirus Hu/GII.13/10N4358/2010/NP
4064	VP1	JN183163	4064	8474	12884, 17294, 21704, 26114, 30524, 34934, 39344	norovirus Hu/GI.4/S14/2008/LillaEdet/Sweden

4065	VP1	EU373815	4065	8475	12885, 17295, 21705, 26115, 30525, 34935, 39345	norovirus Hu/GII/Luckenwalde591/2002/DE
4066	VP1	KC473547	4066	8476	12886, 17296, 21706, 26116, 30526, 34936, 39346	norovirus Hu/GI/HuzhouNII/2008/CHN
4067	VP1	GQ266692	4067	8477	12887, 17297, 21707, 26117, 30527, 34937, 39347	norovirus Hu/Zuerich/P4d1/2007
4068	VP1	GQ266693	4068	8478	12888, 17298, 21708, 26118, 30528, 34938, 39348	norovirus Hu/Zuerich/P4d28l/2007
4069	VP1	EU004673	4069	8479	12889, 17299, 21709, 26119, 30529, 34939, 39349	murine norovirus GV/CR3/2005/USA
4070	VP1	AB601769	4070	8480	12890, 17300, 21710, 26120, 30530, 34940, 39350	murine norovirus
4071	VP1	EU004676	4071	8481	12891, 17301, 21711, 26121, 30531, 34941, 39351	murine norovirus GV/CR6/2005/USA
4072	VP1	JQ237823	4072	8482	12892, 17302, 21712, 26122, 30532, 34942, 39352	murine norovirus GV/CR6/2005/USA
4073	VP1	DQ223043	4073	8483	12893, 17303, 21713, 26123, 30533, 34943, 39353	murine norovirus 4
4074	VP1	JX048594	4074	8484	12894, 17304, 21714, 26124, 30534, 34944, 39354	murine norovirus
4075	VP1	GQ266691	4075	8485	12895, 17305, 21715, 26125, 30535, 34945, 39355	norovirus Hu/Zuerich/P3d683/2008
4076	VP1	GQ266690	4076	8486	12896, 17306, 21716, 26126, 30536, 34946, 39356	norovirus Hu/Zuerich/P3d1/2006
4077	VP1	JN183164	4077	8487	12897, 17307, 21717, 26127, 30537, 34947, 39357	norovirus Hu/GI.3/S26/2008/Lilla Edet/Sweden
4078	VP1	AB809995	4078	8488	12898, 17308, 21718, 26128, 30538, 34948, 39358	norovirus Hu/GII.13/09N3779/2009/NP
4079	VP1	KT732275	4079	8489	12899, 17309, 21719, 26129, 30539, 34949, 39359	norovirus GII.17
4080	VP1	AB809998	4080	8490	12900, 17310, 21720, 26130, 30540, 34950, 39360	norovirus Hu/GII.13/09N3816/2009/NP
4081	VP1	AB809984	4081	8491	12901, 17311, 21721, 26131, 30541, 34951, 39361	norovirus Hu/GII.13/09N3546/2009/NP

4082	VP1	KT732276	4082	8492	12902, 17312, 21722, 26132, 30542, 34952, 39362	norovirus GII.17
4083	VP1	AB810009	4083	8493	12903, 17313, 21723, 26133, 30543, 34953, 39363	norovirus Hu/GII.13/ION4488/2010/NP
4084	VP1	KM461690	4084	8494	12904, 17314, 21724, 26134, 30544, 34954, 39364	norovirus 08-AG-1/2008/GII.P7/GII.6
4085	VP1	JN400618	4085	8495	12905, 17315, 21725, 26135, 30545, 34955, 39365	norovirus Hu/GII-4/CGMH20/2009/TW
4086	VP1	JQ653095	4086	8496	12906, 17316, 21726, 26136, 30546, 34956, 39366	norovirus Hu/01/URY/2008
4087	VP1	JN183161	4087	8497	12907, 17317, 21727, 26137, 30547, 34957, 39367	norovirus Hu/GI.7/S24/2008/Lilla Edet/Sweden
4088	VP1	KT906670	4088	8498	12908, 17318, 21728, 26138, 30548, 34958, 39368	norovirus GII.17
4089	VP1	KT906671	4089	8499	12909, 17319, 21729, 26139, 30549, 34959, 39369	norovirus GII.17
4090	VP1	AB810013	4090	8500	12910, 17320, 21730, 26140, 30550, 34960, 39370	norovirus Hu/GII.13/ION4555/2010/NP
4091	VP1	EU096510	4091	8501	12911, 17321, 21731, 26141, 30551, 34961, 39371	norovirus Hu/norovirus/GII-4/Cegled1603/2002/HUN
4092	VP1	EU096513	4092	8502	12912, 17322, 21732, 26142, 30552, 34962, 39372	norovirus Hu/norovirus/GII-4/Pecs2967/2007/HUN
4093	VP1	EU096514	4093	8503	12913, 17323, 21733, 26143, 30553, 34963, 39373	norovirus Hu/norovirus/GII-4/Kapuvar3029/2007/HUN
4094	VP1	EU096512	4094	8504	12914, 17324, 21734, 26144, 30554, 34964, 39374	norovirus Hu/norovirus/GII-4/Mosonmagyarovar2594/2006/HUN
4095	VP1	KU311161	4095	8505	12915, 17325, 21735, 26145, 30555, 34965, 39375	norovirus Hu/GI.7/AlbertaEI404/2012/CA
4096	VP1	KX907730	4096	8506	12916, 17326, 21736, 26146, 30556, 34966, 39376	norovirus Hu/USA/2014/GI.P7_GI.7/GA5043
4097	VP1	EU096507	4097	8507	12917, 17327, 21737, 26147, 30557, 34967, 39377	norovirus Hu/norovirus/GII-4/Kiskunhalas1264/2002/HUN
4098	VP1	AB810007	4098	8508	12918, 17328, 21738, 26148, 30558, 34968, 39378	norovirus Hu/GII.13/ION4487/2010/NP

4099	VP1	AB809989	4099	8509	12919, 17329, 21739, 26149, 30559, 34969, 39379	norovirus Hu/GII.13/09N3683/2009/NP
4100	VP1	AB810000	4100	8510	12920, 17330, 21740, 26150, 30560, 34970, 39380	norovirus Hu/GII.13/10N3917/2010/NP
4101	VP1	AB809999	4101	8511	12921, 17331, 21741, 26151, 30561, 34971, 39381	norovirus Hu/GII.13/10N3852/2010/NP
4102	VP1	FJ692501	4102	8512	12922, 17332, 21742, 26152, 30562, 34972, 39382	norovirus dog/GVI.1/HKU_Ca035F/2007/HKG
4103	VP1	FJ692500	4103	8513	12923, 17333, 21743, 26153, 30563, 34973, 39383	norovirus dog/GVI.1/HKU_Ca026F/2007/HKG
4104	VP1	AB031013	4104	8514	12924, 17334, 21744, 26154, 30564, 34974, 39384	human calicivirus NLV/Aichi/124-89/JP
4105	VP1	KU253442	4105	8515	12925, 17335, 21745, 26155, 30565, 34975, 39385	norovirus GI.1
4106	VP1	EF547392	4106	8516	12926, 17336, 21746, 26156, 30566, 34976, 39386	norovirus Hu/Maizuru/030512/2003/JP/4656
4107	VP1	KT943503	4107	8517	12927, 17337, 21747, 26157, 30567, 34977, 39387	norovirus TF1/USA/2008
4108	VP1	AY502016	4108	8518	12928, 17338, 21748, 26158, 30568, 34978, 39388	norovirus GI
4109	VP1	KU253446	4109	8519	12929, 17339, 21749, 26159, 30569, 34979, 39389	norovirus GI.1
4110	VP1	KU253445	4110	8520	12930, 17340, 21750, 26160, 30570, 34980, 39390	norovirus GI.1
4111	VP1	KF039735	4111	8521	12931, 17341, 21751, 26161, 30571, 34981, 39391	norovirus Hu/GI.1/CHA3A007/2008/USA
4112	VP1	KF039732	4112	8522	12932, 17342, 21752, 26162, 30572, 34982, 39392	norovirus Hu/GI.1/CHA5A010/2009/USA
4113	VP1	KF039734	4113	8523	12933, 17343, 21753, 26163, 30573, 34983, 39393	norovirus Hu/GI.1/CHA6A014/2009/USA
4114	VP1	KF039729	4114	8524	12934, 17344, 21754, 26164, 30574, 34984, 39394	norovirus Hu/GI.1/CHA6A007/2010/USA
4115	VP1	KF039737	4115	8525	12935, 17345, 21755, 26165, 30575, 34985, 39395	norovirus Hu/GI.1/CHA6A003_20091104/2009/USA

4116	VP1	KF039731	4116	8526	12936, 17346, 21756, 26166, 30576, 34986, 39396	norovirus Hu/GI.1/CH4X0533/2009/USA
4117	VP1	KT732279	4117	8527	12937, 17347, 21757, 26167, 30577, 34987, 39397	norovirus GI.1
4118	VP1	FJ384783	4118	8528	12938, 17348, 21758, 26168, 30578, 34988, 39398	norovirus Hu/GI.1/P7-587/2007/Stromstad/Sweden
4119	VP1	EU085522	4119	8529	12939, 17349, 21759, 26169, 30579, 34989, 39399	norovirus Hu/GI.1/Mussels/M10nov2004/Foto/Sweden
4120	VP1	L23828	4120	8530	12940, 17350, 21760, 26170, 30580, 34990, 39400	Norwalk virus
4121	VP1	KX764843	4121	8531	12941, 17351, 21761, 26171, 30581, 34991, 39401	norovirus GII
4122	VP1	KX764841	4122	8532	12942, 17352, 21762, 26172, 30582, 34992, 39402	norovirus GII
4123	VP1	KX764840	4123	8533	12943, 17353, 21763, 26173, 30583, 34993, 39403	norovirus GII
4124	VP1	KT864687	4124	8534	12944, 17354, 21764, 26174, 30584, 34994, 39404	norovirus GII
4125	VP1	KX764842	4125	8535	12945, 17355, 21765, 26175, 30585, 34995, 39405	norovirus GII
4126	VP1	KT864685	4126	8536	12946, 17356, 21766, 26176, 30586, 34996, 39406	norovirus GII
4127	VP1	KT864684	4127	8537	12947, 17357, 21767, 26177, 30587, 34997, 39407	norovirus GII
4128	VP1	KX764836	4128	8538	12948, 17358, 21768, 26178, 30588, 34998, 39408	norovirus GII
4129	VP1	KX764845	4129	8539	12949, 17359, 21769, 26179, 30589, 34999, 39409	norovirus GII
4130	VP1	KX764837	4130	8540	12950, 17360, 21770, 26180, 30590, 35000, 39410	norovirus GII
4131	VP1	KX764838	4131	8541	12951, 17361, 21771, 26181, 30591, 35001, 39411	norovirus GII
4132	VP1	KU687016	4132	8542	12952, 17362, 21772, 26182, 30592, 35002, 39412	norovirus GII

4133	VP1	KU687015	4133	8543	12953, 17363, 21773, 26183, 30593, 35003, 39413	norovirus GII
4134	VP1	KU687013	4134	8544	12954, 17364, 21774, 26184, 30594, 35004, 39414	norovirus GII
4135	VP1	KX764839	4135	8545	12955, 17365, 21775, 26185, 30595, 35005, 39415	norovirus GII
4136	VP1	KX764844	4136	8546	12956, 17366, 21776, 26186, 30596, 35006, 39416	norovirus GII
4137	VP1	KT864686	4137	8547	12957, 17367, 21777, 26187, 30597, 35007, 39417	norovirus GII
4138	VP1	KU687012	4138	8548	12958, 17368, 21778, 26188, 30598, 35008, 39418	norovirus GII
4139	VP1	KU687018	4139	8549	12959, 17369, 21779, 26189, 30599, 35009, 39419	norovirus GII
4140	VP1	KU687021	4140	8550	12960, 17370, 21780, 26190, 30600, 35010, 39420	norovirus GII
4141	VP1	KU687020	4141	8551	12961, 17371, 21781, 26191, 30601, 35011, 39421	norovirus GII
4142	VP1	KU687014	4142	8552	12962, 17372, 21782, 26192, 30602, 35012, 39422	norovirus GII
4143	VP1	KU687019	4143	8553	12963, 17373, 21783, 26193, 30603, 35013, 39423	norovirus GII
4144	VP1	KU687017	4144	8554	12964, 17374, 21784, 26194, 30604, 35014, 39424	norovirus GII
4145	VP1	KU687024	4145	8555	12965, 17375, 21785, 26195, 30605, 35015, 39425	norovirus GII
4146	VP1	KU687022	4146	8556	12966, 17376, 21786, 26196, 30606, 35016, 39426	norovirus GII
4147	VP1	KU687023	4147	8557	12967, 17377, 21787, 26197, 30607, 35017, 39427	norovirus GII
4148	VP1	KX764847	4148	8558	12968, 17378, 21788, 26198, 30608, 35018, 39428	norovirus GII
4149	VP1	KX764846	4149	8559	12969, 17379, 21789, 26199, 30609, 35019, 39429	norovirus GII

