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(71) Applicant (for all designated States except US): **QUARK BIOTECH INC** [US/US]; 6536 Kaiser Drive, Fremont, California 94555 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **MOR, Orna** [IL/IL]; Emek Ayalon 12, Ganei Ilan, 55029 Kiryat Ono (IL). **FEINSTEIN, Elena** [IL/IL]; 12/29 HaHagana Street, Rehovot (IL).

(74) Common Representative: **QUARK BIOTECH INC**; 3 Meir Weisgall Street, Kiryat Weizmann Science Park, 70400 Nes Zionna (IL).

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(54) Title: OLIGORIBONUCLEOTIDES AND METHODS OF USE THEREOF FOR TREATMENT OF FIBROTIC CONDITIONS AND OTHER DISEASES

(57) Abstract: The invention relates to a double-stranded compound, preferably an oligoribonucleotide, which down-regulates the expression of a gene of the TGase family at post-transcriptional level. The invention also relates to a pharmaceutical composition comprising the compound, or a vector capable of expressing the oligoribonucleotide, and a pharmaceutically acceptable carrier. The present invention also contemplates a method of treating a patient suffering from fibrotic disease such as kidney and liver fibrosis and ocular scarring comprising administering to the patient the pharmaceutical composition in a therapeutically effective amount so as to thereby treat the patient. The invention also relates to treatment of fibrotic and other diseases by use of antibodies to TGase polypeptides.



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OLIGORIBONUCLEOTIDES AND METHODS OF USE THEREOF FOR TREATMENT OF FIBROTIC CONDITIONS AND OTHER DISEASES

This application claims priority of U.S. provisional patent application Serial Number 60/689616, filed June 10 2005, which is hereby incorporated by reference. Throughout this application various patent and scientific publications are cited. The disclosures for these publications in their entireties are hereby incorporated by reference into this application to more fully describe the state of the art to which this invention pertains. In particular co-assigned patent application PCT/IL 2005/000102 filed 27-Jan-2005 is hereby incorporated by reference into this application.

BACKGROUND OF THE INVENTION

siRNAs and RNA interference

RNA interference (RNAi) is a phenomenon involving double-stranded (ds) RNA-dependent gene specific posttranscriptional silencing. Originally, attempts to study this phenomenon and to manipulate mammalian cells experimentally were frustrated by an active, non-specific antiviral defense mechanism which was activated in response to long dsRNA molecules; see Gil et al. 2000, Apoptosis, 5:107-114. Later it was discovered that synthetic duplexes of 21 nucleotide RNAs could mediate gene specific RNAi in mammalian cells, without the stimulation of the generic antiviral defence mechanisms see Elbashir et al. Nature 2001, 411:494-498 and Caplen et al. Proc Natl Acad Sci 2001, 98:9742-9747. As a result, small interfering RNAs (siRNAs), which are short double-stranded RNAs, have become powerful tools in attempting to understand gene function.

Thus, RNA interference (RNAi) refers to the process of sequence-specific post-transcriptional gene silencing in mammals mediated by small interfering RNAs (siRNAs) (Fire et al, 1998, Nature 391, 806) or microRNAs (miRNAs) (Ambros V. Nature 431:7006,350-355(2004); and Bartel DP. Cell. 2004 Jan 23; 116(2): 281-97 *MicroRNAs: genomics, biogenesis, mechanism, and function*). The corresponding process in plants is commonly referred to as specific post-transcriptional gene silencing or RNA silencing and is also referred to as quelling in fungi. An siRNA is a double-stranded RNA molecule which

down-regulates or silences (prevents) the expression of a gene/ mRNA of its endogenous (cellular) counterpart. RNA interference is based on the ability of dsRNA species to enter a specific protein complex, where it is then targeted to the complementary cellular RNA and specifically degrades it. Thus, the RNA interference response features an endonuclease complex containing an siRNA, commonly referred to as an RNA-induced silencing complex (RISC), which mediates cleavage of single-stranded RNA having a sequence complementary to the antisense strand of the siRNA duplex. Cleavage of the target RNA may take place in the middle of the region complementary to the antisense strand of the siRNA duplex (Elbashir et al 2001, *Genes Dev.*, 15, 188). In more detail, longer dsRNAs are digested into short (17-29 bp) dsRNA fragments (also referred to as short inhibitory RNAs – “siRNAs”) by type III RNAses (DICER, DROSHA, etc., Bernstein et al., *Nature*, 2001, v.409, p.363-6; Lee et al., *Nature*, 2003, 425, p.415-9). The RISC protein complex recognizes these fragments and complementary mRNA. The whole process is culminated by endonuclease cleavage of target mRNA (McManus&Sharp, *Nature Rev Genet* , 2002, v.3, p.737-47; Paddison &Hannon, *Curr Opin Mol Ther.* 2003 Jun; 5(3): 217-24). For information on these terms and proposed mechanisms, see Bernstein E., Denli AM. Hannon GJ: 2001 *The rest is silence*. *RNA*. I; 7(11): 1509-21; Nishikura K.: 2001 *A short primer on RNAi: RNA-directed RNA polymerase acts as a key catalyst*. *Cell*. I 16; 107(4): 415-8 and PCT publication WO 01/36646 (Glover et al).

The selection and synthesis of siRNA corresponding to known genes has been widely reported; see for example Chalk AM, Wahlestedt C, Sonnhammer EL. 2004 *Improved and automated prediction of effective siRNA* *Biochem. Biophys. Res. Commun.* Jun 18; 319(1): 264-74; Sioud M, Leirdal M., 2004, *Potential design rules and enzymatic synthesis of siRNAs*, *Methods Mol Biol.*; 252:457-69; Levenkova N, Gu Q, Rux JJ. 2004 *Gene specific siRNA selector* *Bioinformatics*. I 12; 20(3): 430-2. and Ui-Tei K, Naito Y, Takahashi F, Haraguchi T, Ohki-Hamazaki H, Juni A, Ueda R, Saigo K., *Guidelines for the selection of highly effective siRNA sequences for mammalian and chick RNA interference* *Nucleic Acids Res.* 2004 I 9;32(3):936-48. See also Liu Y, Braasch DA, Nulf CJ, Corey DR. *Efficient and isoform-selective inhibition of cellular gene expression by peptide nucleic acids*, *Biochemistry*, 2004 I 24;43(7):1921-7. See also PCT publications WO 2004/015107 (Atugen) and WO 02/44321 (Tuschl et al), and also Chiu YL, Rana TM. *siRNA function in RNAi: a chemical modification analysis*, *RNA* 2003 Sep;9(9):1034-48 and I Patent Nos.5898031 and 6107094 (Crooke) for production of modified/ more stable siRNAs.

Several groups have described the development of DNA-based vectors capable of generating siRNA within cells. The method generally involves transcription of short hairpin RNAs that are efficiently processed to form siRNAs within cells. Paddison et al. *PNAS* 2002, 99:1443-1448; Paddison et al. *Genes & Dev* 2002, 16:948-958; Sui et al. *PNAS* 2002, 8:5515-5520; and Brummelkamp et al. *Science* 2002, 296:550-553. These reports describe methods to generate siRNAs capable of specifically targeting numerous endogenously and exogenously expressed genes.

siRNA has recently been successfully used for inhibition in primates; for further details see Tolentino et al., *Retina* 24(1) February 2004 I 132-138.

Transglutaminase (TGase) Family

The TGase polypeptides (EC 2.3.2.13) are a family of proteins that act as TGase enzymes with cross-linking activities (i.e. they catalyse reactions resulting in protein cross-links and/or covalent incorporation of biogenic amines). TGase polypeptides further catalyse the formation of a covalent glutamyl - lysyl bond, a unique isopeptide bond that is highly resistant to proteolysis and denaturants and that cannot be disrupted by any known vertebrate endopeptidase.

The family comprises 9 different enzymes among which are the factor XIIIa (plasma transglutaminase), keratinocyte transglutaminase (TGaseI also termed TGase 1), epidermal transglutaminase (TGaseIII also termed TGase 3), prostate transglutaminase (TGaseIV also termed TGase 4), Transglutaminase 5 (TGx also termed TGase 5), Transglutaminase 7 (TGz also termed TGase 7) and tissue-type transglutaminase (TGase II). Although the overall primary structure of these enzymes is different, they all share a common amino acid sequence at the active site (Y-G-Q-C-W) and a strict calcium dependence for their activity (Lesort M, Tucholski J, Miller ML, Johnson GV, Tissue transglutaminase: a possible role in neurodegenerative diseases. *Prog Neurobiol.* 2000 Aug; 61(5):439-63).

Abberant activity of the enzymes of the TGase family is characteristics of several neurodegenerative diseases, such as Alzheimer disease (AD), Parkinson disease (PD), supranuclear palsy and Huntington disease (HD), is associated with celiac disease, (Transglutaminases - possible drug targets in human diseases, impaired wound healing, autoimmunity, diabetes, articular cartilage calcification, atherosclerosis , cancer metastasis,

skin disorders and fibrotic diseases. (Fesus L, Piacentini M, Transglutaminase 2: an enigmatic enzyme with diverse functions. Trends Biochem Sci. 2002 Oct;27(10):534-9 ; Karpouzas GA, Terkeltaub RA, New developments in the pathogenesis of articular cartilage calcification. . Curr Rheumatol Rep. 1999 Dec;1(2):121-7; Aeschlimann D, Thomazy V. , Protein crosslinking in assembly and remodelling of extracellular matrices: the role of transglutaminases. Connect Tissue Res. 2000;41(1):1-27.; Ishida-Yamamoto A, Iizuka H. , Structural organization of cornified cell envelopes and alterations in inherited skin disorders. Exp Dermatol. 1998 Feb;7(1):1-10)

Transglutaminase I

Transglutaminase type 1 (TGaI) is a member of the TGase class of enzymes that catalyze the cross-linking of proteins, a characteristic feature of epidermal differentiation and squamous metaplasia. TGM1(transglutaminase 1) crosslinks the cornified envelope of mature keratinocytes. TGase I is a Ca(2+)-dependent enzyme which catalyzes epsilon-(gamma-glutamyl)lysine cross-linking of substrate proteins. In the skin such proteins are involucrin and loricrin to generate the cornified envelope at the cell periphery of the stratum corneum(Inada et al *Facilitated wound healing by activation of the Transglutaminase 1 gene. Am J Pathol. 2000 Dec;157(6):1875-82.*) . Appropriate expression of the TGM1 gene is crucial for proper keratinocyte function as inactivating mutations lead to the debilitating skin disease, lamellar ichthyosis. TGM1 is also expressed in squamous metaplasia, a consequence in some epithelia of vitamin A deficiency or toxic insult that can lead to neoplasia During epithelial cell differentiation transglutaminase 1 is known to cross-link the cornified envelope proteins involucrin and loricrin. TGase I was shown also to be expressed in normal lung and its expression is evident a normal feature of bronchial epithelium and is linked to the process of squamous differentiation occurring in preinvasive lesions . Its activity was also related to pathological keratinization of ocular surface epithelium (*Pathological keratinization of ocular surface epithelium: Adv Exp Med Biol. 2002;506(Pt A):641-6; Nakamura T, Nishida K, Dota A, Matsuki M, Yamanishi K, Kinoshita S. Elevated expression of transglutaminase 1 and keratinization-related proteins in conjunctiva in severe ocular surface disease. Invest Ophthalmol Vis Sci. 2001 Mar;42(3):549-56.*)

TGase 3

Epidermal-type transglutaminase (TGase 3) cross-links a variety of structural proteins during the formation of the cornified cell envelope in the epidermis. It is called "epidermal" or "hair

follicle" TGase and is a zymogen, requiring proteolytic activation to achieve maximal specific activity. TGase 3 mRNA is also expressed in the brain, stomach, spleen, small intestine, testis, skeletal muscle and skin. The stomach and testis expressed TGase 3 protein in size similar to that observed in the epidermis. In celiac disease epidermal transglutaminase, rather than tissue transglutaminase, is the dominant autoantigen in dermatitis herpetiformis thus explaining why skin symptoms appear in a proportion of patients having gluten sensitive disease (Epidermal transglutaminase (TGase 3) is the autoantigen of dermatitis herpetiformis. Sardy M, Karpati S, Merkl B, Paulsson M, Smyth N. J Exp Med. 2002 Mar 18;195(6):747-57). TGase 3 was shown to be expressed in upper layers of epidermis. TGase 3 displayed a diffuse cytoplasmic distribution in vitro consistent with its proposed role in the early phase of cornified cell envelope assembly in the cytoplasm (J Dermatol Sci. 2003 Aug;32(2):95-103. Analysis of epidermal-type transglutaminase (transglutaminase 3) in human stratified epithelia and cultured keratinocytes using monoclonal antibodies. Hitomi K, Presland RB, Nakayama T, Fleckman P, Dale BA, Maki M.)

TGase 5

Transglutaminase5 was originally cloned from keratinocytes, and a partial biochemical characterisation showed its involvement in skin differentiation, in parallel to TGase1 and TGase 3 . It was shown to be able to induce cell death when intracellularly overexpressed and to contain GTP binding domains which are similar to those in transglutaminase 2 (Overexpressed transglutaminase 5 triggers cell death. Cadot B, Rufini A, Pietroni V, Ramadan S, Guerrieri P, Melino G, Candi E. Amino Acids. 2004 Jul;26(4):405-8).

Moreover, it was shown that GTP and ATP inhibit TGase 5 cross-linking activity in vitro, and Ca^{2+} is capable of completely reversing this inhibition. In addition, TGase 5 mRNA is present in different adult and foetal tissues, suggesting a role for TGase 5 outside the epidermis (Biochem J. 2004 Jul 1;381(Pt 1):313-9 Transglutaminase 5 is regulated by guanine-adenine nucleotides. Candi E, Paradisi A, Terrinoni A, Pietroni V, Oddi S, Cadot B, Jogini V, Meiyappan M, Clardy J, Finazzi-Agro A, Melino G).

Fibrotic diseases

Fibrotic diseases are all characterized by the excess deposition of a fibrous material within the extracellular matrix, which contributes to abnormal changes in tissue architecture and interferes

with normal organ function. Unfortunately, although fibrosis is widely prevalent, debilitating and often life threatening, there is no effective treatment currently available.

All tissues damaged by trauma respond by the initiation of a wound-healing program. Fibrosis, a type of disorder characterized by excessive scarring, occurs when the normal self-limiting process of wound healing response is disturbed, and causes excessive production and deposition of collagen. As a result, normal organ tissue is replaced with scar tissue, which eventually leads to the functional failure of the organ.

Fibrosis may be initiated by diverse causes and in various organs. Liver cirrhosis, pulmonary fibrosis, sarcoidosis, keloids and kidney fibrosis are all chronic conditions associated with progressive fibrosis, thereby causing a continuous loss of normal tissue function.

Acute fibrosis (usually with a sudden and severe onset and of short duration) occurs as a common response to various forms of trauma including accidental injuries (particularly injuries to the spine and central nervous system), infections, surgery, ischemic illness (e.g. cardiac scarring following heart attack), burns, environmental pollutants, alcohol and other types of toxins, acute respiratory distress syndrome, radiation and chemotherapy treatments).

Ocular surgery and ocular scarring

Contracture of scar tissue resulting from eye surgery may often occur. Glaucoma surgery to create new drainage channels often fails due to scarring and contraction of tissues and the generated drainage system may be blocked requiring additional surgical intervention. Current anti-scarring regimens (Mitomycin C or 5FU) are limited due to the complications involved (e.g. blindness) e.g. see Cordeiro MF, Gay JA, Khaw PT., *Human anti-transforming growth factor-beta2 antibody: a new glaucoma anti-scarring agent* Invest Ophthalmol Vis Sci. 1999 Sep;40(10):2225-34. Also there may be contraction of scar tissue formed after corneal trauma or corneal surgery, for example laser or surgical treatment for myopia or refractive error in which contraction of tissues may lead to inaccurate results. Scar tissue may be formed on/in the vitreous humor or the retina, for example, and may eventually causes blindness in some diabetics, and may be formed after detachment surgery, called proliferative vitreoretinopathy (PVR). PVR is the most common complication following retinal detachment and is associated with a retinal hole or break. PVR refers to the growth of cellular membranes within the vitreous cavity and on the front and back surfaces of the retina containing retinal pigment epithelial (RPE) cells. These membranes, which are essentially scar tissues, exert

traction on the retina and may result in recurrences of retinal detachment, even after an initially successful retinal detachment procedure.

Scar tissue may be formed in the orbit or on eye and eyelid muscles after squint, orbital or eyelid surgery, or thyroid eye disease, and where scarring of the conjunctiva occurs as may happen after glaucoma surgery or in cicatricial disease, inflammatory disease, for example, pemphigoid, or infective disease, for example, trachoma. A further eye problem associated with the contraction of collagen-comprising tissues is the opacification and contracture of the lens capsule after cataract extraction. Ocular diseases include wound healing, cataract, dry eye, sterile corneal ulceration, recurrent epithelial erosion, corneal neovascularization, pterygium, conjunctivochalasis, glaucoma, PVR, and ocular fibrosis.

Cataract

A cataract is a clouding of the lens in the eye that affects vision. Most cataracts are related to aging. By age 80, more than half of all Americans either have a cataract or have had cataract surgery. A cataract can occur in either or both eyes.

Age-related cataracts develop in two ways:

1. Protein aggregates reduce the sharpness of the image reaching the retina.
2. The clear lens slowly changes to a yellowish/brownish color, adding a brownish tint to vision.

Although most cataracts are related to aging, there are other types of cataract:

- Secondary cataract. Cataracts can form after surgery for other eye conditions, such as glaucoma. Cataracts also can develop in people who have other health problems, such as diabetes. Cataracts are sometimes linked to steroid use.
- Traumatic cataract. Cataracts can develop after an eye injury, sometimes years later.
- Congenital cataract. Some babies are born with cataracts or develop them in childhood, often in both eyes. These cataracts may be so small that they do not affect vision. If they do, the lenses may need to be removed.
- Radiation cataract. Cataracts can develop after exposure to certain types of radiation.

Liver fibrosis

Liver fibrosis (LF) is a generally irreversible consequence of hepatic damage of several etiologies. In the Western world, the main etiologic categories are: alcoholic liver disease (30-50%), viral hepatitis (30%), biliary disease (5-10%), primary hemochromatosis (5%), and drug-related and cryptogenic cirrhosis of unknown etiology, (10-15%). Wilson's disease, α_1 -antitrypsin deficiency and other rare diseases also have liver fibrosis as one of the symptoms. Liver cirrhosis, the end stage of liver fibrosis, frequently requires liver transplantation and is among the top ten causes of death in the Western world.

Kidney fibrosis and related conditions

Chronic Renal Failure (CRF)

Chronic renal failure is a gradual and progressive loss of the ability of the kidneys to excrete wastes, concentrate urine, and conserve electrolytes. CRF is slowly progressive. It most often results from any disease that causes gradual loss of kidney function, and fibrosis is the main pathology that produces CRF.

Diabetic nephropathy

Diabetic nephropathy, hallmarks of which are glomerulosclerosis and tubulointerstitial fibrosis, is the single most prevalent cause of end-stage renal disease in the modern world, and diabetic patients constitute the largest population on dialysis. Such therapy is costly and far from optimal. Transplantation offers a better outcome but suffers from a severe shortage of donors. More targeted therapies against diabetic nephropathy (as well as against other types of kidney pathologies) are not developed, since molecular mechanisms underlying these pathologies are largely unknown. Identification of an essential functional target gene that is modulated in the disease and affects the severity of the outcome of diabetes nephropathy has a high diagnostic as well as therapeutic value.

Origins of kidney pathology

- 5 Many pathological processes in the kidney (e.g., glomerular nephritis, physical obstructions, toxic injuries, metabolic and immunological diseases) eventually culminate in similar or identical morphological changes, namely glomerulosclerosis and tubulointerstitial fibrosis. Thus, different types of insults converge on the same single genetic program resulting in two hallmarks of fibrosis: the proliferation of fibroblasts and overproduction by them of various

protein components of connective tissue. In addition, thickening of the basal membrane in the glomeruli accompanies interstitial fibrosis and culminates in glomerulosclerosis.

Pulmonary fibrosis

Interstitial pulmonary fibrosis (IPF) is scarring of the lung caused by a variety of inhaled agents including mineral particles, organic dusts, and oxidant gases, or by unknown reasons (idiopathic lung fibrosis). The disease afflicts millions of individuals worldwide, and there are no effective therapeutic approaches. A major reason for the lack of useful treatments is that few of the molecular mechanisms of disease have been defined sufficiently to design appropriate targets for therapy (Lasky JA., Brody AR. (2000), "*Interstitial fibrosis and growth factors*", Environ Health Perspect.;108 Suppl 4:751-62).

Cardiac fibrosis

Heart failure is unique among the major cardiovascular disorders in that it alone is increasing in prevalence while there has been a striking decrease in other conditions. Some of this can be attributed to the aging of the populations of the United States and Europe. The ability to salvage patients with myocardial damage is also a major factor, as these patients may develop progression of left ventricular dysfunction due to deleterious remodelling of the heart.

The normal myocardium is composed of a variety of cells, cardiac myocytes and noncardiomyocytes, which include endothelial and vascular smooth muscle cells and fibroblasts.

Structural remodeling of the ventricular wall is a key determinant of clinical outcome in heart disease. Such remodeling involves the production and destruction of extracellular matrix proteins, cell proliferation and migration, and apoptotic and necrotic cell death. Cardiac fibroblasts are crucially involved in these processes, producing growth factors and cytokines that act as autocrine and paracrine factors, as well as extracellular matrix proteins and proteinases. Recent studies have shown that the interactions between cardiac fibroblasts and cardiomyocytes are essential for the progression of cardiac remodeling of which the net effect is deterioration in cardiac function and the onset of heart failure (Manabe I, Shindo T, Nagai R. (2002), "*Gene expression in fibroblasts and fibrosis: involvement in cardiac hypertrophy*", Circ Res. 13;91(12):1103-13).

Burns and scars

A particular problem which may arise, particularly in fibrotic disease, is contraction of tissues, for example contraction of scars. Contraction of tissues comprising extracellular matrix components, especially of collagen-comprising tissues, may occur in connection with many different pathological conditions and with surgical or cosmetic procedures.

Contracture, for example, of scars, may cause physical problems, which may lead to the need for medical treatment, or it may cause problems of a purely cosmetic nature. Collagen is the major component of scar and other contracted tissue and as such is the most important structural component to consider. Nevertheless, scar and other contracted tissue also comprises other structural components, especially other extracellular matrix components, for example, elastin, which may also contribute to contraction of the tissue.

Contraction of collagen-comprising tissue, which may also comprise other extracellular matrix components, frequently occurs in the healing of burns. The burns may be chemical, thermal or radiation burns and may be of the eye, the surface of the skin or the skin and the underlying tissues. It may also be the case that there are burns on internal tissues, for example, caused by radiation treatment. Contraction of burnt tissues is often a problem and may lead to physical and/or cosmetic problems, for example, loss of movement and/or disfigurement.

Skin grafts may be applied for a variety of reasons and may often undergo contraction after application. As with the healing of burnt tissues the contraction may lead to both physical and cosmetic problems. It is a particularly serious problem where many skin grafts are needed as, for example, in a serious burns case.

Contraction is also a problem in production of artificial skin. To make a true artificial skin it is necessary to have an epidermis made of epithelial cells (keratinocytes) and a dermis made of collagen populated with fibroblasts. It is important to have both types of cells because they signal and stimulate each other using growth factors. The collagen component of the artificial skin often contracts to less than one tenth of its original area when populated by fibroblasts.

Cicatricial contraction, contraction due to shrinkage of the fibrous tissue of a scar, is common. In some cases the scar may become a vicious cicatrix, a scar in which the contraction causes serious deformity. A patient's stomach may be effectively separated into two separate chambers in an hour-glass contracture by the contraction of scar tissue formed

when a stomach ulcer heals. Obstruction of passages and ducts, cicatricial stenosis, may occur due to the contraction of scar tissue. Contraction of blood vessels may be due to primary obstruction or surgical trauma, for example, after surgery or angioplasty. Stenosis of other hollow visci, for examples, ureters, may also occur. Problems may occur where any form of scarring takes place, whether resulting from accidental wounds or from surgery. Conditions of the skin and tendons which involve contraction of collagen-comprising tissues include post-trauma conditions resulting from surgery or accidents, for example, hand or foot tendon injuries, post-graft conditions and pathological conditions, such as scleroderma, Dupuytren's contracture and epidermolysis bullosa. Scarring and contraction of tissues in the eye may occur in various conditions, for example, the sequelae of retinal detachment or diabetic eye disease (as mentioned above). Contraction of the sockets found in the skull for the eyeballs and associated structures, including extra-ocular muscles and eyelids, may occur if there is trauma or inflammatory damage. The tissues contract within the sockets causing a variety of problems including double vision and an unsightly appearance.

The mechanism and control of contraction of tissues comprising extracellular matrix components, for example, collagen-comprising tissues, is still poorly understood. Some degree of contraction appears to be part of the healing process, but the trigger for contraction is not known.

For further information on different types of fibrosis see: Molina V, Blank M, Shoenfeld Y. (2002), "*Fibrotic diseases*", Harefuah, 141(11): 973-8, 1009; Yu L, Noble NA, Border WA (2002), "*Therapeutic strategies to halt renal fibrosis*", Curr Opin Pharmacol. 2(2):177-81; Keane WF, Lyle PA. (2003), "*Recent advances in management of type 2 diabetes and nephropathy: lessons from the RENAAL study*", Am J Kidney Dis. 41(3 Suppl 2): S22-5; Bohle A, Kressel G, Muller CA, Muller GA. (1989), "*The pathogenesis of chronic renal failure*", Pathol Res Pract. 185(4):421-40; Kikkawa R, Togawa M, Isono M, Isshiki K, Haneda M. (1997), "*Mechanism of the progression of diabetic nephropathy to renal failure*", Kidney Int Suppl. 62:S39-40; Bataller R, Brenner DA. (2001), "*Hepatic stellate cells as a target for the treatment of liver fibrosis*", Semin Liver Dis. 21(3):437-51; Gross TJ, Hunninghake GW, (2001) "*Idiopathic pulmonary fibrosis*", N Engl J Med. 345(7):517-25; Frohlich ED. (2001) "*Fibrosis and ischemia: the real risks in hypertensive heart disease*", Am J Hypertens;14(6 Pt 2):194S-199S; Friedman SL. (2003), "*Liver fibrosis - from bench to bedside*", J Hepatol. 38 Suppl 1:S38-53; Albanis E, Safadi R, Friedman SL. (2003),

"Treatment of hepatic fibrosis: almost there", Curr Gastroenterol Rep. 5(1):48-56; (Weber KT. (2000), "Fibrosis and hypertensive heart disease", Curr Opin Cardiol. 15(4):264-72).

Osteoarthritis

Among the main characteristics of osteoarthritis are the degradation of articular cartilage and the formation of new bone at the joint edges, so-called osteophytes. See Van den Berg WB., *Growth factors in experimental osteoarthritis: transforming growth factor beta pathogenic?* J Rheumatol Suppl. 1995 Feb;43:143-5; Scharstuhl A, Glansbeek HL, Van Beuningen HM, Vitters EL, Van der Kraan PM, Van den Berg WB., *Inhibition of endogenous TGF-beta during experimental osteoarthritis prevents osteophyte formation and impairs cartilage repair.* J Immunol. 2002 Jul 1;169(1):507-14; Karpouzas GA, Terkeltaub RA., *New developments in the pathogenesis of articular cartilage calcification.* Curr Rheumatol Rep. 1999 Dec;1(2):121-7 .

Neurological diseases

Polyglutamine diseases are a group of neurological diseases that are caused by expansion of CAG trinucleotide repeats coding for polyglutamine insert. Polyglutamine diseases include Huntington's disease (HD), spinobulbar muscular atrophy, dentatorubral-pallidoluysian atrophy and spinocerebellar ataxias (SCAs) 1, 2, 3, 6, 7 and 17. All these diseases are characterized by the presence of expansion of polyglutamine stretches (exceeding 35-40 glutamines), thus forming intranuclear aggregates, which leads to neuronal death. Alzheimer's disease (AD) is the most common cause of cognitive impairment in older patients and is expected to increase greatly in prevalence. Neurofibrillary degeneration, associated with the formation of paired helical filaments (PHF), is one of the critical neuropathological hallmarks of Alzheimer's disease (AD). Parkinson disease is a neurodegenerative disorder of aging characterized by a selective and progressive loss of dopaminergic neurons within the substantia nigra. See also Mastroberardino PG, Iannicola C, Nardacci R, Bernassola F, De Laurenzi V, Melino G, Moreno S, Pavone F, Oliverio S, Fesus L, Piacentini M. *Tissue transglutaminase ablation reduces neuronal death and prolongs survival in a mouse model of Huntington's disease.* Cell Death Differ. 2002 Sep;9(9):873-80; Karpuj MV, Becher MW, Springer JE, Chabas D, Youssef S, Pedotti R, Mitchell D, Steinman L., *Prolonged survival and decreased abnormal movements in transgenic model of Huntington disease, with administration of the transglutaminase inhibitor cystamine.* Nat Med. 2002 Feb;8(2):143-9; Citron BA, Suo Z, SantaCruz K, Davies PJ, Qin F, Festoff BW., *Protein crosslinking, tissue transglutaminase, alternative splicing and neurodegeneration.*

Neurochem Int. 2002 Jan;40(1):69-78; Chen JS, Mehta K., *Tissue transglutaminase: an enzyme with a split personality*. Int J Biochem Cell Biol. 1999 Aug;31(8):817-36.

Although the above discussion of diseases and disorders relates in particular to humans, animals and in particular mammals may exhibit the conditions described above or similar or analogous conditions

In conclusion, there are no effective modes of therapy for the prevention and/or treatment of fibrosis in general and for its related pathologies and certainly no effective treatment for contraction of tissues, nor is there effective treatment for ocular scarring. Treatments that are available suffer from, *inter alia*, the drawbacks of severe side effects due to the lack of selective targeting and there is a need therefore to develop novel compounds and methods of treatment for these purposes.

SUMMARY OF THE INVENTION

The invention provides novel double stranded oligoribonucleotides. These oligoribonucleotides inhibit the TGase family of genes, in particular one or more of TGase 1, TGase 3, TGase 5 and TGase 7 by the mechanism of RNA interference. The invention also provides a pharmaceutical composition comprising such oligoribonucleotides, and vectors capable of expressing the ribonucleotides.

The present invention also provides a method of treating a patient suffering from a fibrosis-related pathology comprising administering to the patient the oligoribonucleotide typically as a pharmaceutical composition, in a therapeutically effective amount so as to thereby treat the patient. The present invention also contemplates treating other diseases and conditions. The invention also relates to treatment of fibrotic and other diseases by use of an antibody to a TGase polypeptide in particular to one or more of TGase 1, TGase 3, TGase 5 and TGase 7 polypeptide.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1. This figure sets forth the nucleotide sequence of the human TGase I gene-
SEQ ID NO:1.

Figure 2 This figure sets forth the amino acid sequence of the human TGase I corresponding polypeptide – SEQ ID NO:2.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates generally to compounds which down-regulate i.e. inhibit expression of the TGase gene family particularly to novel small interfering RNAs (siRNAs), and to the use of these novel siRNAs in the treatment of various diseases and medical conditions in particular fibrotic diseases. Moreover, the present invention relates generally to compounds which inhibit expression of one or more of the TGase gene family particularly the TGase I gene, TGase 3 gene, TGase 5 gene and/or TGase 7 gene and particularly to novel small interfering RNAs (siRNAs), and to the use of these novel siRNAs in combination with anti TGase gene family siRNAs in the treatment of various diseases and medical conditions in particular fibrotic diseases, cataract and glaucoma. The fibrotic diseases are in particular kidney fibrosis, liver fibrosis, and ocular scarring, cataract, glaucoma and other diseases related to aberrant expression of any of the genes of the Transglutaminase gene family.

Thus, the inhibitor of TGaseII expression (transcription or translation) or polypeptide activity may be *inter alia* siRNA, antibodies, preferably neutralizing antibodies or fragments thereof, including single chain antibodies, antisense oligonucleotides, antisense DNA or RNA molecules, proteins, polypeptides and peptides including peptido-mimetics and dominant negatives, and also expression vectors expressing all the above. Additional inhibitors may be small chemical molecules, which generally have a molecular weight of less than 2000 daltons, more preferably less than 1000 daltons, even more preferably less than 500 daltons. These inhibitors may act as follows: small molecules may affect expression and/or activity; antibodies may affect activity; all kinds of antisense may affect TGaseII expression; and dominant negative polypeptides and peptidomimetics may affect activity; expression vectors may be used *inter alia* for delivery of antisense or dominant-negative polypeptides or antibodies.

The present invention provides methods and compositions for inhibiting expression of one or more of the target genes of the TGase gene family in particular one or more of TGase 1, TGase 3, TGase 5 and TGase 7 genes *in vivo*. In general, the method includes administering oligoribonucleotides, such as small interfering RNAs (i.e., siRNAs) that are targeted to a particular mRNA and hybridize to, or interact with, it under biological conditions (within the cell), or a nucleic acid material that can produce siRNA in a cell, in an amount sufficient to inhibit expression of a target gene by an RNA interference mechanism. In particular, the

subject method can be used to inhibit expression of one or more of the TGase1, TGase 3, TGase 5 and TGase 7 genes for treatment of disease. Additionally the siRNAs of the invention can be used *in vitro* as part of a compound screening system to look for small compounds that compete with, or overcome effect of, siRNAs.

In accordance with the present invention, the siRNA molecules or inhibitors such as antibodies of the Transglutaminase ("TGase") family of genes, in particular at least one of TGase 1, TGase 3, TGase 5 and TGase 7 genes may be used as drugs to treat various pathologies including fibrosis related pathologies (as defined below) and also to treat ocular diseases including cataract, glaucoma, cardiovascular diseases, neurological diseases, polyglutamine diseases (including Huntington's disease (HD), spinobulbar muscular atrophy, dentatorubral-pallidoluysian atrophy and spinocerebellar ataxias (SCAs) 1, 2, 3, 6, 7 and 17), Alzheimer's and Parkinson's disease, and osteoarthritis.

As used herein, the term "TGase 1 gene" is defined as any homolog including any allelic variant thereof of TGase 1 gene having preferably 90% homology, more preferably 95% homology, and even more preferably 98% homology to the amino acid encoding region of SEQ ID NO:1, or nucleic acid sequences which bind to the gene under conditions of highly stringent hybridization, which are well-known in the art (for example, see Ausubel et al., Current Protocols in Molecular Biology, John Wiley and Sons, Baltimore, Maryland (1988), updated in 1995 and 1998).

Similarly, as used herein, the term "TGase 3 gene", or "TGase 5 gene" or "TGase 7 gene", is defined as any homolog including any allelic variant thereof of the TGase 3 gene or TGase 5 gene or TGase 7 gene respectively having preferably 90% homology, more preferably 95% homology, and even more preferably 98% homology to the amino acid encoding region of the TGase 3 gene or TGase 5 gene or TGase 7 gene respectively, or nucleic acid sequences which bind to the TGase 3 gene or TGase 5 gene or TGase 7 gene respectively under conditions of highly stringent hybridization, which are well-known in the art (for example, see Ausubel et al., Current Protocols in Molecular Biology, John Wiley and Sons, Baltimore, Maryland (1988), updated in 1995 and 1998). The Genebank references for the genes, which set forth the amino acid encoding region for each gene, are as follows: TGase 3 - GI:39777600 ;TGase 5 - GI:4759229 and 42518071 (TGase 5 has 2 splice variants); and TGase 7 - GI:16445034.