4150	VP1	KX764833	4150	8560	12970, 17380, 21790, 26200, 30610, 35020, 39430	norovirus GII
4151	VP1	KX764834	4151	8561	12971, 17381, 21791, 26201, 30611, 35021, 39431	norovirus GII
4152	VP1	KU687027	4152	8562	12972, 17382, 21792, 26202, 30612, 35022, 39432	norovirus GII
4153	VP1	KX764835	4153	8563	12973, 17383, 21793, 26203, 30613, 35023, 39433	norovirus GII
4154	VP1	KX764832	4154	8564	12974, 17384, 21794, 26204, 30614, 35024, 39434	norovirus GII
4155	VP1	KU687025	4155	8565	12975, 17385, 21795, 26205, 30615, 35025, 39435	norovirus GII
4156	VP1	KU687026	4156	8566	12976, 17386, 21796, 26206, 30616, 35026, 39436	norovirus GII
4157	VP1	KU687028	4157	8567	12977, 17387, 21797, 26207, 30617, 35027, 39437	norovirus GII
4158	VP1	KX764831	4158	8568	12978, 17388, 21798, 26208, 30618, 35028, 39438	norovirus GII
4159	VP1	JN222366	4159	8569	12979, 17389, 21799, 26209, 30619, 35029, 39439	norovirus Hu/GI.6/DK/2010
4160	VP1	KM386679	4160	8570	12980, 17390, 21800, 26210, 30620, 35030, 39440	norovirus 07-AC-1/2007/GII.P22/GII.5
4161	VP1	AY549156	4161	8571	12981, 17391, 21801, 26211, 30621, 35031, 39441	bovine enteric calicivirus
4162	VP1	AY549163	4162	8572	12982, 17392, 21802, 26212, 30622, 35032, 39442	bovine enteric calicivirus
4163	VP1	AY549159	4163	8573	12983, 17393, 21803, 26213, 30623, 35033, 39443	bovine enteric calicivirus
4164	VP1	AY549166	4164	8574	12984, 17394, 21804, 26214, 30624, 35034, 39444	bovine enteric calicivirus
4165	VP1	AF320113	4165	8575	12985, 17395, 21805, 26215, 30625, 35035, 39445	Norwalk-like virus
4166	VP1	AY549153	4166	8576	12986, 17396, 21806, 26216, 30626, 35036, 39446	bovine enteric calicivirus

4167	VP1	AY549157	4167	8577	12987, 17397, 21807, 26217, 30627, 35037, 39447	bovine enteric calicivirus
4168	VP1	AY549158	4168	8578	12988, 17398, 21808, 26218, 30628, 35038, 39448	bovine enteric calicivirus
4169	VP1	AY549165	4169	8579	12989, 17399, 21809, 26219, 30629, 35039, 39449	bovine enteric calicivirus
4170	VP1	AY549167	4170	8580	12990, 17400, 21810, 26220, 30630, 35040, 39450	bovine enteric calicivirus
4171	VP1	AY549154	4171	8581	12991, 17401, 21811, 26221, 30631, 35041, 39451	bovine enteric calicivirus
4172	VP1	AY549155	4172	8582	12992, 17402, 21812, 26222, 30632, 35042, 39452	bovine enteric calicivirus
4173	VP1	AF320625	4173	8583	12993, 17403, 21813, 26223, 30633, 35043, 39453	Norwalk-like virus
4174	VP1	AY274820	4174	8584	12994, 17404, 21814, 26224, 30634, 35044, 39454	Norwalk-like virus
4175	VP1	AF542083	4175	8585	12995, 17405, 21815, 26225, 30635, 35045, 39455	bovine enteric calicivirus
4176	VP1	EU794907	4176	8586	12996, 17406, 21816, 26226, 30636, 35046, 39456	norovirus Bo/GIII/B309/2003/BEL
4177	VP1	AY126474	4177	8587	12997, 17407, 21817, 26227, 30637, 35047, 39457	Norwalk-like virus
4178	VP1	JX145650	4178	8588	12998, 17408, 21818, 26228, 30638, 35048, 39458	norovirus GIII
4179	VP1	AY549161	4179	8589	12999, 17409, 21819, 26229, 30639, 35049, 39459	bovine enteric calicivirus
4180	VP1	AY549164	4180	8590	13000, 17410, 21820, 26230, 30640, 35050, 39460	bovine enteric calicivirus
4181	VP1	AY126476	4181	8591	13001, 17411, 21821, 26231, 30641, 35051, 39461	Norwalk-like virus
4182	VP1	EU794905	4182	8592	13002, 17412, 21822, 26232, 30642, 35052, 39462	norovirus Bo/GIII/BV15/2007/BEL
4183	VP1	EU794906	4183	8593	13003, 17413, 21823, 26233, 30643, 35053, 39463	norovirus Bo/GIII/BV24/2007/BEL

4184	VP1	AY126475	4184	8594	13004, 17414, 21824, 26234, 30644, 35054, 39464	Norwalk-like virus
4185	VP1	AF542084	4185	8595	13005, 17415, 21825, 26235, 30645, 35055, 39465	bovine enteric calicivirus
4186	VP1	KC695807	4186	8596	13006, 17416, 21826, 26236, 30646, 35056, 39466	norovirus Hu/GII.4/Sydney/NSW0514/2012/AU
4187	VP2	AGL98415	4187	8597	13007, 17417, 21827, 26237, 30647, 35057, 39467	norovirus Hu/GII/KL45/MY/1978
4188	VP2	AGL98417	4188	8598	13008, 17418, 21828, 26238, 30648, 35058, 39468	norovirus Hu/GII/T091/TN/1976
4189	VP2	AFI08232	4189	8599	13009, 17419, 21829, 26239, 30649, 35059, 39469	norovirus Hu/GI/10360/2010/VNM
4190	VP2	AFI08235	4190	8600	13010, 17420, 21830, 26240, 30650, 35060, 39470	norovirus Hu/GII/10002/2009/VNM
4191	VP2	AFI08238	4191	8601	13011, 17421, 21831, 26241, 30651, 35061, 39471	norovirus Hu/GII/10003/2009/VNM
4192	VP2	AFI08241	4192	8602	13012, 17422, 21832, 26242, 30652, 35062, 39472	norovirus Hu/GII/10012/2009/VNM
4193	VP2	AFI08244	4193	8603	13013, 17423, 21833, 26243, 30653, 35063, 39473	norovirus Hu/GII/10037/2009/VNM
4194	VP2	AFJ38520	4194	8604	13014, 17424, 21834, 26244, 30654, 35064, 39474	norovirus Hu/GII.4/CHDC5191/1974/USA
4195	VP2	AFX71657	4195	8605	13015, 17425, 21835, 26245, 30655, 35065, 39475	norovirus Hu/GII.3/HK71/1978/CHN
4196	VP2	AFX71660	4196	8606	13016, 17426, 21836, 26246, 30656, 35066, 39476	norovirus Hu/GII.2/KL109/1978/MYS
4197	VP2	AFX71666	4197	8607	13017, 17427, 21837, 26247, 30657, 35067, 39477	norovirus Hu/GII.6/CHDC4073/1984/USA
4198	VP2	AFX71669	4198	8608	13018, 17428, 21838, 26248, 30658, 35068, 39478	norovirus Hu/GII.4/NIHIC9/2011/USA
4199	VP2	AFX81122	4199	8609	13019, 17429, 21839, 26249, 30659, 35069, 39479	norovirus Hu/Norwalk/10034/2009/VNM
4200	VP2	AFX81125	4200	8610	13020, 17430, 21840, 26250, 30660, 35070, 39480	norovirus Hu/Norwalk/10051/2009/VNM

4201	VP2	AFX81131	4201	8611	13021, 17431, 21841, 26251, 30661, 35071, 39481	norovirus Hu/Norwalk/10062/2009/VNM
4202	VP2	AFX81134	4202	8612	13022, 17432, 21842, 26252, 30662, 35072, 39482	norovirus Hu/Norwalk/10074/2009/VNM
4203	VP2	AFX81137	4203	8613	13023, 17433, 21843, 26253, 30663, 35073, 39483	norovirus Hu/Norwalk/10075/2009/VNM
4204	VP2	AFX81140	4204	8614	13024, 17434, 21844, 26254, 30664, 35074, 39484	norovirus Hu/Norwalk/10078/2009/VNM
4205	VP2	AFX81143	4205	8615	13025, 17435, 21845, 26255, 30665, 35075, 39485	norovirus Hu/Norwalk/10079/2009/VNM
4206	VP2	AFX81149	4206	8616	13026, 17436, 21846, 26256, 30666, 35076, 39486	norovirus Hu/Norwalk/10114/2009/VNM
4207	VP2	AFX81152	4207	8617	13027, 17437, 21847, 26257, 30667, 35077, 39487	norovirus Hu/Norwalk/10116/2009/VNM
4208	VP2	AFX81155	4208	8618	13028, 17438, 21848, 26258, 30668, 35078, 39488	norovirus Hu/Norwalk/10129/2009/VNM
4209	VP2	AFX81158	4209	8619	13029, 17439, 21849, 26259, 30669, 35079, 39489	norovirus Hu/Norwalk/10136/2009/VNM
4210	VP2	AFX81164	4210	8620	13030, 17440, 21850, 26260, 30670, 35080, 39490	norovirus Hu/Norwalk/10145/2009/VNM
4211	VP2	AFX81173	4211	8621	13031, 17441, 21851, 26261, 30671, 35081, 39491	norovirus Hu/Norwalk/10160/2009/VNM
4212	VP2	AFX81179	4212	8622	13032, 17442, 21852, 26262, 30672, 35082, 39492	norovirus Hu/Norwalk/10163/2009/VNM
4213	VP2	AFX81182	4213	8623	13033, 17443, 21853, 26263, 30673, 35083, 39493	norovirus Hu/Norwalk/10169/2009/VNM
4214	VP2	AFX81185	4214	8624	13034, 17444, 21854, 26264, 30674, 35084, 39494	norovirus Hu/Norwalk/10173/2009/VNM
4215	VP2	AFX81188	4215	8625	13035, 17445, 21855, 26265, 30675, 35085, 39495	norovirus Hu/Norwalk/10176/2009/VNM
4216	VP2	AFX81191	4216	8626	13036, 17446, 21856, 26266, 30676, 35086, 39496	norovirus Hu/Norwalk/10177/2009/VNM
4217	VP2	AFX81194	4217	8627	13037, 17447, 21857, 26267, 30677, 35087, 39497	norovirus Hu/Norwalk/10179/2009/VNM

4218	VP2	AFX81197	4218	8628	13038, 17448, 21858, 26268, 30678, 35088, 39498	norovirus Hu/Norwalk/10182/2009/VNM
4219	VP2	AFX81200	4219	8629	13039, 17449, 21859, 26269, 30679, 35089, 39499	norovirus Hu/Norwalk/10183/2009/VNM
4220	VP2	AFX81203	4220	8630	13040, 17450, 21860, 26270, 30680, 35090, 39500	norovirus Hu/Norwalk/10194/2009/VNM
4221	VP2	AFX81206	4221	8631	13041, 17451, 21861, 26271, 30681, 35091, 39501	norovirus Hu/Norwalk/10199/2009/VNM
4222	VP2	AFX81209	4222	8632	13042, 17452, 21862, 26272, 30682, 35092, 39502	norovirus Hu/Norwalk/10203/2009/VNM
4223	VP2	AFX81212	4223	8633	13043, 17453, 21863, 26273, 30683, 35093, 39503	norovirus Hu/Norwalk/10204/2009/VNM
4224	VP2	AFX81215	4224	8634	13044, 17454, 21864, 26274, 30684, 35094, 39504	norovirus Hu/Norwalk/10222/2009/VNM
4225	VP2	AFX81218	4225	8635	13045, 17455, 21865, 26275, 30685, 35095, 39505	norovirus Hu/Norwalk/10223/2009/VNM
4226	VP2	AFX81221	4226	8636	13046, 17456, 21866, 26276, 30686, 35096, 39506	norovirus Hu/Norwalk/10235/2009/VNM
4227	VP2	AFX81224	4227	8637	13047, 17457, 21867, 26277, 30687, 35097, 39507	norovirus Hu/Norwalk/10236/2009/VNM
4228	VP2	AFX81227	4228	8638	13048, 17458, 21868, 26278, 30688, 35098, 39508	norovirus Hu/Norwalk/10238/2009/VNM
4229	VP2	AFX81230	4229	8639	13049, 17459, 21869, 26279, 30689, 35099, 39509	norovirus Hu/Norwalk/10247/2009/VNM
4230	VP2	AFX81233	4230	8640	13050, 17460, 21870, 26280, 30690, 35100, 39510	norovirus Hu/Norwalk/10255/2009/VNM
4231	VP2	AFX81239	4231	8641	13051, 17461, 21871, 26281, 30691, 35101, 39511	norovirus Hu/Norwalk/10296/2010/VNM
4232	VP2	AFX81242	4232	8642	13052, 17462, 21872, 26282, 30692, 35102, 39512	norovirus Hu/Norwalk/10313/2010/VNM
4233	VP2	AFX81245	4233	8643	13053, 17463, 21873, 26283, 30693, 35103, 39513	norovirus Hu/Norwalk/10325/2010/VNM
4234	VP2	AFX81248	4234	8644	13054, 17464, 21874, 26284, 30694, 35104, 39514	norovirus Hu/Norwalk/10328/2010/VNM

4235	VP2	AFX81251	4235	8645	13055, 17465, 21875, 26285, 30695, 35105, 39515	norovirus Hu/Norwalk/10368/2010/VNM
4236	VP2	AFX81254	4236	8646	13056, 17466, 21876, 26286, 30696, 35106, 39516	norovirus Hu/Norwalk/10378/2010/VNM
4237	VP2	AFX81257	4237	8647	13057, 17467, 21877, 26287, 30697, 35107, 39517	norovirus Hu/Norwalk/10386/2010/VNM
4238	VP2	AFX81260	4238	8648	13058, 17468, 21878, 26288, 30698, 35108, 39518	norovirus Hu/Norwalk/20008/2009/VNM
4239	VP2	AFX81263	4239	8649	13059, 17469, 21879, 26289, 30699, 35109, 39519	norovirus Hu/Norwalk/20010/2009/VNM
4240	VP2	AFX81269	4240	8650	13060, 17470, 21880, 26290, 30700, 35110, 39520	norovirus Hu/Norwalk/20016/2009/VNM
4241	VP2	AFX81272	4241	8651	13061, 17471, 21881, 26291, 30701, 35111, 39521	norovirus Hu/Norwalk/20019/2009/VNM
4242	VP2	AFX81275	4242	8652	13062, 17472, 21882, 26292, 30702, 35112, 39522	norovirus Hu/Norwalk/20033/2009/VNM
4243	VP2	AFX81278	4243	8653	13063, 17473, 21883, 26293, 30703, 35113, 39523	norovirus Hu/Norwalk/20035/2009/VNM
4244	VP2	AFX81281	4244	8654	13064, 17474, 21884, 26294, 30704, 35114, 39524	norovirus Hu/Norwalk/20044/2009/VNM
4245	VP2	AFX81284	4245	8655	13065, 17475, 21885, 26295, 30705, 35115, 39525	norovirus Hu/Norwalk/20047/2009/VNM
4246	VP2	AFX81287	4246	8656	13066, 17476, 21886, 26296, 30706, 35116, 39526	norovirus Hu/Norwalk/20066/2009/VNM
4247	VP2	AFX81290	4247	8657	13067, 17477, 21887, 26297, 30707, 35117, 39527	norovirus Hu/Norwalk/20067/2009/VNM
4248	VP2	AFX81293	4248	8658	13068, 17478, 21888, 26298, 30708, 35118, 39528	norovirus Hu/Norwalk/20069/2009/VNM
4249	VP2	AFX81296	4249	8659	13069, 17479, 21889, 26299, 30709, 35119, 39529	norovirus Hu/Norwalk/20092/2009/VNM
4250	VP2	AFX81299	4250	8660	13070, 17480, 21890, 26300, 30710, 35120, 39530	norovirus Hu/Norwalk/20093/2009/VNM
4251	VP2	AFX81302	4251	8661	13071, 17481, 21891, 26301, 30711, 35121, 39531	norovirus Hu/Norwalk/20094/2009/VNM

4252	VP2	AFX81305	4252	8662	13072, 17482, 21892, 26302, 30712, 35122, 39532	norovirus Hu/Norwalk/20118/2009/VNM
4253	VP2	AFX81308	4253	8663	13073, 17483, 21893, 26303, 30713, 35123, 39533	norovirus Hu/Norwalk/20122/2009/VNM
4254	VP2	AFX81311	4254	8664	13074, 17484, 21894, 26304, 30714, 35124, 39534	norovirus Hu/Norwalk/20123/2009/VNM
4255	VP2	AFX81314	4255	8665	13075, 17485, 21895, 26305, 30715, 35125, 39535	norovirus Hu/Norwalk/20128/2009/VNM
4256	VP2	AFX81317	4256	8666	13076, 17486, 21896, 26306, 30716, 35126, 39536	norovirus Hu/Norwalk/20135/2009/VNM
4257	VP2	AFX81320	4257	8667	13077, 17487, 21897, 26307, 30717, 35127, 39537	norovirus Hu/Norwalk/20139/2009/VNM
4258	VP2	AFX81323	4258	8668	13078, 17488, 21898, 26308, 30718, 35128, 39538	norovirus Hu/Norwalk/20140/2009/VNM
4259	VP2	AFX81326	4259	8669	13079, 17489, 21899, 26309, 30719, 35129, 39539	norovirus Hu/Norwalk/20142/2009/VNM
4260	VP2	AGE89434	4260	8670	13080, 17490, 21900, 26310, 30720, 35130, 39540	norovirus Hu/GII/10101/2009/VNM
4261	VP2	AGE89437	4261	8671	13081, 17491, 21901, 26311, 30721, 35131, 39541	norovirus Hu/GII/10127/2009/VNM
4262	VP2	AGE89440	4262	8672	13082, 17492, 21902, 26312, 30722, 35132, 39542	norovirus Hu/GII/10370/2010/VNM
4263	VP2	AGE89443	4263	8673	13083, 17493, 21903, 26313, 30723, 35133, 39543	norovirus Hu/GII/10405/2010/VNM
4264	VP2	AGE89449	4264	8674	13084, 17494, 21904, 26314, 30724, 35134, 39544	norovirus Hu/GII/10411/2010/VNM
4265	VP2	AGE89455	4265	8675	13085, 17495, 21905, 26315, 30725, 35135, 39545	norovirus Hu/GII/20048/2009/VNM
4266	VP2	AGE89458	4266	8676	13086, 17496, 21906, 26316, 30726, 35136, 39546	norovirus Hu/GII/20064/2009/VNM
4267	VP2	AGE89461	4267	8677	13087, 17497, 21907, 26317, 30727, 35137, 39547	norovirus Hu/GII/20079/2009/VNM
4268	VP2	AGE89464	4268	8678	13088, 17498, 21908, 26318, 30728, 35138, 39548	norovirus Hu/GII/20107/2009/VNM

4269	VP2	AGE89467	4269	8679	13089, 17499, 21909, 26319, 30729, 35139, 39549	norovirus Hu/GII/20108/2009/VNM
4270	VP2	AGE89470	4270	8680	13090, 17500, 21910, 26320, 30730, 35140, 39550	norovirus Hu/GII/20144/2009/VNM
4271	VP2	AGE89473	4271	8681	13091, 17501, 21911, 26321, 30731, 35141, 39551	norovirus Hu/GII/20146/2009/VNM
4272	VP2	AGE89476	4272	8682	13092, 17502, 21912, 26322, 30732, 35142, 39552	norovirus Hu/GII/20150/2009/VNM
4273	VP2	AGE89479	4273	8683	13093, 17503, 21913, 26323, 30733, 35143, 39553	norovirus Hu/GII/20151/2009/VNM
4274	VP2	AGE89482	4274	8684	13094, 17504, 21914, 26324, 30734, 35144, 39554	norovirus Hu/GII/20153/2009/VNM
4275	VP2	AGE89485	4275	8685	13095, 17505, 21915, 26325, 30735, 35145, 39555	norovirus Hu/GII/20154/2009/VNM
4276	VP2	AGE89488	4276	8686	13096, 17506, 21916, 26326, 30736, 35146, 39556	norovirus Hu/GII/20156/2009/VNM
4277	VP2	AGE89491	4277	8687	13097, 17507, 21917, 26327, 30737, 35147, 39557	norovirus Hu/GII/20159/2009/VNM
4278	VP2	AGE89494	4278	8688	13098, 17508, 21918, 26328, 30738, 35148, 39558	norovirus Hu/GII/20161/2009/VNM
4279	VP2	AGE89497	4279	8689	13099, 17509, 21919, 26329, 30739, 35149, 39559	norovirus Hu/GII/20162/2009/VNM
4280	VP2	AGE89500	4280	8690	13100, 17510, 21920, 26330, 30740, 35150, 39560	norovirus Hu/GII/20164/2009/VNM
4281	VP2	AGE89503	4281	8691	13101, 17511, 21921, 26331, 30741, 35151, 39561	norovirus Hu/GII/20171/2009/VNM
4282	VP2	AGE89506	4282	8692	13102, 17512, 21922, 26332, 30742, 35152, 39562	norovirus Hu/GII/20172/2009/VNM
4283	VP2	AGE89509	4283	8693	13103, 17513, 21923, 26333, 30743, 35153, 39563	norovirus Hu/GII/20173/2009/VNM
4284	VP2	AGE89512	4284	8694	13104, 17514, 21924, 26334, 30744, 35154, 39564	norovirus Hu/GII/20176/2009/VNM
4285	VP2	AGE89515	4285	8695	13105, 17515, 21925, 26335, 30745, 35155, 39565	norovirus Hu/GII/20180/2009/VNM

4286	VP2	AGE89518	4286	8696	13106, 17516, 21926, 26336, 30746, 35156, 39566	norovirus Hu/GII/20182/2009/VNM
4287	VP2	AGE89521	4287	8697	13107, 17517, 21927, 26337, 30747, 35157, 39567	norovirus Hu/GII/20184/2009/VNM
4288	VP2	AGE89524	4288	8698	13108, 17518, 21928, 26338, 30748, 35158, 39568	norovirus Hu/GII/20185/2009/VNM
4289	VP2	AGE89530	4289	8699	13109, 17519, 21929, 26339, 30749, 35159, 39569	norovirus Hu/GII/20189/2009/VNM
4290	VP2	AGE89533	4290	8700	13110, 17520, 21930, 26340, 30750, 35160, 39570	norovirus Hu/GII/20190/2009/VNM
4291	VP2	AGE89536	4291	8701	13111, 17521, 21931, 26341, 30751, 35161, 39571	norovirus Hu/GII/20192/2009/VNM
4292	VP2	AGE89539	4292	8702	13112, 17522, 21932, 26342, 30752, 35162, 39572	norovirus Hu/GII/20196/2009/VNM
4293	VP2	AGE89542	4293	8703	13113, 17523, 21933, 26343, 30753, 35163, 39573	norovirus Hu/GII/20198/2009/VNM
4294	VP2	AGE89545	4294	8704	13114, 17524, 21934, 26344, 30754, 35164, 39574	norovirus Hu/GII/20202/2009/VNM
4295	VP2	AGE89548	4295	8705	13115, 17525, 21935, 26345, 30755, 35165, 39575	norovirus Hu/GII/20205/2009/VNM
4296	VP2	AGE89551	4296	8706	13116, 17526, 21936, 26346, 30756, 35166, 39576	norovirus Hu/GII/20206/2009/VNM
4297	VP2	AGE89554	4297	8707	13117, 17527, 21937, 26347, 30757, 35167, 39577	norovirus Hu/GII/20208/2009/VNM
4298	VP2	AGE89557	4298	8708	13118, 17528, 21938, 26348, 30758, 35168, 39578	norovirus Hu/GII/20215/2009/VNM
4299	VP2	AGE89560	4299	8709	13119, 17529, 21939, 26349, 30759, 35169, 39579	norovirus Hu/GII/20217/2009/VNM
4300	VP2	AGE89563	4300	8710	13120, 17530, 21940, 26350, 30760, 35170, 39580	norovirus Hu/GII/20229/2009/VNM
4301	VP2	AGE89566	4301	8711	13121, 17531, 21941, 26351, 30761, 35171, 39581	norovirus Hu/GII/20230/2009/VNM
4302	VP2	AGE89569	4302	8712	13122, 17532, 21942, 26352, 30762, 35172, 39582	norovirus Hu/GII/20233/2009/VNM

4303	VP2	AGE89572	4303	8713	13123, 17533, 21943, 26353, 30763, 35173, 39583	norovirus Hu/GII/20248/2009/VNM
4304	VP2	AGE89578	4304	8714	13124, 17534, 21944, 26354, 30764, 35174, 39584	norovirus Hu/GII/20263/2009/VNM
4305	VP2	AGE89581	4305	8715	13125, 17535, 21945, 26355, 30765, 35175, 39585	norovirus Hu/GII/20271/2009/VNM
4306	VP2	AGE89587	4306	8716	13126, 17536, 21946, 26356, 30766, 35176, 39586	norovirus Hu/GII/20302/2009/VNM
4307	VP2	AGE89590	4307	8717	13127, 17537, 21947, 26357, 30767, 35177, 39587	norovirus Hu/GII/20344/2009/VNM
4308	VP2	AGE89593	4308	8718	13128, 17538, 21948, 26358, 30768, 35178, 39588	norovirus Hu/GII/20350/2009/VNM
4309	VP2	AGE89596	4309	8719	13129, 17539, 21949, 26359, 30769, 35179, 39589	norovirus Hu/GII/20357/2009/VNM
4310	VP2	AGE89599	4310	8720	13130, 17540, 21950, 26360, 30770, 35180, 39590	norovirus Hu/GII/20365/2010/VNM
4311	VP2	AGE89602	4311	8721	13131, 17541, 21951, 26361, 30771, 35181, 39591	norovirus Hu/GII/20373/2010/VNM
4312	VP2	AGE89605	4312	8722	13132, 17542, 21952, 26362, 30772, 35182, 39592	norovirus Hu/GII/20407/2010/VNM
4313	VP2	AGE89608	4313	8723	13133, 17543, 21953, 26363, 30773, 35183, 39593	norovirus Hu/GII/20413/2010/VNM
4314	VP2	AGE89611	4314	8724	13134, 17544, 21954, 26364, 30774, 35184, 39594	norovirus Hu/GII/20424/2010/VNM
4315	VP2	AGE89614	4315	8725	13135, 17545, 21955, 26365, 30775, 35185, 39595	norovirus Hu/GII/20448/2010/VNM
4316	VP2	AGE89617	4316	8726	13136, 17546, 21956, 26366, 30776, 35186, 39596	norovirus Hu/GII/20457/2010/VNM
4317	VP2	AGE89620	4317	8727	13137, 17547, 21957, 26367, 30777, 35187, 39597	norovirus Hu/GII/20460/2010/VNM
4318	VP2	AGE89623	4318	8728	13138, 17548, 21958, 26368, 30778, 35188, 39598	norovirus Hu/GII/20469/2010/VNM
4319	VP2	AGE89626	4319	8729	13139, 17549, 21959, 26369, 30779, 35189, 39599	norovirus Hu/GII/20477/2010/VNM