As used herein, the term "Transglutaminase I polypeptide", or "TGase I polypeptide", or is defined as any homolog of TGase I polypeptide having preferably 90% homology, more

preferably 95% homology, and even more preferably 98% homology to SEQ ID NO:2, as either full-length or fragments or a domain thereof, as a mutant of the polypeptide encoded by a spliced variant nucleic acid sequence, as a chimera with other polypeptides, provided that any of the above has the same or substantially the same biological function as the TGase I polypeptide. TGase I polypeptide, or a TGase I polypeptide homolog, may be present in different forms, including but not limited to soluble protein, membrane-bound (either in purified membrane preparations or on a cell surface), bead-bound, or any other form presenting TGase I polypeptide or fragments and polypeptides derived thereof.

Similarly, as used herein, the term "TGase 3 polypeptide", or "TGase 5 polypeptide" or "TGase 7 polypeptide", is defined as any homolog of TGase 3 polypeptide or TGase 5 polypeptide or TGase 7 polypeptide respectively having preferably 90% homology, more preferably 95% homology, and even more preferably 98% homology to the amino acid sequence of TGase 3 polypeptide or TGase 5 polypeptide or TGase 7 polypeptide respectively, as either full-length or fragments or a domain thereof, as a mutant of the polypeptide encoded by a spliced variant nucleic acid sequence, as a chimera with other polypeptides, provided that any of the above has the same or substantially the same biological function as the TGase 3, 5, or 7 polypeptide respectively. TGase 3, 5, or 7 polypeptide respectively, or a TGase 3, 5, or 7 polypeptide homolog, may be present in different forms, including but not limited to soluble protein, membrane-bound (either in purified membrane preparations or on a cell surface), bead-bound, or any other form presenting TGase 3, 5, or 7 polypeptide or fragments and polypeptides derived thereof. The Genebank references for the polypeptides, which set forth the amino acid sequence, are given above.

5 As used herein, an "interactor" is a molecule with which a TGase polypeptide binds or interacts or activates in nature; for example, a molecule on the surface of a cell that expresses a TGase polypeptide, a molecule on the surface of a second cell or a cytoplasmic molecule. An interactor may be a ligand that is activated by TGase alone or by TGase as part of a complex with other components. An interactor may be a component of a signal transduction
0 pathway that facilitates transduction of an extracellular signal from TGase through the cell membrane and into the cell. An interactor, for example, can be a second intercellular protein that mediates downstream signaling from TGase. The interactor is a molecule with which TGase binds in competition with a known TGase substrate (e.g. fibronectin).

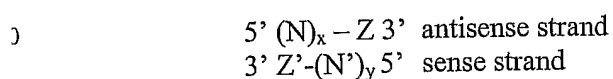
As used herein, the term "lysyl donor" or "K donor" is defined as any polypeptide having the ability to donate a lysyl side chain to allow the formation of gamma-glutamyl-lysine bonds during transglutamination process.

As used herein, the term "glutamyl donor" or "Q donor" is defined as any polypeptide having the ability to donate glutamine side chain to allow the formation of gamma-glutamyl-lysine bonds during transglutamination process.

The present invention provides double-stranded oligoribonucleotides (siRNAs), which down-regulate (inhibit) the expression of any one of the TGase gene family. The present invention in particular provides double-stranded oligoribonucleotides (siRNAs), which down-regulate the expression of genes TGase I, TGase 3, TGase 5 and TGase 7. The downregulation of the expression of each transglutaminase can be measured by e.g., measuring the amount of the lysyl- glutamyl crosslinked material produced in the presence of the siRNAs or by direct assessment of the amounts of TGase mRNA or polypeptide. The amount of TGase mRNA may be measured by e.g., by Northern blotting, RNase protection, RT-PCR or real-time PCR. The amount of TGase polypeptide may be measured by immunoblotting or by immunoprecipitation or by ELISA with TGase -specific antibodies.

An siRNA of the invention is a duplex oligoribonucleotide in which the sense strand is derived from the mRNA sequence of a TGase gene, and the antisense strand is complementary to the sense strand. In general, some deviation from the target mRNA sequence is tolerated without compromising the siRNA activity (see e.g. Czauderna et al 2003 Nucleic Acids Research 31(11), 2705-2716). An siRNA of the invention inhibits gene expression on a post-transcriptional level with or without destroying the mRNA. Without being bound by theory, siRNA may target the mRNA for specific cleavage and degradation and/ or may inhibit translation from the targeted message.

More particularly, the invention provides a compound having the structure:



wherein each N and N' is a ribonucleotide which may be modified or unmodified in its sugar residue and $(N)_x$ and $(N')_y$ is oligomer in which each consecutive N or N' is joined to the next N or N' by covalent bond ;

wherein each of x and y is an integer between 17 and 40;

wherein each of Z and Z' may be present or absent, but if present is dTdT and is covalently attached at the 3' terminus;
and wherein the sequence of (N)_x comprises any one of the antisense sequences present in Tables A through I.

It will be readily understood by those skilled in the art that the compounds of the present invention consist of a multitude of nucleotides which are linked through a covalent linkage; this covalent linkage may be a phosphodiester linkage, a phosphothioate linkage, or a combination of both, along the length of the nucleotide sequence of the individual strand. Other possible backbone modifications are described *inter alia* in U.S. Patent Nos. 5,587,361; 6,242,589; 6,277,967; 6,326,358; 5,399,676; 5,489,677; and 5,596,086.

In particular embodiments, x and y may preferably be an integer between about 17 to about 27, most preferably from about 18 to about 23. In a particular embodiment of the compound of the invention, x may be equal to y (viz., $x = y$) and in preferred embodiments $x = y = 19$, and $x = y = 21$. In a particularly preferred embodiment $x = y = 19$.

In one embodiment of the compound of the invention, Z and Z' are both absent; in another embodiment Z or Z' is present.

In one embodiment of the compound of the invention, all of the ribonucleotides of the compound are unmodified in their sugar residues.

In some embodiments of the compound of the invention, at least one ribonucleotide is modified in its sugar residue, preferably a modification at the 2' position. The modification at the 2' position is preferably selected from the group comprising amino, fluoro, methoxy, alkoxy and alkyl, and in a most preferred embodiment the modification at the 2' position is methoxy (2'-O-methyl).

In some embodiments of the invention, alternating ribonucleotides are modified in both the antisense and the sense strands of the compound.

In particularly preferred embodiments of the invention, the antisense strand is phosphorylated at the 5' terminus, and may or may not be phosphorylated at the 3' terminus; and the sense strand may or may not be phosphorylated at the 5' terminus and at the 3' terminus.

In another embodiment of the compound of the invention, the ribonucleotides at the 5' and 3' termini of the antisense strand are modified in their sugar residues, and the ribonucleotides at the 5' and 3' termini of the sense strand are unmodified in their sugar residues.

The invention further provides a vector capable of expressing any of the aforementioned oligoribonucleotides in a cell.

The invention also provides a composition comprising one or more of the compounds of the invention and a carrier, preferably a pharmaceutically acceptable carrier.

The invention also provides a composition comprising a carrier and one or more of the compounds of the invention in an amount effective to down-regulate expression in a cell of a gene of the TGase family which comprises a sequence substantially complementary to the sequence of (N)_x.

The invention also provides a composition comprising a carrier and one or more of the compounds of the invention in an amount effective to down-regulate expression in a cell of a one or more genes of the TGase family, in particular gene TGase 1, 3 5 or 7 which comprises a sequence substantially complementary to the sequence of (N)_x.

The invention also provides a method of inhibiting the expression of a TGase gene by at least 50% as compared to a control comprising contacting an mRNA transcript of the gene with one or more of the compounds of the invention.

In one embodiment the compound is inhibiting a gene of the TGase family, whereby the inhibition of TGase is selected from the group comprising inhibition of TGase function (which may be examined by an enzymatic assay or a binding assay with a known interactor of the native gene / polypeptide, *inter alia*), inhibition of TGase protein (which may be examined by Western blotting, ELISA or immuno-precipitation, *inter alia*) and inhibition of TGase mRNA expression (which may be examined by Northern blotting, quantitative RT-PCR, *in-situ* hybridisation or microarray hybridisation, *inter alia*).

In a particular embodiment the compound is inhibiting TGase I, whereby the inhibition of TGase I is selected from the group comprising inhibition of TGase I function (which may be examined by an enzymatic assay or a binding assay with a known interactor of the native

gene / polypeptide, *inter alia*), inhibition of TGase I protein (which may be examined by Western blotting, ELISA or immuno-precipitation, *inter alia*) and inhibition of TGase I mRNA expression (which may be examined by Northern blotting, quantitative RT-PCR, in-situ hybridisation or microarray hybridisation, *inter alia*).

In other particular embodiment the compound is inhibiting TGase 3, 5 or 7, whereby the inhibition of TGase 3, 5 or 7, respectively is selected from the group comprising inhibition of TGase 3, 5 or 7 function respectively (which may be examined by an enzymatic assay or a binding assay with a known interactor of the native gene / polypeptide, *inter alia*), inhibition of TGase 3, 5 or 7 protein (which may be examined by Western blotting, ELISA or immuno-precipitation, *inter alia*) and inhibition of TGase 3, 5 or 7 mRNA expression (which may be examined by Northern blotting, quantitative RT-PCR, in-situ hybridisation or microarray hybridisation, *inter alia*).

The invention also provides a method of treating a patient suffering from fibrosis or a fibrosis related pathology comprising administering to the patient a composition of the invention in a therapeutically effective dose so as to thereby treat the patient.

The invention also provides a method of treating a patient suffering from a pathology related to aberrant cross-linking of cellular proteins via transglutaminase proteins comprising administering to the patient a composition of the invention in a therapeutically effective dose so as to thereby treat the patient.

The invention also provides a use of a therapeutically effective amount of one or more compounds of the invention for the preparation of a composition for promoting recovery in a patient suffering from fibrosis or a fibrosis related pathology or of pathology related to aberrant crosslinking of cellular proteins via transglutaminase enzymes. Fibrotic diseases or diseases in which fibrosis is evident (fibrosis related pathology) include both acute and chronic forms of fibrosis of organs, including all etiological variants of the following: pulmonary fibrosis, including interstitial lung disease and fibrotic lung disease, liver fibrosis, cardiac fibrosis including myocardial fibrosis, kidney fibrosis including chronic renal failure, skin fibrosis including scleroderma, keloids and hypertrophic scars; myelofibrosis (bone marrow fibrosis); all types of ocular scarring including proliferative vitreoretinopathy (PVR) and scarring resulting from surgery to treat cataract or glaucoma; inflammatory bowel disease of variable etiology, macular degeneration, Grave's ophthalmopathy, drug induced ergotism, keloid scars, scleroderma, psoriasis, glioblastoma in Li-Fraumeni syndrome, sporadic

glioblastoma, myleoid leukemia, acute myelogenous leukemia, myelodysplastic syndrome, myeloproliferative syndrome, gynecological cancer, Kaposi's sarcoma, Hansen's disease, and collagenous colitis .

The compounds of the invention may be used to treat many other diseases and conditions apart from fibrotic diseases. Other indications may be ocular diseases including cataract and glaucoma, cardiovascular diseases especially cardiac hypertrophy, atherosclerosis / restenosis, neurological diseases, including polyglutamine diseases (such as Huntington's disease), spinobulbar muscular atrophy, dentatorubral-pallidoluysian atrophy and spinocerebellar ataxias (SCAs) 1, 2, 3, 6, 7 and 17, Alzheimer's disease and Parkinson's disease.

The compound may have homologs wherein up to two of the ribonucleotides in each terminal region a base is altered; the terminal region refers to the four terminal ribonucleotides e.g. refers to bases 1-4 and/or 16-19 in a 19-mer sequence and to bases 1-4 and/or 18-21 in a 21-mer sequence.

The preferred oligonucleotides of the invention are the siRNA oligonucleotides corresponding to TGase I which are set forth in Table A1. The most preferred oligonucleotides of the invention are human TGase I oligonucleotides of Table A1 in particular TGM1_1 and TGM1_11

The presently most preferred compound of the invention is a blunt-ended 19-mer oligonucleotide, i.e. $x=y=19$ and Z and Z' are both absent; the oligonucleotide is phosphorylated at the 5' position of the antisense strand and at the 3' position of the sense strand wherein alternating ribonucleotides are modified at the 2' position in both the antisense and the sense strands, wherein the moiety at the 2' position is methoxy (2'-O-methyl) and wherein the ribonucleotides at the 5' and 3' termini of the antisense strand are modified in their sugar residues, and the ribonucleotides at the 5' and 3' termini of the sense strand are unmodified in their sugar residues. The presently most preferred such compounds are such modified oligonucleotides comprising the sequences depicted in Table A1, in particular the human TGase I oligonucleotides of Table A1 especially TGM1_1 and TGM1_11.

In one aspect of the invention the oligonucleotide comprises a double-stranded structure, whereby such double-stranded structure comprises

a first strand and a second strand, whereby

the first strand comprises a first stretch of contiguous nucleotides and the second strand comprises a second stretch of contiguous nucleotides, whereby

the first stretch is either complementary or identical to a nucleic acid sequence coding for a TGase polypeptide and whereby the second stretch is either identical or complementary to a nucleic acid sequence coding for a TGase polypeptide .

In an embodiment the first stretch and /or the second stretch comprises from about 14 to 40 nucleotides, preferably about 18 to 30 nucleotides, more preferably from about 19 to 27 nucleotides and most preferably from about 19 to 23 nucleotides, in particular from about 19 to 21 nucleotides.

Additionally, further nucleic acids according to the present invention comprise at least 14 contiguous nucleotides of any one of the SEQ. ID. NO. 3 to last SEQ. ID. NO (any of the 19-mers or 21-mers in Tables A-I), and more preferably 14 contiguous nucleotide base pairs at any end of the double-stranded structure comprised of the first stretch and second stretch as described above.

The term "treatment" as used herein refers to administration of a therapeutic substance effective to ameliorate symptoms associated with a disease, to lessen the severity or cure the disease, or to prevent the disease from occurring.

In a particular embodiment, the administration comprises intravenous administration. In another particular embodiment the administration comprises topical or local administration such as for example administration to the eye via intravitreal or anterior chamber injection.

0 Additionally, the present invention provides a method of regulating a pathology or disease (as recited above) in a patient in need of such treatment by administering to a patient a therapeutically effective dose of at least inhibitor e.g. at least one antisense (AS) oligonucleotide or at least one siRNA against the nucleic acid sequences or a dominant negative peptide directed against the TGase sequences or TGase proteins or an antibody

directed against the TGase polypeptide. Additionally the present invention provides a method of treating a patient suffering from a disorder comprising administering to the patient one or more inhibitors of human TGase in a therapeutically effective dose so as to thereby treat the patient. In a preferred method the inhibitors are siRNAs.

Delivery: Delivery systems aimed specifically at the enhanced and improved delivery of siRNA into mammalian cells have been developed, see, for example, Shen et al (FEBS letters 539: 111-114 (2003)), Xia et al., Nature Biotechnology 20: 1006-1010 (2002), Reich et al., Molecular Vision 9: 210-216 (2003), Sorensen et al. (J.Mol.Biol. 327: 761-766 (2003), Lewis et al., Nature Genetics 32: 107-108 (2002) and Simeoni et al., Nucleic Acids Research 31, 11: 2717-2724 (2003). siRNA has recently been successfully used for inhibition in primates; for further details see Tolentino et al., Retina 24(1) February 2004 I 132-138. Respiratory formulations for siRNA are described in U.S. patent application No. 2004/0063654 of Davis et al. Cholesterol-conjugated siRNAs (and other steroid and lipid conjugated siRNAs) can be used for delivery see Soutschek et al Nature 432: 173-177(2004) *Therapeutic silencing of an endogenous gene by systemic administration of modified siRNAs*; and Lorenz et al. Bioorg. Med. Chemistry. Lett. 14:4975-4977 (2004) *Steroid and lipid conjugates of siRNAs to enhance cellular uptake and gene silencing in liver cells*.

The siRNAs or pharmaceutical compositions of the present invention are administered and dosed in accordance with good medical practice, taking into account the clinical condition of the individual patient, the disease to be treated, the site and method of administration, scheduling of administration, patient age, sex, body weight and other factors known to medical practitioners.

The "therapeutically effective dose" for purposes herein is thus determined by such considerations as are known in the art. The dose must be effective to achieve improvement including but not limited to improved survival rate or more rapid recovery, or improvement or elimination of symptoms and other indicators as are selected as appropriate measures by those skilled in the art. The compounds of the present invention can be administered by any of the conventional routes of administration. It should be noted that the compound can be administered as the compound or as pharmaceutically acceptable salt and can be administered alone or as an active ingredient in combination with pharmaceutically acceptable carriers, solvents, diluents, excipients, adjuvants and vehicles. The compounds can be administered

orally, subcutaneously or parenterally including intravenous, intraarterial, intramuscular, intraperitoneally, and intranasal administration as well as intrathecal and infusion techniques. Implants of the compounds are also useful. Liquid forms may be prepared for injection, the term including subcutaneous, transdermal, intravenous, intramuscular, intrathecal, and other parental routes of administration. The liquid compositions include aqueous solutions, with and without organic cosolvents, aqueous or oil suspensions, emulsions with edible oils, as well as similar pharmaceutical vehicles. In addition, under certain circumstances the compositions for use in the novel treatments of the present invention may be formed as aerosols, for intranasal and like administration. The patient being treated is a warm-blooded animal and, in particular, mammals including man. The pharmaceutically acceptable carriers, solvents, diluents, excipients, adjuvants and vehicles as well as implant carriers generally refer to inert, non-toxic solid or liquid fillers, diluents or encapsulating material not reacting with the active ingredients of the invention and they include liposomes and microspheres. Examples of delivery systems useful in the present invention include U. S. Patent Nos. 5,225,182; 5,169,383; 5,167,616; 4,959,217; 4,925,678; 4,487,603; 4,486,194; 4,447,233; 4,447,224; 4,439,196; and 4,475,196. Many other such implants, delivery systems, and modules are well known to those skilled in the art. In one specific embodiment of this invention topical and transdermal formulations are particularly preferred.

In general, the active dose of compound for humans is in the range of from 1ng/kg to about 20-100 mg/kg body weight per day, preferably about 0.01 mg to about 2-10 mg/kg body weight per day, in a regimen of one dose per day or twice or three or more times per day for a period of 1-4 weeks or longer. Treatment for many years or even lifetime treatment is also envisaged for some of the indications disclosed herein.

The present invention also provides for a process of preparing a pharmaceutical composition which comprises:

- obtaining at one or more double stranded compound of the invention ; and
- admixing said compound with a pharmaceutically acceptable carrier.

The present invention also provides for a process of preparing a pharmaceutical composition which comprises admixing a compound of the present invention with a pharmaceutically acceptable carrier.

In a preferred embodiment, the compound used in the preparation of a pharmaceutical composition is admixed with a carrier in a pharmaceutically effective amount. In a particular

embodiment the compound of the present invention is conjugated to a steroid or to a lipid or to another suitable molecule; in a specific example the conjugation is to cholesterol.

Modifications or analogs of nucleotides can be introduced to improve the therapeutic properties of the nucleotides. Improved properties include increased nuclease resistance and/or increased ability to permeate cell membranes.

Accordingly, the present invention also includes all analogs of, or modifications to, a oligonucleotide of the invention that does not substantially affect the function of the polynucleotide or oligonucleotide. In a preferred embodiment such modification is related to the base moiety of the nucleotide, to the sugar moiety of the nucleotide and/or to the phosphate moiety of the nucleotide.

In embodiments of the invention, the nucleotides can be selected from naturally occurring or synthetically modified bases. Naturally occurring bases include adenine, guanine, cytosine, thymine and uracil. Modified bases of the oligonucleotides include inosine, xanthine, hypoxanthine, 2-aminoadenine, 6-methyl-, 2-propyl- and other alkyl- adenines, 5-halo uracil, 5-halo cytosine, 6-aza cytosine and 6-aza thymine, pseudo uracil, 4-thiuracil, 8-halo adenine, 8-aminoadenine, 8-thiol adenine, 8-thiolalkyl adenines, 8-hydroxyl adenine and other 8-substituted adenines, 8-halo guanines, 8-amino guanine, 8-thiol guanine, 8-thioalkyl guanines, 8-hydroxyl guanine and other substituted guanines, other aza and deaza adenines, other aza and deaza guanines, 5-trifluoromethyl uracil and 5-trifluoro cytosine.

In addition, analogs of nucleotides can be prepared wherein the structures of the nucleotides are fundamentally altered and are better suited as therapeutic or experimental reagents. An example of a nucleotide analog is a peptide nucleic acid (PNA) wherein the deoxyribose (or ribose) phosphate backbone in DNA (or RNA) is replaced with a polyamide backbone similar to that found in peptides. PNA analogs have been shown to be resistant to degradation by enzymes and to have extended lives *in vivo* and *in vitro*. Further, PNAs have been shown to bind more strongly to a complementary DNA sequence than to a DNA molecule. This observation is attributed to the lack of charge repulsion between the PNA strand and the DNA strand. Other modifications that can be made to oligonucleotides include polymer backbones, cyclic backbones, or acyclic backbones.

In one embodiment the modification is a modification of the phosphate moiety, whereby the modified phosphate moiety is selected from the group comprising phosphothioate.

The compounds of the present invention can be synthesized by any of the methods that are well-known in the art for synthesis of ribonucleic (or deoxyribonucleic) oligonucleotides. Such synthesis is, among others, described in Beaucage S.L. and Iyer R.P., *Tetrahedron* 1992; 48: 2223-2311, Beaucage S.L. and Iyer R.P., *Tetrahedron* 1993; 49: 6123-6194 and Caruthers M.H. et. al., *Methods Enzymol.* 1987; 154: 287-313, the synthesis of thioates is, among others, described in Eckstein F., *Annu. Rev. Biochem.* 1985; 54: 367-402, the synthesis of RNA molecules is described in Sproat B., in *Humana Press* 2005 Edited by Herdewijn P.; Kap. 2: 17-31 and respective downstream processes are, among others, described in Pingoud A. et. al., in *IRL Press* 1989 Edited by Oliver R.W.A.; Kap. 7: 183-208 and Sproat B., in *Humana Press* 2005 Edited by Herdewijn P.; Kap. 2: 17-31 (*supra*).

Other synthetic procedures are known in the art e.g. the procedures as described in Usman et al., 1987, *J. Am. Chem. Soc.*, 109, 7845; Scaringe et al., 1990, *Nucleic Acids Res.*, 18, 5433; Wincott et al., 1995, *Nucleic Acids Res.* 23, 2677-2684; and Wincott et al., 1997, *Methods Mol. Bio.*, 74, 59, and these procedures may make use of common nucleic acid protecting and coupling groups, such as dimethoxytrityl at the 5'-end, and phosphoramidites at the 3'-end. The modified (e.g. 2'-O-methylated) nucleotides and unmodified nucleotides are incorporated as desired.

The oligonucleotides of the present invention can be synthesized separately and joined together post-synthetically, for example, by ligation (Moore et al., 1992, *Science* 256, 9923; Draper et al., International PCT publication No. WO93/23569; Shabarova et al., 1991, *Nucleic Acids Research* 19, 4247; Bellon et al., 1997, *Nucleosides & Nucleotides*, 16, 951; Bellon et al., 1997, *Bioconjugate Chem.* 8, 204), or by hybridization following synthesis and/or deprotection.

- 5 It is noted that a commercially available machine (available, *inter alia*, from Applied Biosystems) can be used; the oligonucleotides are prepared according to the sequences disclosed herein. Overlapping pairs of chemically synthesized fragments can be ligated using methods well known in the art (e.g., see U.S. Patent No. 6,121,426). The strands are synthesized separately and then are annealed to each other in the tube. Then, the double-stranded siRNAs are
- 0 separated from the single-stranded oligonucleotides that were not annealed (e.g. because of the excess of one of them) by HPLC. In relation to the siRNAs or siRNA fragments of the present invention, two or more such sequences can be synthesized and linked together for use in the present invention.

The compounds of the invention can also be synthesized via a tandem synthesis methodology, for example as described in US patent application publication No. US2004/0019001(McSwiggen) wherein both siRNA strands are synthesized as a single contiguous oligonucleotide fragment or strand separated by a cleavable linker which is subsequently cleaved to provide separate siRNA fragments or strands that hybridize and permit purification of the siRNA duplex. The linker can be a polynucleotide linker or a non-nucleotide linker.

The compounds of the present invention can be delivered either directly or with viral or non-viral vectors. When delivered directly the sequences are generally rendered nuclease resistant. Alternatively the sequences can be incorporated into expression cassettes or constructs such that the sequence is expressed in the cell as discussed herein below. Generally the construct contains the proper regulatory sequence or promoter to allow the sequence to be expressed in the targeted cell. Vectors optionally used for delivery of the compounds of the present invention are commercially available, and may be modified for the purpose of delivery of the compounds of the present invention by methods known to one of skill in the art.

It is also envisaged that a long oligonucleotide (typically 25-500 nucleotides in length) comprising one or more stem and loop structures, where stem regions comprise the sequences of the oligonucleotides of the invention, may be delivered in a carrier, preferably a pharmaceutically acceptable carrier, and may be processed intracellularly by endogenous cellular complexes (e.g. by DROSHA and DICER as described above) to produce one or more smaller double stranded oligonucleotides (siRNAs) which are oligonucleotides of the invention. This oligonucleotide can be termed a tandem shRNA construct. It is envisaged that this long oligonucleotide is a single stranded oligonucleotide comprising one or more stem and loop structures, wherein each stem region comprises a sense and corresponding antisense siRNA sequence of a TGase gene. In particular, it is envisaged that this oligonucleotide comprises sense and antisense siRNA sequences as depicted in any one of Tables A through I, which are located below in Example 1.

0 As used herein, the term "polypeptide" refers to, in addition to a polypeptide, an oligopeptide, peptide and a full protein.

Animal model systems: Testing the active siRNAs of the invention may be done in predictive animal models. Several models for kidney fibrosis are described in Example 3.

Two models of liver fibrosis in rats are the Bile Duct Ligation (BDL) with sham operation as controls, and CCl₄ poisoning, with olive oil fed animals as controls, as described in the following references: Lotersztajn S, Julien B, Teixeira-Clerc F, Grenard P, Mallat A, *Hepatic Fibrosis: Molecular Mechanisms and Drug Targets*. Annu Rev Pharmacol Toxicol. 2004 Oct 07; Uchio K, Graham M, Dean NM, Rosenbaum J, Desmouliere A., *Down-regulation of connective tissue growth factor and type I collagen mRNA expression by connective tissue growth factor antisense oligonucleotide during experimental liver fibrosis*. Wound Repair Regen. 2004 Jan-Feb;12(1):60-6. ;and. Xu XQ, Leow CK, Lu X, Zhang X, Liu JS, Wong WH, Asperger A, Deininger S, Eastwood Leung HC., *Molecular classification of liver cirrhosis in a rat model by proteomics and bioinformatics* Proteomics. 2004 Oct;4(10):3235-45.

Models for ocular scarring are well known in the art e.g. Sherwood MB et al., J Glaucoma. 2004 Oct;13(5):407-12. *A new model of glaucoma filtering surgery in the rat*; Miller MH et al., Ophthalmic Surg. 1989 May;20(5):350-7. *Wound healing in an animal model of glaucoma fistulizing surgery in the rabbit*; vanBockxmeer FM et al., Retina. 1985 Fall-Winter; 5(4): 239-52. *Models for assessing scar tissue inhibitors*; Wiedemann P et al., J Pharmacol Methods. 1984 Aug; 12(1): 69-78. *Proliferative vitreoretinopathy: the rabbit cell injection model for screening of antiproliferative drugs*.

Models of cataract are described in the following publications: The role of Src family kinases in cortical cataract formation. Zhou J, Menko AS. Invest Ophthalmol Vis Sci. 2002 Jul;43(7):2293-300; Bioavailability and anticataract effects of a topical ocular drug delivery system containing disulfiram and hydroxypropyl-beta-cyclodextrin on selenite-treated rats. Wang S, Li D, Ito Y, Nabekura T, Wang S, Zhang J, Wu C. Curr Eye Res. 2004 Jul;29(1):51-8; and Long-term organ culture system to study the effects of UV-A irradiation on lens transglutaminase. Weinreb O, Dovrat A.; Curr Eye Res. 2004 Jul;29(1):51-8.

Antibody production

By the term "antibody" as used in the present invention is meant both poly- and mono-clonal complete antibodies as well as fragments thereof, such as Fab, F(ab')₂, miniantibody (minibody) and Fv, which are capable of binding the epitopic determinant. These antibody fragments retain the ability to selectively bind with its antigen or receptor and are exemplified as follows, *inter alia*:

- (1) Fab, the fragment which contains a monovalent antigen-binding fragment of an antibody molecule can be produced by digestion of whole antibody with the enzyme papain to yield a light chain and a portion of the heavy chain;
- (2) (Fab')₂, the fragment of the antibody that can be obtained by treating whole antibody with the enzyme pepsin without subsequent reduction; F(ab')₂ is a dimer of two Fab fragments held together by two disulfide bonds;
- (3) Fv, defined as a genetically engineered fragment containing the variable region of the light chain and the variable region of the heavy chain expressed as two chains; and
- (4) Single chain antibody (SCA), defined as a genetically engineered molecule containing the variable region of the light chain and the variable region of the heavy chain linked by a suitable polypeptide linker as a genetically fused single chain molecule.
- (5) Miniantibody (minibody), defined as a genetically engineered molecule containing variable regions of the light chain and variable regions of the heavy chain (scFv or single chain variable fragment) linked by a suitable polypeptide linker combined with constant Fc regions.

Such fragments having antibody functional activity can be prepared by methods known to those skilled in the art (e.g. Bird *et al.* (1988) Science 242:423-426)

Conveniently, antibodies may be prepared against the immunogen or portion thereof, for example, a synthetic peptide based on the sequence, or prepared recombinantly by cloning techniques or the natural gene product and/or portions thereof may be isolated and used as the immunogen. Immunogens can be used to produce antibodies by standard antibody production technology well known to those skilled in the art, as described generally in Harlow and Lane (1988), *Antibodies: A Laboratory Manual*, Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, and Borrebaeck (1992), *Antibody Engineering - A Practical Guide*, W.H. Freeman and Co., NY.

For producing polyclonal antibodies a host, such as a rabbit or goat, is immunized with the immunogen or immunogen fragment, generally with an adjuvant and, if necessary, coupled to a carrier; antibodies to the immunogen are collected from the sera. Further, the polyclonal antibody can be absorbed such that it is monospecific; that is, the sera can be absorbed against related immunogens so that no cross-reactive antibodies remain in the sera, rendering it monospecific.

For producing monoclonal antibodies the technique involves hyperimmunization of an appropriate donor with the immunogen, generally a mouse, and isolation of splenic antibody-

producing cells. These cells are fused to an immortal cell, such as a myeloma cell, to provide a fused cell hybrid that is immortal and secretes the required antibody. The cells are then cultured, in bulk, and the monoclonal antibodies harvested from the culture media for use.

For producing recombinant antibody see generally Huston *et al.* (1991) "Protein engineering of single-chain Fv analogs and fusion proteins" in *Methods in Enzymology* (JJ Langone, ed., Academic Press, New York, NY) 203:46-88; Johnson and Bird (1991) "Construction of single-chain Fvb derivatives of monoclonal antibodies and their production in *Escherichia coli* in *Methods in Enzymology* (JJ Langone, ed.; Academic Press, New York, NY) 203:88-99; Mernaugh and Mernaugh (1995) "An overview of phage-displayed recombinant antibodies" in *Molecular Methods In Plant Pathology* (RP Singh and US Singh, eds.; CRC Press Inc., Boca Raton, FL:359-365). In particular scFv antibodies are described in WO 2004/007553 (Tedesco and Marzari). Additionally, messenger RNAs from antibody-producing B-lymphocytes of animals, or hybridoma can be reverse-transcribed to obtain complementary DNAs (cDNAs). Antibody cDNA, which can be full or partial length, is amplified and cloned into a phage or a plasmid. The cDNA can be a partial length of heavy and light chain cDNA, separated or connected by a linker. The antibody, or antibody fragment, is expressed using a suitable expression system to obtain recombinant antibody. Antibody cDNA can also be obtained by screening pertinent expression libraries.

The antibody can be bound to a solid support substrate or conjugated with a detectable moiety or be both bound and conjugated as is well known in the art. (For a general discussion of conjugation of fluorescent or enzymatic moieties see Johnstone & Thorpe (1982.), *Immunochemistry in Practice*, Blackwell Scientific Publications, Oxford). The binding of antibodies to a solid support substrate is also well known in the art (for a general discussion, see Harlow & Lane (1988) *Antibodies: A Laboratory Manual*, Cold Spring Harbor Laboratory Publications, New York; and Borrebaeck (1992), *Antibody Engineering - A Practical Guide*, W.H. Freeman and Co.). The detectable moieties contemplated with the present invention can include, but are not limited to, fluorescent, metallic, enzymatic and radioactive markers such as biotin, gold, ferritin, alkaline phosphatase, β -galactosidase, peroxidase, urease, fluorescein, rhodamine, tritium, ^{14}C and iodination.

Additional compounds which are also considered to be useful in the treatment of the diseases and disorders discussed herein may be antisense DNA molecules (which can be generated using the sequence in Figure 1 by methods known in the art), catalytic RNAs such as

ribozymes, polypeptides such as dominant negative peptides (which can be generated using the sequence in Figure 2 by methods known in the art) or other polypeptide inhibitors. Antisense DNA molecules which comprise the siRNA sequences disclosed herein (with the appropriate nucleic acid modifications stemming from the differences between DNA and RNA) are particularly desirable and may be used in the same capacity as their corresponding siRNAs for all uses and methods disclosed herein.

Screening:

The compounds and compositions of the present invention may be used in a screening assay for identifying and isolating compounds which modulate the activity of Transglutaminases, in particular TGases I, 3, 5, 7 in particular, compounds which modulate TGase crosslinking activity, fibrotic disease, ocular scarring, cataract and glaucoma. The compounds to be screened comprise *inter alia* substances such as small chemical molecules, antibodies especially neutralizing antibodies, antisense oligonucleotides, antisense DNA or RNA molecules, polypeptides and dominant negatives, and expression vectors.

The inhibitory activity of the compounds of the present invention on TGase gene expression may be used to determine the interaction of an additional compound with the TGase gene or polypeptide, e.g., if the additional compound competes with the oligoribonucleotides of the present invention for TGase inhibition, or if the additional compound rescues said inhibition. The inhibition or activation can be tested by various means, such as, *inter alia*, assaying for the TGase mRNA or polypeptide, a product of the activity of the TGase polypeptide, radiolabeled or fluorescent competition assays.

METHODS

General methods in molecular biology

- 5 Standard molecular biology techniques known in the art and not specifically described were generally followed as in Sambrook et al., Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory Press, New York (1989), and as in Ausubel et al., Current Protocols in Molecular Biology, John Wiley and Sons, Baltimore, Maryland (1989) and as in Perbal, A Practical Guide to Molecular Cloning, John Wiley & Sons, New York (1988), and
- 0 as in Watson et al., Recombinant DNA, Scientific American Books, New York and in Birren et al (eds) Genome Analysis: A Laboratory Manual Series, Vols. 1-4 Cold Spring Harbor Laboratory Press, New York (1998) and methodology as set forth in United States patents

4,666,828; 4,683,202; 4,801,531; 5,192,659 and 5,272,057 and incorporated herein by reference. Polymerase chain reaction (PCR) was carried out generally as in PCR Protocols: A Guide To Methods And Applications, Academic Press, San Diego, CA (1990). In situ (In cell) PCR in combination with Flow Cytometry can be used for detection of cells containing specific DNA and mRNA sequences (Testoni et al., 1996, Blood 87:3822.) Methods of performing RT-PCR are also well known in the art.

The present invention is illustrated in detail below with reference to Examples, but is not to be construed as being limited thereto.

EXAMPLES

EXAMPLE 1

Generation of sequences for active siRNA compounds

Using proprietary algorithms and the known sequence of each TGase gene, the sequences of many potential siRNAs were generated and subsequently selected. These are shown in Tables A through I which follow below.

- 5 Tables A through I describe many 19-mer and 21-mer siRNAs which inhibit TGases I, 3 5 and 7.