4320	VP2	AGE89629	4320	8730	13140, 17550, 21960, 26370, 30780, 35190, 39600	norovirus Hu/GII/20478/2010/VNM
4321	VP2	AGE89635	4321	8731	13141, 17551, 21961, 26371, 30781, 35191, 39601	norovirus Hu/GII/30026/2009/VNM
4322	VP2	AGE89638	4322	8732	13142, 17552, 21962, 26372, 30782, 35192, 39602	norovirus Hu/GII/30040/2009/VNM
4323	VP2	AGE89641	4323	8733	13143, 17553, 21963, 26373, 30783, 35193, 39603	norovirus Hu/GII/30045/2009/VNM
4324	VP2	AGE89644	4324	8734	13144, 17554, 21964, 26374, 30784, 35194, 39604	norovirus Hu/GII/30112/2009/VNM
4325	VP2	AGE89647	4325	8735	13145, 17555, 21965, 26375, 30785, 35195, 39605	norovirus Hu/GII/30113/2009/VNM
4326	VP2	AGE89650	4326	8736	13146, 17556, 21966, 26376, 30786, 35196, 39606	norovirus Hu/GII/30129/2009/VNM
4327	VP2	AGE89653	4327	8737	13147, 17557, 21967, 26377, 30787, 35197, 39607	norovirus Hu/GII/30199/2009/VNM
4328	VP2	AGE89656	4328	8738	13148, 17558, 21968, 26378, 30788, 35198, 39608	norovirus Hu/GII/30201/2009/VNM
4329	VP2	AGE89659	4329	8739	13149, 17559, 21969, 26379, 30789, 35199, 39609	norovirus Hu/GII/30206/2009/VNM
4330	VP2	AGE89662	4330	8740	13150, 17560, 21970, 26380, 30790, 35200, 39610	norovirus Hu/GII/30207/2009/VNM
4331	VP2	AGE89665	4331	8741	13151, 17561, 21971, 26381, 30791, 35201, 39611	norovirus Hu/GII/30211/2009/VNM
4332	VP2	AGE89668	4332	8742	13152, 17562, 21972, 26382, 30792, 35202, 39612	norovirus Hu/GII/30212/2009/VNM
4333	VP2	AGE89671	4333	8743	13153, 17563, 21973, 26383, 30793, 35203, 39613	norovirus Hu/GII/30257/2009/VNM
4334	VP2	AGE89674	4334	8744	13154, 17564, 21974, 26384, 30794, 35204, 39614	norovirus Hu/GII/30266/2009/VNM
4335	VP2	AGE99604	4335	8745	13155, 17565, 21975, 26385, 30795, 35205, 39615	norovirus Hu/GII.4/NIHIC4.1/2011/USA
4336	VP2	AGE99607	4336	8746	13156, 17566, 21976, 26386, 30796, 35206, 39616	norovirus Hu/GII.4/C110/1978/GUF

4337	VP2	AGK36312	4337	8747	13157, 17567, 21977, 26387, 30797, 35207, 39617	norovirus Hu/GII.4/20199/2009/VNM
4338	VP2	AGK36315	4338	8748	13158, 17568, 21978, 26388, 30798, 35208, 39618	norovirus Hu/GII.4/20406/2010/VNM
4339	VP2	AGM33209	4339	8749	13159, 17569, 21979, 26389, 30799, 35209, 39619	norovirus Hu/GI.1/CHA7A009/2010/USA
4340	VP2	AGM33215	4340	8750	13160, 17570, 21980, 26390, 30800, 35210, 39620	norovirus Hu/GI.1/CHA6A003_20091028/2009/USA
4341	VP2	AGM33218	4341	8751	13161, 17571, 21981, 26391, 30801, 35211, 39621	norovirus Hu/GI.1/CHA2A014/2008/USA
4342	VP2	AGM33221	4342	8752	13162, 17572, 21982, 26392, 30802, 35212, 39622	norovirus Hu/GI.1/CHA6A007/2010/USA
4343	VP2	AGM33224	4343	8753	13163, 17573, 21983, 26393, 30803, 35213, 39623	norovirus Hu/GI.1/CHA9A004_20110419/2011/USA
4344	VP2	AGM33227	4344	8754	13164, 17574, 21984, 26394, 30804, 35214, 39624	norovirus Hu/GI.1/CH4X0533/2009/USA
4345	VP2	AGM33230	4345	8755	13165, 17575, 21985, 26395, 30805, 35215, 39625	norovirus Hu/GI.1/CHA5A010/2009/USA
4346	VP2	AGM33233	4346	8756	13166, 17576, 21986, 26396, 30806, 35216, 39626	norovirus Hu/GI.1/CHA9A004_20110426/2011/USA
4347	VP2	AGM33236	4347	8757	13167, 17577, 21987, 26397, 30807, 35217, 39627	norovirus Hu/GI.1/CHA6A014/2009/USA
4348	VP2	AGM33239	4348	8758	13168, 17578, 21988, 26398, 30808, 35218, 39628	norovirus Hu/GI.1/CHA3A007/2008/USA
4349	VP2	AGM33242	4349	8759	13169, 17579, 21989, 26399, 30809, 35219, 39629	norovirus Hu/GI.1/CHA7A011/2010/USA
4350	VP2	AGM33245	4350	8760	13170, 17580, 21990, 26400, 30810, 35220, 39630	norovirus Hu/GI.1/CHA6A003_20091104/2009/USA
4351	VP2	AGT17786	4351	8761	13171, 17581, 21991, 26401, 30811, 35221, 39631	norovirus Hu/GI.1/8MollIL/1972/USA
4352	VP2	AGT17793	4352	8762	13172, 17582, 21992, 26402, 30812, 35222, 39632	norovirus Hu/GI.1/8W/1968/USA
4353	VP2	AGT17796	4353	8763	13173, 17583, 21993, 26403, 30813, 35223, 39633	norovirus Hu/GII.4/NIHIC13/2011/USA

4354	VP2	AGT17799	4354	8764	13174, 17584, 21994, 26404, 30814, 35224, 39634	norovirus Hu/GII.4/NIHIC1.13/2012/USA
4355	VP2	AGT17804	4355	8765	13175, 17585, 21995, 26405, 30815, 35225, 39635	norovirus Hu/GI.1/8McIII/1973/USA
4356	VP2	AGT17807	4356	8766	13176, 17586, 21996, 26406, 30816, 35226, 39636	norovirus Hu/GI.1/8CKIIIc/1974/USA
4357	VP2	AGT17810	4357	8767	13177, 17587, 21997, 26407, 30817, 35227, 39637	norovirus Hu/GI.1/8UIIIf/1973/USA
4358	VP2	AGT17814	4358	8768	13178, 17588, 21998, 26408, 30818, 35228, 39638	norovirus Hu/GII.4/NIHIC17.1/2012/USA
4359	VP2	AGT17820	4359	8769	13179, 17589, 21999, 26409, 30819, 35229, 39639	norovirus Hu/GII.4/NIHIC18.1/2012/USA
4360	VP2	AGT17824	4360	8770	13180, 17590, 22000, 26410, 30820, 35230, 39640	norovirus Hu/GII.4/NIHIC1.3/2010/USA
4361	VP2	AGT17827	4361	8771	13181, 17591, 22001, 26411, 30821, 35231, 39641	norovirus Hu/GI.1/8K/1979/USA
4362	VP2	AGT17831	4362	8772	13182, 17592, 22002, 26412, 30822, 35232, 39642	norovirus Hu/GII.4/NIHIC28.5/2012/USA
4363	VP2	AGT17837	4363	8773	13183, 17593, 22003, 26413, 30823, 35233, 39643	norovirus Hu/GI.1/8MC/1978/USA
4364	VP2	AGT17843	4364	8774	13184, 17594, 22004, 26414, 30824, 35234, 39644	norovirus Hu/GII.4/NIHIC1.5/2011/USA
4365	VP2	AGX85887	4365	8775	13185, 17595, 22005, 26415, 30825, 35235, 39645	norovirus Hu/GII.4/NIHIC17.8/2013/USA
4366	VP2	AGX85893	4366	8776	13186, 17596, 22006, 26416, 30826, 35236, 39646	norovirus Hu/GII.4/NIHIC1.10/2012/USA
4367	VP2	AGX85896	4367	8777	13187, 17597, 22007, 26417, 30827, 35237, 39647	norovirus Hu/GII.4/NIHIC1.7/2012/USA
4368	VP2	AGX85905	4368	8778	13188, 17598, 22008, 26418, 30828, 35238, 39648	norovirus Hu/GII.4/NIHIC27.2/2012/USA
4369	VP2	AGX85914	4369	8779	13189, 17599, 22009, 26419, 30829, 35239, 39649	norovirus Hu/GII.4/NIHIC1.14/2012/USA
4370	VP2	AGX85917	4370	8780	13190, 17600, 22010, 26420, 30830, 35240, 39650	norovirus Hu/GII.4/NIHIC17.6/2012/USA

4371	VP2	AGX85923	4371	8781	13191, 17601, 22011, 26421, 30831, 35241, 39651	norovirus Hu/GII.4/NIHIC28.3/2012/USA
4372	VP2	AGX85926	4372	8782	13192, 17602, 22012, 26422, 30832, 35242, 39652	norovirus Hu/GII.4/NIHIC11.3/2013/USA
4373	VP2	AGX85932	4373	8783	13193, 17603, 22013, 26423, 30833, 35243, 39653	norovirus Hu/GII.4/NIHIC1.12/2012/USA
4374	VP2	AGX85935	4374	8784	13194, 17604, 22014, 26424, 30834, 35244, 39654	norovirus Hu/GII.4/NIHIC1.11/2012/USA
4375	VP2	AHI59155	4375	8785	13195, 17605, 22015, 26425, 30835, 35245, 39655	norovirus Hu/GII.6/HS245/2010/USA
4376	VP2	AHI59158	4376	8786	13196, 17606, 22016, 26426, 30836, 35246, 39656	norovirus Hu/GII.4/HS292/2012/USA
4377	VP2	AHI59160	4377	8787	13197, 17607, 22017, 26427, 30837, 35247, 39657	norovirus Hu/GII.2/HS255/2011/USA
4378	VP2	AHI59163	4378	8788	13198, 17608, 22018, 26428, 30838, 35248, 39658	norovirus Hu/GII.4/HS288/2012/USA
4379	VP2	AHI59166	4379	8789	13199, 17609, 22019, 26429, 30839, 35249, 39659	norovirus Hu/GII.4/HS66/2001/USA
4380	VP2	AHX22026	4380	8790	13200, 17610, 22020, 26430, 30840, 35250, 39660	norovirus Hu/GII/BGIC0282/2011/BGD
4381	VP2	AHX22029	4381	8791	13201, 17611, 22021, 26431, 30841, 35251, 39661	norovirus Hu/GII/BGIC0391/2012/BGD
4382	VP2	AHX22033	4382	8792	13202, 17612, 22022, 26432, 30842, 35252, 39662	norovirus Hu/GII/BGIC0066/2011/BGD
4383	VP2	AHX22036	4383	8793	13203, 17613, 22023, 26433, 30843, 35253, 39663	norovirus Hu/GII/BGIC0241-32/2011/BGD
4384	VP2	AHX22039	4384	8794	13204, 17614, 22024, 26434, 30844, 35254, 39664	norovirus Hu/GII/BGIC0398/2012/BGD
4385	VP2	AHX22042	4385	8795	13205, 17615, 22025, 26435, 30845, 35255, 39665	norovirus Hu/GII/BGIC0405/2012/BGD
4386	VP2	AHX22048	4386	8796	13206, 17616, 22026, 26436, 30846, 35256, 39666	norovirus Hu/GII/BGIC0004/2010/BGD
4387	VP2	AHX22051	4387	8797	13207, 17617, 22027, 26437, 30847, 35257, 39667	norovirus Hu/GII/BGIC0241-33/2011/BGD

4388	VP2	AHX22055	4388	8798	13208, 17618, 22028, 26438, 30848, 35258, 39668	norovirus Hu/GII/BGICO270/2011/BGD
4389	VP2	AII02849	4389	8799	13209, 17619, 22029, 26439, 30849, 35259, 39669	norovirus Hu/GII/CZH-45/2011/VNM
4390	VP2	AKE07101	4390	8800	13210, 17620, 22030, 26440, 30850, 35260, 39670	norovirus GII
4391	VP2	AKE07104	4391	8801	13211, 17621, 22031, 26441, 30851, 35261, 39671	norovirus GII
4392	VP2	AKE07107	4392	8802	13212, 17622, 22032, 26442, 30852, 35262, 39672	norovirus GII
4393	VP2	ALE30634	4393	8803	13213, 17623, 22033, 26443, 30853, 35263, 39673	norovirus GII
4394	VP2	ALE30636	4394	8804	13214, 17624, 22034, 26444, 30854, 35264, 39674	norovirus GII
4395	VP2	BAR42290	4395	8805	13215, 17625, 22035, 26445, 30855, 35265, 39675	norovirus Hu/GII/JP/2015/GII.P17_GII.17/Kawasaki308
4396	VP2	BAR47617	4396	8806	13216, 17626, 22036, 26446, 30856, 35266, 39676	norovirus Hu/GII/JP/2014/GII.P17_GII.17/Nagano7-1
4397	VP2	BAR63716	4397	8807	13217, 17627, 22037, 26447, 30857, 35267, 39677	norovirus Hu/GII/JP/2013/GII.P17_GII.17/Saitama5203
4398	VP2	BAR63719	4398	8808	13218, 17628, 22038, 26448, 30858, 35268, 39678	norovirus Hu/GII/JP/2013/GII.P17_GII.17/Saitama5309
4399	VP2	BAR63722	4399	8809	13219, 17629, 22039, 26449, 30859, 35269, 39679	norovirus Hu/GII/JP/2014/GII.P17_GII.17/Nagano8-1
4400	VP2	BAS02084	4400	8810	13220, 17630, 22040, 26450, 30860, 35270, 39680	norovirus Hu/GII/JP/2015/GII.Pe_GII.4/Osaka/OSF78
4401	VP2	CRL46953	4401	8811	13221, 17631, 22041, 26451, 30861, 35271, 39681	norovirus GI/Hu/NL/2011/GI.4/Groningen
4402	VP2	CRL46956	4402	8812	13222, 17632, 22042, 26452, 30862, 35272, 39682	norovirus GI/Hu/NL/2012/GI.6/Groningen
4403	VP2	CRL46959	4403	8813	13223, 17633, 22043, 26453, 30863, 35273, 39683	norovirus GII/Hu/NL/2012/GII.4/Groningen
4404	VP2	CRL46962	4404	8814	13224, 17634, 22044, 26454, 30864, 35274, 39684	norovirus GII/Hu/NL/2014/GII.4/Groningen01

4405	VP2	CRL46965	4405	8815	13225, 17635, 22045, 26455, 30865, 35275, 39685	norovirus GII/Hu/NL/2014/GII.4/Groningen02
4406	VP2	CRL46968	4406	8816	13226, 17636, 22046, 26456, 30866, 35276, 39686	norovirus GII/Hu/NL/2014/GII.6/Groningen
4407	VP2	CRL46971	4407	8817	13227, 17637, 22047, 26457, 30867, 35277, 39687	norovirus GII/Hu/NL/2014/GII.21/Groningen
4408	VP2	CRL46974	4408	8818	13228, 17638, 22048, 26458, 30868, 35278, 39688	norovirus GII/Hu/NL/2014/GII.2/Groningen
4409	VP2	CRL46977	4409	8819	13229, 17639, 22049, 26459, 30869, 35279, 39689	norovirus GII/Hu/NL/2012/GII.4/Nijmegen01
4410	VP2	CRL46980	4410	8820	13230, 17640, 22050, 26460, 30870, 35280, 39690	norovirus GII/Hu/NL/2012/GII.4/Nijmegen02

Legend to **Table 1**: Column 1: protein name (according to NCBI or Genbank entry); Column 2: NCBI or Genbank Accession No.; Column 3 ("A"): SEQ ID NOs of amino acid sequence; Column 4 ("B"): SEQ ID NOs of wild type coding sequences; Column 5 ("C"): SEQ ID NOs of optimized coding sequence.