TGase 1

- Table A1 shows the fourteen preferred 19-mer siRNAs. Ten of these have been synthesized and tested for activity, as shown in Table A2. Nine of these (all except TGM1_3) showed
0 activity against one or both of rabbit or human TGase 1 expression. TGM1_1 and TGM1_11 showed the best activity against both rabbit and human TGase 1. Thus these two siRNAs are preferred for use in animal (rabbit) studies with the expectation that they will also be active in humans.

- Table B below shows additional 19-mer siRNAs which have been generated by the
5 proprietary algorithms but not yet synthesized. Table C below shows additional 21-mer siRNAs which have been generated by the proprietary algorithms

TGases 3, 5 and 7.

Tables D and E below describe 19 and 21-mer siRNAs, respectively, corresponding to TGase 3. Similarly Tables F and G, describe respectively 19 and 21-mer siRNAs corresponding to TGase 5, and Tables H and I describe respectively 19 and 21-mer siRNAs corresponding to TGase7.

Table A1

TGase I: 19-mers (selected)

name	Method	Oligo Length	Sense siRNA	AntiSense siRNA	human 4507474	mouse 31982704	rabbit 165769	rat 13928911	Cow 38641347
(TGM1_8)	Single Sp	19	GCAGGAGUAGUUCUUAUU	ATTAAGAACATACCTCTGC	[872-890]	-	-	-	-
(TGM1_1)	Single Sp	19	GCAGCAAAACCCAAUGUGUA	TACACATTGGGTTTGCTGC	[1771-1789]	-	[1794-1812]	-	-
(TGM1_9)	Cross Sp	19	CUCCCUUGAGUAGACAAUGGA	TCCATTGTCTATCCAGGGAG	[1070-1088]	[1146-1164]	[1113-1131]	[1117-1135]	-
(TGM1_2)	Cross Sp	19	GAACUCCUUGGAGUAGACAAU	ATTGTCATCCAGGGAGTTTC	[1087-1085]	[1143-1161]	[1110-1128]	[1114-1132]	-
(TGM1_10)	Cross Sp	19	GGAGAUCCUUGCUUAGCUAC	GTAGCTAAGCAGGATCTCC	[1157-1175]	-	[1200-1218]	[1204-1222]	-
(TGM1_11)	Cross Sp	19	UGGAGAUCCUUGCUUAGCUA	TAGCTAAGCAGGATCTCCA	[1156-1174]	-	[1199-1217]	[1203-1221]	-
(TGM1_12)	Cross Sp	19	GUGGAGAUCCUUGCUUAGCU	AGCTAAGCAGGATCTCCAC	[1155-1173]	-	[1198-1216]	[1202-1220]	-
(TGM1_3)	Cross Sp	19	GGCAGCAAAACCCAAUGUGU	ACACATTGGGTTTGCTGCC	[1770-1788]	-	[1793-1811]	-	[1376-1394]
(TGM1_13)	Cross Sp	19	CCAUUGCUUCUCAAUGUCUC	GAGACATTGAGCAGCATGG	[2071-2089]	-	[2094-2112]	-	-
(TGM1_4)	Cross Sp	19	GUGACAAGGUGUACUUGGCA	TGCCAGTACACCTTGTCCAC	[1579-1597]	-	[1622-1640]	-	-
(TGM1_14)	Cross Sp	19	GGUGAAUAGUGACAAAGGUG	CACCTTGTCACTATTCCACC	[1571-1589]	-	[1614-1632]	-	-
(TGM1_5)	Single Sp	19	CCAUUGGACAUUCUUAUUGA	TCAAAGTAGATGTCCATGG	-	-	[1358-1376]	-	-
(TGM1_6)	Single Sp	19	CUGGAACUAGGCCAGUUAU	AACTGGCCATAGTTCCAG	-	-	[984-1002]	-	-
(TGM1_7)	Single Sp	19	CCAUCAUUGGCCAAAUUCCA	TGGAATTGCCCAATGATGG	-	-	[767-785]	-	-

Table A2

Results of inhibition of TGase 1 expression by ten of the selected siRNAs

	Sense siRNA	% Inhibition of rabbit TGase 1 expression (tested 48hr following cotransfection with rabbit TGase 1 into 293 cell line)	% Inhibition of human TGase 1 expression (tested 48hr following transfection to SKBR3 human cell line)
TGM1_11	UGGAGA UCCUGCUUAGCUA	95	85
TGM1_12	GUGGAGA UCCUGCUUAGCU	0	55
TGM1_5	CCAUGGACAUCUACUUUGA	60	90
TGM1_13	CCAUGCUGCUCAAUGUCUC	40	90
TGM1_6	CUGGAACUAUGGCCAGUUU	30	10
TGM1_14	GGUGAAUAGUGACAAGGUG	50	70
TGM1_8	GCAGGAGUAUGUUCUUAU	0	94
TGM1_1	GCAGCAAACCCAAUGUGUA	85	90
TGM1_10	GGAGA UCCUGCUUAGCUAC	20	60
TGM1_3	GGCAGCAAACCCAAUGUGU	0	0

Table B

TGase 1 : 19-mers

Method	Oligo Length	Sense siRNA	Antisense siRNA	human	mouse	rabbit	rat	Cow GI
Cross Sp	19	AUAAAGCACCCAGAGGCUC	GAGCCUUCUGGGUGCUUAU	4507474	31982704	165769	13928911	31343554
Cross Sp	19	CUAUAAAGCACCCAGAGGC	GCCUUCUGGGUGCUUAUAG	1711-1729	1787-1805	1754-1772	1758-1776	-
Cross Sp	19	UCUAUAAAGCACCCAGAGGC	CCUUCUGGGUGCUUAUAGA	1709-1727	1785-1803	1752-1770	1756-1774	-
Single Sp	19	GCAAUGAGAUCAUACUCCU	AGGAUGAGAUCAUACUCC	1708-1726	1784-1802	1751-1769	1755-1773	-
Single Sp	19	GGAGUAUGUUAUUAUAG	CUCAUUAAAGAAUACUCC	799-817	875-893	842-860	846-864	-
Cross Sp	19	GGGAAACUCCUGGAUGAC	GUAUCCAGGGAGUUCACC	875-893	-	-	-	-
Cross Sp	19	AUGGUGAAACUCCUGGAUG	CAUCCAGGGAGUUCACCAU	1064-1082	1140-1158	1107-1125	1111-1129	-
Cross Sp	19	CUCUGCCAUUGGUGAACUCC	GGAGUUCACCAUGGCGAGAG	1062-1080	1138-1156	1105-1123	1109-1127	-
Cross Sp	19	CAUGGUGAACUCCUGGAGU	AUCCAGGGAGUUCACCAUG	1055-1073	1131-1149	1098-1116	1102-1120	-
Cross Sp	19	UAUAAGCACCCAGAGGCUC	AGCCUUCUGGGUGCUUAU	1061-1079	1137-1155	1104-1122	1108-1126	-
Cross Sp	19	AACUCCUGGAUGACAAUUG	CAUUGUAUCCAGGGAGUU	1710-1728	1786-1804	1753-1771	1757-1775	-
Cross Sp	19	CUGCCAUUGGUGAACUCCU	AGGAGUUCACCAUGGCGAG	1068-1086	1144-1162	1111-1129	1115-1133	-
Cross Sp	19	UCUGCCAUUGGUGAACUCC	GGGAGUUCACCAUGGCGAG	1057-1075	1133-1151	1100-1118	1104-1122	-
Cross Sp	19	UGGUGAACUCCUGGAUGA	UCAUCCAGGGAGUUCACCA	1056-1074	1132-1150	1099-1117	1103-1121	-
Cross Sp	19	AGCAGUGGCAUUCUUCUGCU	AGCAGAAAGAUCCACUGCU	1063-1081	1139-1157	1106-1124	1110-1128	-
Cross Sp	19	CCUUGACCCCGCAUUGA	UCAUUGCGGGGUAUAAAGG	1476-1494	1552-1570	1519-1537	1523-1541	-
Cross Sp	19	UCCUGGAUGACAAUUGGAG	CUCUUAUGUAUCCAGGGGA	787-805	863-881	830-848	834-852	-
Cross Sp	19	CCUUGGAUGAACUCCUGGA	UCCAGGAGUUCACCAUUGG	1071-1089	1147-1165	1114-1132	1118-1136	-
Cross Sp	19	CCUUGGAUGAACUCCUGGA	UCCAGGAGUUCACCAUUGG	1060-1078	1136-1154	1103-1121	1107-1125	-
Cross Sp	19	CCUUGGAUGAACUCCUGGA	ACUCCAUUGUAUCCAGGGG	1072-1090	1148-1166	1115-1133	1119-1137	-
Single Sp	19	GGCAGCCUUAUCCAUUAGCU	AGCAUUAUGGAAAGGCGUCC	511-529	-	554-566	-	-
Cross Sp	19	UCUCUGCCAUUGGUGAACUC	GAGUUAUCCAGGGAGAGAG	1054-1072	1130-1148	1097-1115	1101-1119	-
Cross Sp	19	UGAACUCCUGGAUGACAA	UUUGUAUCCAGGGAGUUA	1066-1084	1142-1160	1109-1127	1113-1131	-
Single Sp	19	CUGUGAUGCUGAUCAUUA	UGAUUGAUGCAGCAUACAG	1870-1888	-	-	-	-
Cross Sp	19	ACUCCUGGAUGACAAUUGG	CCAUUGUAUCCAGGGAGU	1069-1087	1145-1163	1112-1130	1116-1134	-

Method	Oligo Length	Sense siRNA	AntiSense siRNA	human	mouse	rabbit	rat	Cow Gl
Single Sp	19	CCAGUGGGCAGAAUCUGAA	UUCAGAUUCUGCCACACUGG	679-697	-	-	13928911	31343554
Single Sp	19	AGAUCUACAUCUCUUAACA	UUGAAGAGGAGUAGUAGAU	805-823	881-899	850-866	852-870	-
Cross Sp	19	UGCUCAAUGUCUCAGGCCA	UGGCCUGAGACAUUGAGCA	2077-2095	2153-2171	2100-2118	2124-2142	-
Cross Sp	19	GUGAACUCCUGGAGUAGACA	UGCAUCCAGGGAGUUCAC	1065-1083	1141-1159	1108-1126	1112-1130	-
Single Sp	19	CCAUCACUGGGCAAGUUUCA	UGAAACUUGCCGAGUAGUGG	724-742	800-818	-	771-789	-
Cross Sp	19	UGCCAUGGUGAACUCCUG	CAGGGAGUUCACCAUGGCA	1058-1076	1134-1152	1101-1119	1105-1123	-
Cross Sp	19	GCAGUGGCAUCUUCUGCUG	CAGCAGAAGAGCCACUGC	1477-1495	1553-1571	1520-1538	1524-1542	-
Single Sp	19	GCAUCACCCUUGAGUUAU	AGUAAACUCAAGGUGAUGC	565-583	-	-	-	-
Cross Sp	19	AGAUCUUGCUUAGCUACCU	AGGUAGCUAAGCAGGAUCU	1159-1177	-	1202-1220	1206-1224	-
Cross Sp	19	ACUGUCACCAACUUAACU	AGUUGAAGUUGGUGACAGU	1269-1287	-	1312-1330	1316-1334	-
Single Sp	19	CCAGACCUUCUCUGACAU	AUGUCAGAGAGGUGUCUGG	2151-2161	-	-	2198-2216	-
Single Sp	19	CGAAGACUGGGCACAAGAA	UUCUUGUGCCGAGUCUUCG	-	-	-	907-925	-
Cross Sp	19	CUGUCACCAACUUAACUC	GAGUUGAAGUUGGUGACAG	1270-1288	-	1313-1331	1317-1335	-
Single Sp	19	CCACACCGAUAGAUUUGAA	UUCAAACUCAUCGGUGUGG	-	-	510-527	514-532	-
Cross Sp	19	GAGAUCCUGCUUAGCUACC	GGUAGCUAAGCAGGAUCUC	1158-1176	-	1201-1219	1205-1223	-
Single Sp	19	CUCUCCUUAUUGCCAUCAU	AAUGAUGGCAUUAAGGGGAG	-	-	-	760-778	-
Single Sp	19	GGCAGCCCUUCCACAUAAU	AUUAUGUGGAAGGGCUGCC	-	-	-	558-576	-
Single Sp	19	CCAUCAUUGGCAAGUUAU	UGAAACUUGCCAAUUGAUGG	724-742	-	767-779	771-789	-
Single Sp	19	GAGACUGGGCACAAGAAU	AUUCUUGUGCCGAGUCUUC	-	-	-	908-926	-
Single Sp	19	CGAUGAGUUUGAAUUGAC	GUCAUAUUAACAUCAUCG	-	-	517-533	520-538	-
Cross Sp	19	CAGAGGACAUUGUGUACGU	ACGUACACAAGUCCUCUG	835-853	-	878-896	-	-
Cross Sp	19	AAUGUCUCAGGCCACGUA	UGACGUGGCCUGAGACAUU	2082-2100	-	2105-2123	-	-
Cross Sp	19	AUGCGGCAGAUAGACGACUG	CAGUCGUCAUCUGCCGCAU	244-262	-	317-335	-	-
Cross Sp	19	AGUGACAAGGUGUACUGGC	GCCAGUACACCUUGUACAU	1578-1596	-	1621-1639	-	-
Cross Sp	19	CUGGUGCCCAGAGGACAUU	AAUGUCCUCUGGGCACCAG	827-845	-	870-888	-	-
Cross Sp	19	GCGUGGAGAUCCUGCUUAG	CUAAGCAGGAUCUCCACGC	1153-1171	-	1196-1214	-	-
Cross Sp	19	UGGCCAGUGCUGGGUCUUU	AAAGACCCAGCACUGGCCA	1202-1220	-	1245-1263	-	-
Cross Sp	19	GAAUAGUGACAAGGUGUAC	GUACACCUUGUACAUUUC	1574-1592	-	1617-1635	-	-
Cross Sp	19	AAUGAGUCUGGGAGAAU	AAAUUCUCCAGACUCAUU	888-906	-	931-949	-	-
Cross Sp	19	AUUGCCAGCUUGGACAGCC	GGCUGUCCAAAGCUGGCAU	2379-2397	-	2402-2420	-	-

Method	Oligo Length	Sense siRNA	AntiSense siRNA	human 4507474	mouse 31982704	rabbit 165769	rat 13928911	Cow Gi 31343554
Cross Sp	19	GGGAUGAUGGCAGCUUCAAG	CUUGAAGCUGCCAUCAUCC	1604-1622	-	1647-1665	-	-
Cross Sp	19	AGCAUUGGGACUGGAGUCA	UGACUCCAGUCCCAUUGCU	2547-2565	-	2567-2585	-	-
Cross Sp	19	AUCGGAACAACCCCGAGG	CCUCGGGUUGUUUCCGAU	585-603	-	628-646	-	-
Cross Sp	19	GAUGGCAGCUUCAAGAUUG	CAUUCUUGAAGCUGCCAUUC	1608-1626	-	1651-1669	-	-
Cross Sp	19	CAUGCUGCUCAAUUGUCUCA	UGAGACAUUGAGCAGCAUG	2072-2090	-	2095-2113	-	-
Cross Sp	19	AGGACAUUGUGUACGUGGA	UCCACGUACACAAUGUCCU	838-856	-	881-899	-	-
Cross Sp	19	AUGAUGGCAGCUUCAAGAU	AUCUUGAAGCUGCCAUCAU	1606-1624	-	1649-1667	-	-
Cross Sp	19	CAUUGUCUCAGGCCACGUC	GACGUGGCCUGAGACAUUG	2081-2099	-	2104-2122	-	-
Cross Sp	19	UGGAUGACAAUUGGAGUCCU	AGGACUCCAUUUGCAUCCA	1075-1093	-	1118-1136	-	-
Cross Sp	19	UCGGAACAACCCCGAGGU	ACCUCGGGUUGUUUCCGA	586-604	-	629-647	-	-
Cross Sp	19	AUUGUGUACGUGGACCAUG	CAUGGUCCACGUACACAAU	843-861	-	886-904	-	-
Cross Sp	19	AUGCUGCUCAUUGUCUCAG	CUGAGACAUUGAGCAGCAU	2073-2091	-	2096-2114	-	-
Cross Sp	19	UGUACGUGGACCAUGAGGA	UCCUCAUGGUCCACGUACA	847-865	-	890-908	-	-
Cross Sp	19	AUAGUGACAAGGUGUACUG	CAGUACACCUUUGUCACUUA	1576-1594	-	1619-1637	-	-
Cross Sp	19	CAUUGUGUACGUGGACCAU	AUGGUCCACGUACACAAUUG	842-860	-	885-903	-	-
Cross Sp	19	CCCAGAGGACAAUUGUGUAC	GUACACAAUUGUCCUCUGG	833-851	-	876-894	-	-
Cross Sp	19	GCUCAUUGCCAGCUUGGAC	GUCCAAGCUGGCAAUAGAGC	2375-2393	-	2398-2416	-	-
Cross Sp	19	CAGGAUGAUGGCAGCUUUA	UGAAGCUGCCAUCAUCCUG	1602-1620	-	1645-1663	-	-
Cross Sp	19	AUUGCGGACAGUAGCAGCU	AGUCGUCAUCUGCCGCAU	243-261	-	316-334	-	-
Cross Sp	19	GAGGACAUUGUGUACGUGG	CCAGGUACACAAUUGUCCUC	837-855	-	880-898	-	-
Cross Sp	19	CAGUGGCAUUCUUCUGCUGC	GCAGCAGAAGAUGCCACUG	1478-1496	-	1521-1539	-	-
Cross Sp	19	CCAGUGCUGGGUCUUUGCU	AGCAAAAGACCAGCAGCUGG	1205-1223	-	1248-1266	-	-
Cross Sp	19	GGACAUUGUGUACGUGGAC	GUCCACGUACACAAUUGUCC	839-857	-	882-900	-	-
Single Sp	19	GAGAGGGCAUGCUAGUAGU	ACUACUAGCAUGCCCUUC	397-415	-	440-452	-	-
Cross Sp	19	UGUCUCAGGCCACGUCAGG	CUUGACGUGGCCUGAGACA	2084-2102	-	2107-2125	-	-
Cross Sp	19	CUGCUCAAUUGUCACAGGCC	GGCCUGAGACAUUGAGCAG	2076-2094	-	2099-2117	-	-
Cross Sp	19	CUCAAUGUCUCAGGCCACG	CGUGGCCUGAGACAUUGAG	2079-2097	-	2102-2120	-	-
Cross Sp	19	AUGGCAGCUUCAAGAUUGU	ACAACUUGAAGCUGCCAU	1609-1627	-	1652-1670	-	-
Cross Sp	19	CAGCGUGGAGAUCCUGCUU	AAGCAGGAUCUCCACGCUU	1151-1169	-	1194-1212	-	-
Cross Sp	19	GAGGUGAAUAGUGACAAAGG	CCUUGUACAUUACCCUC	1569-1587	-	1612-1630	-	-

Method	Oligo Length	Sense siRNA	AntiSense siRNA	human	mouse	rabbit	rat	Cow GI
Cross Sp	19	AGUGGCAUCUUCUGUGCG	CGCAGCAGAAGAUCCACAU	1479-1497	-	165769	13928911	31343554
Cross Sp	19	GACAUUGUGUACGUGGACC	GGUCCACGUAACAAUUGUC	840-858	-	1522-1540	-	-
Cross Sp	19	CCAGAGGACAUUGUGUACG	CGUACACAAUUGUCCUUGG	834-852	-	883-901	-	-
Cross Sp	19	CCUGGAUGACAAUGGAGUC	GACUCCAUUGUACUCCAGG	1073-1091	-	877-895	-	-
Cross Sp	19	UGAAUAGUGACAAAGGUGUA	UACACCUUGUACACUUAUCA	1573-1591	-	1116-1134	-	-
Single Sp	19	CCAAGAUAGGGGCACACUA	UAGUGUGCCCUAUUCUUGG	2585-2603	-	1616-1634	-	-
Cross Sp	19	CAUUGCCAGCUUGGACAGC	GCUGUCCAAAGCUGGCAUUG	2378-2396	-	-	-	-
Cross Sp	19	UCAUUGUCUCAGGCCACGUC	ACGUGGCCUGAGACAUUGA	2080-2098	-	2401-2419	-	-
Cross Sp	19	AUGAGUCUGGGAGAAUUA	UAAUUCUCCAGACUUAU	889-907	-	2103-2121	-	-
Cross Sp	19	GUGAAUAGUGACAAAGGUGU	ACACCUUGUACAUUUCAC	1572-1590	-	932-950	-	-
Cross Sp	19	CAGUGUGGGUCUUCUGCUG	CAGCAAAGACCCAGCACUG	1206-1224	-	1615-1633	-	-
Cross Sp	19	AGCGUGGAGAUCCUGCUUA	UAAAGCAGGAUCCUCCACGCU	1152-1170	-	1249-1267	-	-
Cross Sp	19	UCUCAGGCCACGUAAGGA	UCCUUGACGUGGCCUGAGA	2086-2104	-	1195-1213	-	-
Cross Sp	19	GUGUACGUGGACCAUAGAG	CCUACUUGGUCCACGUACAC	846-864	-	2109-2127	-	-
Cross Sp	19	UGCCCCAGAGGACAUUGUGU	ACACAUGUCCUCCUGGGCA	831-849	-	889-907	-	-
Cross Sp	19	UUGUGUACGUGGACCAUGA	UCAUGGUCCACGUACACAA	844-862	-	874-892	-	-
Cross Sp	19	UCAUUGCCAGCUUUGGACAG	CUGUCCAAAGCUGGCAUUGA	2377-2395	-	887-905	-	-
Cross Sp	19	CGUGGAGAUCCUGCUUAGC	GCUAAGCAGGAUCCUCCACG	1154-1172	-	2400-2418	-	-
Single Sp	19	GGGAACAGAUAGCUAAUAAA	UUUAUUAAGCAUCUGUUCUCC	2678-2696	-	1197-1215	-	-
Cross Sp	19	AUGUGGCCAUAGCAGGUGGA	UCCACCUUGCAUGGCCACAU	1813-1831	-	-	-	-
Single Sp	19	CAAGGACAUUGCCCCAAGA	UCUUGGGGCAUUGUCCUUG	2572-2590	-	1836-1854	-	-
Cross Sp	19	GCCCAGAGGACAUUGUGUA	UACACAAUGUCCUCCUGGGC	832-850	-	-	-	-
Cross Sp	19	UGAUGGCAGCUUCAAGAUU	AAUCUUGAAGCUGGCCAUCA	1607-1625	-	875-893	-	-
Cross Sp	19	ACAUUGUGUACGUGGACCA	UGGUCCACGUAACAAUUGU	841-859	-	1650-1668	-	-
Cross Sp	19	GCUCAAUUGUCAGGCCAC	GUGGCCUGAGACAUUGAGC	2078-2096	-	884-902	-	-
Cross Sp	19	AUGUCUCAGGCCACGUCAA	UUAGACUUGGCCUGAGACAU	2083-2101	-	2101-2119	-	-
Cross Sp	19	UAGUGACAAAGGUGUACUGG	CCAGUACACCUUGUACACUA	1577-1595	-	2106-2124	-	-
Cross Sp	19	CUGGAUGACAAUGGAGUCC	GGACUCCAUUGUACUCCAG	1074-1092	-	1620-1638	-	-
Cross Sp	19	GGUGGCCAGAGGACAUUGU	ACAAUGUCCUCCUGGGACCC	829-847	-	1117-1135	-	-
Cross Sp	19	GCUGCUCAAUUGUCUCAGGC	GCCUGAGACAUUGAGCAGC	2075-2093	-	872-890	-	-
Cross Sp	19	GCUGCUCAAUUGUCUCAGGC	GCCUGAGACAUUGAGCAGC	2075-2093	-	2098-2116	-	-

Method	Oligo Length	Sense siRNA	AntiSense siRNA	human 4507474	mouse 31982704	rabbit 165769	rat 13928911	Cow GI 31343554
Cross Sp	19	UGCUGCUCAAAUGUCUCAGG	CCUGAGACAUUGAGCAGCA	2074-2092	-	2097-2115	-	-
Cross Sp	19	UAUUGGCCAGUGCUGGGUUCU	AGACCCAGCACUCUGGCCAU	1200-1218	-	1243-1261	-	-
Cross Sp	19	AGGUGAAUAGUGACAAAGGU	ACCUUGUCACUAUUCACCU	1570-1588	-	1613-1631	-	-
Cross Sp	19	CUCAUUGCCAGCUUGGACA	UGUCAAAGCUGGCAAUAG	2376-2394	-	2399-2417	-	-
Cross Sp	19	AAUAGUGACAAAGGUGUACU	AGUACACCUUUGUCACUAU	1575-1593	-	1618-1636	-	-
Cross Sp	19	UGUGUACGUGGACCAUGAG	CUCAUGGUCCACGUACACA	845-863	-	888-906	-	-
Cross Sp	19	GGCAGGAUGAUGGCAGCUU	AAGCUGCCAUCAUCCUGCC	1600-1618	-	1643-1661	-	-
Cross Sp	19	GGGCCAUGCUGCUCAAUUGU	ACAUUGAGCAGCAUGGCC	2068-2086	-	2091-2109	-	-
Cross Sp	19	GCAGGAUGAUGGCAGCUUC	GAAGCUGCCAUCAUCCUGC	1601-1619	-	1644-1662	-	-
Cross Sp	19	UCAGGCCACGUCUAAAGGAGA	UCUCCUUGAGCUGGCCUGA	2088-2106	-	2111-2129	-	-
Cross Sp	19	AUGGCCAGUGCUGGGUCUU	AAGACCCAGCACUGGCCAU	1201-1219	-	1244-1262	-	-
Single Sp	19	GCACCACACAGACGAGU	AUACUCGUCUGUGGUGGC	464-482	-	507-523	-	-
Cross Sp	19	UGGUGCCAGAGGACAUUG	CAAUUGCCUCUGGGCACCA	828-846	-	871-889	-	-
Cross Sp	19	GUGCCAGAGGACAUUGUG	CACAAUGCCUCUGGGCAC	830-848	-	873-891	-	-
Cross Sp	19	GGCCAUGCUGCUCUAAUGUC	GACAUUGAGCAGCAUGGCC	2069-2087	-	2092-2110	-	-
Cross Sp	19	GAUGAUGGCAGCUUCAAGA	UCUUGAAGCUGGCCAUCAUC	1605-1623	-	1648-1666	-	-
Cross Sp	19	AGGAUGAUGGCAGCUUCA	UUGAAGCUGGCCAUCAUCCU	1603-1621	-	1646-1664	-	-
Cross Sp	19	AGAGGACAUUGUGUACGUG	CACGUACACAAUGUCCUCU	836-854	-	879-897	-	-
Cross Sp	19	GCCAUGCUGCUCUAAUGUCU	AGACAUUGAGCAGCAUGGC	2070-2088	-	2093-2111	-	-
Cross Sp	19	AGUGCUGGGUCUUUGCUGG	CCAGCAAAGACCCAGCACU	1207-1225	-	1250-1268	-	-
Cross Sp	19	AGGAUGUGGCCAUGCAGGU	ACCUCAUGGCCCAUCCU	1810-1828	-	1833-1851	-	-
Cross Sp	19	AUCUCUGCCCAUGGUGAACU	AGUUCACCAUGGCAGAGAU	1053-1071	-	1096-1114	-	659-677
Cross Sp	19	AGCUCAUUGCCAGCUUGGA	UCCAAGCUGGCAAUAGAGCU	2374-2392	-	2397-2415	-	1980-1998
Cross Sp	19	GGUCAUCUCUGCCAUUGGUG	CACCAUGGCAGAGAGUACC	1049-1067	-	1092-1110	-	655-673
Cross Sp	19	CCAGCUCAUUGCCAGCUUG	CAAGCUGGCAUUGAGCUGG	2372-2390	-	2395-2413	-	1978-1996
Cross Sp	19	GGGUCAUCUCUGCCAUUGGU	ACCAUGGCAGAGUAGACCC	1048-1066	-	1091-1109	-	654-672
Cross Sp	19	CAGCUCAUUGCCAGCUUGG	CCAAGCUGGCAUUGAGCUG	2373-2391	-	2396-2414	-	1979-1997
Cross Sp	19	GUAUCUCUGCCAUUGGUGA	UCACCAUGGCAGAGAGUAC	1050-1068	-	1093-1111	-	656-674
Cross Sp	19	CAUCUCUGCCAUUGGUGAAC	GUUCACCAUGGCAGAGAU	1052-1070	-	1095-1113	-	658-676
Cross Sp	19	GCCAGCUCAUUGCCAGCUU	AAGCUGGCAUUGAGCUGGC	2371-2389	-	2394-2412	-	1977-1995

Method	Oligo Length	Sense siRNA	AntiSense siRNA	human	mouse	rabbit	rat	Cow GI
Cross Sp	19	UCAUCUCUGCCCAUGGUGAA	UUCACCAUGGCAGAGAUGA	4507474	31982704	165769	13928911	31343554
Single Sp	19	UGACCCGGUGUGGAUUUGCU	AGCAAAUCCACACCCGGUCA	1051-1069	-	1094-1112	-	657-675
Single Sp	19	GCAAUAGAAAUCUACAUCU	AGGAUGUAGAUUUCAUUUGC	-	-	458-476	-	-
Single Sp	19	GCACCCACACAGAGAGUUU	AAACUCAUCUGUGUGGUGC	-	-	842-860	-	-
Single Sp	19	GGCAGCCUUUCCACUUAGU	ACUAGUGGAAAGGCUGCC	-	-	507-525	-	-
Single Sp	19	GGAUGGGCAUAAACUAAU	AAUAGUUUUUUGCCAUCC	-	-	554-572	-	-
Single Sp	19	GCAGGAUUUUGUGCUGAAU	AUUCAGCACAUAAUCCUGC	-	-	2705-2723	-	-
Single Sp	19	GGAACUAUGGCCAGUUIUGA	UCAAACUGGCCCAUAGUICC	-	-	915-933	-	-
Single Sp	19	GGAACUAUGGCCAGUUIUGA	UCAAACUGGCCCAUAGUICC	-	-	986-1004	-	-

Table C

TGase 1: 21-mers

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human	rat	mouse	rabbit	dog	Cow	Chimpanzee
Single Sp	21	CAAGGACAUUGCCCCAAGAU	UAUCUUGGGGCAAUUGUCCUUG	4507474	13928911	31982704	165769	50978753	38641347	55640444
Single Sp	21	GCAUAGAGAUCAUACUCCUCU	AGAGGAUGUAGAUCAUUGC	2572-2592	2616-2635	2645-2664	-	-	-	-
Single Sp	21	GAGGAGUAGUUCUUAUAUGA	UCAUUAGAAACAUACUCCUGC	799-819	846-866	875-895	842-862	723-738	405-425	722-742
Single Sp	21	CCAUGAUUCUGUGGAAACUUA	AAGUUCAGAGAAUACUAGG	872-892	-	-	-	-	-	795-815
Single Sp	21	GGAGUAGUUCUUAUAGUUC	GACUUAUAAAGAAUACUCC	1364-1384	926-942	1440-1460	-	1283-1303	970-990	1287-1307
Single Sp	21	CCAGGAGUGUAAAGUACAGAU	AUCUGUACUUCACACUCCUGG	875-895	926-942	955-971	-	794-814	481-501	798-818
Single Sp	21	CCAGGAGUGUAAAGUACAGAU	AUCUGUACUUCACACUCCUGG	2192-2212	-	-	-	2111-2131	1798-1818	2049-2069
Single Sp	21	GCAGGAGUAGGCGAGCUUCAA	UUGAAGCUGCCAUCAUCCUGC	1601-1621	1648-1668	1677-1694	1644-1664	1521-1540	1208-1227	1524-1544
Cross Sp	21	GAACUCCUGGAGACAAUG	CAUUGUACUCCAGGAGUUA	1066-1086	1113-1133	1142-1162	1109-1129	985-1005	672-692	989-1009
Cross Sp	21	CCAGCUCUUGCCAGCUUGGA	UCCAAAGCUGGCAUAGAGCUGG	2372-2392	2419-2433	2448-2468	2395-2415	2291-2311	1978-1998	2229-2249
Cross Sp	21	CCAUGCUCUAAUGUCUCAG	CUGAGACAUUAGCAGCAUUG	2071-2091	2124-2138	2153-2167	2094-2114	1990-2010	1677-1689	1928-1948
Single Sp	21	CAUCAUCGGCAAGUUCAGU	ACUGAAACUUGCCGAUAGU	724-744	771-789	800-820	-	643-663	330-350	647-667
Single Sp	21	GCAUCACCCUUGAGUUAUUA	UGAGUAAACUACAGGUGAUGC	565-585	-	-	-	-	-	488-508
Single Sp	21	GGUGCUGGAGUCCUGCUUAUA	UAUAGCAGGCAUCCAGCACC	968-988	1015-1030	1044-1059	1011-1026	387-398	-	391-411
Cross Sp	21	GAACUCCUGGAGUACAAUGG	CCAUUGUACUCCAGGAGUUA	1067-1087	1114-1134	1143-1163	1110-1130	986-1006	673-693	990-1010
Cross Sp	21	UGGUGAACUCCUGGAGUAGAC	GUCAUCCAGGAGUUAACCAU	1062-1082	1109-1129	1138-1158	1105-1125	981-1001	668-688	985-1005
Cross Sp	21	UCUCUGCCAUUGGUAACUCC	GGGAGUUCACCAUUGGCAGAGA	1054-1074	1101-1121	1130-1150	1097-1117	973-992	660-680	977-997
Cross Sp	21	CAUGGUGAACUCCUGGAGUAG	CAUCCAGGAGUUAACCAUUG	1060-1080	1107-1127	1136-1156	1103-1123	979-999	666-686	983-1003
Cross Sp	21	CGGUGGAGAUCCUGCUUAGCU	AGCUAAGCAGGAGUUAACCAU	1153-1173	1202-1220	1231-1249	1196-1216	1072-1084	759-771	1076-1096
Cross Sp	21	UGUGUACCGUGGACCAUAGG	CCUUAUGGUGUCCAGUACACAA	844-864	-	922-940	887-907	765-783	452-470	767-787
Cross Sp	21	UGGAGAUCCUGCUUAGCUACC	GGUAGCUAAGCAGGAGUUAU	1156-1176	1203-1223	1232-1252	1199-1219	-	-	1079-1099
Cross Sp	21	UGCUCAUUGUCUAGGCCACG	CGUGGCCUGAGACAUUAGGCA	2077-2097	2124-2142	2153-2171	2100-2120	1996-2016	1683-1703	1934-1954
Cross Sp	21	AUAGACAAAGGUGUACUGGC	GCCAGUACACCCUUGUCACUUAU	1576-1596	-	-	1619-1639	-	-	1499-1519