Claims:

1. Artificial nucleic acid comprising at least one coding region encoding at least one polypeptide derived from a Norovirus, and/or a fragment or variant thereof.

2. The artificial nucleic acid according to claim 1, wherein the at least one encoded polypeptide is selected from the group consisting of a non-structural protein derived from a Norovirus and/or a capsid protein derived from a Norovirus, and/or a fragment or variant thereof.

3. The artificial nucleic acid according to claim 1 or 2, wherein the at least one encoded polypeptide is selected from the group consisting of Norovirus non-structural proteins NS1/NS2, NS3, NS4, NS5, NS6, NS7, Norovirus capsid protein VP1 and Norovirus capsid protein VP2, and/or a fragment or variant thereof.

4. The artificial nucleic acid according to any one of claims 1 to 3, wherein the artificial nucleic acid is derived from a Norovirus selected from the group consisting of genogroup I Norovirus, genogroup II Norovirus, genogroup III Norovirus, genogroup IV Norovirus, and genogroup V Norovirus; preferably the artificial nucleic acid is derived from a Norovirus selected from the group consisting of a GI.1 to GI.17 Norovirus, GII.1 to GII.24 Norovirus, GIII.1 to GIII.4 Norovirus, GIV.1 to GIV.4 Norovirus and GV.1 to GV.4 Norovirus; more preferably, the artificial nucleic acid is derived from a Norovirus selected from the group consisting of GI.1 Norovirus and GII.4 Norovirus, even more preferably, the artificial nucleic acid is derived from a GII.4 Norovirus, still more preferably, the artificial nucleic acid is derived from a GII.4 CIN-1 Norovirus or a GII.4 Sydney Norovirus or a GII.4 Sydney 2012 Norovirus.

5. The artificial nucleic acid according to any one of claims 1 to 4, wherein the at least one encoded polypeptide comprises at least one Norovirus capsid protein VP1 or Norovirus capsid protein VP2 and/or a fragment or a variant thereof.

6. The artificial nucleic acid according to any one of claims 1 to 5, wherein the at least one encoded polypeptide comprises at least one Norovirus capsid protein VP1 and/or a fragment or variant thereof.

7. The artificial nucleic acid according to any one of claims 1 to 6, wherein the at least one encoded polypeptide comprises

(i) at least one of the amino acid sequences according to any one of SEQ ID NOs: 1-4410; and/or

(ii) at least one of the amino acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% sequence identity to the amino acid sequence represented by any one of SEQ ID NOs: 1-4410; and/or

(iii) an orthologue or a paralogue of any one of SEQ ID NOs: 1-39690, 39713-39746; and/or a fragment or variant of any of these sequences.

8. The artificial nucleic acid according to any one of claims 1 to 7, wherein the at least one coding region comprises

(i) at least one of the nucleic acid sequences according to any one of SEQ ID NOs: 4411-39690, 39713-39746; and/or

(ii) at least one of the nucleic acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%, 73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% sequence identity to the nucleic acid sequence represented by any one of SEQ ID NOs: 4411-39690, 39713-39746; and/or

(iii) at least one complement of the nucleic acid sequences which are capable of hybridizing with a nucleic acid sequence comprising a sequence as shown in SEQ ID NOs: 4411-39690, 39713-39746, and/or to a nucleic acid encoding a polypeptide having a sequence as shown in SEQ ID NOs: 1-4410; and/or

(iv) an orthologue or a paralogue of any one of SEQ ID NOs: 1-39690, 39713-39746; and/or a fragment or variant of any of these sequences.

9. The artificial nucleic acid according to any one of claims 1 to 8, wherein the artificial nucleic acid is monocistronic, bicistronic or multicistronic.

10. The artificial nucleic acid according to any one of claims 1 to 9, wherein the artificial nucleic acid is monocistronic and wherein the coding region encodes a polypeptide comprising at least two different Norovirus proteins as defined in any one of claims 1 to 9, or a fragment or variant thereof.

11. The artificial nucleic acid according to any one of claims 1 to 9, wherein the artificial nucleic acid is bi- or multicistronic and comprises at least two coding regions, wherein the at least two coding regions encode at least two polypeptides, wherein each of the at least two polypeptides comprises at least one Norovirus protein as defined in any one of claims 1 to 9, or a fragment or variant of any one of these proteins, wherein the at least two polypeptides are preferably different polypeptides.

12. The artificial nucleic acid according to any one of claims 1 to 11, wherein the artificial nucleic acid is an RNA, preferably an mRNA.

13. The artificial nucleic acid according to any one of claims 1 to 12, wherein the artificial nucleic acid comprises a 5'-cap structure.

14. The artificial nucleic acid according to any one of claims 1 to 13, wherein the G/C content of the coding region of the mRNA sequence is increased compared to the G/C content of the corresponding coding sequence of the wild type mRNA, or wherein the C content of the coding region of the mRNA sequence is increased compared to the C content of the corresponding coding sequence of the wild type mRNA, or wherein the codon usage in the coding region of the mRNA sequence is adapted to the human codon usage, or wherein the codon adaptation index (CAI) is increased or maximised in the coding region of the mRNA sequence, wherein the encoded amino acid sequence of the mRNA sequence is preferably not being modified compared to the encoded amino acid sequence of the wild type mRNA.

15. The artificial nucleic acid according to any one of claims 1 to 14, wherein

(i) the at least one coding region comprises a nucleic acid sequence, which is codon-optimized; and/or

(ii) the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 8821-13230, 26461-39690, 39715, 39716, 39717, 39720, 39721, 39724, 39725, 39728, 39729, 39730, 39733, 39734, 39737, 39738, 39741, 39742, 39745 and 39746, or a fragment or variant of any of these sequences; and/or

(iii) the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 13231-17640, or a fragment or variant of any of these sequences; and/or

(iv) the artificial nucleic acid according to any one of the preceding claims, wherein the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 17641-22050, or a fragment or variant of any of these sequences; and/or

(v) the artificial nucleic acid according to any one of the preceding claims, wherein the at least one coding sequence comprises a nucleic acid sequence, which is identical or at least 50%, 60%, 70%, 80%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 22051-26460, or a fragment or variant of any of these sequences.

16. The artificial nucleic acid according to any one of claims 1 to 15, wherein the artificial nucleic acid comprises at least one histone stem-loop.

17. The artificial nucleic acid according to claim 16, wherein the at least one histone stem-loop comprises a nucleic acid sequence according to the following formulae (I) or (II):

formula (I) (stem-loop sequence without stem bordering elements):

$$\underbrace{[N_{0-2}GN_{3-5}]}_{\text{stem1}}\ \underbrace{[N_{0-4}(U/T)N_{0-4}]}_{\text{loop}}\ \underbrace{[N_{3-5}CN_{0-2}]}_{\text{stem2}}$$

formula (II) (stem-loop sequence with stem bordering elements):

$$\underbrace{N_{1-6}}_{\text{stem1 bordering element}}\ \underbrace{[N_{0-2}GN_{3-5}]}_{\text{stem1}}\ \underbrace{[N_{0-4}(U/T)N_{0-4}]}_{\text{loop}}\ \underbrace{[N_{3-5}CN_{0-2}]}_{\text{stem2}}\ \underbrace{N_{1-6}}_{\text{stem2 bordering element}}$$

wherein:

stem1 or stem2 bordering elements N_{1-6}	is a consecutive sequence of 1 to 6, preferably of 2 to 6, more preferably of 2 to 5, even more preferably of 3 to 5, most preferably of 4 to 5 or 5 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C, or a nucleotide analogue thereof;
stem1 $[N_{0-2}GN_{3-5}]$	is reverse complementary or partially reverse complementary with element stem2, and is a consecutive sequence between of 5 to 7 nucleotides;
	wherein N_{0-2} is a consecutive sequence of 0 to 2, preferably of 0 to 1, more preferably of 1 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof;
	wherein N_{3-5} is a consecutive sequence of 3 to 5, preferably of 4 to 5, more preferably of 4 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof, and
	wherein G is guanosine or an analogue thereof, and may be optionally replaced by a cytidine or an analogue thereof, provided that its complementary nucleotide cytidine in stem2 is replaced by guanosine;

loop sequence [N_{0-4}(U/T)N_{0-4}] is located between elements steml and stem2, and is a consecutive sequence of 3 to 5 nucleotides, more preferably of 4 nucleotides;

wherein each N_{0-4} is independent from another a consecutive sequence of 0 to 4, preferably of 1 to 3, more preferably of 1 to 2 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof; and

wherein U/T represents uridine, or optionally thymidine;

stem2 [N_{3-5}CN_{0-2}] is reverse complementary or partially reverse complementary with element steml, and is a consecutive sequence between of 5 to 7 nucleotides;

wherein N_{3-5} is a consecutive sequence of 3 to 5, preferably of 4 to 5, more preferably of 4 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof;

wherein N_{0-2} is a consecutive sequence of 0 to 2, preferably of 0 to 1, more preferably of 1 N, wherein each N is independently from another selected from a nucleotide selected from A, U, T, G and C or a nucleotide analogue thereof; and

wherein C is cytidine or an analogue thereof, and may be optionally replaced by a guanosine or an analogue thereof provided that its complementary nucleotide guanosine in steml is replaced by cytidine;

wherein

steml and stem2 are capable of base pairing with each other

forming a reverse complementary sequence, wherein base pairing may occur between steml and stem2, or

forming a partially reverse complementary sequence, wherein an incomplete base pairing may occur between steml and stem2.

18. The artificial nucleic acid according to claim 17, wherein the at least one histone stem-loop comprises a nucleic acid sequence according to the following formulae (Ia) or (IIa):

formula (Ia) (stem-loop sequence without stem bordering elements):

$$\underbrace{[N_{0-1}GN_{3-5}]}_{\text{stem1}}\ \underbrace{[N_{1-3}(U/T)N_{0-2}]}_{\text{loop}}\ \underbrace{[N_{3-5}CN_{0-1}]}_{\text{stem2}}$$

formula (IIa) (stem-loop sequence with stem bordering elements):

$$\underbrace{N_{2-5}}_{\substack{\text{stem1}\\ \text{bordering element}}}\ \underbrace{[N_{0-1}GN_{3-5}]}_{\text{stem1}}\ \underbrace{[N_{1-3}(U/T)N_{0-2}]}_{\text{loop}}\ \underbrace{[N_{3-5}CN_{0-1}]}_{\text{stem2}}\ \underbrace{N_{2-5}}_{\substack{\text{stem2}\\ \text{bordering element}}}$$

19. The artificial nucleic acid according to any one of claims 16 to 18, wherein the at least one histone stem loop comprises a nucleic acid sequence according to SEQ ID NO: 39709 to SEQ ID NO: 39710, or a fragment or variant thereof.

20. The artificial nucleic acid molecule according to any one of claims 1 to 19, wherein the artificial nucleic acid comprises an untranslated region (UTR).

21. The artificial nucleic acid according to claim 20, wherein the artificial nucleic acid comprises a 3'-UTR.

22. The artificial nucleic acid according to claim 21, wherein the 3'-UTR comprises at least one heterologous 3'-UTR element.

23. The artificial nucleic acid according to claim 21 or 22, wherein the 3'-UTR comprises a poly(A) sequence and/or a poly(C) sequence.

24. The artificial nucleic acid according to claim 23, wherein the poly(A) sequence comprises 10 to 200, 10 to 100, 40 to 80 or 50 to 70 adenosine nucleotides, and/or the poly(C) sequence comprises 10 to 200, 10 to 100, 20 to 70, 20 to 60 or 10 to 40 cytosine nucleotides.

25. The artificial nucleic acid according to any one of claims 1 to 24, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence derived from a 3'-UTR of a gene, which preferably encodes a stable mRNA, or from a homolog, a fragment or a variant of said gene.

26. The artificial nucleic acid according to any one of claims 1 to 25, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence derived from a 3'-UTR of a gene selected from the group consisting of an albumin gene, an α-globin gene, a β-globin gene, a tyrosine hydroxylase gene, a lipoxygenase gene, and a collagen alpha gene, or from a homolog, a fragment or a variant thereof.

27. The artificial nucleic acid according to any one of claims 1 to 26, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence derived from a 3'-UTR of an α-globin gene, preferably comprising the corresponding RNA sequence of the nucleic acid sequence according to SEQ ID NO: 39701, or SEQ ID NO: 39702, a homolog, a fragment, or a variant thereof.