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human	rat	mouse	rabbit	dog	Cow	Chimpanzee
Cross Sp	21	GGCCCAUGGUCUAAUGUCU	AGACUUGAGCAGCAUGGCC	2088-2088	13928911	31982704	165769	50978753	38641347	55640444
Cross Sp	21	ACAUUGUGUAGGAGCAUUG	CAUGGUCCACGUACACAUGU	841-861	2115-2135	2144-2164	2091-2111	1990-2007	1674-1689	1925-1945
Single Sp	21	CUGAUCGCAUCACCCUUGAGU	ACUAAAGGUGAUGCGAUCAG	559-579	-	1702-1712	884-904	760-780	-	764-784
Cross Sp	21	GGUACUUCUGGCAUGGUGAA	UUCACCAUGGCAGAGUAGCC	1049-1069	1096-1116	1130-1145	1092-1112	968-988	655-675	482-502
Cross Sp	21	UACUUCUGGCAUGGUGAACU	AGUACCAUGGCAGAGAGUA	1051-1071	1101-1118	1130-1147	1094-1114	970-990	657-677	972-992
Cross Sp	21	CUCCUGGAGUAGACAAUGGAGU	ACUCAAUUGUACUCCAGGAG	1070-1090	1117-1137	1146-1166	1113-1133	989-1006	676-693	974-994
Cross Sp	21	GGAGAUCCUGCUUAGCUACCU	AGGUAGCUAAGCAGGAUCUCC	1157-1177	1204-1224	1233-1253	1200-1220	-	-	993-1013
Cross Sp	21	UGAAUAGUGACAAGGUGUACU	AGUACACCUUGUCACUAUUA	1573-1593	-	-	1616-1636	-	-	1080-1100
Cross Sp	21	UACUUGCCAGCUUGGACAGCC	GGCUGUCCAAAGCUGGCAUUA	2377-2397	-	2453-2471	2400-2420	2296-2316	1983-2003	1496-1516
Cross Sp	21	AGAGGACAUUGUACGUGGA	UCCACGUACACAAGUCCUCU	836-856	-	1702-1712	879-899	755-775	-	2234-2254
Cross Sp	21	GCAGGUGGAGAUCCUGCUUA	UAAGCAGGAUCCUCCAGCUGC	1150-1170	1197-1217	1226-1244	1193-1213	1069-1084	756-771	759-779
Cross Sp	21	CAUUGUCUAGGCGACGUA	UUGACGUGGCCUGAGACAUUG	2081-2101	2128-2148	2157-2177	2104-2124	2000-2020	1692-1704	1073-1093
Cross Sp	21	UAUGCCAGUGCGGUGCUUU	AAAGACCCAGCAGUCCGCAUA	1200-1220	1247-1267	1279-1296	1243-1263	1119-1138	809-825	1938-1958
Cross Sp	21	CUAUAAGCACCAGAGGCU	GAGCCUUCUGGUGCUUAUAG	1709-1729	1756-1776	1785-1805	1752-1772	1628-1648	1316-1335	1123-1143
Cross Sp	21	GCUGCUAAUUGUCAGGCGCA	UGGCCUGAGACAUUGAGCAGC	2075-2095	2124-2142	2153-2171	2098-2118	1994-2014	-	1632-1652
Cross Sp	21	AGGACAUUGUGUAGGUGACC	GGUCCACGUACACAAGUCCU	838-858	-	1702-1712	881-901	757-777	-	1932-1952
Single Sp	21	GCACACACAGAGAGUAGA	UACUACUUGUCUGUGUGUGC	464-484	-	-	507-523	-	-	761-781
Cross Sp	21	GGUGAAUAGUACAAGGUGUA	UACACCUUGUCACUAUUAUAC	1571-1591	-	-	1614-1634	383-399	-	387-407
Single Sp	21	GAGAGGCAUGCUAGUAGUGA	UCACUACUAGCAUGCCUCCUC	397-417	-	-	440-452	-	1177-1188	1494-1514
Cross Sp	21	GAACAUGAAGCCUUGGAGCA	UGCUCAGGGGUCAUGUUC	1337-1357	1384-1404	1413-1424	1380-1400	1256-1276	-	320-340
Cross Sp	21	GCAGCAAAACCCAAUUGUGAUG	CAUACAUUUGGUGUUGCUGC	1771-1791	-	-	1794-1812	1690-1708	943-963	1260-1280
Cross Sp	21	UGGAGCACCUGAACCAUGAUU	AAUCAUGGUUCAGGUGCUCCA	1351-1371	1398-1418	1435-1447	1396-1408	1270-1290	1377-1397	1694-1714
Cross Sp	21	CACCGUACUGUCACCAACUU	AAGUUGGUGACAGUACGGGUG	1262-1282	1310-1329	1339-1358	1305-1325	1182-1201	957-977	1274-1294
Cross Sp	21	GUACUGUACCAACCUUACAUCU	AGUUGAAGUUGGUGACAGUAC	1267-1287	1314-1334	1343-1363	1312-1330	1188-1206	868-888	1185-1205
Cross Sp	21	UGGUCUACAUGAAGUACGACA	UGUCGUACUUCUAGUAGACCA	1531-1551	1580-1598	1609-1627	1574-1594	1452-1470	873-893	1190-1210
Single Sp	21	GGCUGCUGUUAUGCCGAAAU	AUUUCGGCAUGAACAGAGCC	225-245	-	-	-	-	1137-1157	1454-1474
Cross Sp	21	GCACCUAGAACCAUGAUUCUGU	ACAGAAUACUAGGUUACAGGUGC	1355-1375	1402-1422	1435-1451	1398-1418	1274-1294	961-981	148-168
Cross Sp	21	CCAGUGGCGAGAAUUGAACC	GGUUCAGAUUCUCCCCACUGG	679-699	-	-	-	598-618	285-305	1278-1298
Cross Sp	21	UACAGAUUGUCUUAAGAACC	GGUUCUUAAGAACAUCUGUA	2206-2226	-	-	-	2125-2145	1812-1832	602-622
Cross Sp	21	UAGACCCAGAGGCUACAGA	UCUGAGCCUUCUGGUGCUUA	1712-1732	1759-1779	1788-1808	1755-1772	1635-1651	1812-1832	2063-2083
Cross Sp	21	CCCGUACUGUACCAACUUA	UGAAGUUGGUGACAGUACGGG	1264-1284	1311-1331	1340-1360	1307-1327	1183-1203	1318-1338	1635-1655
Cross Sp	21	CCCGUACUGUACCAACUUA	UGAAGUUGGUGACAGUACGGG	1264-1284	1311-1331	1340-1360	1307-1327	1183-1203	870-890	1187-1207

Source	Oligo Length	Sense siRNA	Antisense siRNA	human	rat	mouse	rabbit	dog	Cow	Chimpanzee
Cross Sp	21	AGUACAGAUUGUCUUAAGAA	UUCUUGAAGACAAUCUGUACU	2204-2224	-	-	-	50978753	38641347	55640444
Cross Sp	21	AGAAACAUGAAGCCCGGAGC	GCUCACAGGGGCUCAUGUUCU	1336-1356	1383-1403	1412-1424	1379-1391	2123-2143	1810-1830	2061-2081
Cross Sp	21	CCUGAACCAUGAUUCUGUCUG	CAGACAGAAUACUGGUUCAGG	1358-1378	-	1435-1451	-	1277-1294	964-984	1259-1279
Cross Sp	21	GGAAACUACGGCCAGUUGACC	GGUCAAACUGGCCGUGAUUCC	943-963	998-1010	-	986-1006	-	549-569	1281-1301
Cross Sp	21	GAACCAUGAUUCUGUCUGGAA	UUCACAGACAAUACUAGGUUC	1361-1381	-	1437-1457	-	1280-1300	967-987	866-886
Cross Sp	21	UGGUAACUCCUGGAUGACA	UGUACUCCAGGGAGUUCACCA	1063-1083	1110-1130	1139-1159	1106-1126	982-1002	969-989	1284-1304
Cross Sp	21	CUCAUUGUCUACGCCACGUC	GACGUGGCCUGAGACAUUGAG	2079-2099	2126-2142	2155-2171	2102-2122	1998-2018	1692-1704	986-1006
Cross Sp	21	GGACAUUGUGUACGUGGACCA	UGGUCCACGUAACAAUUGUC	339-359	-	1702-1712	882-902	758-778	-	1936-1956
Cross Sp	21	UCACAGGCCACGUCAGGAGA	UCUCCUUGACGUGGCCUGAGA	2086-2106	-	-	2109-2129	2005-2025	1692-1712	762-782
Cross Sp	21	UGUCUCAGGCCACGUCAGGGA	UCCUUGACGUGGCCUGAGACA	2084-2104	2131-2151	2160-2180	2107-2127	2003-2023	1692-1710	1943-1963
Cross Sp	21	AUGUCUCAGGCCACGUCAGG	CCUUGACGUGGCCUGAGACAU	2083-2103	2130-2150	2159-2179	2106-2126	2002-2022	1692-1709	1941-1961
Cross Sp	21	CUCAUUGCCAGCUUGGACAGC	GCUGUCCAAAGCUGGCAUUGAG	2376-2396	2423-2442	2452-2471	2399-2419	2295-2315	1982-1998	1940-1960
Cross Sp	21	CAGCUCAUUGCCAGCUUGGAC	GUCCAAGCUGGCCAAUAGCUG	2373-2393	2420-2433	2449-2469	2396-2416	2292-2312	1982-1998	2233-2253
Cross Sp	21	CAGAGGACAUUGUGUACGUGG	CCACGUACACAAUUGCCUCUG	835-855	-	-	878-898	-	1979-1998	2230-2250
Cross Sp	21	CCCUGAUGACAAUGGAGUCC	GGACUCCAUUGUCAUCCAGGG	1072-1092	1119-1137	1148-1166	1115-1135	994-1011	678-698	758-778
Cross Sp	21	GCCCAGAGGACAUUGUGUACG	CGUACACAAUUGUCCUGGGC	832-852	881-897	908-926	875-895	751-771	438-456	995-1015
Cross Sp	21	CUAUGGCCAGUCUGGGUUCUU	AAGACCCAGCACUGGCCAUAG	1199-1219	1246-1266	1279-1295	1242-1262	1118-1138	809-825	755-775
Cross Sp	21	UCUAUAAGCACCCAGAGGCU	AGCCUUCUGGGUGCUUAUAGA	1708-1728	1755-1775	1784-1804	1751-1771	1627-1647	1316-1334	1122-1142
Cross Sp	21	GGCCAUUGCUCUAAUUGUCUC	GAGACAUUGAGCAGCAUUGGCC	2069-2089	2124-2136	2153-2165	2092-2112	1990-2008	1675-1689	1631-1651
Cross Sp	21	AAACAACCCCGAGGUGGGCAA	UUGCCCAUUGGUGGUGUUGU	590-610	637-657	676-686	633-653	-	206-216	1926-1946
Cross Sp	21	GUGCCAGAGGACAUUGUGUA	UACACAAUUGUCCUCUGGGCAC	830-850	881-897	906-926	873-893	749-769	436-456	513-533
Cross Sp	21	AUUGUCUACGGCCACGUCUAG	CUUGACGUGGCCUGAGACAUU	2082-2102	2129-2149	2158-2178	2105-2125	2001-2021	1692-1704	753-773
Cross Sp	21	UGUACGUGGACCAUUGAGGA	UCCUACUUGUCCACGUACACA	845-865	-	922-941	888-908	765-784	452-471	1939-1959
Cross Sp	21	GUAUCUCUGCCAUUGGUAAC	GUUACCAUUGCCUCUGGGCAC	1050-1070	1101-1117	1130-1146	1093-1113	969-989	656-676	768-788
Cross Sp	21	GGUGCCAGAGGACAUUGUGU	ACACAUGUCCUCUGGGCAC	829-849	876-896	905-925	872-892	748-768	656-676	973-993
Cross Sp	21	GAUGAGGAGCUUCAAAGAUU	AAUCUUGAAGCUGGCCAUAC	1605-1625	1652-1671	1681-1700	1648-1668	1527-1543	435-455	752-772
Cross Sp	21	UGAUGGACGCUUCAAAGAUU	ACAUCUUGAAGCUGGCCAUAC	1607-1627	1658-1671	1693-1700	1650-1670	1527-1543	1211-1231	1531-1548
Cross Sp	21	CAGGAUGAGGACGCUUCAAAG	CUUGAAGCUGGCCAUUCCUG	1602-1622	1649-1669	1678-1694	1645-1665	1521-1541	1217-1233	1531-1550
Cross Sp	21	AUGAUGGACGCUUCAAAGAUU	CAUUCUUGAAGCUGGCCAUAC	1606-1626	1653-1671	1682-1700	1649-1669	1527-1543	1208-1228	1525-1545
Cross Sp	21	GGAUGAGGACGCUUCAAAGAU	AUCUUGAAGCUGGCCAUUCC	1604-1624	1651-1671	1690-1700	1647-1667	1527-1543	1212-1232	1531-1549
Cross Sp	21	UUGACCCCGCAUUGAGAUUCU	AGAUCUACUUGGGGGUCAA	790-810	837-857	866-886	833-853	-	396-416	1531-1547
Cross Sp	21	UUGACCCCGCAUUGAGAUUCU	AGAUCUACUUGGGGGUCAA	790-810	837-857	866-886	833-853	-	396-416	713-733

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human	rat	mouse	rabbit	dog	Cow	Chimpanzee
Cross Sp	21	CGGCAGCAACCCAAUUGUGUA	UACACAUUGGUUUGUCUGCCG	1769-1789	1817-1836	1846-1865	1793-1812	1689-1708	3864-1347	55640444
Cross Sp	21	CCCGCAUAGAGAUCAUACUCC	GGAUGUAGAUCAUUGCCGG	796-816	843-863	872-892	-	723-735	402-422	1692-1712
Cross Sp	21	AACCAUGAUUCUGUCUGAAC	GUCCAGACAGAAUACUGGUU	1362-1382	-	1438-1458	-	1281-1301	968-988	719-739
Cross Sp	21	CAUAGAGAUCAUACUCCUUC	AAGAGGAUGUAGAUCAUUG	800-820	847-867	876-896	843-863	723-739	406-426	1285-1305
Cross Sp	21	UGAAACUACGGCCAGUUUGAC	GUCAAACUGCCGUGAUUCCA	942-962	999-1009	-	985-1005	-	548-568	723-743
Cross Sp	21	UGUGGAGGAGAGAGGCCAUCG	CGAUGGCCUUCUCCUCCACAU	1630-1650	-	-	1675-1691	1549-1567	1236-1256	865-885
Cross Sp	21	ACUACGGCCAGUUUGACCACG	CGUGGUCAAACUGGCCGUGU	946-966	998-1011	1030-1040	989-1007	-	552-572	1553-1573
Cross Sp	21	UGAACCAUGAUUCUGUCUGGA	UCCAGACAGAAUACUGGUUCA	1360-1380	-	1436-1456	-	1279-1299	966-986	869-889
Cross Sp	21	GCAACCCCAUUGUGUAUGCCA	UGGCAUACACAUUGGGUUUGC	1774-1794	1821-1841	1850-1870	1797-1812	-	1380-1400	1283-1303
Cross Sp	21	AACAUGAAGCCCGGAGCAC	GUGCUACAGGGGCUUACUGUU	1338-1358	1385-1405	1414-1424	1381-1401	1257-1277	944-964	1697-1717
Cross Sp	21	CUGUACCAACUUAACUCCG	CGGAGUUAGAUUGGUGACAG	1270-1290	1317-1335	1348-1364	1313-1331	1189-1207	876-896	1261-1281
Cross Sp	21	CCCCCGCAUAGAGAUCAU	AUGUAGAUCAUUGCGGGG	794-814	841-861	870-890	837-857	713-733	400-420	1193-1213
Cross Sp	21	CAAGCAGCACACUUCGUCU	AGACGAAAGGUGUGUCUUG	2123-2143	2170-2188	2199-2217	2146-2164	2046-2062	1729-1749	717-737
Cross Sp	21	UUGACCCCGCAUAGAGAUCA	GAUCUACUUGCGGGGUGACAA	789-809	836-856	865-885	832-848	-	395-415	1980-2000
Cross Sp	21	UUGAUUGGGAAUCUGUCUG	CAGACAGUUCUCCAAUCAGGA	1090-1110	1139-1153	1168-1182	1133-1153	-	696-716	712-732
Cross Sp	21	GGCAGCAACCAUUGUGUAU	AUACACAUUGGUUUGUCUGCC	1770-1790	1817-1837	1846-1866	1793-1812	1689-1708	1376-1396	1013-1033
Cross Sp	21	UGACCCCGCAUAGAGAUCA	UAGAUCUACUUGCGGGGUGCA	791-811	838-858	867-887	834-854	-	397-417	1693-1713
Cross Sp	21	UGAGAUCAUACUCCUUCUCAA	UUGAAGAGGAUGUAGAUCAU	803-823	850-870	879-899	850-866	723-739	409-429	714-734
Cross Sp	21	CCACCCGUAUCUGUACCAACU	AGUUGGUGACAGUACGGUUG	1261-1281	1310-1328	-	1304-1324	1182-1200	867-887	726-746
Cross Sp	21	GGAGCACCUAGAACAUAGAUUC	GAUACUUGGUUACGGUUCUCC	1352-1372	1399-1419	1435-1448	1396-1408	1271-1291	958-978	1184-1204
Cross Sp	21	AAGUACAGAUUGUCUUAAGA	UCUUGAAGACAAUUCUACUU	2203-2223	-	-	-	2122-2142	1809-1829	1275-1295
Cross Sp	21	CUGGAACUACGGCCAGUUUGA	UCAAACUGCCCGUAGUCCAG	941-961	988-1008	-	984-1004	-	547-567	2060-2080
Cross Sp	21	GAACUACGGCCAGUUUGACCA	UGGUCAAACUGCCCGUAGUUC	944-964	998-1011	1020-1040	987-1007	-	550-570	864-884
Cross Sp	21	AGCACCUAGAACCAUAGAUUCG	CAGAAUACUUGGUUACAGGUGCU	1354-1374	1401-1421	1435-1450	1397-1417	1273-1293	960-980	867-887
Cross Sp	21	AUGAUUCUGUCUGGAACUUC	GGAAGUUCACAGACAGAAUCAU	1366-1386	-	-	-	-	972-992	1277-1297
Cross Sp	21	CUUUGACCCCGCAUAGAGAU	AUCUCAUUGCGGGGUGCAAAAG	788-808	835-855	864-884	831-848	-	394-414	1289-1309
Cross Sp	21	AAGCAGCACACCUUCCGUCUG	CAGACGGAAGGUGUGCUGCUU	2124-2144	2171-2188	2200-2217	2147-2164	2046-2063	1730-1750	711-731
Cross Sp	21	ACAGAUUGUCUUAAGAACCC	GGGUUCUUAAGACAAUUCUGU	2207-2227	2255-2274	2283-2303	-	2126-2146	1813-1833	1981-2001
Cross Sp	21	AAGACCCAGAAAGGCUACG	CUGAGCCUUCUGGGGUGCUUUAU	1711-1731	1758-1778	1787-1807	1754-1772	1630-1650	1317-1337	2064-2084
Cross Sp	21	AUGAGAUCAUACUCCUUCU	UGAAGAGGAUGUAGAUCAU	802-822	849-869	878-898	845-865	723-739	408-428	1634-1654
Cross Sp	21	AUGAGAUCAUACUCCUUC	GAAGAGGAUGUAGAUCAU	801-821	848-868	877-897	844-864	723-739	407-427	725-745

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human	rat	mouse	rabbit	dog	Cow	Chimpanzee
Cross Sp	21	CGUACUGUCACCAACUUAAC	GUUGAAGUUGGUGACAGUACG	4507474	13928911	31982704	165769	50978753	38641347	55640444
Cross Sp	21	CGUACUGUCACCAACUUAAC	GUUGAAGUUGGUGACAGUACG	1266-1286	1313-1333	1342-1362	1312-1329	1188-1205	872-892	1189-1209
Cross Sp	21	GUCCUGAUUGGGACUGGUCU	AGACCCAGUUCGCCAAUCAGGAC	1089-1109	1139-1153	1168-1182	1132-1152	1008-1028	695-715	1012-1032
Cross Sp	21	GUACAGAUUGUCUUCAGAAC	GUUCUUGAAGACAAUCUGUAC	2205-2225	-	-	-	2124-2144	1811-1831	2062-2082
Cross Sp	21	CCACGGCAGCAACCCAAUGU	ACAUUGGGUUUGCUGCCGUGG	1766-1786	1817-1833	1846-1862	1793-1809	1689-1702	1372-1392	1689-1709

Table DTGase 3: 19-mers

Method	Oligo Length	Sense siRNA	AntiSense siRNA	human 39777600	mouse 6678330
Single Sp	19	CGAAGACAGUGACAGUGAA	UUCACUGUCACUGUCUUCG	[1570-1588]	[1590-1601]
Single Sp	19	GCAUCUGCCUCUCAUUCUU	AAGAUUGAGAGGCAGAUUC	[595-613]	-
Single Sp	19	GCAACAAGUUCUUGCAAU	AUUGCAGGGAACUUGUUGC	[2065-2083]	-
Single Sp	19	GCAGAACAUCUCAUAAAGA	UCUUUAUUGGGAUGUUCUGC	[1680-1698]	-
Single Sp	19	GAAGGACUCUGCCACAAGU	CAUUGUGGCAGAGUCCUUC	[1640-1658]	-
Single Sp	19	GCACGCUUGUACAUGAAGU	ACUUCAGUACAAGCGUGUC	[1618-1636]	-
Single Sp	19	CGGCACGCUUGUACAUGAA	UUCAUGUACAAGCGUGCCG	[1616-1634]	-
Single Sp	19	CAACGGCACGCUUGUACA	AUGUACAAGCGUGCCGUUG	[1613-1631]	-
Single Sp	19	CCUGGACCAUCAUCUACAA	UUGUAGAUGAUGGUCCAGG	[1597-1615]	[1616-1634]
Single Sp	19	GCAAAGAAGUCAACCUUGU	ACCAGGUUGACUUCUUGC	[1522-1540]	[1541-1552]
Single Sp	19	CUCUAGGAGUCCAGAGUUA	AUACUCUGGACUCCUAGAG	[43-61]	-
Single Sp	19	CAAUGGGUUUGGAAACAGA	UCUGUUUCCAAACCAUUG	[1447-1465]	-
Single Sp	19	CAAUAGCAAUGAUGACAAU	AUUGUCAUAUUGCUAUUG	[707-725]	[731-743]
Single Sp	19	GUGCCAUGAUCAAUAGCAA	UUGCUAUUGAUCUAGGCAC	[697-715]	-
Single Sp	19	GCAGAAUUGACCCAAUA	UAUUUGGGGUCAUUUCUGC	[661-679]	[680-698]
Single Sp	19	CUCAGCAUCUGCCUCUCAA	UUGAGAGGCAGAUUCUGAG	[591-609]	-
Single Sp	19	CUGGAACUUUGGACAGUUU	AAACUGUCCAAGUUCAG	[560-578]	[579-597]
Single Sp	19	AAACCGAAUUGGCAUGAUU	AAUCAUGCCAAUUCGGUUU	[539-557]	[562-573]
Single Sp	19	GAAGAUGCCGGCAUCUUCU	AGAUGAUGCCGGCAUCUUC	[507-525]	-
Single Sp	19	CGUUCAUACUGCUUUUUA	UUAAAAAGCAGUAUGAACG	[424-442]	-
Single Sp	19	GGACGUUCAUACUGCUUUU	AAAAGCAGUAUGAACGUCC	[421-439]	-
Single Sp	19	CAAUGGCCCUCCAGAUUUU	AAGAUCUGGAGGGCCAUUG	[370-388]	-
Single Sp	19	CCAUAGGACGGUACACAAU	AUUGUGUACCGUCCUAGG	[355-373]	-
Single Sp	19	GCAAUACUCUGACUACAG	CUGAUAGUCAGAUUUGC	[313-331]	-
Single Sp	19	CCAGCAAUGGCAUACUCU	AGAGUAUUGCCAUUGCUGG	[304-322]	-
Single Sp	19	GGCCAGCAAUGGCAUACU	AGUAUUGCCAUUGCUGGCC	[302-320]	-
Single Sp	19	CGAAGGCUGUGUUUCCACU	AGUGGAAACACAGCCUUCG	[244-262]	-
Single Sp	19	CCAUGACGAAGGCUUGUUGU	AACACAGCCUUCGUCAUGG	[238-256]	-
Single Sp	19	CACCCUAACUCAAAUAAA	UUUAUUUUGAGUUAGGGUG	[2573-2591]	-
Single Sp	19	GCACUCACACCCUAAACUCA	UGAGUUAAGGUGUGAGUGC	[2566-2584]	-
Single Sp	19	GGAGUUCAUUGUCUCCACA	UGUGGAGACAAUGAACUCC	[197-215]	-
Single Sp	19	CCUAUGACUUGAUCACUUU	AAAGUGAUCAAGUCAUAGG	[2308-2326]	-
Single Sp	19	CCACCCUGUCCUUAUGACUU	AAGUCAUAGGACAGGGUGG	[2299-2317]	-
Single Sp	19	GGAGAGCUCACCAUGGAU	AUUCCAUGGUGAGCUCUCC	[2163-2181]	-
Single Sp	19	GGCCUUGGCUCUAACGAAA	UUUCGUUAGAGCCAAGGCC	[174-192]	-
Single Sp	19	GUACAACUUGGACAACAC	GUGUUGUCCAAGUUUGUAC	[2137-2155]	-
Single Sp	19	GCAAUCAAGGCCAUUGUUGU	ACAACAUUGCCUUGAUUGC	[2079-2097]	[2099-2112]
Single Sp	19	CAAGUUCUCCUGCAAUCAAG	CUUGAUUGCAGGGAACUUG	[2069-2087]	-
Single Sp	19	GACUUCUCCUGCAACAAGU	ACUUGUUGCAGGAGAAGUC	[2055-2073]	-
Single Sp	19	GGAGUCCAGAGUAUCAACU	AGUUGAUACUCUGGACUCC	[48-66]	-
Single Sp	19	CAACAUGAUCCGGGAUCACA	UGUGAUCCGGAUCAUGUUG	[1736-1754]	[1755-1770]
Single Sp	19	CAGACAACAUGAUCCGGAU	AUCCGGAUCAUGUUGUCUG	[1732-1750]	[1751-1769]
Single Sp	19	UGAAGUCAGACAACAUGAU	AUCAUGUUGUCUGACUUA	[1726-1744]	[1745-1763]
Single Sp	19	AGAAGUACCUGAAGUCAGA	UCUGACUUCAGGUACUUCU	[1717-1735]	-
Single Sp	19	CGUACGCUCAGUAUGAGAA	UUCUCAUACUGAGCGUACG	[1702-1720]	[1727-1738]

Method	Oligo Length	Sense siRNA	AntiSense siRNA	human 39777600	mouse 6678330
Single Sp	19	GAUCUCGUACGCUÇAGUUAU	AUACUGAGCGUACGAGAUC	[1697-1715]	-
Single Sp	19	AGAUCUCGUACGCUÇAGUA	UACUGAGCGUACGAGAUCU	[1696-1714]	-
Single Sp	19	CCAUAAAGAUUCUCGUACGC	GCGUACGAGAUUUUAUGG	[1690-1708]	-
Single Sp	19	GAACAUCCCAUAAAGAUUCU	AGAUCUUUAUGGGAUGUUC	[1683-1701]	

Table ETGase 3: 21-mers

Method	Oligo Length	Sense siRNA	AntiSense siRNA	human 39777600	mouse 6678330
Single Sp	21	GCAACAAGUCCCUGCAAUCA	UGAUUGCAGGGAACUUGUUGC	[2065-2085]	-
Single Sp	21	CGAAGACAGUGACAGUGAACA	UGUUCACUGUCACUGUCUUCG	[1570-1590]	[1590-1601]
Single Sp	21	CAAGGGUAGUGAUAGCGUAUG	CAUACGCUAUCACUACCCUUG	[998-1018]	[1024-1034]
Single Sp	21	CAACUCAGCUCAUGACACAGA	UCUGUGUCAUGAGCUGAGUUG	[926-946]	-
Single Sp	21	ACAAGCGCAUCACACAGACAA	UUGUCUGUGUGAUGCGCUUGU	[86-106]	[109-125]
Single Sp	21	GCGUGGAGAUCCUCAAAAAU	AAUUUUUGAGGAUCCACACGC	[793-813]	[814-827]
Single Sp	21	GCGAGCUGGAGAUCCUCAAAA	UUUUGAGGAUCCACACGUCG	[790-810]	[814-827]
Single Sp	21	UGAGUGCCAUGAUCAAUAGCA	UGCUAUUGAUC AUGGCACUCA	[694-714]	[713-725]
Single Sp	21	GGUGCUGAGUGCCAU GAUCAA	UUGAUC AUGGCACUCAGCACC	[689-709]	[708-725]
Single Sp	21	CAGCAGAAUAGACCCCAAUA	UAUUUGGGUCAUUUCUGCUG	[659-679]	[680-698]
Single Sp	21	CUACUGAUGUGGCCAGCAGAA	UUCUGCUGGCCACAUCAGUAG	[646-666]	[667-677]
Single Sp	21	GCCUCUCAUUCUUGGAUAGGA	UCCUAUCCAAGAUUGAGAGGC	[601-621]	-
Single Sp	21	GCAUCUGCCUCUCAUCUUGG	CCAAGAUGAGAGGCAGAUUGC	[595-615]	-
Single Sp	21	CUGGAACUUUGGACAGUUUGA	UCAAACUGUCCAAAGUUCAG	[560-580]	[579-599]
Single Sp	21	GAAGAUGCCGGCAUCUUCUU	AAAGAUGAUGCCGGCAUCUUC	[507-527]	-
Single Sp	21	GGAAGAUGCCGGCAUCUUCU	AAGAUGAUGCCGGCAUCUUC	[506-526]	-
Single Sp	21	UCAGGAAGAUGCCGGCAUCAU	AUGAUGCCGGCAUCUUCUGA	[503-523]	-
Single Sp	21	GGACGUUCAUACUGCUUUUUA	UAAAAAGCAGUAUGAACGUCC	[421-441]	-
Single Sp	21	CUCUAGGAGUCCAGAGUAUCA	UGAUACUCUGGACUCCUAGAG	[43-63]	-
Single Sp	21	CAAUGGCCCUCCAGAUUCUUCU	AGAAGAUCUGGAGGCCAUUG	[370-390]	-
Single Sp	21	GCAUACUCUGACUAUCAGCA	UGCUGAUAGUCAGAGUAUUGC	[313-333]	-
Single Sp	21	GGCCAGCAAUGGCAUACUCU	AGAGUAUUGCCAUUGCUGGCC	[302-322]	-
Single Sp	21	GCAUCACACCCUAAUCUAAA	UUUGAGUUAGGGUGUGAGUGC	[2566-2586]	-
Single Sp	21	AGAAGCUGGUCUAGACUGUUU	AAACAGUCUAGACCAGCUUCU	[2462-2482]	-
Single Sp	21	CGAAGGCUGUGUUUCCACUCU	AGAGUGGAAACACAGCCUUCG	[244-264]	-
Single Sp	21	CCACCCUGUCCU AUGACUUGA	UCAAGUCAUAGGACAGGGUGG	[2299-2319]	-
Single Sp	21	GGAGAGCUCACCAUGGAAUGA	UCAUCCAUUGGUGAGCUCUCC	[2163-2183]	-
Single Sp	21	CCAUCGAUGUAGCCGAUUGAA	UUCAUUCGGCUACAUCGAUGG	[2098-2118]	-
Single Sp	21	GCCAUGUUGUCCAUCGAUGUA	UACAUCGAUGGACAACAUGGC	[2088-2108]	-
Single Sp	21	CAACAAGUCCCUGCAAUCAA	UUGAUUGCAGGGAACUUGUUG	[2066-2086]	-

Table FTGase 5: 19-mers

Method	Oligo Length	Sense siRNA	AntiSense siRNA	human 42518071	human 4759229	rat 34856752	mouse 27229193
Single Sp	19	CAACAGCAAUGAUGAUAAU	AUUUAUCAUUGCUGUUG	[695-713]	[449-467]	[751-764]	[791-804]
Single Sp	19	GCAGGAGUAUGUCAUGAAU	AUUC AUGACAUACUCCUGC	[479-497]	[233-251]	[534-545]	[574-585]
Single Sp	19	GAAGUGGCCUCUUCAGAA	UUCUUGAAGAGGCCACUUC	[1984-2002]	[1738-1756]	-	-
Single Sp	19	GAACUCCAUGUCUGGAU	AUUCAGACAUUGGAAGUUC	[1010-1028]	[764-782]	-	-
Single Sp	19	UGAGUAUUUAUGACAACACA	UGUGUUGUCAUAAUACUCA	[953-971]	[707-725]	[1008-1026]	-
Single Sp	19	GAAACCUGAUCAUAGAUGA	UCAUCUAUGAUCAGGUUUC	[937-955]	[691-709]	[994-1010]	[1034-1050]
Single Sp	19	CGAUACAGAUUGAAACCUG	CAGGUUCCAUUCUGUAUCG	[926-944]	[680-698]	-	-
Single Sp	19	CUACCCGUGUGAUCACCAA	UUGGUGAUCACACGGGUAG	[892-910]	[646-664]	[949-965]	[989-1005]
Single Sp	19	CCAUGUCCUGGAACUUG	CAUAGUCCAGGGACAUGG	[540-558]	[294-312]	[601-613]	[635-653]
Single Sp	19	AAAGGCAGAUCCAAGCUAA	UUAGCUUGGAUCUGCCUUU	[2086-2104]	[1840-1858]	[2138-2156]	[2178-2196]
Single Sp	19	GCAUCAUUCUGGAGACCGU	ACGGUCCAGAAUGAUGC	[2050-2068]	[1804-1822]	-	-
Single Sp	19	CCAUAACAGGUGAUUUUUC	GAUUUAUACCCUGUAUGG	[1918-1936]	[1672-1690]	-	-
Single Sp	19	AGAAAUCCUGGUGAACAA	UUGUUCACCAGGAUUUUCU	[1828-1846]	[1582-1600]	[1880-1898]	[1920-1938]
Single Sp	19	GAAGAGCAGUCCUGAGAA	UUUCUCAGGACUGCUUUUC	[1814-1832]	[1568-1586]	[1870-1884]	[1912-1924]
Single Sp	19	UCAUCACACUCUCUCCUAA	UUAGGAGAGAGUGUGAUGA	[1699-1717]	[1453-1471]	-	-
Single Sp	19	UCAAGGACCUCAAAGUGAA	UUCACUUUGAGGUCCUUGA	[1615-1633]	[1369-1387]	-	-
Single Sp	19	CCAGUGAUGUGGUGCAAGU	ACUUGCACCAUACACUGG	[1510-1528]	[1264-1282]	-	-
Single Sp	19	AGAGGCAGGUGUUUCUGAA	UUCAGAAACACCGCCUCU	[1366-1384]	[1120-1138]	[1421-1436]	-
Single Sp	19	CUACAAGUAUGAAGAAGGA	UCCUUCUUAUACUUGUAG	[1337-1355]	[1091-1109]	[1392-1409]	[1432-1449]
Single Sp	19	AGAUCACUGUGGACCACCU	AGGUGGUCCACAGUGAUCU	[82-100]	[82-100]	-	-
Single Sp	19	UCAUCUUCGUGGUUGAAAC	GUUUAACACGAGAUGAUGA	[178-196]	[178-196]	-	-
Single Sp	19	ACAUCAUCUUCGUGGUUGA	UCAACCACGAAGAUGAUGU	[175-193]	[175-193]	-	-
Single Sp	19	ACAACAUCAUCUUCGUGGU	ACCACGAAGAUGAUGUUGU	[172-190]	[172-190]	-	-
Single Sp	19	UCACAGACCUCAGAGCUC	GAGCUCUGGAGGUCUGUGA	[34-52]	[34-52]	[113-131]	[129-147]
Single Sp	19	GGAUUUUGGGGAUAAGAA	UUCUUAUUCUCCAAAAUCC	[976-994]	[730-748]	-	-
Single Sp	19	GCAGGAUUUUGGGGAUAA	UUUUUCCCCAAAUCCUGC	[973-991]	[727-745]	-	-
Single Sp	19	CCCGUGUGAUCACCAACUU	AAGUUGGUGAUCACACGGG	[895-913]	[649-667]	[950-968]	[990-1008]
Single Sp	19	GCAUUGCUGGGUCUUUGCU	AGCAAGACCCAGCAUUGC	[836-854]	[590-608]	-	[931-949]
Single Sp	19	GCCUGAAGCUGCUAGACAA	UUGUCUAGCAGCUUCAGGC	[589-607]	[343-361]	-	-
Single Sp	19	CUUGGAACUAUGGACAGUUU	AAACUGUCCAUAGUCCAG	[548-566]	[302-320]	[603-621]	[643-661]

Method	Oligo Length	Sense siRNA	AntiSense siRNA	human 42518071	human 4759229	rat 34856752	mouse 27229193
Cross Sp	19	CUCCAGAGCUCCAGAAUA	UAUUUCUGGAGCUCUGGAG	[42-60]	[42-60]	[121-132]	[137-148]
Single Sp	19	GGGAGUUCAUCCUGCUUUU	AAAAGCAGGAUGAACUCCC	[409-427]	-	[464-479]	-
Single Sp	19	GGUACCUCUUGAAAAUCCA	UGGAUUUUAAGAGGUACC	[349-367]	-	-	-
Single Sp	19	GUCGGUACCUCUUGAAAAU	AUUUUCAAGAGGUACCGAC	[346-364]	-	-	-
Single Sp	19	GAAGCAACAAGUUUAAGGA	UCCUUAACUUGUUGCUUC	[2110-2128]	[1864-1882]	-	-
Single Sp	19	GUGGCCUCUUAAGAAACA	UGUUUCUUGAAGAGGCCAC	[1987-2005]	[1741-1759]	-	-
Single Sp	19	GAAGGAAGUGGCCUCUUA	UGAAGAGGCCACUUCUUC	[1980-1998]	[1734-1752]	[2032-2048]	[2072-2088]
Single Sp	19	GAACCAGCCACUCUCCAUA	UAUGGAGAGUGGCGGUUC	[1904-1922]	[1658-1676]	-	-
Single Sp	19	GCAUCAGAUUAAUGUUCU	AGAACAUAUACUGAUGC	[1870-1888]	[1624-1642]	-	[1962-1980]
Single Sp	19	CAAGCAUCACGAUUAUGU	ACAUUAUACUGAUGCUUG	[1867-1885]	[1621-1639]	-	-
Single Sp	19	GCAGUCCUGAGAAAAUCCU	AGGAUUUUCUCAGGACUGC	[1819-1837]	[1573-1591]	[1871-1889]	[1912-1929]
Single Sp	19	CAAGCUGAUCCGCAUCAGU	ACUGAUGCGGAUCAGCUUG	[1781-1799]	[1535-1553]	-	[1873-1891]
Single Sp	19	GCCAGUACCUGUCAACAGA	UCUGUUGACAGGUACUGGC	[1762-1780]	[1516-1534]	[1814-1832]	-
Single Sp	19	CACACUCUCUCCUAAAGAA	UUCUUUAGGAGAGAGUGUG	[1703-1721]	[1457-1475]	-	-
Single Sp	19	CCAGUUAAGGACCUCAAA	UUUGAGGUCCUUGAACUGG	[1610-1628]	[1364-1382]	[1663-1680]	[1703-1720]
Single Sp	19	CCAACAUGGGCCAGGAUUA	AUAUCCUGGCCAUUGUUGG	[1558-1576]	[1312-1330]	-	-
Single Sp	19	GUGCAAGUCUCCUGAAAU	AUUUCAGGGAGACUUGCAC	[1521-1539]	[1275-1293]	-	-
Single Sp	19	GGAGCAGAGUUGCAACCUU	AAGGUUGCAACUCUGCUCC	[1431-1449]	[1185-1203]	-	-
Single Sp	19	GGGAUGACAUCACAGAGAA	UUCUCUGUGAUGUCAUCCC	[1318-1336]	[1072-1090]	-	[1415-1430]
Single Sp	19	GCAAUUUUAUCAGCACAAA	UUUGUGCUGAUAAAAUUGC	[1279-1297]	[1033-1051]	[1336-1349]	[1376-1389]
Single Sp	19	GAGUUCUGUUGGCAUUUU	AAAAUUGCCAACAGAACUC	[1268-1286]	[1022-1040]	-	-
Single Sp	19	CGCCCUUUGUGUUUCGAU	AUCGAAAACACAAGGGCG	[1183-1201]	[937-955]	-	-
Single Sp	19	GAAGGAUACUAUCUGGAAC	GUUCCAGAUAGUAUCCUUC	[995-1013]	[749-767]	-	-
Single Sp	19	GAAGAAGGAUACUAUCUGG	CCAGAUAGUAUCCUUCUUC	[992-1010]	[746-764]	[1047-1065]	-
Single Sp	19	GGAAUAAGAAGAAGGAUAC	GUAUCCUUCUUCUUAUCC	[985-1003]	[739-757]	[1041-1058]	-
Single Sp	19	UCAACCUCACCCUGUACUU	AAGUACAGGGUGAGGUUGA	[124-142]	[124-142]	[209-221]	[225-237]
Single Sp	19	CCUUAACCUCACCCUGUA	UACAGGGUGAGGUUGAAGG	[121-139]	[121-139]	-	-
Single Sp	19	ACACGGAGGAGAUACUGU	ACAGUGAUCUCCUCCUGU	[73-91]	[73-91]	-	-
Single Sp	19	GAAAUAAUGUGCGGCACCA	UGGUGCCGCACAUUAUUC	[55-73]	[55-73]	-	-
Single Sp	19	UGGACAACAUCAUUCUUGU	ACGAAGAUGAUGUUGUCCA	[169-187]	[169-187]	-	-
Single Sp	19	UCACCCUGUACUUCAGGAA	UUCCUGAAGUACAGGGUGA	[130-148]	[130-148]	[209-221]	[225-237]
Single Sp	19	ACCUACCCUGUACUUCAG	CUGAAGUACAGGGUGAGGU	[127-145]	[127-145]	[209-221]	[225-237]
Single Sp	19	AUAAUGUGCGGCACCAAC	GUGUGGUGCCGCACAUUAU	[58-76]	[58-76]	[139-155]	[153-171]
Single Sp	19	CGGAGGAGAUACUGUGGA	UCCACAGUGAUCUCCUCCG	[76-94]	[76-94]	-	-
Single Sp	19	CUAGAAGUGGCCUACACAG	CUGUGAGGGCCACUUCUAG	[21-39]	[21-39]	[100-118]	[116-134]

Method	Oligo Length	Sense siRNA	AntiSense siRNA	human 42518071	human 4759229	rat 34856752	mouse 27229193
Single Sp	19	AGCCAGGCCUGGACAACAU	AUGUUGUCCAGGCCUGGCU	[160-178]	[160-178]	-	-
Single Sp	19	UGGACCACCGCUUGUUCG	CGAACAAGCAGGUGGUCCA	[91-109]	[91-109]	-	-
Single Sp	19	UCACUGUGGACCACCGUCU	AGCAGGUGGUCCACAGUGA	[85-103]	[85-103]	-	-
Single Sp	19	GGAGAUACACUGUGGACCAC	GUGGUCCACAGUGAUCUCC	[80-98]	[80-98]	-	-
Cross Sp	19	AAGUGGCCUCACAGACCU	AGGUCUGUGAGGGCCACUU	[25-43]	[25-43]	[106-122]	[122-138]
Cross Sp	19	AGAAGUGGCCUCACAGAC	GUCUGUGAGGGCCACUUCU	[23-41]	[23-41]	[106-120]	[122-136]
Single Sp	19	UAAUGUGCGGCACCACACG	CGUGUGGUGCCGCACAUUA	[59-77]	[59-77]	[139-156]	[154-172]
Single Sp	19	GACAACACAGGCAGGAUUU	AAUCCUGCCUGUGUUGUC	[963-981]	[717-735]	[1018-1036]	[1058-1075]
Single Sp	19	CCAGAGCUCCAGAAUAAU	AUUUUUCUGGAGCUCUGG	[44-62]	[44-62]	-	-
Single Sp	19	CAUCUUCGUGGUUGAAACU	AGUUUCAACCACGAAGAUG	[179-197]	[179-197]	-	-
Single Sp	19	GCCUGGACAACAUCAUCUU	AAGAUGAUGUUGUCCAGGC	[166-184]	[166-184]	-	-
Single Sp	19	CAGGCCUGGACAACAUCAU	AUGAUGUUGUCCAGGCCUG	[163-181]	[163-181]	-	-
Single Sp	19	CCAGAAUAAUGUGCGGCA	UGCCGCACAUUAAUUCUGG	[52-70]	[52-70]	-	-
Single Sp	19	AGAGCUCCAGAAUAAUGU	ACAUUAAUUCUGGAGCUCU	[46-64]	[46-64]	-	-
Single Sp	19	CAGAGCUCCAGAAUAAUG	CAUUAUUCUGGAGCUCUG	[45-63]	[45-63]	-	-
Single Sp	19	ACCUCAGAGCUCCAGAAA	UUUCUGGAGCUCUGGAGGU	[40-58]	[40-58]	[119-132]	[135-148]
Single Sp	19	CAACAUCAUUCUGUGGUU	AACCACGAAGAUGAUGUUG	[173-191]	[173-191]	-	-
Single Sp	19	GGACAACAUCAUUCUGUG	CACGAAGAUGAUGUUGUCC	[170-188]	[170-188]	-	-
Single Sp	19	CUGUACUUCAGGAACCGGA	UCCGGUCCUGAAGUACAG	[135-153]	[135-153]	-	-
Single Sp	19	CUCACCCUGUACUUCAGGA	UCCUGAAGUACAGGGUGAG	[129-147]	[129-147]	[209-221]	[225-237]
Single Sp	19	CAACCUACCCUGUACUUC	GAAGUACAGGGUGAGGUUG	[125-143]	[125-143]	[209-221]	[225-237]
Single Sp	19	UUCAACCUCACCCUGUACU	AGUACAGGGUGAGGUUGAA	[123-141]	[123-141]	[209-220]	[225-236]
Single Sp	19	CAGAAUAAUGUGCGGCAC	GUGCCGCACAUUAAUUCUG	[53-71]	[53-71]	-	-
Single Sp	19	CUCCAGAAUAAUGUGCGG	CCGCACAUUAAUUCUGGAG	[50-68]	[50-68]	-	-
Single Sp	19	UAGAAGUGGCCUCACAGA	UCUGUGAGGGCCACUUCUA	[22-40]	[22-40]	[101-119]	[117-135]
Single Sp	19	AAUAAUGUGCGGCACCACA	UGUGUGCCGCACAUUAAU	[57-75]	[57-75]	-	-
Single Sp	19	AGAAUAAUGUGCGGCACC	GGUGCCGCACAUUAAUUCU	[54-72]	[54-72]	-	-
Single Sp	19	UGUACUUCAGGAACCGGAG	CUCCGGUCCUGAAGUACA	[136-154]	[136-154]	-	-
Single Sp	19	ACCCUGUACUUCAGGAACC	GGUCCUGAAGUACAGGGU	[132-150]	[132-150]	[211-221]	[227-237]
Single Sp	19	AAUAAUGUGCGGCACCAC	GUGGUGCCGCACAUUAAU	[56-74]	[56-74]	-	-
Single Sp	19	CCACACGGAGGAGAUACAU	AGUGAUCUCCUCCUGUGG	[71-89]	[71-89]	-	-
Single Sp	19	CCAGGCCUGGACAACAUCA	UGAUGUUGUCCAGGCCUGG	[162-180]	[162-180]	-	-
Single Sp	19	UGGCCCAAGGGCUAGAAGU	ACUUCUAGCCCUUGGGCCA	[10-28]	[10-28]	-	-
Single Sp	19	CUGUGGACCACCGCUUGU	ACAAGCAGGUGGUCCACAG	[88-106]	[88-106]	-	-
Single Sp	19	CACUGUGGACCACCGCUU	AAGCAGGUGGUCCACAGUG	[86-104]	[86-104]	-	-

Method	Oligo Length	Sense siRNA	AntiSense siRNA	human 42518071	human 4759229	rat 34856752	mouse 27229193
Single Sp	19	GACCUCCAGAGCUCCAGAA	UUCUGGAGCUCUGGAGGUC	[39-57]	[39-57]	[118-132]	[134-148]
Single Sp	19	GCUAGAAGUGGCCUCACA	UGUGAGGGCCACUUCUAGC	[20-38]	[20-38]	[99-117]	[116-133]
Single Sp	19	GAUCACUGUGGACCACCUG	CAGGUGGUCCACAGUGAUC	[83-101]	[83-101]	-	-
Single Sp	19	AUGGCCCAAGGGCUAGAAG	CUUCUAGCCCUUGGGCCAU	[9-27]	[9-27]	-	[89-99]
Single Sp	19	GGAGGAGAUACUGUGGAC	GUCCACAGUGAUCUCCUCC	[77-95]	[77-95]	-	-
Single Sp	19	ACCACACGGAGGAGAUAC	GUGAUCUCCUCCGUGUGGU	[70-88]	[70-88]	-	-
Single Sp	19	UACCAUGGCCCAAGGGCUA	UAGCCCUUGGGCCAUUGGUA	[5-23]	[5-23]	-	[86-99]
Single Sp	19	AGACCUCCAGAGCUCCAGA	UCUGGAGCUCUGGAGGUCU	[38-56]	[38-56]	[117-132]	[133-148]
Single Sp	19	ACAGACCUCCAGAGCUCCA	UGGAGCUCUGGAGGUCUGU	[36-54]	[36-54]	[115-132]	[131-148]
Single Sp	19	UCAGGAACCGGAGCUCCA	UGGAAGCUCGCUUCCUGA	[142-160]	[142-160]	-	-
Single Sp	19	GUACUUCAGGAACCGGAGC	GCUCCGGUUCUGAAGUAC	[137-155]	[137-155]	-	-
Single Sp	19	CCCUGUACUUCAGGAACCG	CGGUUCCUGAAGUACAGGG	[133-151]	[133-151]	-	-
Single Sp	19	AGGCCUUAACCUACCCU	AGGGUGAGGUUGAAGGCCU	[118-136]	[118-136]	-	-
Single Sp	19	UUCAGGAACCGGAGCUUCC	GGAAGCUCGCUUCCUGAA	[141-159]	[141-159]	-	-

Table GTGase 5: 21- mers

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 42518071	human 4759229	rat 34856752	mouse 27229193
Single Sp	21	CCAUGUCCUGGAACUAUGGA	UCCAUAGUCCAGGGACAUGG	[540-560]	[294-314]	[601-614]	[635-654]
Single Sp	21	GCAGGAGUAUGUCAUGAAUGA	UCAUUAUGACAUACUCCUGC	[479-499]	[233-253]	[534-545]	[574-585]
Single Sp	21	GGAAGGAAGUGGCCUCUUCAA	UUGAAGAGGCCACUCCUUC	[1979-1999]	[1733-1753]	[2031-2048]	[2071-2088]
Single Sp	21	CCAUCACAGGUGAUUUUUCAA	UUGAAAAUAUACCCUGUAUG	[1918-1938]	[1672-1692]	-	-
Single Sp	21	CCAGUGAUGUGGUGCAAGUCU	AGACUUGCACCACAUACUGG	[1510-1530]	[1264-1284]	-	-
Single Sp	21	GAACUCCAUGUCUGGAAUGA	UCAUUCAGACAUUGAAGUUC	[1010-1030]	[764-784]	-	-
Single Sp	21	GAAACCGAUCUAUGAUGAGU	ACUCAUCUAUGAUCAGGUUUC	[937-957]	[691-711]	[994-1012]	[1034-1052]
Single Sp	21	CGAUACAGAUGGAAACCUGAU	AUCAGGUUCCAUCUGUAUCG	[926-946]	[680-700]	-	-
Single Sp	21	CUACCCGUGUGAUCACCAACU	AGUUGGUGAUCACACGGGUAG	[892-912]	[646-666]	[949-967]	[989-1007]
Single Sp	21	CAACAGCAAUGAUGAUAAUGG	CCAUAUCAUCAUUGCUGUUG	[695-715]	[449-469]	[751-764]	[791-804]
Single Sp	21	GAAUGAUUAUGGCUUCAUCUA	UAGAUGAAGCCAUAAUCAUUC	[494-514]	[248-268]	[553-569]	[593-609]
Single Sp	21	AAAGGCAGAUCCAAGCUAAUA	UAUUAGCUUGGAUCUGCCUUU	[2086-2106]	[1840-1860]	[2138-2156]	[2178-2197]
Single Sp	21	GAAGUGGCCUCUUCAGAAAC	GUUUCUUGAAGAGGCCACUUC	[1984-2004]	[1738-1758]	-	-
Single Sp	21	ACAAGAUCAUCACCUUAUCUU	AAGAUAGGUGAUGAUCUUGU	[1843-1863]	[1597-1617]	[1895-1910]	[1935-1950]
Single Sp	21	UGAACAGAUAUCACCUUAU	AUAAGGUGAUGAUCUUGUUA	[1840-1860]	[1594-1614]	[1892-1910]	[1932-1950]
Single Sp	21	AGAAAAUCCUGGUGAACAAAGA	UCUUGUUCACCAGGAUUUUCU	[1828-1848]	[1582-1602]	[1880-1900]	[1920-1940]
Single Sp	21	GAAAAGCAGUCCUGAGAAAAU	AUUUUCUCAGGACUGCUUUUC	[1814-1834]	[1568-1588]	[1870-1886]	[1912-1926]
Cross Sp	21	ACAUAUCUUCGUGGUUGAAA	UUUCAACCACGAAGAUGAUGU	[175-195]	[175-195]	-	-
Single Sp	21	CUACAAGUAUGAAGAAGGAUC	GAUCCUUCUUAUACUUGUAG	[1337-1357]	[1091-1111]	[1392-1409]	[1432-1449]
Single Sp	21	AUAAUGGGGUGCUCAUUGGAA	UUCUAUUGAGCACCCCAUUUAU	[709-729]	[463-483]	[772-782]	[812-822]
Single Sp	21	ACAAGAGCCUGCACUUCAGGA	UCUGGAAGUGCAGGCUCUUGU	[604-624]	[358-378]	-	-
Single Sp	21	ACAUCUGCCUGAAGCUGCUAG	CUAGCAGCUUCAGGCAGAUGU	[583-603]	[337-357]	-	-
Single Sp	21	AUAGACAUCUGCCUGAAGCUG	CAGCUUCAGGCAGAUGUCUUA	[579-599]	[333-353]	[634-654]	-
Single Sp	21	AGAGGAUGCUGUCUACUUGGA	UCCAAGUAGACAGCAUCCUCU	[443-463]	[198-217]	-	-
Single Sp	21	GAAUGUUUAUGUAGACUUUGC	GCAAAGUCUACAUAACAUAUUC	[2144-2164]	[1898-1918]	-	-
Single Sp	21	AAAUCCUGGUGAACAAGAUA	UGAUCUUGUUCACCAGGAUUU	[1831-1851]	[1585-1605]	[1883-1903]	[1923-1943]
Cross Sp	21	UCAUCUUCGUGGUUGAAACUG	CAGUUUAACCACGAAGAUGA	[178-198]	[178-198]	-	-
Cross Sp	21	ACAACAUAUCUUCGUGGUUG	CAACCACGAAGAUGAUGUUGU	[172-192]	[172-192]	-	-
Single Sp	21	UCAUCACACUCUCUCCUAAAG	CUUUAGGAGAGAGUGUGAUGA	[1699-1719]	[1453-1473]	-	-
Single Sp	21	ACACAGCGUUAUCACACUCU	AGAGUGUGAUGAACGCUGUGU	[1690-1710]	[1444-1464]	[1750-1760]	[1782-1800]
Single Sp	21	UCAAGGACCUCAAAGUGAAC	GGUUCACUUUGAGGUCCUUGA	[1615-1635]	[1369-1389]	-	-
Single Sp	21	UGAAGGCUCUGCAGAAGCUGA	UCAGCUUCUGCAGAGCCUUA	[1381-1401]	[1135-1155]	[1441-1454]	[1478-1494]
Single Sp	21	AGAGGCAGGUGUUUCUGAAGG	CCUUCAGAAACACCUGCCUCU	[1366-1386]	[1120-1140]	[1421-1436]	-
Single Sp	21	UCAGAGCCAUCAAAGAAGGAG	CUCCUUCUUUGAUGGCUCUGA	[1141-1161]	[895-915]	[1200-1216]	[1240-1256]
Cross Sp	21	UCACAGACCUCCAGAGCUCCA	UGGAGCUCUGGAGGUCUGUGA	[34-54]	[34-54]	[113-132]	[129-148]

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 42518071	human 4759229	rat 34856752	mouse 27229193
Single Sp	21	GAAGGAUACUAUCUGGAACUU	AAGUUCAGAUAGUAUCCUUC	[995-1015]	[749-769]	-	-
Single Sp	21	GGAAUAAGAAGAAGGAUACUA	UAGUAUCCUUCUUCUUAUUC	[985-1005]	[739-759]	[1041-1059]	-
Single Sp	21	GGAUUUUGGGGAUAAGAAGA	UCUUCUUAUUCUCCAAAAUCC	[976-996]	[730-750]	-	-
Single Sp	21	GCAGGAUUUUGGGGAUAAGA	UCUUAUUCUCCAAAAUCCUGC	[973-993]	[727-747]	-	-
Single Sp	21	CCACGAUACAGAUGGAAACCU	AGGUUCCAUUCUGUAUCGUGG	[923-943]	[677-697]	-	-
Single Sp	21	GCCUGAAGCUGCUAGACAAGA	UCUUGUCUAGCAGCUUCAGGC	[589-609]	[343-363]	-	-
Single Sp	21	CUGGAACUAUGGACAGUUUGA	UCAAACUGUCCAUAGUCCAG	[548-568]	[302-322]	[603-623]	[643-663]
Single Sp	21	CCCAGAGGAUGCUGUCUACUU	AAGUAGACAGCAUCCUCUGGG	[440-460]	[198-214]	-	-
Cross Sp	21	CUCCAGAGCUCCAGAAUAAU	AUUUUUUCUGGAGCUCUGGAG	[42-62]	[42-62]	[121-132]	[137-148]
Single Sp	21	GGGAGUUAUCCUGCUUUUCA	UGAAAAGCAGGAUGAACUCCC	[409-429]	-	[464-484]	-
Single Sp	21	GCAACAAGUUUAAGGACAUUA	UAAUGUCCUAAACUUGUUGC	[2113-2133]	[1867-1887]	-	-
Single Sp	21	CAACACCAAGCAAGCAUCAUU	AAUGAUGCUUGCUUGGUGUUG	[2037-2057]	[1791-1811]	-	-
Single Sp	21	CCAACACCAAGCAAGCAUCAU	AUGAUGCUUGCUUGGUGUUGG	[2036-2056]	[1790-1810]	-	-
Single Sp	21	GAACCAGCCACUCUCCAUACA	UGUAUGGAGAGUGGCUGGUUC	[1904-1924]	[1658-1678]	-	-
Single Sp	21	CCAAGCAUCACGAUUAUGUU	AACAUUAUUCGUGAUGCUUGG	[1866-1886]	[1620-1640]	-	-
Single Sp	21	CUGAGAAAUCCUGGUGAACA	UGUUCACCAGGAUUUUCUCAG	[1825-1845]	[1579-1599]	[1877-1897]	[1917-1937]
Single Sp	21	GCAAAGACCUACCCUGCAAA	UUUGCAGGGGUAGGUCUUUGC	[1722-1742]	[1476-1496]	[1776-1794]	-
Single Sp	21	CCAGUUAAGGACCUCAAAGU	ACUUUGAGGUCCUUGAACUGG	[1610-1630]	[1364-1384]	[1663-1680]	[1703-1720]
Single Sp	21	CCAACAUGGGCCAGGAUUAU	AUAUAUCCUGGCCCAUGUUGG	[1558-1578]	[1312-1332]	-	-
Single Sp	21	GAAGCUGAAGGCUAGAAGCUU	AAGCUUCUAGCCUUCAGCUUC	[1394-1414]	[1148-1168]	-	-
Single Sp	21	GGGAUGACAUCACAGAGAACU	AGUUCUCUGUGAUGUCAUCCC	[1318-1338]	[1072-1092]	-	[1415-1430]
Single Sp	21	GCAAUUUUUAUCAGCACAAAGA	UCUUUGUGCUGAUAAAAUUGC	[1279-1299]	[1033-1053]	[1336-1354]	[1376-1394]
Single Sp	21	GAGUUCUGUUGGCAUUUUUAU	AUAAAAUUGCCAACAGAACUC	[1268-1288]	[1022-1042]	-	-
Single Sp	21	CACGAGUUCUGUUGGCAUUUU	AAAUUGCCAACAGAACUCGUG	[1265-1285]	[1019-1039]	-	-
Cross Sp	21	CCUUAACCCUACCCUGUACU	AGUACAGGGUGAGGUUGAAGG	[121-141]	[121-141]	[209-220]	[225-236]
Single Sp	21	GAUACUAUCUGGAACUCCAU	AUGGAAGUCCAGAUAGUAUC	[999-1019]	[753-773]	-	-
Single Sp	21	GAAGAAGGAUACUAUCUGGAA	UUCAGAUAGUAUCCUUCUUC	[992-1012]	[746-766]	[1047-1067]	-
Single Sp	21	UGACAACACAGGCAGGAUUUU	AAAAUCCUGCCUGUGUUGUCA	[962-982]	[716-736]	[1017-1037]	[1058-1075]
Single Sp	21	UACGGGCAUUGCUGGGUCUUU	AAAGACCCAGCAUUGCCCGUA	[831-851]	[585-605]	-	[929-946]
Single Sp	21	AAUGGAAACUGGAGUGAGAAU	AUUCUCACUCCAGUUUCCAUU	[723-743]	[477-497]	[778-798]	[818-838]
Single Sp	21	AUGGGGUGUCUAAUGGAAACU	AGUUUCCAUUGAGCACCCCAU	[712-732]	[466-486]	[772-787]	[812-827]
Single Sp	21	CAGCAAUGAUGAUAAUGGGGU	ACCCCAUUAUCAUUGCUG	[698-718]	[452-472]	[753-764]	[793-804]
Single Sp	21	UGAUC AACAGCAAUGAUGAUA	UAUCAUUAUGCUGUUGAUA	[691-711]	[445-465]	[746-764]	[786-804]
Single Sp	21	GUGCCAUGAUCAACAGCAAUG	CAUUGCUGUUGAUAUGGCAC	[685-705]	[439-459]	-	-
Single Sp	21	AGUGGUGUGUGCCAUGAUCAA	UUGAUAUGGCACACACCACU	[677-697]	[431-451]	[736-749]	[776-789]
Single Sp	21	CUAGACAAGAGCCUGCACUUC	GAAGUCAGGCUCUUGUCUAG	[600-620]	[354-374]	-	-
Single Sp	21	GAAGCUGCUAGACAAGAGCCU	AGGCUCUUGUCUAGCAGCUUC	[593-613]	[347-367]	-	-
Single Sp	21	UGGACAGUUUGAAGACAAAAU	AUUUUUGUCUCAAACUGUCCA	[557-577]	[311-331]	[616-626]	[656-666]
Single Sp	21	AGGAGUAUGUAUGAAUGAUU	AAUCAUUAUGACAUACUCCU	[481-501]	[235-255]	-	-
Single Sp	21	AGAGGCAGGAGUAUGUAUGA	UCAUGACAUACUCCUGCCUCU	[475-495]	[229-249]	[530-545]	[570-585]
Single Sp	21	CUGUCUACUUGGACAGUGAAC	GUUCACUGUCCAAGUAGACAG	[451-471]	[205-225]	-	-
Single Sp	21	UAGGGGAGUUAUCCUGCUUU	AAAGCAGGAUGAACUCCCUA	[406-426]	-	[463-479]	-

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 42518071	human 4759229	rat 34856752	mouse 27229193
Single Sp	21	CUAGGGGAGUUCAUCCUGCUU	AAGCAGGAUGAACUCCCCUAG	[405-425]	-	[463-479]	-
Single Sp	21	GGUACCUCUUGAAAAUCCACA	UGUGGAUUUUAAGAGGUACC	[349-369]	-	-	-
Single Sp	21	GUCGGUACCUCUUGAAAAUCC	GGAUUUUAAGAGGUACCGAC	[346-366]	-	-	-
Single Sp	21	ACAGGAUGUUUAUGUAGACU	AGUCUACAUAACAUCUCCUGU	[2140-2160]	[1894-1914]	-	-
Single Sp	21	GGACAUUAAGGGUACAGGAA	UUCUGUAACCCUUAUUGUCC	[2126-2146]	[1880-1900]	-	-
Single Sp	21	CAAGUUUAAGGACAUUAAGGG	CCCUUAUUGUCCUUAACUUG	[2117-2137]	[1871-1891]	-	-
Single Sp	21	GAAGCAACAAGUUUAAGGACA	UGUCCUUAACUUGUUGCUUC	[2110-2130]	[1864-1884]	-	-
Single Sp	21	GCAGAUCCAAGCUAAUUAUGAG	CUCAUUAUAGCUUGGAUCUGC	[2090-2110]	[1844-1864]	[2143-2156]	[2182-2202]
Single Sp	21	CAAGAGUGGACAAAGGCAGAU	AUCUGCCUUUGUCCACUCUUG	[2075-2095]	[1829-1849]	-	[2167-2187]
Single Sp	21	CUUCAAGAGUGGACAAAGGCA	UGCCUUUGUCCACUCUUGAAG	[2072-2092]	[1826-1846]	[2125-2141]	[2164-2184]
Single Sp	21	UCAAGAAACAGCAGAAAGUCU	AGACUUUCUGCUGUUUCUUGA	[1996-2016]	[1750-1770]	-	-
Single Sp	21	GUGGCCUCUUAAGAAACAGC	GCUGUUUCUUGAAGAGGCCAC	[1987-2007]	[1741-1761]	-	-
Single Sp	21	GAAGGAAGUGGCCUCUUAAG	CUUGAAGAGGCCACUUCUUC	[1980-2000]	[1734-1754]	[2032-2048]	[2072-2088]
Single Sp	21	GCAUCACGAUUAUUGUUCUAG	CUAGAACAUAUUCGUGAUGC	[1870-1890]	[1624-1644]	-	[1962-1982]
Single Sp	21	CAAGCAUCACGAUUAUUGUUC	GAACAUAUUCGUGAUGCUUG	[1867-1887]	[1621-1641]	-	[1962-1979]
Single Sp	21	UCAUCACCUUAUCUUAUCCAA	UUGGAUAAGAUAAAGGUGAUGA	[1849-1869]	[1603-1623]	-	-
Single Sp	21	CAGACAAGCUGAUCCGCAUCA	UGAUGCGGAUCAGCUUGUCUG	[1777-1797]	[1531-1551]	-	-
Single Sp	21	CAACAGACAAGCUGAUCCGCA	UGCAGCAUCAGCUUGUCUGUUG	[1774-1794]	[1528-1548]	[1828-1838]	-
Single Sp	21	CAGUACCUGUCAACAGACAAG	CUUGUCUGUUGACAGGUACUG	[1764-1784]	[1518-1538]	[1816-1836]	-
Single Sp	21	GCCAGUACCUGUCAACAGACA	UGUCUGUUGACAGGUACUGGC	[1762-1782]	[1516-1536]	[1814-1834]	-
Single Sp	21	GCAAAAUCCUUAUUCUCCAGU	ACUGGGAAUAGGAGAUUUUGC	[1738-1758]	[1492-1512]	-	-
Single Sp	21	CCUGCAAAAUCCUUAUUCUCC	GGGAAUAGGAGAUUUUGCAGG	[1735-1755]	[1489-1509]	-	-
Single Sp	21	AAAGACCUACCCUGCAAAAU	AUUUUGCAGGGGUAGGUCUUU	[1724-1744]	[1478-1498]	[1776-1796]	-
Single Sp	21	CAAAGACCUACCCUGCAAAA	UUUUGCAGGGGUAGGUCUUUG	[1723-1743]	[1477-1497]	[1776-1795]	-
Single Sp	21	CACACUCUCUCCUAAAGAAGC	GCUUCUUUAGGAGAGAGUGUG	[1703-1723]	[1457-1477]	-	-
Single Sp	21	AUCACACUCUCUCCUAAAGAA	UUCUUUAGGAGAGAGUGUGAU	[1701-1721]	[1455-1475]	-	-
Single Sp	21	CAGCGUUAUCACACUCUCUC	GAGAGAGUGUGAUGAACGCUG	[1693-1713]	[1447-1467]	[1750-1760]	[1785-1800]
Single Sp	21	UCAACAUGUCCUCCAGUUA	UGAACUGGGAGGACAUGUUGA	[1597-1617]	[1351-1371]	-	-
Single Sp	21	CUCAACAUGUCCUCCAGUUC	GAACUGGGAGGACAUGUUGAG	[1596-1616]	[1350-1370]	-	-
Single Sp	21	ACAUGGGCCAGGAUAUAGCU	AGCAUAUAUCCUGGCCCAUGU	[1561-1581]	[1315-1335]	-	-
Single Sp	21	GUGCAAGUCUCCUGAAAUUC	GAAUUUCAGGGAGACUUGCAC	[1521-1541]	[1275-1295]	-	-
Single Sp	21	UGGUGCAAGUCUCCUGAAAU	AUUUCAGGGAGACUUGCACCA	[1519-1539]	[1273-1293]	-	-
Single Sp	21	GAGCAGAGUUGCAACCUUCCA	UGGAAGGUUGCAACUCUGCUC	[1432-1452]	[1186-1206]	-	-
Single Sp	21	CCAAAGAGGAGCAGAGUUGCA	UGCAACUCUGCUCCUCUUUGG	[1424-1444]	[1178-1198]	-	-
Single Sp	21	UGCAGAAGCUGAAGGCUAGAA	UUCUAGCCUUCAGCUUCUGCA	[1390-1410]	[1144-1164]	-	-