28. The artificial nucleic acid according to any one of claims 1 to 27, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence, which is derived from the 3'-UTR of a vertebrate albumin gene or from a variant thereof, preferably from the 3'-UTR of a mammalian albumin gene or from a variant thereof, more preferably from the 3'-UTR of a human albumin gene or from a variant thereof, even more preferably from the 3'-UTR of the human albumin gene according to Genbank Accession number NM_000477.5, or from a fragment or variant thereof.

29. The artificial nucleic acid according to any one of claims 1 to 28, wherein the at least one heterologous 3'-UTR element comprises a nucleic acid sequence according to to any one of SEQ ID NO: 39703 to SEQ ID NO: 39708, or a homolog, a fragment or a variant thereof.

30. The artificial nucleic acid according to any one of claims 1 to 29, wherein the artificial nucleic acid comprises a 5'-UTR.

31. The artificial nucleic acid sequence according to any one of claims 1 to 30, wherein the 5'-UTR comprises at least one heterologous 5'-UTR element.

32. The artificial nucleic acid according to any one of claims 1 to 31, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence, which is derived from the 5'-UTR of a TOP gene, preferably from a corresponding RNA sequence, or a homolog, a fragment, or a variant thereof, preferably lacking the 5'TOP motif.

33. The artificial nucleic acid according to any one of claims 1 to 32, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence, which is derived from a 5'-UTR of a TOP gene encoding a ribosomal protein, preferably from a corresponding RNA sequence, or from a homolog, a fragment or a variant thereof, preferably lacking the 5'TOP motif.

34. The artificial nucleic acid according to any one of claims 1 to 33, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence, which is derived from a 5'-UTR of a TOP gene encoding a ribosomal Large protein (RPL), preferably RPL32 or RPL35A, or from a gene selected from the group consisting of HSD17B4, ATP5A1, AIG1, ASAH1, COX6C or ABCB7 (MDR), or from a homolog, a fragment or variant of any one of these genes, preferably lacking the 5'TOP motif.

35. The artificial nucleic acid according to any one of claims 1 to 34, wherein the at least one heterologous 5'-UTR element comprises a nucleic acid sequence according to SEQ ID NO: 39691 to SEQ ID NO: 39694, or a homolog, a fragment or a variant thereof.

36. The artificial nucleic acid according to any one of claims 1 to 35 comprising, preferably in 5' to 3' direction, the following elements:

a) optionally a 5'-cap structure, preferably m7GpppN,

b) a coding region encoding at least one polypeptide derived from a Norovirus as described herein, preferably VP1, or a fragment or variant thereof,

c) optionally a poly(A) tail, preferably consisting of 10 to 200, 10 to 100, 40 to 80 or 50 to 70 adenosine nucleotides,

d) optionally a poly(C) tail, preferably consisting of 10 to 200, 10 to 100, 20 to 70, 20 to 60 or 10 to 40 cytosine nucleotides, and

e) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEQ ID NO: 39709 to SEQ ID NO: 39710.

37. The artificial nucleic acid according to any one of claims 1 to 36 comprising, preferably in 5' to 3' direction, the following elements:

a) optionally a 5'-cap structure, preferably m7GpppN,

b) a coding region encoding at least one polypeptide derived from a Norovirus, preferably VP1 as described herein, or a fragment or variant thereof,

c) a 3'-UTR element comprising a nucleic acid sequence, which is derived from an α-globin gene, preferably comprising the corresponding RNA sequence of the nucleic acid sequence according to SEQ ID NO: 39701, or SEQ ID NO: 39702, or a homolog, a fragment or a variant thereof,

d) optionally a poly(A) tail, preferably consisting of 10 to 200, 10 to 100, 40 to 80 or 50 to 70 adenosine nucleotides,

e) optionally a poly(C) tail, preferably consisting of 10 to 200, 10 to 100, 20 to 70, 20 to 60 or 10 to 40 cytosine nucleotides, and

f) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEQ ID NO: 39709 to SEQ ID NO: 39710.

38. The artificial nucleic acid according to any one of claims 1 to 37, wherein the artificial nucleic acid comprises a nucleic acid sequence according to any one of SEQ ID NOs: 39713-39746, preferably a nucleic acid sequence according to any one of SEQ ID NOs: 39716, 39721, 39729, 39734, 39738, 39725, or a fragment or variant of any of these sequences.

39. The artificial nucleic acid according to any one of claims 1 to 38, comprising, preferably in 5' to 3' direction, the following elements:

a) optionally a 5'-cap structure, preferably m7GpppN,

b) a 5'-UTR element, which comprises or consists of a nucleic acid sequence, which is derived from the 5'-UTR of a TOP gene, preferably comprising a nucleic acid sequence according to SEQ ID NO: 39691, or SEQ ID NO: 39692, or a homolog, a fragment or a variant thereof,

c) a coding region encoding at least one polypeptide derived from a Norovirus, preferably VP1 as described herein, or a fragment or variant thereof,

d) a 3'-UTR element comprising a nucleic acid sequence, which is derived from an albumin gene, preferably comprising the corresponding RNA sequence of the nucleic acid sequence according to SEQ ID NO: 39705, or SEQ ID NO: 39706, or a homolog, a fragment or a variant thereof,

e) optionally a poly(A) tail, preferably consisting of 10 to 200, 10 to 100, 40 to 80 or 50 to 70 adenosine nucleotides,

f) optionally a poly(C) tail, preferably consisting of 10 to 200, 10 to 100, 20 to 70, 20 to 60 or 10 to 40 cytosine nucleotides, and

g) optionally a histone stem-loop, preferably comprising the RNA sequence according to SEQ ID NO: 39709 to SEQ ID NO: 39710.

40. The artificial nucleic acid according to any one of claims 1 to 39, wherein the artificial nucleic acid comprises a nucleic acid sequence according to any one of SEQ ID NOs: 39713-39746, preferably a nucleic acid sequence according to any one of SEQ ID NOs: 39716, 39721, 39729, 39734, 39738, 39725, or a fragment or variant of any of these sequences.

41. The artificial nucleic acid according to any one of claims 1 to 40, wherein the coding region comprises a modified nucleic acid sequence.

42. The artificial nucleic acid according to any one of claims 1 to 41, wherein the at least one coding region comprises a nucleic acid sequence encoding a molecular tag and wherein the molecular tag is selected from the group consisting of a FLAG tag, a glutathione-S-transferase (GST) tag, a His tag, a Myc tag, an E tag, a Strep tag, a green fluorescent protein (GFP) tag and an HA tag.

43. Composition comprising at least one artificial nucleic acid as defined by any one of claims 1 to 42 and a pharmaceutically acceptable carrier.

44. The composition according to claim 43, wherein the at least one mRNA is complexed with one or more cationic or polycationic compounds, preferably with cationic or polycationic polymers, cationic or polycationic peptides or proteins, e.g. protamine, cationic or polycationic polysaccharides and/or cationic or polycationic lipids.

45. The composition according to any one of claims 43 to 44, wherein the N/P ratio of the at least one mRNA to the one or more cationic or polycationic compounds is in the range of about 0.1 to 20, including a range of about 0.3 to 4, of about 0.5 to 2, of about 0.7 to 2 and of about 0.7 to 1.5.

46. The composition according to any one of claims 43 to 45 comprising the at least one mRNA, which is complexed with one or more cationic or polycationic compounds, and at least one free mRNA.

47. The composition according to any one of claims 43 to 46, wherein the at least one complexed mRNA is identical to the at least one free mRNA.

48. The composition according to any one of claims 43 to 47, wherein the mRNA is complexed with one or more lipids, thereby forming liposomes, lipid nanoparticles and/or lipoplexes.

49. The composition according to any one of claims 43 to 48, wherein the composition comprises at least one adjuvant.

50. The composition according to any one of claims 43 to 49, wherein

a) the composition comprises a plurality or more than one of the mRNA sequences each defined in any one of claims 1 to 42; or

b) the composition comprises at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more artificial nucleic acids as defined by any one of claims 1 to 42, wherein each of the at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more artificial nucleic acids comprises at least one coding region encoding at least one polypeptide comprising a Norovirus protein as defined in any one of claims 1 to 42, and/or a fragment or a variant of any one of these proteins, wherein each coding region preferably encodes a different Norovirus protein, more preferably each coding region encodes a capsid protein, preferably VP1 of a different Norovirus.

51. The composition according to any one of claims 43 to 50, wherein

a) wherein each of the mRNA sequences encodes at least one different antigenic peptide or protein derived from proteins of the same Norovirus; and/or

b) the composition comprises at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more artificial nucleic acids as defined by any one of claims 1 to 42, wherein each of the at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more artificial nucleic acids comprises at least one coding region encoding at least one polypeptide comprising at least two different Norovirus proteins, preferably VP1 and VP2, as defined in any one of claims 1 to 42, and/or a fragment or a variant of any one of these proteins.

52. The composition according to any one of claims 43 to 51, wherein the at least one artificial nucleic acid is complexed at least partially with a cationic or polycationic compound and/or a polymeric carrier, preferably a cationic protein or peptide.

53. The composition according to any one of claims 43 to 52, wherein

(i) the ratio of complexed nucleic acid to free nucleic acid is selected from a range of about 5:1 (w/w) to about 1:10 (w/w), more preferably from a range of about 4:1 (w/w) to about 1:8 (w/w), even more preferably from a range of about 3:1 (w/w) to about 1:5 (w/w) or 1:3 (w/w), wherein the ratio is most preferably about 1:1 (w/w); or

(ii) the mRNA is complexed with one or more cationic or polycationic compounds in a weight ratio selected from a range of about 6:1 (w/w) to about 0.25:1 (w/w), more preferably from about 5:1 (w/w) to about 0.5:1 (w/w), even more preferably of about 4:1 (w/w) to about 1:1 (w:w) or of about 3:1 (w/w) to about 1:1 (w/w), and most preferably a ratio of about 3:1 (w/w) to about 2:1 (w/w) of mRNA to cationic or polycationic compound and/or with a polymeric carrier; or optionally in a nitrogen/phosphate ratio of mRNA to cationic or polycationic compound and/or polymeric carrier in the range of about 0.1-10, preferably in a range of about 0.3-4 or 0.3-1, and most preferably in a range of about 0.5-1 or 0.7-1, and even most preferably in a range of about 0.3-0.9 or 0.5-0.9;

and/or wherein the at least one artificial nucleic acid or mRNA is complexed with one or more cationic or polycationic compounds, preferably with cationic or polycationic polymers, cationic or polycationic peptides or proteins, e.g. protamine, cationic or polycationic polysaccharides and/or cationic or polycationic lipids

and/or wherein the at least one artificial nucleic acid or mRNA is complexed with one or more lipids and thereby forming liposomes, lipid nanoparticles and/or lipoplexes.

54. The composition according to any one of claims 43 to 53 wherein the composition comprises

(i) at least 2, 3, 4, 5, 6, 7, 8, 9, 10 or more artificial nucleic acids as defined in claims 1 to 42; or

(ii) at least 10, 15, 20 or 50 artificial nucleic acids as defined in claims 1 to 42; or

(iii) 2-10, 10-15, 15-20, 20-50, 50-100 or 100-200 artificial nucleic acids as defined in claims 1 to 42;

and a pharmaceutically acceptable carrier, wherein preferably the artificial nucleic acid encodes a capsid protein VP1 derived from a Norovirus.

55. The composition according to any one of claims 43 to 54, wherein

(i) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GII Noroviruses; or

(iv) the artificial nucleic acids are derived from a single GIII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GIII Noroviruses; or

(iv) the artificial nucleic acids are derived from a single GIV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GIV Noroviruses; or

(v) the artificial nucleic acids are derived from a single GV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GV Noroviruses; or

(vi) the artificial nucleic acids are derived from a single GI Norovirus and additionally from a single GII Norovirus, GIII Norovirus, GIV Norovirus and/or GV Norovirus; or

(vii) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI Noroviruses and additionally from a single GII, GIII, GIV or GV Norovirus and/or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 and/or more GII, GIII, GIV or GV Noroviruses;

wherein preferably the artificial nucleic acids encode a capsid protein VP1 derived from a Norovirus.

56. The composition according to any one of claims 43 to 55, wherein

(i) the artificial nucleic acids are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI.1 Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GII.4 Noroviruses; or

(iii) the artificial nucleic acids are derived from a single GI.1 Norovirus and additionally from a single GII.4 Norovirus; or

(iv) the artificial nucleic acids are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI.1 Noroviruses and additionally from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more GII.4 Noroviruses; and/or

wherein

(i) at least one of the nucleic acid sequences according to any one of SEQ ID NO: 39713 to SEQ ID NO: 39746; and/or

(ii) at least one of the nucleic acid sequences having, in increasing order of preference, at least 50%, 51%, 52%, 53%, 54%, 55%, 56%, 57%, 58%, 59%, 60%, 61%, 62%, 63%, 64%, 65%, 66%, 67%, 68%, 69%, 70%, 71%, 72%,

73%, 74%, 75%, 76%, 77%, 78%, 79%, 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, or 99% sequence identity to the nucleic acid sequence represented by any one of SEQ ID NO: 39713 to SEQ ID NO: 39746; and/or

(iii) at least one complement of the nucleic acid sequences which are capable of hybridizing with a nucleic acid sequence comprising a sequence as shown in SEQ ID NO: 39713 to SEQ ID NO: 39746; and/or

(iv) an orthologue or a paralogue of any one of SEQ ID NO: 39713 to SEQ ID NO: 39746; and/or a fragment or variant of any of these sequences.