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 42518071	human 4759229	rat 34856752	mouse 27229193
Single Sp	21	GCAGGUGUUUCUGAAGGCUCU	AGAGCCUUCAGAAACACCUGC	[1370-1390]	[1124-1144]	[1426-1445]	-
Single Sp	21	CAAGUAUGAAGAAGGAUCCCU	AGGGAUCCUUCUUAUACUUG	[1340-1360]	[1094-1114]	[1395-1415]	[1435-1455]
Single Sp	21	ACAGAGAACUACAAGUAUGAA	UUAUACUUGUAGUUCUCUGU	[1329-1349]	[1083-1103]	[1387-1404]	[1427-1444]
Single Sp	21	ACAUCACAGAGAACUACAAGU	ACUUGUAGUUCUCUGUGAUGU	[1324-1344]	[1078-1098]	[1382-1399]	-
Single Sp	21	GCACAAAGAGCAUCCAGAGUG	CACUCUGGAUGCUCUUUGUGC	[1291-1311]	[1045-1065]	[1346-1366]	[1386-1406]
Single Sp	21	GGACACGAGUUCUGUUGGCAA	UUGCCAACAGAACUCGUGUCC	[1262-1282]	[1016-1036]	-	-
Cross Sp	21	UCAACCUCACCCUGUACUUA	UGAAGUACAGGGUGAGGUUGA	[124-144]	[124-144]	[209-221]	[225-237]
Single Sp	21	GGUGAAUGCUGACUGCAUGUC	GACAUGCAGUCAGCAUUCACC	[1202-1222]	[956-976]	[1257-1277]	[1297-1317]
Single Sp	21	GAUGGUGAAUGCUGACUGCAU	AUGCAGUCAGCAUUCACCAUC	[1199-1219]	[953-973]	[1255-1274]	[1295-1314]
Single Sp	21	UUUGUGUUUUCGAUGGUGAAU	AUUCACCAUCGAAAACACAAA	[1188-1208]	[942-962]	-	-
Single Sp	21	ACACGCCCCUUUGUGUUUCGA	UCGAAAACACAAAGGGCGUGU	[1180-1200]	[934-954]	-	-
Single Sp	21	CUAUGACACGCCCUUUGUGUU	AACACAAAGGGCGUGUCAUAG	[1175-1195]	[929-949]	-	-
Single Sp	21	CCUGAACUAUGACACGCCCUU	AAGGGCGUGUCAUAGUUCAGG	[1169-1189]	[923-943]	[1225-1235]	[1268-1278]
Single Sp	21	AAGUGGACCUGAACUAUGACA	UGUCAUAGUUCAGGUCCACUU	[1162-1182]	[916-936]	[1225-1235]	-
Single Sp	21	AAGGAGAAGUGGACCUGAACU	AGUUCAGGUCCACUUCUCCUU	[1156-1176]	[910-930]	-	-
Single Sp	21	CUAUCUGGAACUCCAUGUCU	AGACAUGGAAGUUCAGAUAG	[1003-1023]	[757-777]	-	-
Single Sp	21	AUACUAUCUGGAACUCCAUG	CAUGGAAGUUCAGAUAGUAU	[1000-1020]	[754-774]	-	-
Single Sp	21	UAAGAAGAAGGAUACUAUCUG	CAGAUAGUAUCCUUCUUCUUA	[989-1009]	[743-763]	[1047-1064]	-
Single Sp	21	ACACAGGCAGGAUUUUGGGGA	UCCCCAAAUCCUGCCUGUGU	[967-987]	[721-741]	-	[1062-1075]
Single Sp	21	AGAUGAGUAUUAUGACAACAC	GUGUUGUCAUAAUACUCAUCU	[950-970]	[704-724]	[1006-1025]	[1046-1065]
Single Sp	21	AUGGAAACCUGAUCAUAGAUG	CAUCUAUGAUCAGGUUUCCAU	[934-954]	[688-708]	[989-1009]	[1029-1049]
Single Sp	21	UGAUCACCAACUUCGACUCUG	CAGAGUCGAAGUUGGUGAUCA	[901-921]	[655-675]	[956-976]	[996-1016]
Single Sp	21	GAAUUAACACAGACGGCGCCAA	UUGGCGCCGUCUGUAAUUC	[740-760]	[494-514]	-	-
Single Sp	21	AAACUGGAGUGAGAAUUAACAC	GUGUAAUUCACUCCAGUUU	[728-748]	[482-502]	[784-800]	[824-840]
Single Sp	21	GGUGCUCAAUGGAAACUGGAG	CUCCAGUUUCCAUUGAGCACC	[716-736]	[470-490]	[772-791]	[812-831]
Single Sp	21	UAAUGGGGUGCUAAUGGAAA	UUUCCAUUGAGCACCCCAUUA	[710-730]	[464-484]	[772-782]	[812-822]
Single Sp	21	UGAUGAUAAUGGGGUGCUCAA	UUGAGCACCCCAUUAUCAUCA	[704-724]	[458-478]	-	-
Single Sp	21	CAAUGAUGAUAAUGGGGUGCU	AGCACCCCAUUAUCAUUAUG	[701-721]	[455-475]	-	-
Single Sp	21	UGUGUGCCAUGAUCAACAGCA	UGCUGUUGAUCAUGGCACACA	[682-702]	[436-456]	[737-757]	[777-797]
Single Sp	21	AGAGUGGUGUGUGCCAUGAUC	GAUCAUGGCACACACCACUCU	[675-695]	[429-449]	[730-749]	[770-789]
Single Sp	21	UCAUAGACAUCUGCCUGAAGC	GCUUCAGGCAGAUUCUAUGA	[577-597]	[331-351]	[632-645]	-
Single Sp	21	CAAAAUCAUAGACAUCUGCCU	AGGCAGAUUCUAUGAUUUUG	[572-592]	[326-346]	[631-645]	-
Cross Sp	21	GAAAUAAUGUGCGGCACCACA	UGUGGUGCCGCACAUUUAUUC	[55-75]	[55-75]	-	-
Single Sp	21	AUGGCUUCAUCUACCAAGGCA	UGCCUUGGUAGAUAGGCCAU	[502-522]	[256-276]	[557-575]	[597-615]
Single Sp	21	UGUCAUGAAUGAUUAUGGCUU	AAGCCAUAAUCAUUCAGACA	[488-508]	[242-262]	[548-563]	[588-603]
Single Sp	21	AGGAUGCUGUCUACUUGGACA	UGUCCAAGUAGACAGCAUCCU	[445-465]	[199-219]	-	-
Single Sp	21	UCCUGCUUUUCAUCCUGGU	ACCAGGGAUUGAAAAGCAGGA	[418-438]	-	[473-493]	[513-533]
Single Sp	21	UCAUCCUGCUUUUCAUCCCU	AGGGAUUGAAAAGCAGGAUGA	[415-435]	-	-	-
Single Sp	21	AGUUCAUCCUGCUUUUCAUUC	GAUUGAAAAGCAGGAUGAACU	[412-432]	-	[467-487]	-
Single Sp	21	UGAAAAUCCACAUCGACUCCU	AGGAGUCGAUGGGAUUUUUCA	[358-378]	-	-	-
Single Sp	21	UCUUGAAAAUCCACAUCGACU	AGUCGAUGUGGAUUUUCAAGA	[355-375]	-	-	-
Single Sp	21	UUAAGGACAUUAAGGGUUAUA	UGUAACCCUUAUUGUCCUUA	[2122-2142]	[1876-1896]	-	-
Single Sp	21	ACAAGUUUAAGGACAUUAAGG	CCUUAUUGUCCUUAACUUGU	[2116-2136]	[1870-1890]	-	-

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 42518071	human 4759229	rat 34856752	mouse 27229193
Single Sp	21	UGAGAAGCAACAAGUUUAAGG	CCUUAACUUGUUGCUUCUCA	[2107-2127]	[1861-1881]	-	-
Single Sp	21	CAAGCAUCAUUCUGGAGACCG	CGGUCUCCAGAAUGAUGCUUG	[2047-2067]	[1801-1821]	-	-
Single Sp	21	AAGCAAGCAUCAUUCUGGAGA	UCUCCAGAAUGAUGCUUGCUU	[2044-2064]	[1798-1818]	-	-
Single Sp	21	CAAACCCCAACACCAAGCAAG	CUUGCUUGGUGUUGGGUUUUG	[2030-2050]	[1784-1804]	-	-
Single Sp	21	AGUCUUCUUGGAGUCCUCA	UUGAGGACUCCAAGGAAGACU	[2012-2032]	[1766-1786]	[2072-2084]	-
Single Sp	21	GAAAGUCUUCUUGGAGUCCU	AGGACUCCAAGGAAGACUUUC	[2009-2029]	[1763-1783]	-	-
Single Sp	21	AGCAGAAAGUCUUCUUGGAG	CUCCAAGGAAGACUUUCUGCU	[2005-2025]	[1759-1779]	-	-
Single Sp	21	AGAAACAGCAGAAAGUCUCC	GGAAGACUUUCUGCUGUUUCU	[1999-2019]	[1753-1773]	-	-
Single Sp	21	UGCUGACUGUGGAAGGAAGUG	CACUCCUCCACAGUCAGCAGCA	[1969-1989]	[1723-1743]	[2021-2041]	[2061-2081]
Single Sp	21	ACUGUGUGCUGACUGUGGAAG	CUUCCACAGUCAGCACACAGU	[1963-1983]	[1717-1737]	-	[2055-2067]
Single Sp	21	UGAGGACUGUGUGCUGACUGU	ACAGUCAGCACAGUCCUCA	[1958-1978]	[1712-1732]	-	[2050-2067]
Single Sp	21	GUGAUUUUUCAAACCCCCUC	GAGGGGUUUUGAAAAUAUCAC	[1926-1946]	[1680-1700]	[1984-1994]	-
Single Sp	21	CGAUUAAUGUUCUAGGAGCAG	CUGCUCUAGAACAUAUAUCG	[1876-1896]	[1630-1650]	[1929-1946]	[1969-1986]
Single Sp	21	CACGAUUAUGUUCUAGGAGC	GCUCCUAGAACAUAUAUCGUG	[1874-1894]	[1628-1648]	[1929-1946]	[1969-1986]
Single Sp	21	AUCCAAGCAUCACGAUUAUG	CAUUAACUGUGAUGCUUGGAU	[1864-1884]	[1618-1638]	-	-
Single Sp	21	CUUAUCUUAUCCAAGCAUCAC	GUGAUGCUUGGAUAAGAUAG	[1856-1876]	[1610-1630]	-	-
Single Sp	21	AGAUAUCACCUUAUCUUAUC	GAUAAGAUAAAGGUGAUGAUCU	[1846-1866]	[1600-1620]	[1898-1910]	[1938-1950]
Single Sp	21	GCAGUCCUGAGAAAUCUUGG	CCAGGAUUUUCUCAGGACUGC	[1819-1839]	[1573-1593]	[1871-1891]	[1912-1931]
Single Sp	21	CUUCGUGGUUGAAACUGGACC	GGUCCAGUUUCAACCACGAAG	[182-202]	[1582-1598]	-	-
Single Sp	21	GAAGAGAAAAGCAGUCCUGAG	CUCAGGACUGCUUUUCUCUUC	[1809-1829]	[1563-1583]	[1861-1881]	-
Single Sp	21	UGCCUGGGUGAAGAGAAAAG	CUUUUCUUCUACCCAGGGCA	[1799-1819]	[1553-1573]	[1851-1868]	[1891-1908]
Single Sp	21	ACAAGCUGAUCCGCAUCAGUG	CACUGAUGCGGAUCAGCUUGU	[1780-1800]	[1534-1554]	-	[1872-1892]
Single Sp	21	ACAGCCAGUACCUGUCAACAG	CUGUUGACAGGUACUGGCUGU	[1759-1779]	[1513-1533]	[1811-1831]	-
Single Sp	21	AUCUCCAUUCCCAGUACAGC	GCUGUACUGGGAUAGGAGAU	[1743-1763]	[1497-1517]	-	-
Single Sp	21	ACCUACCCUGCAAAUUCUCC	GGAGAUUUUGCAGGGGUAGGU	[1728-1748]	[1482-1502]	-	-
Single Sp	21	ACACUCUCUCCUAAAGAAGCA	UGCUUCUUUAGGAGAGAGUGU	[1704-1724]	[1458-1478]	-	-
Single Sp	21	ACCUCAAAGUGAACCGAGUG	CACUCAGGUUCACUUUGAGGU	[1621-1641]	[1375-1395]	-	-
Single Sp	21	ACAUGUCCUCCAGUUAAGG	CCUUGAACUGGGAGGACAUGU	[1600-1620]	[1354-1374]	-	-
Single Sp	21	AACAUGUCCUCCAGUUAAG	CUUGAACUGGGAGGACAUGUU	[1599-1619]	[1353-1373]	-	-
Single Sp	21	CAGGAUUAUGCUUUGUCCUG	CAGGACAAAGCAUUAUCCUG	[1569-1589]	[1323-1343]	-	-
Single Sp	21	CCCUGAAAUCAAGCUGCUCG	CGAGCAGCUUGAAUUUCAGGG	[1531-1551]	[1285-1305]	-	-
Single Sp	21	AAGUCUCCUGAAAUCAAGC	GCUUGAAUUUCAGGGAGACUU	[1525-1545]	[1279-1299]	-	-
Single Sp	21	UGAUGUGGUGCAAGUCUCCU	AGGGAGACUUGCACCACAUA	[1514-1534]	[1268-1288]	-	-
Single Sp	21	AUACACCUCCUUCGACCCA	UGGGUCGAAGGAAGGUGUAU	[1492-1512]	[1246-1266]	[1545-1564]	[1587-1604]
Single Sp	21	UCCAUGGCUCCAAAGAGGA	UCCUCUUUGGAGCCAUGGAA	[1413-1433]	[1167-1187]	-	-

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 42518071	human 4759229	rat 34856752	mouse 27229193
Single Sp	21	UGAGAAGCAACAAGUUUAAGG	CCUUAACUUGUUGCUUCUCA	[2107-2127]	[1861-1881]	-	-
Single Sp	21	CAAGCAUCAUUCUGGAGACCG	CGGUCUCCAGAAUGAUGCUUG	[2047-2067]	[1801-1821]	-	-
Single Sp	21	AAGCAAGCAUCAUUCUGGAGA	UCUCCAGAAUGAUGCUUGCUU	[2044-2064]	[1798-1818]	-	-
Single Sp	21	CAAACCCCAACACCAAGCAAG	CUUGCUUGGUGUUGGGGUUU	[2030-2050]	[1784-1804]	-	-
Single Sp	21	AGUCUUCUUGGAGUCCUCA	UUGAGGACUCCAAGGAAGACU	[2012-2032]	[1766-1786]	[2072-2084]	-
Single Sp	21	GAAAGUCUUCUUGGAGUCCU	AGGACUCCAAGGAAGACUUUC	[2009-2029]	[1763-1783]	-	-
Single Sp	21	AGCAGAAAGUCUUCUUGGAG	CUCCAAGGAAGACUUUCUGCU	[2005-2025]	[1759-1779]	-	-
Single Sp	21	AGAAACAGCAGAAAGUCUUC	GGAAGACUUUCUGCUUUUCU	[1999-2019]	[1753-1773]	-	-
Single Sp	21	UGCUGACUGUGGAAGGAAGUG	CACUCCUUCACAGUCAGCA	[1969-1989]	[1723-1743]	[2021-2041]	[2061-2081]
Single Sp	21	ACUGUGUGCUGACUGUGGAAG	CUUCCACAGUCAGCACACAGU	[1963-1983]	[1717-1737]	-	[2055-2067]
Single Sp	21	UGAGGACUGUGUGCUGACUGU	ACAGUCAGCACACAGUCCUCA	[1958-1978]	[1712-1732]	-	[2050-2067]
Single Sp	21	GUGAUUUUUCAAACCCCCUC	GAGGGGGUUUGAAAUUAUCAC	[1926-1946]	[1680-1700]	[1984-1994]	-
Single Sp	21	CGAUUAAUGUUCUAGGAGCAG	CUGCUCUAGAACAUAUUAUCG	[1876-1896]	[1630-1650]	[1929-1946]	[1969-1986]
Single Sp	21	CACGAUUAUGUUCUAGGAGC	GCUCCUAGAACAUAUUAUCGUG	[1874-1894]	[1628-1648]	[1929-1946]	[1969-1986]
Single Sp	21	AUCCAAGCAUCACGAUUAUG	CAUUAUUCGUGAUGCUUGGAU	[1864-1884]	[1618-1638]	-	-
Single Sp	21	CUUAUCUUAUCCAAGCAUCAC	GUGAUGCUUGGAUAAGAUAG	[1856-1876]	[1610-1630]	-	-
Single Sp	21	AGAUCAUACCUUAUCUUAUC	GAUAGAUAAGGUGAUGAUCU	[1846-1866]	[1600-1620]	[1898-1910]	[1938-1950]
Single Sp	21	GCAGUCCUGAGAAAUCUGG	CCAGGAUUUUCUCAGGACUGC	[1819-1839]	[1573-1593]	[1871-1891]	[1912-1931]
Single Sp	21	CUUCGUGGUUGAACUGGACC	GGUCCAGUUUACAACCGAAG	[182-202]	[182-198]	-	-
Single Sp	21	GAAGAGAAAAGCAGUCCUGAG	CUCAGGACUGCUUUUCUCUUC	[1809-1829]	[1563-1583]	[1861-1881]	-
Single Sp	21	UGCCCUGGGUGAAGAGAAAAG	CUUUUCUCUUCACCCAGGGCA	[1799-1819]	[1553-1573]	[1851-1868]	[1891-1908]
Single Sp	21	ACAAGCUGAUCCGCAUCAGUG	CACUGAUGCGGAUCAGCUUGU	[1780-1800]	[1534-1554]	-	[1872-1892]
Single Sp	21	ACAGCCAGUACCUGUCAACAG	CUGUUGACAGGUACUGGCUGU	[1759-1779]	[1513-1533]	[1811-1831]	-
Single Sp	21	AUCUCCUAUUCUCCAGUACAGC	GCUGUACUGGGAUAGGAGAU	[1743-1763]	[1497-1517]	-	-
Single Sp	21	ACCUACCCUGCAAAUCUCC	GGAGAUUUUGCAGGGGUAGGU	[1728-1748]	[1482-1502]	-	-
Single Sp	21	ACACUCUCUCCUAAAGAAGCA	UGCUUCUUUAGGAGAGAGUGU	[1704-1724]	[1458-1478]	-	-
Single Sp	21	ACCUCAAAGUGAACCGAGUG	CACUCAGGUUCACUUUGAGGU	[1621-1641]	[1375-1395]	-	-
Single Sp	21	ACAUGUCCUCCAGUUAAGG	CCUUGAACUGGGAGGACAUGU	[1600-1620]	[1354-1374]	-	-
Single Sp	21	AACAUGUCCUCCAGUUAAG	CUUGAACUGGGAGGACAUGUU	[1599-1619]	[1353-1373]	-	-
Single Sp	21	CAGGAUAUAUGCUUUGUCCUG	CAGGACAAAGCAUAUAUCCUG	[1569-1589]	[1323-1343]	-	-
Single Sp	21	CCCUGAAAUCAAGCUGCUCG	CGAGCAGCUUGAAUUUCAGGG	[1531-1551]	[1285-1305]	-	-
Single Sp	21	AAGUCUCCUGAAAUCAAGC	GCUUGAAUUUCAGGGAGACUU	[1525-1545]	[1279-1299]	-	-
Single Sp	21	UGAUGUGGUGCAAGUCUCCU	AGGGAGACUUGCACCACAUA	[1514-1534]	[1268-1288]	-	-
Single Sp	21	AUACACCUUCCUUCGACCCA	UGGGUCGAGGGAAGGUGUAU	[1492-1512]	[1246-1266]	[1545-1564]	[1587-1604]
Single Sp	21	UCCAUGGCUCUCCAAAGAGGA	UCCUCUUGGGAGCCAUGGAA	[1413-1433]	[1167-1187]	-	-

Table HTGase7: 19-mers

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 16445034	mouse 51712629	rat 34857657
Single Sp	19	GGAACGACGUGGUGUAUGU	ACAUACACCACGUCGUUCC	[652-670]	[2210-2222]	[802-818]
Single Sp	19	GAACUUUCAUCCUACUUUU	AAAAGUAGGAUGAAAGUUC	[409-427]	-	-
Single Sp	19	CCAUGCUGGUCCUAAAAGA	UCUUUUAGGACCAGCAUGG	[1792-1810]	[3349-3362]	[1933-1946]
Single Sp	19	GGAUGAACCUGGACUUUGG	CCAAAGUCCAGGUUCAUCC	[1660-1678]	-	-
Single Sp	19	ACAAGAGCCUGUAUCACUU	AAGUGAUACAGGCUCUUGU	[604-622]	-	[752-765]
Single Sp	19	AUAGACAUCUGCUUUGAGA	UCUCAAGCAGAUGUCUAU	[579-597]	[2137-2149]	[733-745]
Single Sp	19	CAAGGGUCAUGAAAGAUUC	GAAUCUUCAUGACCCUUG	[515-533]	-	-
Single Sp	19	UUACAAGGGUCAUGAAAGA	UCUUUCAUGACCCUUGUAA	[512-530]	[2065-2075]	[585-596]
Single Sp	19	CCAACUCUCUCCAAGUUUC	GAAACUUGGAGAGAGUUGG	[298-316]	[1851-1865]	[372-386]
Single Sp	19	GCAACGAGGUCAAGGAGAU	AUCUCCUUGACCUCGUUGC	[2074-2092]	[3787-3800]	[2215-2228]
Single Sp	19	UGAGUGCCAUGAUCAACAG	CUGUUGAUCAUGGCACUCA	[682-700]	[2239-2252]	-
Single Sp	19	AAAGACUGUUCCAGCGGA	UCCGUGGGAAACAGUCUUU	[636-654]	-	-
Single Sp	19	UCACCUUUGUGGCUGAGAC	GUCUCAGCCACAAAGGUGA	[178-196]	[1730-1748]	[251-269]
Single Sp	19	UCAAGGAGAUCAAAGGCUA	UAGCCUUUGAUCUCCUUGA	[2083-2101]	[3791-3809]	[2219-2237]
Single Sp	19	ACACCUJAAUUGGUGGCUCU	AGAGCCACCAUUAAGGUGU	[1900-1918]	-	-
Single Sp	19	CUAUUGAGGUGUCUGAGAG	CUCUCAGACACCUCAAUAG	[1837-1855]	[3389-3400]	[1973-1984]
Single Sp	19	AAAGAUUCAUACCCUCCUG	CAGGAGGUGAUGAAUCUUU	[526-544]	-	-
Single Sp	19	UUUUGGCUUUGUUUACAAG	CUUGUAAACAAAGCCAUAA	[500-518]	-	[574-591]
Single Sp	19	AAAUACUGCUGCAGGAGUA	UACUCCUGCAGCAGUAUUU	[469-487]	-	-
Single Sp	19	AUAGAGAUUCUCUCAGGGCC	GGCCUGAGAGAUUCUUAU	[363-381]	[1916-1933]	-
Single Sp	19	ACAUUUUCGUCACUGUGGC	GCCACAGUGACGAUAUUGU	[2107-2125]	-	-
Single Sp	19	AAAUUCAACUGGACCUCUA	UAGAGGUCCAGUUGAAUUU	[2011-2029]	-	[2148-2165]
Single Sp	19	AAAGAUUCUGUCUGGAGC	GCUCCAGACAGAUUCUUU	[1806-1824]	-	-
Single Sp	19	AAAUAGAGAUUCUCAGGG	CCCUGAGAGAUUCUUAUUU	[361-379]	[1916-1931]	-
Single Sp	19	AUAUCUGUCUGGAGCCUCC	GGAGGCUCCAGACAGAUUAU	[1810-1828]	[3369-3380]	[1953-1964]
Single Sp	19	CAACAGCAACGAUGACA AU	AUUGUCAUCGUUGCUGUUG	[695-713]	-	-
Single Sp	19	GCUUUGAGAUCCUGAACAA	UUGUUCAGGAUCUCAAAGC	[589-607]	[2141-2159]	[737-755]
Single Sp	19	GGAACUACGGGCAGUUUGA	UCAAAACUGCCGUAGUUC	[550-568]	[2102-2120]	[623-636]
Single Sp	19	CGAGAUUAUGGCUUUGUUU	AAACAAAGCCAUAAUCUCG	[495-513]	-	[574-586]
Single Sp	19	GCGAGAUUAUGGCUUUGUU	AACAAAGCCAUAAUCUCG	[494-512]	-	[574-585]
Single Sp	19	CCAUUACACUCUGAAAAUA	UAUUUUCAGAGUGUAAUGG	[347-365]	-	-
Single Sp	19	GCAGUUUAUUGGCCAUUACA	UGUAAUGGCCAAUAAUCUGC	[336-354]	-	-
Single Sp	19	CCAAGUUUCCCUUUUCACA	UGUGAAAAGGGAAACUUGG	[308-326]	-	-
Single Sp	19	CUCCAAGUUUCCCUUUUCA	UGAAAAGGGAAACUUGGAG	[306-324]	-	-
Single Sp	19	CUCCAACUCUCUCCAAGUU	AACUUGGAGAGAGUUGGAG	[296-314]	[1851-1865]	[372-386]
Single Sp	19	CUUCUGAUUUCACCAUUGA	UCAUUGGUGAAAUCAGAAAG	[277-295]	-	[682-698]
Single Sp	19	GACACACCCUCCAAAUUCA	UGAAUUUGGAGGGUGUGUC	[1999-2017]	-	-
Single Sp	19	CUCCCCACUUGUCUAUUGA	UCAAUAGACAAGUGGGGAG	[1825-1843]	[3377-3395]	[1961-1979]
Single Sp	19	GGUCCAUGCUGGUCCUAAA	UUUAGGACCAGCAUGGACC	[1789-1807]	[3349-3359]	[1933-1943]
Single Sp	19	CAAGCUAACGGACGAAAAAG	CUUUUCGUCCGUUAGCUUG	[1727-1745]	-	-
Single Sp	19	ACAAGCUAACGGACGAAAA	UUUUCGUCCGUUAGCUUGU	[1726-1744]	-	-
Single Sp	19	CUACAGCAAUACAGAAAC	GUUUCUGUAAUUGCUGUAG	[1709-1727]	-	[1845-1859]
Single Sp	19	CAGCAACGAUGACAAUGGC	GCCAUUGUCAUCGUUGCUG	[698-716]	-	-

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 16445034	mouse 51712629	rat 34857657
Single Sp	19	UCAACAGCAACGAUGACAA	UUGUCAUCGUUGCUGUUGA	[694-712]	-	-
Single Sp	19	GUGCCAUGAUCAACAGCAA	UUGCUGUUGAUCAUGGCAC	[685-703]	[2239-2255]	[827-839]
Single Sp	19	GAGCCUGUAUCACUAAAAG	CUUUUAGUGAUACAGGCUC	[608-626]	-	-
Single Sp	19	UGAACAAAGAGCCUGUAUCA	UGAUACAGGCUCUUGUUGA	[601-619]	[2153-2165]	[749-765]
Single Sp	19	UCAUAGACAUCUGCUUUGA	UCAAGCAGAUUGUCUAUGA	[577-595]	[2137-2147]	[733-743]
Single Sp	19	GGACAUCAUAGACAUCUGC	GCAGAUUGCUAUGAUUGCC	[572-590]	-	-
Single Sp	19	AAGAGGACAUCAUAGACAU	AUGUCUAUGAUUGCCUCUU	[568-586]	[2120-2130]	[716-726]
Single Sp	19	GGAACAACAAGGAGCACCA	UGGUGCUCCUUGUUGUUGC	[58-76]	[1610-1628]	[131-149]
Single Sp	19	CCAGGAACAACAAGGAGCA	UGCUCUUGUUGUUGUCCUGG	[55-73]	[1607-1622]	[128-143]
Single Sp	19	GUUAUUAUCGCGAGAUUAU	AUAUUCUGCGAUUAUUAUAC	[485-503]	-	-
Single Sp	19	GCAGGAGUAUAUCAUGCGA	UCGCAUGAUUAUACUCCUGC	[479-497]	[2034-2046]	[555-567]
Single Sp	19	GUGAAAUACUGCUGCAGGA	UCCUGCAGCAGUAUUUACAC	[466-484]	-	-
Single Sp	19	CAAGUGAAAUACUGCUGCA	UGCAGCAGUAUUUACACUUG	[463-481]	-	-
Single Sp	19	CCUGCCAAGUGAAAUACUG	CAGUAUUUACACUUGGCAGG	[458-476]	[2010-2023]	-
Single Sp	19	ACGUCUACCUGCCAAGUGA	UCACUUGGCAGGUAGACGU	[451-469]	[2005-2021]	[526-536]
Single Sp	19	AGAGCUCCAGGAACAACAA	UUGUUGUUGCUGGAGCUCU	[49-67]	[1607-1619]	[128-140]
Single Sp	19	GUCACAGUGUGACUUACCC	GGGUAAGUCACACUGUGAC	[385-403]	[1943-1955]	-
Single Sp	19	CCAAUGCAGUUAUUGGCCA	UGGCCAAUACUGCAUUGG	[331-349]	-	-
Single Sp	19	ACCAGCCAAUGCAGUUAUU	AUAACUGCAUUGGCUGGU	[326-344]	-	-
Single Sp	19	CAACUCUCUCCAAGUUUCC	GGAAACUUGGAGAGAGUUG	[299-317]	[1851-1865]	[372-386]
Single Sp	19	GACUCCAACUCUCUCCAAG	CUUGGAGAGAGUUGGAGUC	[294-312]	[1851-1864]	[372-385]
Single Sp	19	CCAUGACUCCAACUCUCU	AGAGAGUUGGAGUCAAUGG	[289-307]	-	-
Single Sp	19	GAGCGCUUCUGAUUUACCC	GGUGAAAUCAGAAGCGCUC	[272-290]	-	[682-693]
Single Sp	19	CGAGCCACAUCUUCUCUA	UGAGGAAGAAUGUGGCUCG	[228-246]	-	-
Single Sp	19	ACGACCACAUCACCUUUGU	ACAAAGGUGAUGUGGUCGU	[169-187]	-	-
Single Sp	19	GAAUGAAGCUCUGUAGAA	UUCUAACAGAGCUUCAUUC	[2251-2269]	-	-
Single Sp	19	GCCUGGGAAUGAAUGAAGC	GCUUCAUUAUUCUCCAGGC	[2241-2259]	-	-
Single Sp	19	CUACUCCUGGCUAUGUCGU	ACGACAUAGCCAGGAGUAG	[2191-2209]	-	-
Single Sp	19	CCUUCUACUCCUGGCUAU	AUAGCCAGGAGUAGAAAGG	[2186-2204]	-	-
Single Sp	19	GGACAUAUUCGUCACUGUG	CACAGUGACGAAUAUGUCC	[2105-2123]	-	-
Single Sp	19	GGAGAUCAAAGGCUACAAG	CUUGUAGCCUUUGAUCUCC	[2087-2105]	[3795-3813]	[2223-2241]
Single Sp	19	ACACACCCUCCAAAUAUCAA	UUGAAUUUGGAGGGUGUGU	[2000-2018]	-	-
Single Sp	19	UCAAUUGGGCAGAUAGCAA	UUUGCUAUCUGCCAUUGA	[1957-1975]	[3509-3521]	[2093-2105]
Single Sp	19	CCUUAUUGGUGGCUCUGAG	CUCAGAGCCACCAUUAAGG	[1903-1921]	-	-
Single Sp	19	UCACCAACACCUAAUUGGU	ACCAUUAAGGUGUUGGUGA	[1894-1912]	[3446-3456]	[2030-2048]
Single Sp	19	CCCCACUUGUCUAUUGAGG	CCUCAUAGACAAGUGGGG	[1827-1845]	[3379-3397]	[1967-1981]
Single Sp	19	UGGAUCAGGUGGCAACCUU	AAGGUUGCCACCUGAUCCA	[7-25]	-	-
Single Sp	19	GAAACAAGCUAACGGACGA	UCGUCCGUUAGCUUGUUUC	[1723-1741]	-	-
Single Sp	19	ACAGAAACAAGCUAACGGA	UCCGUUAGCUUGUUUCUGU	[1720-1738]	-	-
Single Sp	19	UGAACCUUGGACUUUGGGAA	UUCCCAAAGUCCAGGUUCA	[1663-1681]	-	-
Single Sp	19	ACACAGUGCGGAUGAACCU	AGGUUCAUCCGCACUGUGU	[1651-1669]	-	-
Single Sp	19	UGAUCAACAGCAACGAUGA	UCAUCGUUGCUGUUGAUCA	[691-709]	[2243-2255]	[827-839]
Single Sp	19	ACGACGUGGUGUAUGUGUG	CACACAUACACCACGUCGU	[655-673]	[2210-2225]	[803-818]
Single Sp	19	AAAGAACCCGGCCAAAGAC	GUCUUUGGCCGGGUUCUUU	[623-641]	-	-
Single Sp	19	UAAAGAACCCGGCCAAAGA	UCUUUGGCCGGGUUCUUUA	[622-640]	-	-
Single Sp	19	AGAUCCUGAACAGAGCCU	AGGCUCUUGUUCAGGAUCU	[595-613]	[2147-2165]	[743-761]
Single Sp	19	UUGAGAUCUGAACAGAG	CUCUUGUUCAGGAUCUCAA	[592-610]	[2144-2162]	-
Single Sp	19	ACAUCUGCUUUGAGAUCU	AGGAUCUCAAAGCAGAUUGU	[583-601]	[2137-2153]	[733-747]
Single Sp	19	ACAUCAUAGACAUCUGCUU	AAGCAGAUUGCUAUGAUGU	[574-592]	-	-

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 16445034	mouse 51712629	rat 34857657
Single Sp	19	AGGAGUAUAUACUGCGAGA	UCUCGCAUGAUUACUCCU	[481-499]	[2034-2046]	[555-567]
Single Sp	19	UCAUCCUACUUUUUAACCC	GGGUUAAAAAGUAGGAUGA	[415-433]	[1975-1985]	[496-506]
Single Sp	19	UGGGAACUUUCAUCCUACU	AGUAGGAUGAAAGUUCCCA	[406-424]	-	-
Single Sp	19	UUACCCGCGUGGGAACUUUC	GAAAGUUCGCAGCGGGUAA	[398-416]	-	-
Single Sp	19	AGAGAUCUCUCAGGGCCAA	UUGGCCCUGAGAGAUCUCU	[365-383]	[1917-1934]	-
Single Sp	19	UGAAAAUAGAGAUCUCUCA	UGAGAGAUCUCUAUUUUCA	[358-376]	[1916-1928]	-
Single Sp	19	UGCAGUUUAUUGGCCAUUAC	GUAUUGGCCAAUAACUGCA	[335-353]	-	-
Single Sp	19	CAUUGCAGUUUAUUGGCCAU	AUGGCCAAUAACUGCAUUG	[332-350]	-	-
Single Sp	19	UCACACCAGCCAAUGCAGU	ACUGCAUUGGCUGGUGUGA	[322-340]	-	-
Single Sp	19	ACCAUUGACUCCAACUCUC	GAGAGUUGGAGUCAUUGGU	[288-306]	-	-
Single Sp	19	UCACCAUUGACUCCAACUC	GAGUUGGAGUCAUUGGUGA	[286-304]	-	-
Single Sp	19	UUUCACCAUUGACUCCAAC	GUUGGAGUCAUUGGUGAAA	[284-302]	-	-
Single Sp	19	UUGAGUCUGUCGACCUGCA	UGCAGGUCGACAGACUCAA	[31-49]	-	-
Single Sp	19	GAGCCACAUUCUCCUCAC	GUGAGGAAGAAUGUGGCUC	[229-247]	-	-
Single Sp	19	ACAUCACCUUUGUGGCUGA	UCAGCCACAAAGGUGAUGU	[175-193]	[1730-1745]	[251-266]
Single Sp	19	AGAACGACCACAUCACCUU	AAGGUGAUGUGGUCGUUCU	[166-184]	-	-
Single Sp	19	ACACCGUGUGCUUUGGGAA	UUCCCAAAGCACACGGUGU	[2270-2288]	-	-
Single Sp	19	AACACCGUGUGCUUUGGGA	UCCCAAAGCACACGGUGUU	[2269-2287]	-	-
Single Sp	19	GAAACACCGUGUGCUUUGG	CCAAAGCACACGGUGUUUC	[2267-2285]	-	-
Single Sp	19	UUAGAAACACCGUGUGCUU	AAGCACACGGUGUUUCUAA	[2264-2282]	-	-
Single Sp	19	AUGAAGCUCUGUUAGAAAC	GUUUCUAAACAGAGCUUCAU	[2253-2271]	-	-
Single Sp	19	GGGAUUGAAUGAAGCUCUG	CAGAGCUUCAUUAUUCUCC	[2245-2263]	-	-
Single Sp	19	UCUGUCCUCUCUCUAGCCU	AGGCUAGAGAGAGGACAGA	[2222-2240]	-	-
Single Sp	19	UCCUGGCUAUGUCGUCUUG	CAAGACGACAUAGCCAGGA	[2195-2213]	-	-
Single Sp	19	UUCUACUCCUGGCUAUGUC	GACAUAGCCAGGAGUAGAA	[2189-2207]	-	-
Single Sp	19	AGGACAUUAUCGUCACUGU	ACAGUGACGAAUAUGUCCU	[2104-2122]	-	-
Single Sp	19	UCAAAGGCUACAAGGACAU	AUGUCCUUGUAGCCUUUGA	[2092-2110]	[3800-3818]	[2228-2246]
Single Sp	19	AGAUCAAAGGCUACAAGGA	UCCUUGUAGCCUUUGAUCU	[2089-2107]	[3797-3815]	[2225-2243]
Single Sp	19	UCAGCAGCAACGAGGUCAA	UUGACCUCGUUGCUGCUGA	[2068-2086]	-	-
Single Sp	19	UCAUCAGCAGCAACGAGGU	ACCUCGUUGCUGCUGAUGA	[2065-2083]	[3773-3784]	[2201-2212]
Single Sp	19	CCUCCAAAUAUACUGGAC	GUCCAGUUGAAUUGGAGG	[2006-2024]	-	[2148-2159]
Single Sp	19	AAAGGACCUUGGGACUCUG	CAGAGUCCCAAGGUCCUUU	[1973-1991]	[3687-3699]	[2113-2127]
Single Sp	19	UCAUCAUUGGGCAGAUAGC	GCUAUCUGCCCAUUGAUGA	[1954-1972]	[3506-3521]	[2090-2105]
Single Sp	19	CCAACACCUUAAUGGUGGC	GCCACCAUUAAGGUGUUGG	[1897-1915]	-	-
Single Sp	19	UCACCCUCACCAACACCUU	AAGGUGUUGGUGAGGGUGA	[1888-1906]	[3440-3456]	[2024-2040]
Single Sp	19	AUGUCACCCUCACCAACAC	GUGUUGGUGAGGGUGACAU	[1885-1903]	[3440-3455]	[2024-2039]
Single Sp	19	CCACUUGUCUAUUGAGGUG	CACCUCAAUAGACAAGUGG	[1829-1847]	[3381-3399]	[1967-1983]
Single Sp	19	AGAUUUCUGUCUGGAGCCU	AGGCUCCAGACAGAUUUCU	[1808-1826]	-	-
Single Sp	19	AAAGCUCAUCCGCGUGUCU	AGACACGCGAUGAGCUUU	[1742-1760]	-	-
Single Sp	19	ACGAAAAGCUCAUCCGCGU	ACGCGGAUGAGCUUUUCGU	[1738-1756]	-	-
Single Sp	19	ACAACAAGGAGCACCACAC	GUGUGGUGCUCCUUGUUGU	[61-79]	-	-
Single Sp	19	AGAUUCAUACCUCCUGGC	GCCAGGAGGUGAUGAAUCU	[528-546]	-	-
Single Sp	19	AUGAAAGAUUCAUACCUC	GAGGUGAUGAAUCUUUCAU	[523-541]	-	-
Single Sp	19	UUUCCCUUUUCACACCAGC	GCUGGUGUGAAAAGGGAAA	[313-331]	-	-
Single Sp	19	UGGCUCUUUUUACUCCUG	CAGGAGUAGAAAGGAGCCA	[2181-2199]	-	-
Single Sp	19	ACAAGGACAUUAUCGUCAC	GUGACGAAUUGUCCUUGU	[2101-2119]	-	-
Single Sp	19	UCCAGGUUCUCAUCAGCAG	CUGCUGAUGAGAACCUGGA	[2056-2074]	[3772-3782]	[2200-2210]
Single Sp	19	AGAUAGCAAAGGACCUUGG	CCAAGGUCCUUUGCUAUCU	[1966-1984]	-	-
Single Sp	19	UUAUUGGUGGCUCUGAGCA	UGCUCAGAGCCACCAUUA	[1905-1923]	-	-