57. Polypeptide encoded by the artificial nucleic acid according to any one of claims 1 to 42.

58. Polypeptide according to any one of claims 1 to 42 comprising at least one protein selected from the group consisting of NS1/NS2, NS3, NS4, NS5, NS6, NS7, VP1, and VP2 derived from Norovirus, or a fragment or variant of any of these proteins, and at least one amino acid sequence selected from the group consisting of:

a) an amino acid sequence derived from a C-terminal fragment from mature Norovirus capsid protein VP1, or a variant thereof, wherein the C-terminal fragment consists of 3 to 20 amino acid residues,

b) an amino acid sequence derived from a signal sequence of Norovirus capsid protein VP1, or a fragment or variant thereof, and

c) an amino acid sequence derived from an N-terminal fragment from mature Norovirus non-structural protein NS1/NS2, NS3, NS4, NS5, NS6, or NS7, or a variant thereof, wherein the N-terminal fragment consists of 3 to 20 amino acid residues.

59. The polypeptide according to any one of claims 57 to 58 comprising a molecular tag, wherein the molecular tag is selected from the group consisting of a FLAG tag, a glutathione-S-transferase (GST) tag, a His tag, a Myc tag, an E tag, a Strep tag, a green fluorescent protein (GFP) tag and an HA tag.

60. Composition comprising the polypeptide according to any one of claims 57 to 59, and a pharmaceutically acceptable carrier.

61. Vaccine comprising the artificial nucleic acid according to any one of claims 1 to 42, the composition according to any one of claims 43 to 56, the polypeptide according to any one of claims 57 to 59, and/or the composition according to claim 60.

62. The vaccine according to claim 61, wherein the artificial nucleic acid according to any one of claims 1 to 42, the composition according to any one of claims 43 to 56, the polypeptide according to any one of claims 57 to 59, or the composition according to claim 60 elicits an adaptive immune response.

63. The vaccine according to claim 61 to 62, wherein the vaccine further comprises a pharmaceutically acceptable carrier.

64. The vaccine according to any one of claims 61 to 63 further comprising an adjuvant.

65. The vaccine according to any one of claims 61 to 64, wherein the vaccine is multivalent and comprises

(i) at least 2, 3, 4, 5, 6, 7, 8, 9, 10 or more artificial nucleic acids as defined in claims 1 to 42; or

(ii) at least 10, 15, 20 or 50 artificial nucleic acids as defined in claims 1 to 42; or

(iii) 2-10, 10-15, 15-20, 20-50, 50-100 or 100-200 artificial nucleic acids as defined in claims 1 to 43.

66. The vaccine according to any one of claims 61 to 65, wherein

(i) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GII Noroviruses; or

(iii) the artificial nucleic acids are derived from a single GIII Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GIII Noroviruses; or

(iv) the artificial nucleic acids are derived from a single GIV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GIV Noroviruses; or

(v) the artificial nucleic acids are derived from a single GV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GV Noroviruses; or

(vi) the artificial nucleic acids are derived from a single GI Norovirus and additionally from a single GII Norovirus, GIII Norovirus, GIV Norovirus and/or GV Norovirus; or

(vii) the artificial nucleic acids are derived from a single GI Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI Noroviruses and additionally from a single GII, GIII, GIV and/or GV Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more GII, GIII, GIV and/or GV Noroviruses.

67. The vaccine according to any one of claims 61 to 66, wherein

(i) the artificial nucleic acids are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI.1 Noroviruses; or

(ii) the artificial nucleic acids are derived from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GII.4 Noroviruses; or

(iii) the artificial nucleic acids are derived from a single GI.1 Norovirus and additionally from a single GII.4 Norovirus; or

(iv) the artificial nucleic acids are derived from a single GI.1 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more different GI.1 Noroviruses and additionally from a single GII.4 Norovirus or from 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50 or more GII.4 Noroviruses.

68. Kit or kit of parts comprising the artificial nucleic acid according to any one of claims 1 to 42, the composition according to any one of claims 43 to 56, the polypeptide according to any one of claims 57 to 59, the composition according to claim 60 or the vaccine according to any one of claims 61 to 67, optionally comprising a liquid vehicle for solubilising, and optionally technical instructions providing information on administration and dosage of the components.

69. The kit or kit of parts according to claim 68 comprising Ringer lactate solution.

70. The artificial nucleic acid according to any one of claims 1 to 42, the composition according to any one of claims 43 to 56, the polypeptide according to any one of claims 57 to 59, the composition according to claim 60, the vaccine according to any one of claims 61 to 67, or the kit or kit of parts according to claim 68 to 69 for use as a medicament.

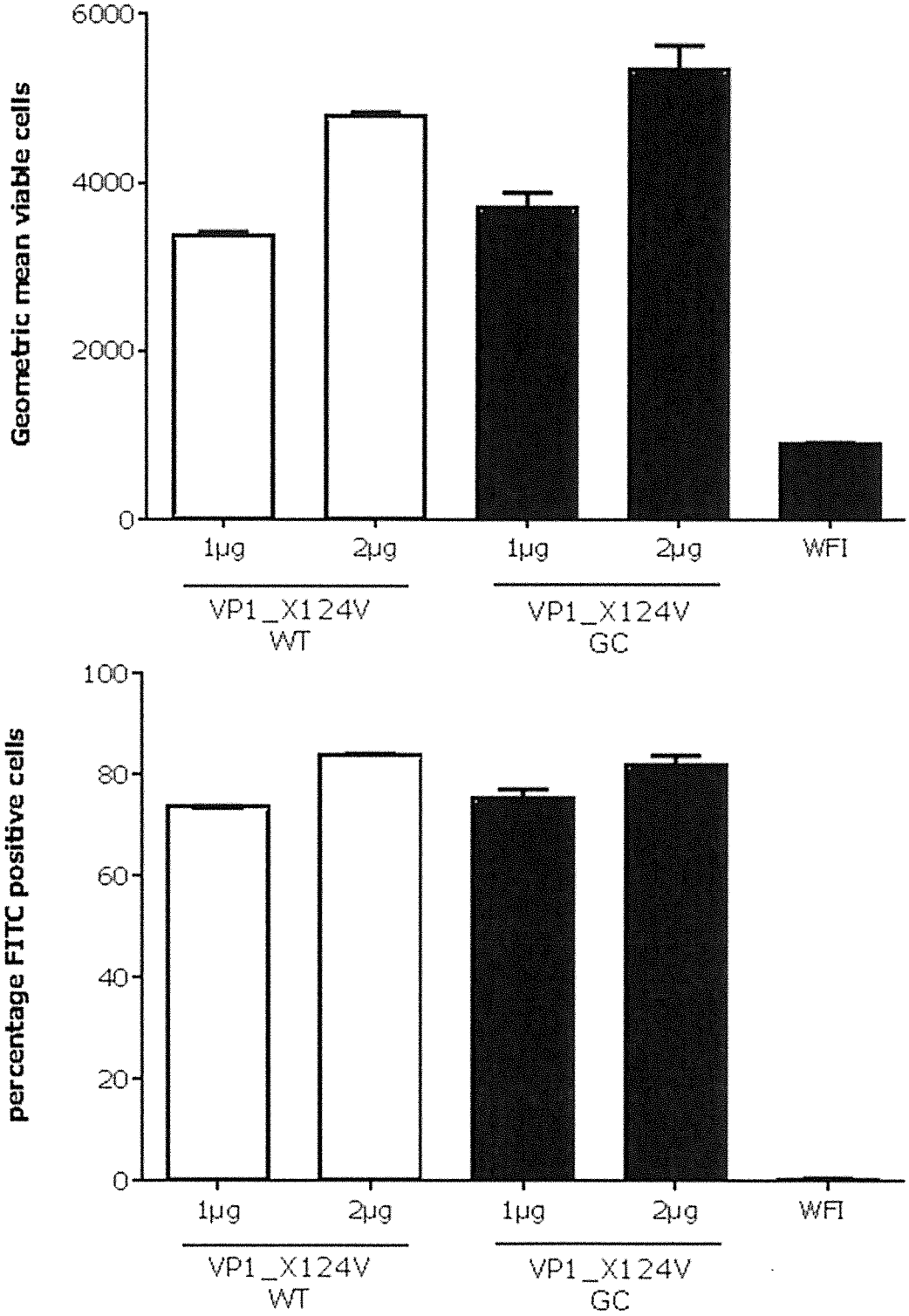
71. The artificial nucleic acid according to any one of claims 1 to 42, the composition according to any one of claims 43 to 56, the polypeptide according to any one of claims 57 to 59, the composition according to claim 60, the vaccine according to any one of claims 61 to 67, or the kit or kit of parts according to claim 68 to 69 for use in the treatment or prophylaxis of an infection with Norovirus or a disorder related to an infection with Norovirus.

72. The artificial nucleic acid according to any one of according to any one of claims 1 to 42, the composition according to any one of claims 43 to 56, the polypeptide according to any one of claims 57 to 59, the composition according to claim 60, the vaccine according to any one of claims 61 to 67, or the kit or kit of parts according to claim 68 to 69, wherein the artificial nucleic acid, the composition, the vaccine or the active component of the kit or kit of parts is administered by injection, preferably by needle-less injection, more preferably by jet injection.

73. The artificial nucleic acid according to any one of claims 1 to 42, the composition according to any one of claims 43 to 56, the polypeptide according to any one of claims 57 to 59, the composition according to claim 60, the vaccine according to any one of claims 61 to 67, or the kit or kit of parts according to claim 68 to 69 for use according to any one of claims 70 to 72, wherein the treatment or prophylaxis comprises the administration of a further active pharmaceutical ingredient.

74. Method of treating or preventing a disorder, wherein the method comprises administering to a subject in need thereof the artificial nucleic acid according to any one of claims 1 to 42, the composition according to any one of claims 43 to 56, the polypeptide according to any one of claims 57 to 59, the composition according to claim 60, the vaccine according to any one of claims 61 to 67, or the kit or kit of parts according to claim 68 to 69.

75. The method according to claim 74, wherein the disorder is an infection with Norovirus or a disorder related to an infection with Norovirus.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2µg
1µg
2µg
WFI
VP1_X124V WT
VP1_X124V GC
percentage FITC positive cells
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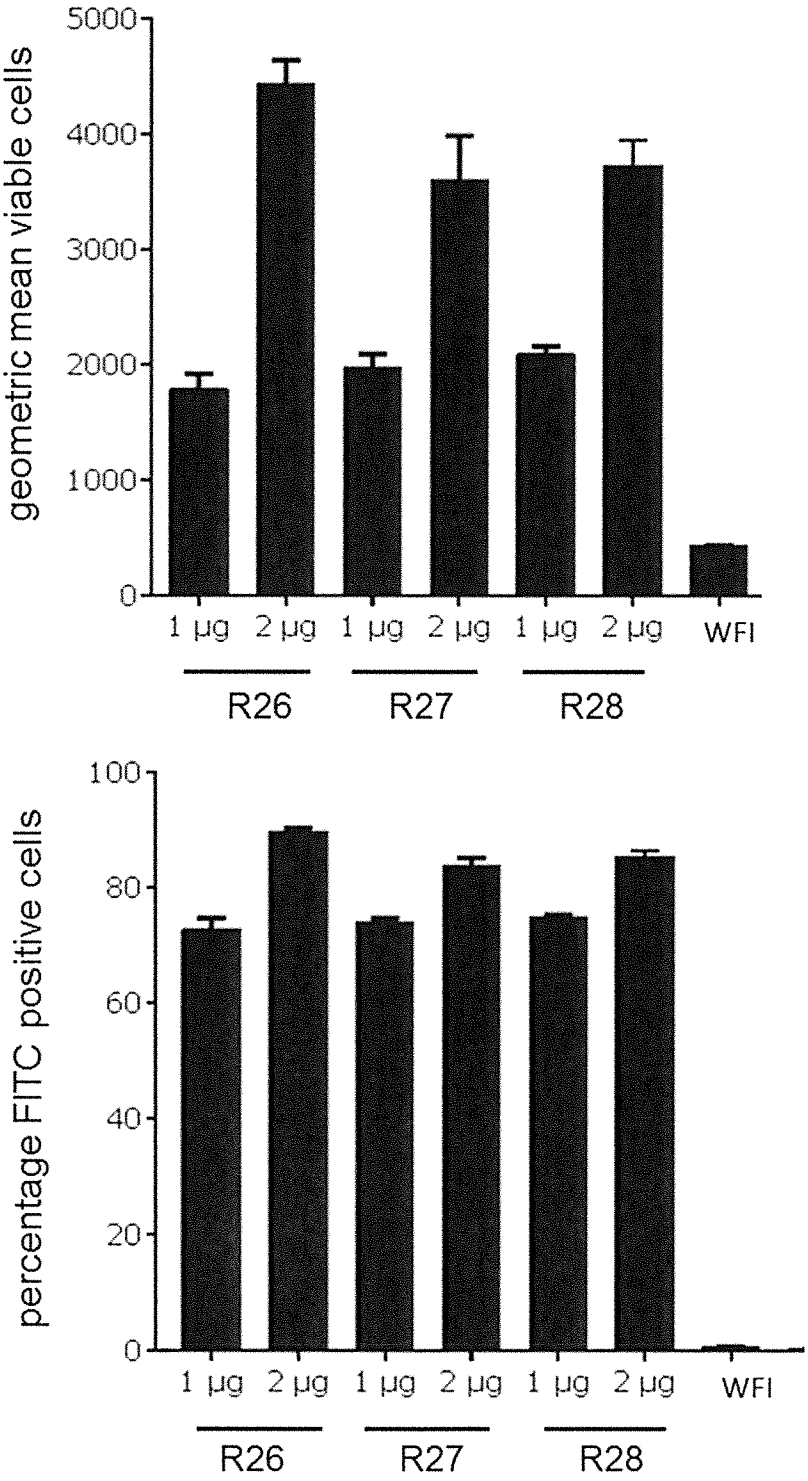
VP1_X124V WT
VP1_X124V GC

FIG. 1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4000
3000
2000
1000
0
1 µg
2 µg
1 µg
2 µg
1 µg
2 µg
WFI
R26
R27
R28
percentage FITC positive cells
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80
60
40
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1 µg
2 µg
1 µg
2 µg
1 µg
2 µg
WFI
R26
R27
R28

FIG. 2

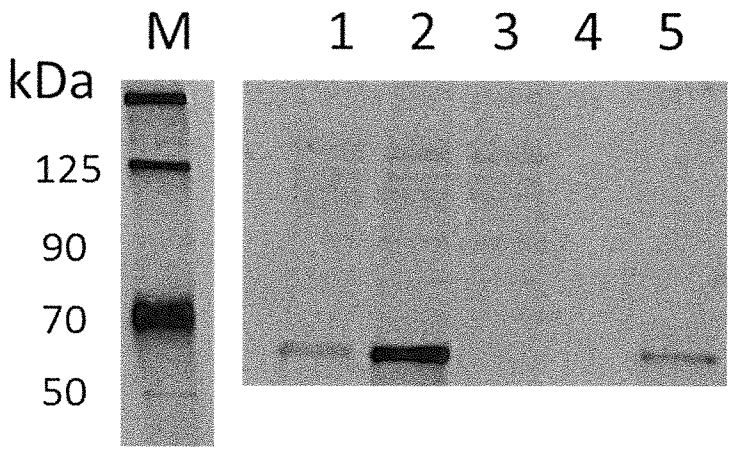
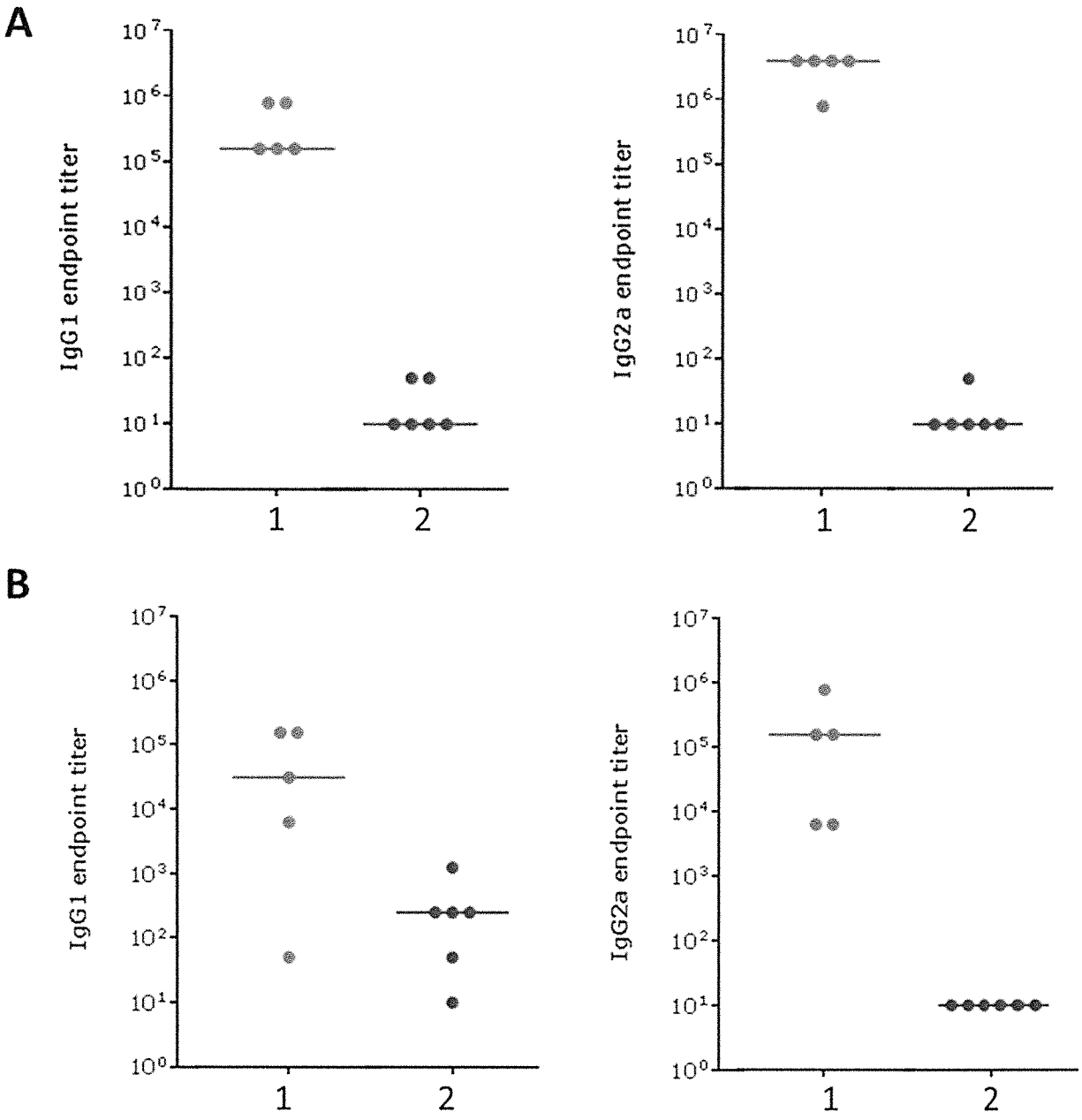


FIG. 3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IgG2a endpoint titer
B
IgG1 endpoint titer
IgG2a endpoint titer
1
2

FIG. 4

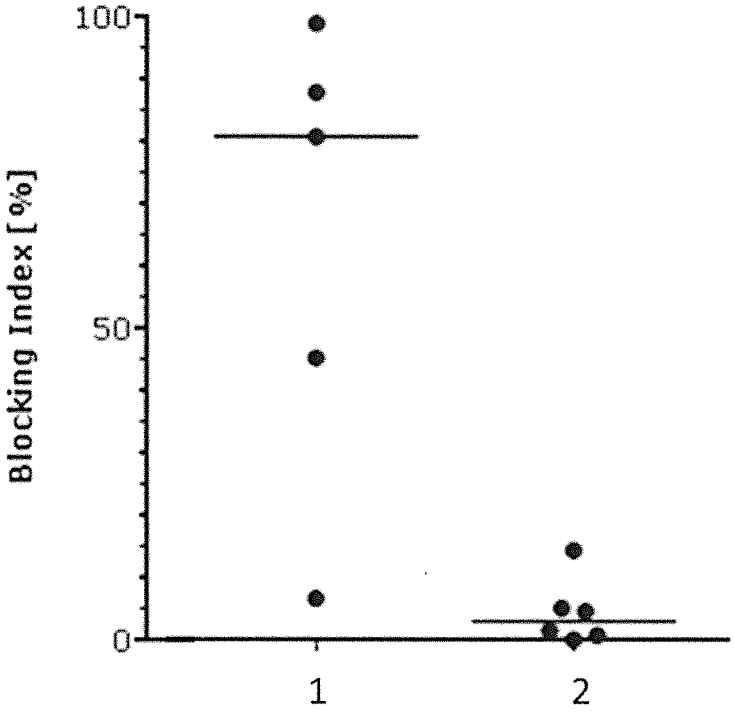
Blocking Index [%]
100
50
0
1
2

FIG. 5

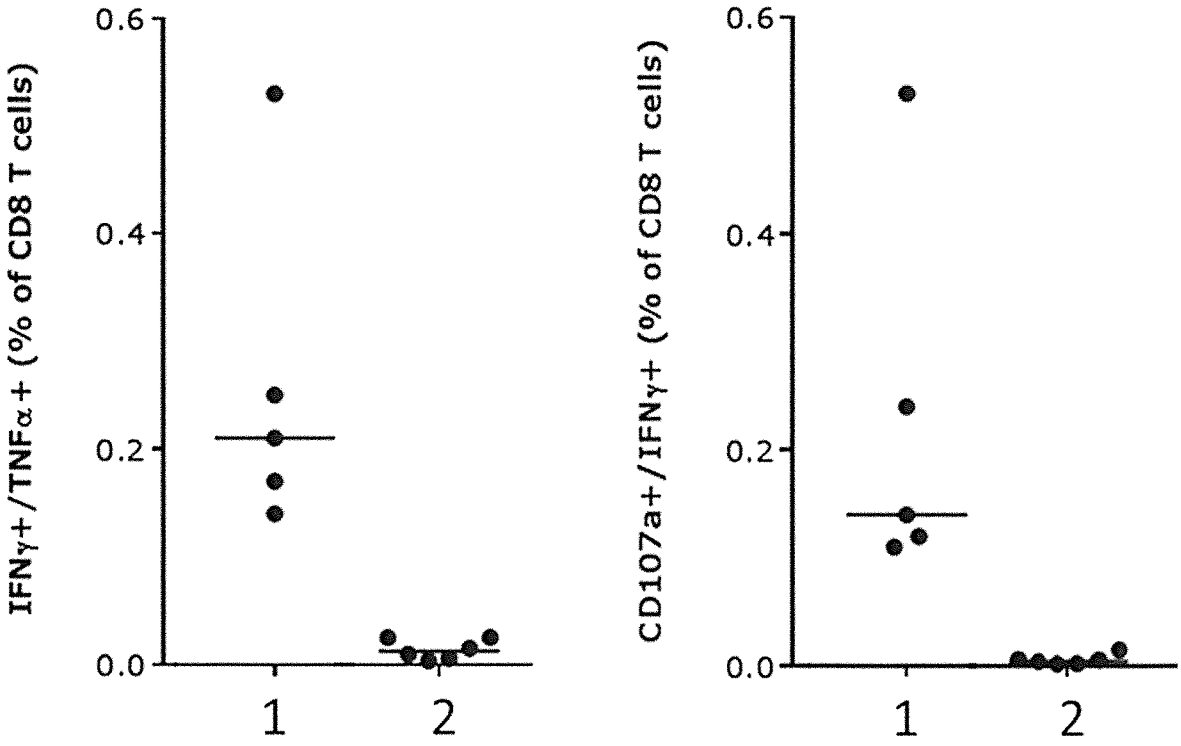
IFNγ+/TNFα+ (% of CD8 T cells)
0.6
0.4
0.2
0.0
1
2
CD107a+/IFNγ+ (% of CD8 T cells)
0.6
0.4
0.2
0.0
1
2

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/060673

A. CLASSIFICATION OF SUBJECT MATTER
INV. C07K14/005
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C07K C12N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, BIOSIS, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DATABASE EMBL [Online] 16 January 2008 (2008-01-16), "Norovirus Hu/Duan/Beijing/2006/China non-structural polyprotein gene, partial cds; and capsid protein VP1 and minor structural protein VP2 genes, complete cds.", XP002771799, retrieved from EBI accession no. EM_STD:EU366113 Database accession no. EU366113 the whole document ----- -/--	1-15, 57-63,68

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
7 July 2017	13/09/2017

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Herrmann, Klaus

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Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2011/005799 A2 (NOVARTIS AG [CH]; GEALL ANDREW [US]; HEKELE ARMIN [US]; MANDL CHRISTIA) 13 January 2011 (2011-01-13) paragraphs [0007], [0024] page 18, line 15 page 36, lines 20, 23	1-75
X	WO 2012/006377 A2 (NOVARTIS AG [CH]; GEALL ANDREW [US]; RAMSAUER KATRIN [AT]; OTTEN GILLI) 12 January 2012 (2012-01-12) claim 1 page 19, line 15 page 1, line 5	1-75
X	P. R. HARRINGTON ET AL: "Systemic, Mucosal, and Heterotypic Immune Induction in Mice Inoculated with Venezuelan Equine Encephalitis Replicons Expressing Norwalk Virus-Like Particles", JOURNAL OF VIROLOGY., vol. 76, no. 2, 15 January 2002 (2002-01-15), pages 730-742, XP055336093, US ISSN: 0022-538X, DOI: 10.1128/JVI.76.2.730-742.2002 abstract page 731, left-hand column, last paragraph page 731, right-hand column, paragraph 3	1-75
A	LJUNGBERG KARL ET AL: "Self-replicating alphavirus RNA vaccines", EXPERT REVIEW OF VACC, EXPERT REVIEWS LTD, GB, vol. 14, no. 2, 1 February 2015 (2015-02-01), pages 177-194, XP008175780, ISSN: 1744-8395, DOI: 10.1586/14760584.2015.965690	1-75
A	D. BAILEY ET AL: "Functional Analysis of RNA Structures Present at the 3' Extremity of the Murine Norovirus Genome: the Variable Polypyrimidine Tract Plays a Role in Viral Virulence", JOURNAL OF VIROLOGY., vol. 84, no. 6, 6 January 2010 (2010-01-06), pages 2859-2870, XP055388557, US ISSN: 0022-538X, DOI: 10.1128/JVI.02053-09	1-75

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2017/060673

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-75(partially)

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-75(partially)

Artificial nucleic acid comprising at least one coding region encoding at least one polypeptide derived from a Norovirus, wherein the at least one encoded polypeptide comprises the amino acid sequence according to SEQ ID NO:1, and/or a fragment or variant thereof; and subject-matter relating thereto.

2-4410. claims: 1-75(partially)

Idem as subject 1 but limited to each of the nucleic acids encoding the amino acid sequences as in SEQ ID NOs:2-4410, respectively. Invention 2 is limited to subject-matter relating to SEQ ID NO:2, invention 3 to SEQ ID NO:3 etc. For practical reasons all claims have been assigned to all inventions.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2017/060673

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2011005799 A2	13-01-2011	CA 2766907 A1	13-01-2011
		EP 2451475 A2	16-05-2012
		US 2011300205 A1	08-12-2011
		WO 2011005799 A2	13-01-2011
WO 2012006377 A2	12-01-2012	EP 2590670 A2	15-05-2013
		US 2013177639 A1	11-07-2013
		WO 2012006377 A2	12-01-2012