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 16445034	mouse 51712629	rat 34857657
Single Sp	19	UAAAAGAUUCUGUCUGGA	UCCAGACAGAUUCUUUUA	[1804-1822]	-	-
Single Sp	19	UUUAACCCUUGGAGUCCAG	CUGGACUCCAAGGGUUA	[426-444]	-	-
Single Sp	19	AAAAGCUCAUCCGCGUGUC	GACACGCGGAUGAGCUUUU	[1741-1759]	-	-
Single Sp	19	CUGCCCUACAGCAAUACA	UGUAAUUGCUGUAGGGCAG	[1704-1722]	[3256-3274]	[1840-1858]
Single Sp	19	CUCCUGCCCUACAGCAAUU	AAUUGCUGUAGGGCAGGAG	[1701-1719]	[3256-3268]	[1840-1855]
Single Sp	19	GUGGUGAGUGCCAUGAUCA	UGAUCAUGGCACUACCAC	[678-696]	-	-
Single Sp	19	GCCUGUAUCACUUAAGAA	UUCUUUAAGUGAUACAGGC	[610-628]	-	-
Single Sp	19	CAAGAGCCUGUAUCACUUA	UAAGUGAUACAGGCUCUUG	[605-623]	-	[753-765]
Single Sp	19	GAAGAGGACAUCAUAGACA	UGUCUAUGAUUCCUCUUC	[567-585]	[2119-2130]	[715-726]
Single Sp	19	GAACUACGGGCAGUUUGAA	UUCAAACUGCCCGUAGUUC	[551-569]	[2103-2121]	[624-636]
Single Sp	19	GGUCAUGAAAGAUUCAUCA	UGAUGAAUCUUUCAUGACC	[519-537]	-	-
Single Sp	19	GAGAUUAUGGCUUUGUUUA	UAAACAAAGCCAUAUUCUC	[496-514]	-	[574-587]
Single Sp	19	CUACCUGCCAAGUGAAUA	UAUUUCACUUGGCAGGUAG	[455-473]	[2007-2023]	-
Single Sp	19	GUCUACCUGCCAAGUGAAA	UUUCACUUGGCAGGUAGAC	[453-471]	[2005-2023]	[526-536]
Single Sp	19	CGUCUACCUGCCAAGUGAA	UUCACUUGGCAGGUAGACG	[452-470]	[2005-2022]	[526-536]
Single Sp	19	CAGAGCUCCAGGAACAACA	UGUUGUUCUGGAGCUCUG	[48-66]	[1607-1618]	[128-139]
Single Sp	19	GGAACUUUCAUCCUACUUU	AAAGUAGGAUGAAAGUUC	[408-426]	-	-
Single Sp	19	GCUGGGAACUUUCAUCCUA	UAGGAUGAAAGUUCUCCAGC	[404-422]	-	-
Single Sp	19	CAAGGUCACAGUGUGACUU	AAGUCACACUGUGACCUUG	[381-399]	-	-
Single Sp	19	GGCCAUUACACUCUGAAAA	UUUUCAGAGUGUAAUGGCC	[345-363]	-	-
Single Sp	19	CUCUCCAAGUUUCCCUUUU	AAAAGGGAAACUUGGAGAG	[304-322]	-	-
Single Sp	19	CGCUUCUGAUUUCACCAUU	AAUGGUGAAUUCAGAAAGCG	[275-293]	-	[682-693]
Single Sp	19	GUCUGGAGCGCUUCUGAUU	AAUCAGAAGCGCUCACAGAC	[267-285]	-	-
Single Sp	19	GAACGACCACAUACCCUUU	AAAGGUGAUGUGGUCGUUC	[167-185]	-	-
Single Sp	19	GAAGAGACAAUAAAGAUGU	ACAUCUUUAUUGUCUCUUC	[2286-2304]	-	-
Single Sp	19	CGUGUGCUUUGGGAAGAGA	UCUCUUCUCCAAAGCACACG	[2274-2292]	-	-
Single Sp	19	CACCUCUGUCCUCUCUCUA	UAGAGAGAGGACAGAGGUG	[2218-2236]	-	-
Single Sp	19	CACCUGGCUCUUCUACU	AGUAGAAAGGAGCCAGGUG	[2177-2195]	-	-
Single Sp	19	GCUACAAGGACAUUUCGU	ACGAAUUGUCCUUGUAGC	[2098-2116]	[3806-3818]	[2234-2246]
Single Sp	19	CGAGGUCAAGGAGAUCAA	UUUGAUCUCCUUGACCUCG	[2078-2096]	[3787-3804]	[2215-2232]
Single Sp	19	CGGACACACCCUCCAAAUU	AAUUUGGAGGGUGUGUCCG	[1997-2015]	-	-
Single Sp	19	CCUCAUCAUUGGGCAGAU	UAUCUGCCCAUUGAUGAGG	[1952-1970]	[3504-3521]	[2088-2105]
Single Sp	19	CCCUCACCAACACCUUAAU	AUUAAGGUGUUGGUGAGGG	[1891-1909]	[3443-3456]	[2027-2045]
Single Sp	19	GGUCCUAAAAGAUUCUGU	ACAGAUUCUUUAGGACC	[1799-1817]	[3351-3363]	[1935-1946]
Single Sp	19	CAUGCUGGUCCUAAAAGAU	AUCUUUAGGACCAGCAUG	[1793-1811]	[3349-3363]	[1933-1946]
Single Sp	19	GUCCAUGCUGGUCCUAAAA	UUUAGGACCAGCAUGGAC	[1790-1808]	[3349-3360]	[1933-1944]
Single Sp	19	GCUAACGGACGAAAAGCUC	GAGCUUUCGUCCGUUAGC	[1730-1748]	-	-
Single Sp	19	AGCUAACGGACGAAAAGCU	AGCUUUCGUCCGUUAGCU	[1729-1747]	-	-
Single Sp	19	CAAUUACAGAAACAAGCUA	UAGCUUGUUUCUGUAAUUG	[1715-1733]	-	-
Single Sp	19	GCAAUUACAGAAACAAGCU	AGCUUGUUUCUGUAAUUGC	[1714-1732]	-	-
Single Sp	19	ACAGCAAUACAGAAACAA	UUGUUUCUGUAAUUGCUGU	[1711-1729]	-	[1847-1859]
Single Sp	19	UACAGCAAUACAGAAACA	UGUUUCUGUAAUUGCUGUA	[1710-1728]	-	[1846-1859]
Single Sp	19	CUGGACUUUGGAAGGAGA	UCUCCUUCUCCAAAGUCCAG	[1668-1686]	-	-
Single Sp	19	GAUGAACCGGACUUUGGG	CCCAAAGUCCAGGUUCAUC	[1661-1679]	-	-
Single Sp	19	CCAUGAUCAACAGCAACGA	UCGUUGCUGUUGAUCAUGG	[688-706]	[2240-2255]	[827-839]
Single Sp	19	UGGUGAGUGCCAUGAUCAA	UUGAUCAUGGCACUCACCA	[679-697]	[2239-2249]	-
Single Sp	19	GAACGACGUGGUGUAUGUG	CACAUACACCACGUCGUUC	[653-671]	[2210-2223]	[802-818]
Single Sp	19	AAGAACCCGGCCAAAGACU	AGUCUUUGCCCGGUUCUU	[624-642]	-	-
Single Sp	19	CUGUAUCACUUAAGAACC	GGUUCUUUAAGUGAUACAG	[612-630]	-	-

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 16445034	mouse 51712629	rat 34857657
Single Sp	19	AGAGCCUGUAUCACUAAA	UUUAAGUGAUACAGGCUCU	[607-625]	-	[755-765]
Single Sp	19	AAGAGCCUGUAUCACUAA	UUAAGUGAUACAGGCUCUU	[606-624]	-	[754-765]
Single Sp	19	GAACAAGAGCCUGUAUCAC	GUGAUACAGGCUCUUGUUC	[602-620]	[2154-2165]	[750-765]
Single Sp	19	CUGAACAAGAGCCUGUAUC	GAUACAGGCUCUUGUUCAG	[600-618]	[2152-2165]	[749-765]
Single Sp	19	CAUCUGCUUUGAGAUCCUG	CAGGAUCUCAAGCAGAUUG	[584-602]	[2137-2154]	[733-747]
Single Sp	19	UAGACAUCUGCUUUGAGAU	AUCUCAAGCAGAUUGUCUA	[580-598]	[2137-2150]	[733-746]
Single Sp	19	UUGAAGAGGACAUCAUAGA	UCUAUGAUUGCCUCUCAA	[565-583]	[2117-2130]	[713-726]
Single Sp	19	GUUUGAAGAGGACAUCAUA	UAUGAUUGCCUCUCAAAC	[563-581]	[2115-2130]	[711-726]
Single Sp	19	AGUUUGAAGAGGACAUCAU	AUGAUUGCCUCUCAAACU	[562-580]	[2114-2130]	[710-726]
Single Sp	19	GCAGUUUGAAGAGGACAUC	GAUGUCCUCUCAAACUGC	[560-578]	[2112-2130]	[710-726]
Single Sp	19	CUACGGGCAGUUUGAAGAG	CUCUCAAACUGCCCGUAG	[554-572]	[2110-2124]	[710-720]
Single Sp	19	ACUACGGGCAGUUUGAAGA	UCUCAAACUGCCCGUAGU	[553-571]	[2105-2123]	[626-636]
Single Sp	19	CAUGAAAGAUUCAUCACCU	AGGUGAUGAAUCUUUCAUG	[522-540]	-	-
Single Sp	19	ACAAGGGUCAUGAAAGAUU	AAUCUUUCAUGACCCUUGU	[514-532]	-	-
Single Sp	19	GUUUACAAGGGUCAUGAAA	UUUCAUGACCCUUGUAAAC	[510-528]	[2065-2075]	[583-596]
Single Sp	19	UGUUACAAGGGUCAUGAA	UUCAUGACCCUUGUAAACA	[509-527]	[2065-2075]	[582-596]
Single Sp	19	GCUUUGUUACAAGGGUCA	UGACCCUUGUAAACAAAGC	[505-523]	[2065-2075]	[578-596]
Single Sp	19	CAUGCGAGAUUAUGGCUUU	AAAGCCAUAAUCUCGCAUG	[491-509]	-	-
Single Sp	19	AGUAUAUCAUGCGAGAUUA	UAAUCUCGCAUGAUUAUCU	[484-502]	[2036-2046]	[557-567]
Single Sp	19	CUGCAGGAGUAUAUCAUGC	GCAUGAUUAUACUCCUGCAG	[477-495]	[2029-2046]	[550-567]
Single Sp	19	UGCUGCAGGAGUAUAUCAU	AUGAUUAUACUCCUGCAGCA	[475-493]	[2029-2045]	[548-566]
Single Sp	19	UACUGCUGCAGGAGUAUAU	AUAUAUACUCCUGCAGCAUA	[472-490]	-	-
Single Sp	19	GCUCCAGGAACAACAAGGA	UCCUUGUUGUCCUGGAGC	[52-70]	[1607-1622]	[128-143]
Single Sp	19	CUACUUUUUAACCCUUGGA	UCCAAGGGUAAAAAGUAG	[420-438]	[1975-1990]	[496-511]
Single Sp	19	CAUCCUACUUUUUAACCCU	AGGGUUAAAAAGUAGGAUG	[416-434]	[1975-1985]	[496-506]
Single Sp	19	CUGGGAACUUUCAUCCUAC	GUAGGAUGAAAGUCCCCAG	[405-423]	-	-
Single Sp	19	UACCCGCUGGGAACUUUCA	UGAAAGUCCCCAGCGGGUA	[399-417]	-	-
Single Sp	19	CUUACCCGCUGGGAACUUU	AAAGUCCCCAGCGGGUAAG	[397-415]	-	-
Single Sp	19	CCAAGGUCACAGUGUGACU	AGUCACACUGUGACCUUGG	[380-398]	-	-
Single Sp	19	CUCUGAAAAUAGAGAUUC	GAGAUUCUAUUUUCAGAG	[355-373]	-	-
Single Sp	19	ACACUCUGAAAAUAGAGAU	AUCUCUAUUUUCAGAGUGU	[352-370]	-	-
Single Sp	19	UUGGCCAUUACACUCUGAA	UUCAGAGUGUAAUGGCCAA	[343-361]	-	-
Single Sp	19	AGUUAUUGGCCAUUACACU	AGUGUAAUGGCCAAUACU	[338-356]	-	-
Single Sp	19	CAGUUAUUGGCCAUUACAC	GUGUAAUGGCCAAUACUG	[337-355]	-	-
Single Sp	19	CCAGCCAAUGCAGUUAUUG	CAUAACUGCAUUGGCUUG	[327-345]	-	-
Single Sp	19	UUUCACACCAGCCAAUGCA	UGCAUUGGCUUGUGUAAA	[320-338]	-	-
Single Sp	19	CCUUUUCACACCAGCCAAU	AUUGGCUUGUGUAAAAGG	[317-335]	-	-
Single Sp	19	CAAGUUUCCCUUUUCACAC	GUGUGAAAAGGAAACUUG	[309-327]	-	-
Single Sp	19	CUCUCUCCAAGUUUCCCUU	AAGGGAACUUGGAGAGAG	[302-320]	[1854-1865]	[375-386]
Single Sp	19	CUGAUUUCACCAUUGACUC	GAGUCAAUGGUGAAUACAG	[280-298]	-	[683-698]
Single Sp	19	UCUGAUUUCACCAUUGACU	AGUCAUUGGUGAAUACAGA	[279-297]	-	[682-698]
Single Sp	19	GCUUCUGAUUUCACCAUUG	CAAUGGUGAAUACAGAAGC	[276-294]	-	[682-693]
Single Sp	19	GGAGCGCUUCUGAUUUCAC	GUGAAUACAGAAGCGCUCC	[271-289]	-	[682-692]
Single Sp	19	UGGAGCGCUUCUGAUUUCA	UGAAUACAGAAGCGCUCCA	[270-288]	-	-
Single Sp	19	CUGGAGCGCUUCUGAUUUC	GAAUACAGAAGCGCUCCAG	[269-287]	-	-
Single Sp	19	UGUCUGGAGCGCUUCUGAU	AUCAGAAGCGCUCCAGACA	[266-284]	-	-
Single Sp	19	AUGUCUGGAGCGCUUCUGA	UCAGAAGCGCUCCAGACAU	[265-283]	-	-
Single Sp	19	CCACAUCACCUUUGUGGCU	AGCCACAAGGUGAUGUGG	[173-191]	[1730-1743]	[246-264]
Single Sp	19	GACCACAUCACCUUUGUGG	CCACAAGGUGAUGUGGUC	[171-189]	[1730-1741]	[244-262]

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 16445034	mouse 51712629	rat 34857657
Single Sp	19	CGACCACAUCACCUUUGUG	CACAAAGGUGAUGUGGUCG	[170-188]	[1730-1740]	[244-261]
Single Sp	19	GGAAGAGACAAUAAAGAUG	CAUCUUUAUUGUCUCUCC	[2285-2303]	-	-
Single Sp	19	UGGGAAGAGACAAUAAAGA	UCUUUAUUGUCUCUCCCA	[2283-2301]	-	-
Single Sp	19	UUUGGGAAGAGACAAUAAA	UUUAUUGUCUCUCCCAAA	[2281-2299]	-	-
Single Sp	19	GUGUGCUUUGGGAAGAGAC	GUCUCUCCCAAGCACAC	[2275-2293]	-	-
Single Sp	19	GAAGCUCUGUUGAAACAC	GUGUUUCUACAGAGCUUC	[2255-2273]	-	-
Single Sp	19	UGAAGCUCUGUUGAAACA	UGUUUCUACAGAGCUUCA	[2254-2272]	-	-
Single Sp	19	UGAAUGAAGCUCUGUUGA	UCUACAGAGCUUCAUUA	[2250-2268]	-	-
Single Sp	19	AAUGAUGAAGCUCUGUUA	UACAGAGCUUCAUUAUU	[2248-2266]	-	-
Single Sp	19	GAAUGAUGAAGCUCUGUU	AACAGAGCUUCAUUAUUC	[2247-2265]	-	-
Single Sp	19	AGCCUGCCUGGGAUGAAU	AUUCAUUCCAGGCAGGCU	[2236-2254]	-	-
Single Sp	19	UAGCCUGCCUGGGAUGAA	UUCAUUCCAGGCAGGCUA	[2235-2253]	-	-
Single Sp	19	CUCCUUUCUACUCCUGGCU	AGCCAGGAGUAGAAAGGAG	[2184-2202]	-	-
Single Sp	19	CUGGCUCUUUCUACUCCU	AGGAGUAGAAAGGAGCCAG	[2180-2198]	-	-
Single Sp	19	CAAGGACAUUUCGUCACU	AGUGACGAAUUGUCCUUG	[2102-2120]	-	-
Single Sp	19	CUACAAGGACAUUUCGUC	GACGAAUUGUCCUUGUAG	[2099-2117]	[3807-3818]	[2235-2246]
Single Sp	19	AAGGCUACAAGGACAUUU	AAUUGUCCUUGUAGCCUU	[2095-2113]	[3803-3818]	[2231-2246]
Single Sp	19	GAGAUCAAAGGCUACAAGG	CCUUGUAGCCUUGAUCUC	[2088-2106]	[3796-3814]	[2224-2242]
Single Sp	19	ACGAGGUCAAAGGAGUCAA	UUGAUCUCCUUGACCUCGU	[2077-2095]	[3787-3803]	[2215-2231]
Single Sp	19	CCCUCCAAAUUCAACUGGA	UCCAGUUGAAUUUGGAGGG	[2005-2023]	-	[2148-2159]
Single Sp	19	ACACCCUCCAAAUUCAACU	AGUUGAAUUUGGAGGGUGU	[2002-2020]	-	-
Single Sp	19	GGACACACCCUCCAAAUUC	GAAUUUGGAGGGUGUGUCC	[1998-2016]	-	-
Single Sp	19	AUGGGCAGAUAGCAAAGGA	UCCUUUGCUAUCUGCCCAU	[1960-1978]	-	-
Single Sp	19	CUCAUCAAUUGGCAGAUAG	CUAUCUGCCCAUUGAUGAG	[1953-1971]	[3505-3521]	[2089-2105]
Single Sp	19	AGGAAGCGGCCUCAUCAU	AUUGAUGAGGCCGCUCCU	[1943-1961]	[3502-3513]	[2086-2097]
Single Sp	19	AAGGAAGCGGCCUCAUCA	UUGAUGAGGCCGCUCCUU	[1942-1960]	[3502-3512]	[2086-2096]
Single Sp	19	CUCACCAACACCUUAAUGG	CCAUAAGGUGUUGGUGAG	[1893-1911]	[3445-3456]	[2029-2047]
Single Sp	19	CUUGUCUAUUGAGGUGUCU	AGACACCUCAUAGACAAG	[1832-1850]	[3384-3400]	[1968-1984]
Single Sp	19	CCUCCCCACUUGUCUAUUG	CAAUAGACAAGUGGGGAGG	[1824-1842]	[3376-3394]	[1960-1978]
Single Sp	19	AGCCUCCCCACUUGUCUAU	AUAGACAAGUGGGGAGGCU	[1822-1840]	[3374-3392]	-
Single Sp	19	CCUAAAAGAUUCUGUCUG	CAGACAGAUUCUUUUAGG	[1802-1820]	-	-
Single Sp	19	UGCUGGUCCUAAAAGAUU	AUAUCUUUUAGGACCAGCA	[1795-1813]	[3349-3363]	[1933-1946]

Table ITGase7: 21-mers

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 16445034	mouse 51712629	rat 34857657
Single Sp	21	GGAACGACGUGGUGUAUGUGU	ACACAUACACCACGUCGUUCC	[652-672]	[2210-2224]	[802-818]
Single Sp	21	CAAGGGUCAUGAAAGAUUCAU	AUGAAUCUUUACUGACCCUUG	[515-535]	-	-
Single Sp	21	GCAACGAGGUCAAGGAGAUA	UGAUCUCCUUGACCUCGUUUC	[2074-2094]	[3787-3802]	[2215-2230]
Single Sp	21	CCAUGCUGGUCCUAAAAGAU	UAUCUUUUAGGACCAGCAUGG	[1792-1812]	[3349-3363]	[1933-1946]
Single Sp	21	GGAGAGAGCUGUCUUAUGAA	UUAUGAAGACAGCUCUCUCC	[1367-1387]	-	-
Single Sp	21	AUAGGAACUUGACCAUCGAUA	UAUCGAUGGUCAAGUCCUUA	[934-954]	[2491-2504]	[1073-1088]
Single Sp	21	ACAAGAGCCUGUAUCACUUA	UUAAGUGAUACAGGCUCUUGU	[604-624]	-	[752-765]
Single Sp	21	UUAACAAGGGUCAUGAAAGAU	AAUCUUUACUGACCCUUGUAA	[512-532]	[2065-2075]	[585-596]
Single Sp	21	CCAACUCUCUCCAAGUUUCCC	GGGAAACUUGGAGAGAGUUGG	[298-318]	[1851-1865]	[372-386]
Single Sp	21	GGAUGAACCUGGACUUUGGGA	UCCCAAAGUCCAGGUUCAUC	[1660-1680]	-	-
Single Sp	21	GAACGCCGAUGAAGUCAUUUG	CAAUGACUUAUCGCGCUUC	[1205-1225]	-	-
Single Sp	21	GGAAAGAUCCCCACCAGGAU	AUCCUGGUGGGAGAUUUUCC	[1045-1065]	-	-
Single Sp	21	UGACCGAAAUGCCGAGAUGCU	AGCAUCUCGGCAUUUCGGUCA	[962-982]	-	-
Single Sp	21	GUAAUGAGAUGCUUAGGUGUU	AACACCUAAGCAUCUCAUUAC	[870-890]	[2422-2442]	[1006-1026]
Single Sp	21	UGAGUGCCAUGAUCAACAGCA	UGCUGUUGAUGAUGGCACUCA	[682-702]	[2239-2254]	[827-838]
Single Sp	21	AUAGACAUCUGCUUUGAGAUC	GAUCUCAAAAGCAGAUGUCUUA	[579-599]	[2137-2151]	[733-747]
Single Sp	21	AAAUACUGCUGCAGGAGUAUA	UAUACUCCUGCAGCAGUAUUU	[469-489]	-	-
Single Sp	21	AUAGAGAUCUCUCAGGGCCAA	UUGGCCUGAGAGAUUCUUAU	[363-383]	[1916-1934]	-
Single Sp	21	UCAAGGAGAUCAAAGGCUACA	UGUAGCCUUUGAUCUCCUUGA	[2083-2103]	[3791-3811]	[2219-2239]
Single Sp	21	ACACCUUAAUGGUGGCUCUGA	UCAGAGCCACCAUUAAGGUGU	[1900-1920]	-	-
Single Sp	21	AAAGAUUACUGUCUGGAGCCU	AGGCUCCAGACAGAUUUCUUU	[1806-1826]	-	-
Single Sp	21	AGAGAGCUGUCUUAUGAAGG	CCUUAUGAAGACAGCUCUCU	[1369-1389]	-	-
Single Sp	21	GAAGUCAUUUGGCUCUUGGG	CCCAAGGAGCCAAUGACUUC	[1215-1235]	-	-
Single Sp	21	AAAGACUGUCCCCAGCGGAAC	GUUCCGUGGGAACAGUCUUU	[636-656]	-	-
Single Sp	21	AAAGAUUACUACCUCCUGGC	GCCAGGAGGUGAUGAAUCUUU	[526-546]	-	-
Single Sp	21	ACAUUUCGUCACUGUGGCUG	CAGCCACAGUGACGAUAUUGU	[2107-2127]	-	-
Single Sp	21	AAAUUACUACUGGACCUCUACC	GGUAGAGGUCCAGUUGAAUUU	[2011-2031]	-	[2148-2167]
Single Sp	21	CUAUUGAGGUGUCUGAGAGGG	CCCUCUCAGACACCUCUAAUAG	[1837-1857]	[3389-3409]	[1973-1984]
Single Sp	21	CAAAGAGCUUCUUUGCCCUUC	GAAGGGCAAAGAAGCUCUUUG	[1413-1433]	-	-
Single Sp	21	UCAUUUGGCUCUUGGGGAUG	CAUCCCCAAGGAGCCAAUGA	[1219-1239]	-	-
Single Sp	21	UUAUGGCUUUGUUUACAAGGG	CCCUUGUAAACAAAGCCAUA	[500-520]	-	[574-593]
Single Sp	21	AAAUAGAGAUUCUCAGGGCC	GGCCUGAGAGAUUCUUAUUU	[361-381]	[1916-1933]	-
Single Sp	21	GAGAUGCUGUCAACUCAGAAA	UUUCUGAGUUGACAGCAUCUC	[975-995]	-	-
Single Sp	21	GGAACUUGACCAUCGAUACGU	ACGUUAUGGUAAGUUCUCC	[937-957]	[2491-2504]	[1073-1088]
Single Sp	21	GCACAACGUGGAUAGGAACUU	AAGUCCUUAUCCACGUUGUGC	[923-943]	-	-
Single Sp	21	CAACCCGUGUUGUUUCCAAUU	AAUUGGAAACAACACGGGUUG	[892-912]	-	-
Single Sp	21	GGUGGUGAGUGCCAUGAUCAA	UUGAUAUGGCACUCACCACC	[677-697]	[2229-2249]	-
Single Sp	21	GAGCCUGUAUCACUUAAGAA	UUCUUUAAGUGAUACAGGCUC	[608-628]	-	-
Single Sp	21	GCUUUGAGAUCUGAACAAGA	UCUUGUUCAGGAUCUCAAAGC	[589-609]	[2141-2161]	[737-757]
Single Sp	21	GCGAGAUUAUGGCUUUGUUUA	UAAACAAAGCCAUAUUCUCGC	[494-514]	-	[574-587]
Single Sp	21	CCAUAACACUCUGAAAAUAGA	UCUUAUUUUCAGAGUGUAUUGG	[347-367]	-	-
Single Sp	21	GCAGUUAUUGGCCAUUACACU	AGUGUAAUGGCCAAUAACUGC	[336-356]	-	-
Single Sp	21	CUCCAAGUUUCCCUUUUCACA	UGUGAAAAGGGAAACUUGGAG	[306-326]	-	-

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 16445034	mouse 51712629	rat 34857657
Single Sp	21	GACUCCAACUCUCUCCAAGUU	AACUUGGAGAGAGUUGGAGUC	[294-314]	[1851-1865]	[372-386]
Single Sp	21	CUUCUGAUUUACCAUUGACU	AGUCAUUGGUGAAAUCAAGAAG	[277-297]	-	[682-698]
Single Sp	21	GGGAUGAAUGAAGCUCUGUU	AACAGAGCUUCAUUCUCC	[2245-2265]	-	-
Single Sp	21	CCUUUCUACUCCUGGCUAUGU	ACAUAGCCAGGAGUAGAAAGG	[2186-2206]	-	-
Single Sp	21	GAAGGAAGCGGCCUCAUCAAU	AUUGAUGAGGCCGCUUCCUUC	[1941-1961]	[3502-3513]	[2086-2097]
Single Sp	21	CAAGCUAACGGACGAAAAGCU	AGCUUUUCGUCCGUUAGCUUG	[1727-1747]	-	-
Single Sp	21	CUACAGCAAUACAGAAACAA	UUGUUUCUGUAAUUGCUGUAG	[1709-1729]	-	[1845-1859]
Single Sp	21	GAAGGCUUCUCGGAUUGCU	AGCAUUUCCGAGAAGCCUUC	[1385-1405]	-	-
Single Sp	21	GCAUACCAGCUCCUACAAGU	ACUUGUAGGAGCUGGUGAUGC	[1327-1347]	-	-
Single Sp	21	GGAAGGAGAUCAAGCAGUAGA	UCUUAGUGCUGAUCUCCUCC	[1282-1302]	-	-
Single Sp	21	GAACUCCAGCUCUGGAUUGA	UCAUCCAGACGUGGAAGUUC	[1010-1030]	[2562-2582]	-
Single Sp	21	GACAAAUAUGGAACUCCAC	GUGGAAGUCCAUAUUUUGUC	[999-1019]	[2551-2571]	[1135-1154]
Single Sp	21	AGAAACGAGACAAAUAUGGA	UCCAUAUUUUGUCUCGUUUCU	[991-1011]	-	-
Single Sp	21	CCGAGAUGCUGUACAACUCAGA	UCUGAGUUGACAGCAUCUCGG	[973-993]	-	-
Single Sp	21	GAAUAGCCGAGAUUCUGUCAA	UUGACAGCAUCUCGGCAUUC	[967-987]	-	-
Single Sp	21	GUACUAGACCGAAUUGCCGA	UCGGCAUUUCGCUAUGUAC	[956-976]	-	[1093-1105]
Single Sp	21	CCAUCGAUACGUACUAUGACC	GGUCAUAGUACGUUACGAUGG	[946-966]	-	-
Single Sp	21	CGCACACGUGGAUAGGAACU	AGUCCUAUCCACGUUGUGCG	[922-942]	-	-
Single Sp	21	CGUGUUGUUCCAUAUUCCGU	ACGGAUAUUGGAAACAACACG	[897-917]	[2455-2467]	[1039-1051]
Single Sp	21	AACCCGUGUUGUUCCAUAUU	AAAUUGGAAACAACACGGGUU	[893-913]	[2445-2465]	[1029-1049]
Single Sp	21	UCCAACCCGUGUUGUUCCA	UUGGAAACAACACGGGUUGGA	[890-910]	-	-
Single Sp	21	GCACCGUAUAGAGAUUCUAG	CUAAGCAUCUAUACGGGUC	[865-885]	[2417-2437]	[1001-1021]
Single Sp	21	CAGCAACGAUGACAAUGGCGU	ACGCCAUUGUACUUGGUCUG	[698-718]	-	-
Single Sp	21	CAACAGCAACGAUGACAAUGG	CCAUUGUACUUGGUCUUGG	[695-715]	-	-
Single Sp	21	UGAUCAACAGCAACGAUGACA	UGUACUUGGUCUUGAUCA	[691-711]	[2243-2255]	[827-839]
Single Sp	21	AGAACCCGCGCCAAAGACUGUU	AACAGUCUUUGGCCGGGUUCU	[625-645]	-	-
Single Sp	21	UGAACAAGAGCCUGAUACACU	AGUGAUACAGGCUCUUGUUA	[601-621]	[2153-2165]	[749-765]
Single Sp	21	UCAUAGACAUCUGCUUUGAGA	UCUCAAGCAGAUUCUAUGA	[577-597]	[2137-2149]	[733-745]
Single Sp	21	GGACAUCAUAGACAUCUGCUU	AAGCAGAUUCUAUGAUGUCC	[572-592]	-	-
Single Sp	21	GGAAACAACAAGGAGCACCACA	UGUGGUGCUCCUUGUUGUCC	[58-78]	[1610-1630]	[131-151]
Single Sp	21	AAGAGGACAUAUAGACAUCU	AGAUGUCUAUGAUGUCCUCU	[568-588]	[2120-2130]	[716-726]
Single Sp	21	CGGGCAGUUUGAAGAGGACAU	AUGUCCUCUCAAACUGCCCG	[557-577]	[2110-2129]	[710-725]
Single Sp	21	GGAACUACGGGCAGUUUGAAG	CUUCAAAACUGCCGUAUUGC	[550-570]	[2102-2122]	[623-636]
Single Sp	21	CGAGAUUAUGGCUUUGUUAC	GUAAACAAAGCCAUAAUCUCG	[495-515]	-	[574-588]
Single Sp	21	AGGAGUAUAUCAUGCGAGAU	AAUCUCGCAUGAUUACUCCU	[481-501]	[2034-2046]	[555-567]
Single Sp	21	GCAGGAGUAUAUCAUGCGAGA	UCUCGCAUGAUUACUCCUGC	[479-499]	[2034-2046]	[555-567]
Single Sp	21	GUGAAUACUGCUGCAGGAGU	ACUCCUGCAGCAGUAUUUCAC	[466-486]	-	-
Single Sp	21	CCUGCCAAGUGAAUACUGCU	AGCAGUAUUUCACUUGGCAGG	[458-478]	[2010-2023]	-
Single Sp	21	ACGUCUACCGCCAAGUGAAA	UUUCACUUGGCAGGUAGACGU	[451-471]	[2005-2023]	[526-536]
Single Sp	21	UGGGAACUUCAUCCUACUUU	AAAGUAGGAUGAAAGUCCCA	[406-426]	-	-
Single Sp	21	UUACCCGCUUGGAACUUUCAU	AUGAAAGUCCAGCGGGUAA	[398-418]	-	-
Single Sp	21	UGACUUACCCGCUUGGAACUU	AAGUCCAGCGGGUAAGUCA	[394-414]	-	-
Single Sp	21	CAUUGCAGUUUUGGCCAUUA	UAAUGGCCAAUACUGCAUUG	[332-352]	-	-
Single Sp	21	CCAUGCAGUUUUGGCCAUU	AAUGGCCAAUACUGCAUUGG	[331-351]	-	-
Single Sp	21	UCACACCAGCCAAUGCAGUUA	UACUGCAUUGGCGUGUGA	[322-342]	-	-
Single Sp	21	CAACUCUCUCCAAGUUUCCU	AGGGAAACUUGGAGAGAUUG	[299-319]	[1851-1865]	[372-386]
Single Sp	21	CUCCAACUCUCUCCAAGUUUC	GAAACUUGGAGAGAUUGGAG	[296-316]	[1851-1865]	[372-386]
Single Sp	21	GAGCGCUUCUGAUUUACCAU	AUGGUGAAAUCAAGCGCUC	[272-292]	-	[682-693]
Single Sp	21	GCCUGGGAUGAAUGAAGCUC	GAGCUCAUUCUCCAGGC	[2241-2261]	-	-

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 16445034	mouse 51712629	rat 34857657
Single Sp	21	CUACUCCUGGCUAUGUCGUCU	AGACGACAUAGCCAGGAGUAG	[2191-2211]	-	-
Single Sp	21	UCAAAGGCUACAAGGACAUU	AUAUGUCCUUGUAGCCUUUGA	[2092-2112]	[3800-3818]	[2228-2246]
Single Sp	21	GGAGAUCAAAGGCUACAAGGA	UCCUUGUAGCCUUUGAUCUCC	[2087-2107]	[3795-3815]	[2223-2243]
Single Sp	21	CCUCCAAAUUACAACUGGACCU	AGGUCCAGUUGAAUUUGGAGG	[2006-2026]	-	[2148-2159]
Single Sp	21	ACACACCCUCCAAAUUCAACU	AGUUGAAUUUGGAGGGUGUGU	[2000-2020]	-	-
Single Sp	21	GACACACCCUCCAAAUUCAAC	GUUGAAUUUGGAGGGUGUGUC	[1999-2019]	-	-
Single Sp	21	UCAUCAUUGGGCAGAUAGCAA	UUGCUAUCUGCCCAUUGAUGA	[1954-1974]	[3506-3521]	[2090-2105]
Single Sp	21	CCUUAUUGGUGGCUCUGAGCA	UGCUCAGAGCCACCAUUAAGG	[1903-1923]	-	-
Single Sp	21	UCACCCUCACCAACACCUUAA	UUAAGGUGUUGGUGAGGGUGA	[1888-1908]	[3440-3456]	[2024-2040]
Single Sp	21	CUCCCCACUUGUCUUAUUGAGG	CCUCAUAGACAAGUGGGGAG	[1825-1845]	[3377-3397]	[1961-1981]
Single Sp	21	GGUCCAUGCUGGUCCUAAAAG	CUUUUAGGACCAGCAUGGACC	[1789-1809]	[3349-3361]	[1933-1945]
Single Sp	21	GAAACAAGCUAACGGACGAAA	UUUCGUCCGUUAGCUUUUUC	[1723-1743]	-	-
Single Sp	21	CCAGAACGACCACAUCACCUU	AAGGUGAUGUGGUCGUUCUGG	[164-184]	-	-
Single Sp	21	CCAAAGAGCUUCUUGCCCUU	AAGGGCAAAGAAGCUCUUUGG	[1412-1432]	-	-
Single Sp	21	CUGUCUUCAUGAAGGCUUCUC	GAGAAGCCUUAUGAAGACAG	[1375-1395]	-	-
Single Sp	21	GAGCUGUCUUAUGAAGGCUU	AAGCCUUAUGAAGACAGCUC	[1372-1392]	-	-
Single Sp	21	UGAGGAGAGAGCGUCUUCAU	AUGAAGACAGCUCUCUCCUCA	[1364-1384]	-	-
Single Sp	21	CUACAAGUACCCAGAAGGAUC	GAUCCUUCUGGGUACUUGUAG	[1340-1360]	[2892-2912]	[1476-1496]
Single Sp	21	CAACACCAGUCCAUUCGGGAA	UUCCCGAUGGAACUGGUGUUG	[1265-1285]	-	-
Single Sp	21	AGGAAAUCCUGGCCCAACA	UGUUGUGGGCCAGGAUUUCCU	[1249-1269]	[2801-2821]	[1385-1405]
Single Sp	21	CUAUGACACCCUUUUGUGUA	UACACAAAGGGGUGUCAUAG	[1175-1195]	[2727-2747]	[1311-1328]
Single Sp	21	AUGUCCACCUGGCCUAUGACA	UGUCAUAGGCCAGGUGGACAU	[1162-1182]	-	-
Single Sp	21	AGAUCUCCACCAGGAUACAA	UUGUAUCCUGGUGGGAGAUUCU	[1049-1069]	-	-
Single Sp	21	GAAAGAUCUCCACCAGGAUA	UAUCCUGGUGGGAGAUUUUC	[1046-1066]	-	-
Single Sp	21	GGAUGAUCCGGAAGAUCUCC	GGAGAUCUUUCCGGAUCAUCC	[1036-1056]	-	-
Single Sp	21	GGAACUUCCACGUCUGGAUUG	CAUUCAGACGUGGAAGUUC	[1009-1029]	[2561-2581]	-
Single Sp	21	UCAGAAACGAGACAAAUUUG	CAUUAUUUUGUCUGUUUCUGA	[989-1009]	-	-
Single Sp	21	AUGCCGAGAUUGCUGCAACUC	GAGUUGACAGCAUCUCGGCAU	[970-990]	-	-
Single Sp	21	UACGUACUAGACCGAAUUGC	GCAUUUCGGUCAUAGUACGUA	[953-973]	-	[1093-1105]
Single Sp	21	ACUUGACCAUCGAUACGUACU	AGUACGUUAUGAUGGUCAAGU	[940-960]	[2492-2504]	[1076-1088]
Single Sp	21	CAAUUUCGGUUCGCGCACAA	UUGUGCGCGGAACGGAUUUG	[908-928]	-	-
Single Sp	21	UUAGGUGUCCAACCCGUGUU	AACACGGGUUGGAACACCUAA	[882-902]	[2434-2450]	[1018-1034]
Single Sp	21	CUUAGGUGUCCAACCCGUGU	ACACGGGUUGGAACACCUAAG	[881-901]	[2433-2450]	[1017-1034]
Single Sp	21	UUAUGUGCACCGUAAUGAGAU	AUCUCAUACGGUGCACAUAA	[859-879]	-	-
Single Sp	21	UCUGUUAUGUGCACCGUAAUG	CAUUACGGUGCACAUAAACAGA	[855-875]	[2407-2427]	[991-1011]
Single Sp	21	CUUCGCCUCUGUUAUGUGCAC	GUGCACAUAAACAGAGGCGAAG	[848-868]	[2407-2420]	[988-1004]
Single Sp	21	UCAAACAGCAACGAUGACAAUG	CAUUGUCAUCGUUGCUGUUGA	[694-714]	-	-
Single Sp	21	GUGCCAUGAUCAACAGCAACG	CGUUGCUGUUGAUCAUGGCAC	[685-705]	[2239-2255]	[827-839]
Single Sp	21	ACGACGUGGUGUAUGUGUGCA	UGCACACAUACACCACGUCGU	[655-675]	[2210-2227]	[803-823]
Single Sp	21	CAAAGACUGUCCCGACGGAA	UCCGCGUGGGAACAGUCUUUG	[635-655]	-	-
Single Sp	21	AAAGAACCCGGCCAAAGACUG	CAGUCUUUGGCCGGGUUCUUU	[623-643]	-	-
Single Sp	21	UAAAGAACCCGGCCAAAGACU	AGUCUUUGGCCGGGUUCUUUA	[622-642]	-	-
Single Sp	21	AGAUCUGAACAAGAGCCUGU	ACAGGCUCUUGUUCAGGAUCU	[595-615]	[2147-2165]	[743-763]
Single Sp	21	ACAUCUGCUUUGAGAUCCUGA	UCAGGAUCUCAAGCAGAUGU	[583-603]	[2137-2155]	[733-747]
Single Sp	21	ACAUCAUAGACAUUGCUUUG	CAAAGCAGAUGUCUAUGAUGU	[574-594]	-	-
Single Sp	21	AUGAAAGAUUCAUACCUCU	AGGAGGUGAUGAAUCUUUCAU	[523-543]	-	-
Single Sp	21	GUAAUUAUGCGAGAUUAUGG	CCAUAUUCUCGCAUGAUUAUAC	[485-505]	-	-
Single Sp	21	AGAGCUCCAGGAACAACAAGG	CCUUGUUGUCCUGGAGCUCU	[49-69]	[1607-1621]	[128-142]
Single Sp	21	CAAGUGAAAUACUGCUCGAGG	CCUGCAGCAGAUUUUCACUUG	[463-483]	-	-

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 16445034	mouse 51712629	rat 34857657
Single Sp	21	UCAUCCUACUUUUUAACCCUU	AAGGGUUAAAAAGUAGGAUGA	[415-435]	[1975-1985]	[496-506]
Single Sp	21	UGCAGUUAUUGGCCAUUACAC	GUGUAAUGGCCAAUACUGCA	[335-355]	-	-
Single Sp	21	ACCAGCCAAUGCAGUUAUUGG	CCAAUAACUGCAUUGGCUGGU	[326-346]	-	-
Single Sp	21	UUUCCCUUUUCACACCAGCCA	UGGCUGGUGUGAAAAGGGAAA	[313-333]	-	-
Single Sp	21	CCAAGUUUCCCUUUUCACACC	GGUGUGAAAAGGGAAACUUGG	[308-328]	-	-
Single Sp	21	UUGAGUCUGUCGACCUGCAGA	UCUGCAGGUCGACAGACUCAA	[31-51]	-	-
Single Sp	21	AGAUGGAUCAGGUGGCAACCU	AGGUUGCCACCUGAUCCAUCU	[4-24]	-	-
Single Sp	21	CCAUUGACUCCAACUCUCUCC	GGAGAGAGUUGGAGUCAUUGG	[289-309]	[1851-1861]	[372-382]
Single Sp	21	ACCAUUGACUCCAACUCUCUC	GAGAGAGUUGGAGUCAUUGGU	[288-308]	-	-
Single Sp	21	UCACCAUUGACUCCAACUCUC	GAGAGUUGGAGUCAUUGGUGA	[286-306]	-	-
Single Sp	21	UUUCACCAUUGACUCCAACUC	GAGUUGGAGUCAUUGGUGAAA	[284-304]	-	-
Single Sp	21	ACACCGUGUGCUUUUGGGAAGA	UCUUCCAAAGCACACGGUGU	[2270-2290]	-	-
Single Sp	21	GAAACACCGUGUGCUUUUGGGA	UCCCAAAGCACACGGUGUUUC	[2267-2287]	-	-
Single Sp	21	UUAGAAACACCGUGUGCUUUUG	CAAAGCACACGGUGUUUCUAA	[2264-2284]	-	-
Single Sp	21	AUGAAGCUCUGUUAGAAACAC	GUGUUUCUAAACAGAGCUUCAU	[2253-2273]	-	-
Single Sp	21	GAAUGAAGCUCUGUUAGAAAC	GUUUCUAAACAGAGCUUCAUUC	[2251-2271]	-	-
Single Sp	21	UUCUACUCCUGGCUAUGUCGU	ACGACAUAGCCAGGAGUAGAA	[2189-2209]	-	-
Single Sp	21	GGACAUUUUCGUCACUGUGGC	GCCACAGUGACGAAUUGUCC	[2105-2125]	-	-
Single Sp	21	ACAAGGACAUUUUCGUCACUG	CAGUGACGAAUUGUCCUUGU	[2101-2121]	-	-
Single Sp	21	AGAUCAAAGGCUACAAGGACA	UGUCCUUGUAGCCUUUGAUCU	[2089-2109]	[3797-3817]	[2225-2245]
Single Sp	21	UCAUCAGCAGCAACGAGGUGA	UGACCUCGUUGCUGCUGAUGA	[2065-2085]	[3773-3793]	[2201-2221]
Single Sp	21	UCCAGGUUCUCAUCAGCAGCA	UGCUGCUGAUGAGAACCUGGA	[2056-2076]	[3772-3784]	[2200-2212]
Single Sp	21	AAAGGACCUUGGGACUCUGGU	ACCAGAGUCCCAAGGUCCUUU	[1973-1993]	[3687-3699]	[2113-2127]
Single Sp	21	AGAUAGCAAAGGACCUUGGGA	UCCCAAGGUCCUUGCUAUCU	[1966-1986]	-	-
Single Sp	21	UCAUUGGGCAGAUAGCAAAGG	CCUUUGCUAUCUGCCCAUUGA	[1957-1977]	[3509-3521]	[2093-2105]
Single Sp	21	CCAACACCUUAAUUGGUGGCUC	GAGCCACCAUUAAGGUGUUGG	[1897-1917]	-	-
Single Sp	21	AUGUCACCCUCACCAACACCU	AGGUGUUGGUGAGGGUGACAU	[1885-1905]	[3440-3456]	[2024-2040]
Single Sp	21	CCACUUGUCUAUUGAGGUGUC	GACACCUCAAUAGACAAGUGG	[1829-1849]	[3381-3400]	[1967-1984]
Single Sp	21	CCCCACUUGUCUAUUGAGGUG	CACCUCAAUAGACAAGUGGGG	[1827-1847]	[3379-3399]	[1967-1983]
Single Sp	21	ACAUCACCUUUGUGGCUGAGA	UCUCAGCCACAAAGGUGAUGU	[175-195]	[1730-1747]	[251-268]
Single Sp	21	ACGAAAAGCUAUCCGCGUGU	ACACGCGGAUGAGCUUUUCGU	[1738-1758]	-	-
Single Sp	21	ACAAGCUAACGGACGAAAAGC	GCUUUUCGUCCGUUAGCUUGU	[1726-1746]	-	-
Single Sp	21	ACGACCACAUACCCUUGUGG	CCACAAAGGUGAUGUGGUGGU	[169-189]	[1730-1741]	[244-262]
Single Sp	21	AGAACGACCACAUACCCUUG	CAAAGGUGAUGUGGUGGUUCU	[166-186]	-	-
Single Sp	21	AGAGCUUCUUUGCCCUUCCUG	CAGGAAGGGCAAAGAAGCUCU	[1416-1436]	-	-
Single Sp	21	AAAAUGCUGGGCCCCCAAAGA	UCUUUGGGGGCCAGCAUUUU	[1398-1418]	-	-
Single Sp	21	AUGAAGGCUUCUCGGAAGAAUG	CAUUUCCGAGAAGCCUUCAU	[1383-1403]	-	-
Single Sp	21	AGAGCUGUCUUAUGAAGGCU	AGCCUUCAUGAAGACAGCUCU	[1371-1391]	-	-
Single Sp	21	UCACCAGCUCCUACAAGUACC	GGUACUUGUAGGAGCUGGUGA	[1330-1350]	[2882-2900]	[1466-1484]
Single Sp	21	AUCACCAGCUCCUACAAGUAC	GUACUUGUAGGAGCUGGUGAU	[1329-1349]	[2881-2900]	[1465-1484]
Single Sp	21	UCAGCACUAAGAUGGUGGGGU	ACCCACCAUCUUAGUGCUGA	[1291-1311]	-	-
Single Sp	21	CCGAUGAAGUCAUUUGGCUC	GGAGCCAAUAGACUUAUCGG	[1210-1230]	-	-
Single Sp	21	UGACACCCCUUUUGUGUAUGC	GCAUACACAAAAGGGUGUCA	[1178-1198]	[2734-2750]	[1318-1328]
Single Sp	21	AAAGAUCUCCACCAGGAUAC	GUAUCCUGGUGGGAGAUCUUU	[1047-1067]	-	-
Single Sp	21	AGUGCUGGAUGAUCCGGAAG	CUUUCGGAUCAUCCAGCACU	[1030-1050]	[2582-2602]	[1166-1186]
Single Sp	21	UGGAUAGUGCUGGAUGAUC	GAUCAUCCAGCACUCAUCCA	[1023-1043]	[2575-2595]	[1159-1179]
Single Sp	21	UAUGGAACUCCACGUCUGGA	UCCAGACGUGGAAGUCCAUA	[1006-1026]	[2560-2578]	[1144-1162]
Single Sp	21	CGAGAUGCUGCAACUCAGAA	UUCUGAGUUGACAGCAUCUG	[974-994]	-	-
Single Sp	21	CUUGACCAUCGAUACGUACUA	UAGUACGUUACGAUGGUCAAG	[941-961]	[2493-2513]	[1077-1097]

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 16445034	mouse 51712629	rat 34857657
Single Sp	21	GAACUUGACCAUCGAUACGUA	UACGUAUCGAUGGUCAAGUUC	[938-958]	[2491-2504]	[1074-1088]
Single Sp	21	GGUGUUGCAACCCGUGUUGUU	AACAACACGGGUUGGAACACC	[885-905]	[2437-2450]	[1021-1034]
Single Sp	21	CUGUUAUGUGCACCGUAAUGA	UCAUUACGGUGCACAUAACAG	[856-876]	[2408-2428]	[992-1012]
Single Sp	21	GGGUCUUCGCCUCUGUUAUGU	ACAUAAACAGAGGCCAAGACCC	[844-864]	-	[980-1000]
Single Sp	21	CUGGGUCUUCGCCUCUGUUAU	AUAACAGAGGCCAAGACCCAG	[842-862]	-	[979-998]
Single Sp	21	CAAGAGCCUGUAUCACUUAUA	UUUAAGUGAUACAGGCUCUUG	[605-625]	-	[753-765]
Single Sp	21	GAACAAGAGCCUGUAUCACUU	AAGUGAUACAGGCUCUUGUUC	[602-622]	[2154-2165]	[750-765]
Single Sp	21	GCAGUUUGAAGAGGACAUCAU	AUGAUGUCCUCUCAAACUGC	[560-580]	[2112-2130]	[710-726]
Single Sp	21	GAACUACGGGCAGUUUGAAGA	UCUCAAACUGCCCGUAGUUC	[551-571]	[2103-2123]	[624-636]
Single Sp	21	GAGAUUAUGGCUUUGUUUACA	UGUAAACAAAGCCAUAUUCUC	[496-516]	-	[574-589]
Single Sp	21	CAUGCGAGAUUAUGGCUUUGU	ACAAAGCCAUAAUCUCGCAUG	[491-511]	-	[574-584]
Single Sp	21	CUACCUGCCAAGUGAAAUACU	AGUAUUUACAUUGGCAGGUAG	[455-475]	[2007-2023]	-
Single Sp	21	GUCUACCUGCCAAGUGAAUA	UAUUUACAUUGGCAGGUAGAC	[453-473]	[2005-2023]	[526-536]
Single Sp	21	CGUCUACCUGCCAAGUGAAU	AUUUACAUUGGCAGGUAGACG	[452-472]	[2005-2023]	[526-536]
Single Sp	21	GGAACUUUACUCCUACUUUUU	AAAAAGUAGGAUGAAAGUUC	[408-428]	-	-
Single Sp	21	CUGGGAACUUUACUCCUACUU	AAGUAGGAUGAAAGUUC	[405-425]	-	-
Single Sp	21	CCGCUGGGAACUUUACUCCUA	UAGGAUGAAAGUUC	[402-422]	-	-
Single Sp	21	CCAAGGUCACAGUGUGACUUA	UAAGUCACACUGUGACCUUGG	[380-400]	-	-
Single Sp	21	GGCCAUUACACUCUGAAAAUA	UAUUUACAGAGUGUAAUGGCC	[345-365]	-	-
Single Sp	21	CUCUCCAAGUUUCCUUUUCA	UGAAAAGGGAAACUUGGAGAG	[304-324]	-	-
Single Sp	21	CUCUCUCCAAGUUUCCUUUU	AAAAGGGAAACUUGGAGAGAG	[302-322]	[1854-1865]	[375-395]
Single Sp	21	CGCUUCUGAUUUACCAUUGA	UCAUUGGUGAAAUACAGAGCG	[275-295]	-	[682-698]
Single Sp	21	GAAGAGACAAUAAAGAUUCU	AGACAUCUUUAUUGUCUCUUC	[2286-2306]	-	-
Single Sp	21	GUGUGCUUUGGGAAGAGACAA	UUGUCUCUUCCAAAGCACAC	[2275-2295]	-	-
Single Sp	21	GCCUGCCUGGGAUGAAUGAA	UUCAUUAUUC	[2237-2257]	-	-
Single Sp	21	CAAGGAGAUCAAAGGCUACAA	UUGUAGCCUUUGAUCUCCUUG	[2084-2104]	[3792-3812]	[2220-2240]
Single Sp	21	GGACACACCCUCCAAAUUCA	UUGAAUUUGGAGGGUGUGUCC	[1998-2018]	-	-
Single Sp	21	CGGACACACCCUCCAAAUUCA	UGAAUUUGGAGGGUGUGUCCG	[1997-2017]	-	-
Single Sp	21	CUCAUCAUUGGCAGAUAGCA	UGCUAUCUGCCAUUGAUGAG	[1953-1973]	[3505-3521]	[2089-2105]
Single Sp	21	GUCACCCUCACCAACACCUUA	UAAGGUGUUGGUGAGGGUGAC	[1887-1907]	[3440-3456]	[2024-2040]
Single Sp	21	CAUGCUGGUCCUAAAAGAUU	AUAUCUUUAGGACCAGCAUG	[1793-1813]	[3349-3363]	[1933-1946]
Single Sp	21	GUCCAUGCUGGUCCUAAAAGA	UCUUUAGGACCAGCAUGGAC	[1790-1810]	[3349-3362]	[1933-1946]
Single Sp	21	GCAUUUACAGAAACAAGCUAA	UUAGCUUGUUUCUGUAAUUGC	[1714-1734]	-	-
Single Sp	21	CUGCCCUACAGCAAUUACAGA	UCUGUAAUUGCUGUAGGGCAG	[1704-1724]	[3256-3275]	[1840-1859]
Single Sp	21	GAACGACCACAUACCUUUUGU	ACAAAGGUGAUGUGGUCGUUC	[167-187]	-	-
Single Sp	21	CAUGAAGGCUUCUCGAAAAU	AUUUUCGAGAAGCCUUAUG	[1382-1402]	-	-
Single Sp	21	CCUACAAGUACCCAGAAGGAU	AUCCUUCUGGGUACUUGUAGG	[1339-1359]	-	-
Single Sp	21	GAAGGAGAUACGACUAAGAU	AUCUAGUGCUGAUCUCCUUC	[1283-1303]	-	-
Single Sp	21	GUUCCAUCGGGAAGGAGAUCA	UGAUCUCCUCCCGAUGGAAC	[1273-1293]	-	-
Single Sp	21	GGUGAACGCCGAUGAAGUCAU	AUGACUUAUCGGCGUUCACC	[1202-1222]	-	-
Single Sp	21	CCUAGACACCCUUUUGUGU	ACACAAAAGGGGUGUCAUAGG	[1174-1194]	[2726-2746]	[1310-1328]
Single Sp	21	CGAGACAAAUAUGGAACUUC	GAAGUCCAUAUUUUGUCUCG	[996-1016]	-	-
Single Sp	21	GAAACGAGACAAAUAUGGAA	UUCCAUAUUUUGUCUCGUUUC	[992-1012]	-	-
Single Sp	21	AACUCAGAAACGAGACAAAU	AUUUUGUCUCGUUUCUGAGUU	[986-1006]	-	-
Single Sp	21	UACUCAGAAACGAGACAAA	UUUGUCUCGUUUCUGAGUUGA	[984-1004]	-	-
Single Sp	21	GCUGUCAACUCAGAAACGAGA	UCUCGUUUCUGAGUUGACAGC	[980-1000]	-	-
Single Sp	21	AUGCUGUCAACUCAGAAACGA	UCGUUUCUGAGUUGACAGCAU	[978-998]	-	-
Single Sp	21	CGAAAUGCCGAGAUGCUGUCA	UGACAGCAUCUCGGCAUUUCG	[966-986]	-	-
Single Sp	21	CGAUACGUACUAUGACCGAAA	UUUCGGUCAUAGUACGUAUCG	[950-970]	-	[1093-1105]

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 16445034	mouse 51712629	rat 34857657
Single Sp	21	GAUAGGAACUUGACCAUCGAU	AUCGAUGGUCAAGUCCUAUC	[933-953]	[2491-2504]	[1073-1088]
Single Sp	21	CAACGUGGAUAGGAACUUGAC	GUCAAGUCCUAUCCACGUUG	[926-946]	-	-
Single Sp	21	GUGUUGUUUCCAAUUUCCGUU	AACGGAAAUUGGAAACAACAC	[898-918]	[2455-2467]	[1039-1051]
Single Sp	21	CCGUGUUGUUUCCAAUUUCCG	CGGAAAUUGGAAACAACACGG	[896-916]	[2455-2467]	[1039-1051]
Single Sp	21	CCCUGUUGUUUCCAAUUUCC	GGAAAUUGGAAACAACACGGG	[895-915]	[2455-2467]	[1039-1051]
Single Sp	21	GAGAUGCUUAGGUGUCCAAC	GUUGGAACACCUAAGCAUCUC	[875-895]	[2427-2447]	[1011-1031]
Single Sp	21	UGAGAUGCUUAGGUGUCCAA	UUGGAACACCUAAGCAUCUCA	[874-894]	[2426-2446]	[1010-1030]
Single Sp	21	ACCGUAAUGAGAUGCUUAGGU	ACCUAAGCAUCUCAUACGGU	[867-887]	[2422-2439]	[1006-1023]
Single Sp	21	CCUCUGUUUAGUGCACCUGAA	UUACGGUGCACAUAACAGAGG	[853-873]	[2407-2425]	[989-1009]
Single Sp	21	GUCUUCGCCUCUGUUUAGUGC	GCACAUACAGAGGCGAAGAC	[846-866]	[2398-2418]	[982-1002]
Single Sp	21	CAACGAUGACAAUGGCGUGCU	AGCACGCCAUUGUCAUCGUUG	[701-721]	-	-
Single Sp	21	CCAUGAUCAACAGCAACGAUG	CAUCGUUGCUGUUGAUCAUGG	[688-708]	[2240-2255]	[827-839]
Single Sp	21	UGGUGAGUGCCAUGAUCAACA	UGUUGAUCAUGGCACUCACCA	[679-699]	[2239-2251]	-
Single Sp	21	GUGGUGAGUGCCAUGAUCAAC	GUUGAUCAUGGCACUCACCAC	[678-698]	[2230-2250]	-
Single Sp	21	GAACGACGUGGUGUAUGUGUG	CACACAUAACACCGUCGUUC	[653-673]	[2210-2225]	[802-818]
Single Sp	21	GCCUGUAUCACUUAAGAACC	GGUUCUUUAAGUGAUACAGGC	[610-630]	-	-
Single Sp	21	AGAGCCUGUAUCACUUAAGA	UCUUUAAGUGAUACAGGCUCU	[607-627]	-	[755-765]
Single Sp	21	CUGAACAGAGCCUGUAUCAC	GUGAUACAGGCUCUUGUUCAG	[600-620]	[2152-2165]	[749-765]
Single Sp	21	UCUGCUUUGAGAUCUGAACA	UGUUCAGGAUCUCAAGCAGA	[586-606]	[2138-2158]	[734-754]
Single Sp	21	CAUCUGCUUUGAGAUCUGAA	UUCAGGAUCUCAAGCAGAUG	[584-604]	[2137-2156]	[733-752]
Single Sp	21	GAAGAGGACAUCAUAGACAUC	GAUGUCUAUGAUGUCCUCUUC	[567-587]	[2119-2130]	[715-726]
Single Sp	21	UGAAGAGGACAUCAUAGACAU	AUGUCUAUGAUGUCCUCUUC	[566-586]	[2118-2130]	[714-726]
Single Sp	21	UUGAAGAGGACAUCAUAGACA	UGUCUAUGAUGUCCUCUCAA	[565-585]	[2117-2130]	[713-726]
Single Sp	21	GUUUGAAGAGGACAUCAUAGA	UCUAUGAUGUCCUCUCAAAC	[563-583]	[2115-2130]	[711-726]
Single Sp	21	CUACGGGCAGUUUGAAGAGGA	UCCUCUCAAACUGCCCGUAG	[554-574]	[2110-2126]	[710-722]
Single Sp	21	UGGAACUACGGGCAGUUUGAA	UCAAACUGCCCGUAGUCCA	[549-569]	[2101-2121]	[622-636]
Single Sp	21	GGUCAUGAAAGAUUCAUACC	GGUGAUGAAUCUUUCAUGACC	[519-539]	-	-
Single Sp	21	ACAAGGGUCAUGAAAGAUUCA	UGAAUCUUUCAUGACCCUUGU	[514-534]	-	-
Single Sp	21	GUUUACAAGGGUCAUGAAAGA	UCUUUCAUGACCCUUGUAAAC	[510-530]	[2065-2075]	[583-596]
Single Sp	21	GCUUUGUUUACAAGGGUCAUG	CAUGACCCUUGUAAACAAAGC	[505-525]	[2065-2075]	[578-596]
Single Sp	21	GGCUUUGUUUACAAGGGUCAU	AUGACCCUUGUAAACAAAGCC	[504-524]	[2056-2075]	[577-596]
Single Sp	21	CUGCAGGAGUAUAUCAUGCGA	UCGCAUGAUUACUCCUGCAG	[477-497]	[2029-2046]	[550-567]
Single Sp	21	UACUGCUGCAGGAGUAUAUCA	UGAUUACUCCUGCAGCAGUA	[472-492]	[2029-2044]	[546-565]
Single Sp	21	CAGAGCUCCAGGAACAACAAG	CUUGUUGUCCUGGAGCUCUG	[48-68]	[1607-1620]	[128-141]
Single Sp	21	GAUUACUGCUGCAGGAGUAU	AUACUCCUGCAGCAGUAUUUC	[468-488]	-	-
Single Sp	21	CUACUUUUUAACCCUUGGAGU	ACUCCAAGGGUAAAAAGUAG	[420-440]	[1975-1992]	[496-513]
Single Sp	21	CCUACUUUUUAACCCUUGGAG	CUCCAAGGGUAAAAAGUAGG	[419-439]	[1975-1991]	[496-512]
Single Sp	21	GCUGGGAACUUUCAUCCUACU	AGUAGGAUGAAAGUCCAGC	[404-424]	-	-
Single Sp	21	CUUACCCGUGGGAAACUUUCA	UGAAAGUCCAGCGGGUAAG	[397-417]	-	-
Single Sp	21	CAAGGUCACAGUGUGACUUAC	GUAAGUCACACUGUGACCUUG	[381-401]	[1943-1953]	-
Single Sp	21	CUCUGAAAAUAGAGAUUCUC	GAGAGAUUCUUAUUUCAGAG	[355-375]	[1916-1927]	-
Single Sp	21	ACACUCUGAAAAUAGAGAUUCU	AGAUCUCUAUUUUCAGAGUGU	[352-372]	-	-
Single Sp	21	UUGGCCAUUACACUCUGAAAA	UUUUCAGAGUGUAAUGGCCAA	[343-363]	-	-
Single Sp	21	AUUGGCCAUUACACUCUGAAA	UUUCAGAGUGUAAUGGCCAAU	[342-362]	-	-
Single Sp	21	CAGUUAUUGGCCAUUACACUC	GAGUGUAAUGGCCAAUACUG	[337-357]	-	-
Single Sp	21	CCAGCCAAUGCAGUUAUUGGC	GCCAAUAAUCGCAUUGGCUGG	[327-347]	-	-
Single Sp	21	CCUUUUCACACCAGCCAAUGC	GCAUUGGCUGGUGUAAAAAGG	[317-337]	-	-
Single Sp	21	CAAGUUUCCUUUUCACACCA	UGGUGUGAAAAAGGAAACUUG	[309-329]	-	-
Single Sp	21	CUGAUUUCACCAUUGACUCCA	UGGAGUCAUUGUGAAUUCAG	[280-300]	-	[683-698]

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 16445034	mouse 51712629	rat 34857657
Single Sp	21	GCUUCUGAUUUACCAUUGAC	GUCAAUGGUGAAUUCAGAAGC	[276-296]	-	[682-698]
Single Sp	21	GGAGCGCUUCUGAUUUACCA	UGGUGAAAUCAGAAGCGCUCC	[271-291]	-	[682-693]
Single Sp	21	CUGGAGCGCUUCUGAUUUCAC	GUGAAAUCAGAAGCGCUCCAG	[269-289]	-	[682-692]
Single Sp	21	GUCUGGAGCGCUUCUGAUUUC	GAAUUCAGAAGCGCUCCAGAC	[267-287]	-	-
Single Sp	21	UGUCUGGAGCGCUUCUGAUUU	AAUUCAGAAGCGCUCCAGACA	[266-286]	-	-
Single Sp	21	AUGUCUGGAGCGCUUCUGAUU	AAUCAGAAGCGCUCCAGACAU	[265-285]	-	-
Single Sp	21	GAAUGUCUGGAGCGCUUCUGA	UCAGAAGCGCUCCAGACAUUC	[263-283]	-	-
Single Sp	21	GGAAGAGACAAUAAAGAUUC	GACAUUUUUAUUGUCUUCUCC	[2285-2305]	-	-
Single Sp	21	UUUGGGAAGAGACAAUAAAGA	UCUUUAUUGUCUCUCCCAA	[2281-2301]	-	-
Single Sp	21	UGUGCUUUUGGAAGAGACAAU	AUUGUCUCUCCCAAAGCACA	[2276-2296]	-	-
Single Sp	21	CGUGUGCUUUUGGAAGAGACA	UGUCUCUCCCAAAGCACACG	[2274-2294]	-	-
Single Sp	21	CUGUUAGAAACACCGUGUGCU	AGCACACGGUGUUUCUACAG	[2261-2281]	-	-
Single Sp	21	UGAAUGAAGCUCUGUUAGAAA	UUUCUAAACAGAGCUUCAUUA	[2250-2270]	-	-
Single Sp	21	AUGAAUGAAGCUCUGUUAGAA	UUCUAAACAGAGCUUCAUUAU	[2249-2269]	-	-
Single Sp	21	AAUGAAUGAAGCUCUGUUAGA	UCUAAACAGAGCUUCAUUAU	[2248-2268]	-	-
Single Sp	21	AGCCUGCCUGGGAUGAAUGA	UCAUUAUUCACAGGCAGGCU	[2236-2256]	-	-
Single Sp	21	CUCUUUCUACUCCUGGCUAU	AUAGCCAGGAGUAGAAAGGAG	[2184-2204]	-	-
Single Sp	21	GCUCUUUCUACUCCUGGCUA	UAGCCAGGAGUAGAAAGGAGC	[2183-2203]	-	-
Single Sp	21	CAAGGACAUUUCGUCACUGU	ACAGUGACGAAUUGUCCUUG	[2102-2122]	-	-
Single Sp	21	GCUACAAGGACAUUUCGUCA	UGACGAAUUGUCCUUGUAGC	[2098-2118]	[3806-3818]	[2234-2246]
Single Sp	21	AGGCUACAAGGACAUUUCGU	ACGAAUUGUCCUUGUAGCCU	[2096-2116]	[3804-3818]	[2232-2246]
Single Sp	21	AUCAAAGGCUACAAGGACAU	UAUGUCCUUGUAGCCUUGAU	[2091-2111]	[3799-3818]	[2227-2246]
Single Sp	21	GAGAUCAAAGGCUACAAGGAC	GUCCUUGUAGCCUUGUAGUC	[2088-2108]	[3796-3816]	[2224-2244]
Single Sp	21	CGAGGUCAAGGAGAUCAAAGG	CCUUUGAUCUCCUUGACCUCG	[2078-2098]	[3787-3806]	[2215-2234]
Single Sp	21	CAGCAACGAGGUCAAGGAGAU	AUCUCCUUGACCUCGUUGCUG	[2072-2092]	[3787-3800]	[2215-2228]
Single Sp	21	GUUCUCAUCAGCAGCAACGAG	CUCGUUGCUGCUGAUGAGAAC	[2061-2081]	[3772-3784]	[2200-2212]
Single Sp	21	CCAGGUUCUCAUCAGCAGCAA	UUGCUGCUGAUGAGAACCUGG	[2057-2077]	[3772-3784]	[2200-2212]
Single Sp	21	CCAAAUUCAACUGGACCUCUA	UAGAGGUCCAGUUGAAUUUGG	[2009-2029]	-	[2148-2165]
Single Sp	21	GGGCAGAUAGCAAAGGACCUU	AAGGUCCUUGCUAUCUGCCC	[1962-1982]	-	-
Single Sp	21	CAAUGGGCAGAUAGCAAAGGA	UCCUUUGCUAUCUGCCCAUUG	[1958-1978]	[3510-3521]	[2094-2105]
Single Sp	21	CCUCAUCAUUGGGCAGAUAGC	GCUAUCUGCCCAUUGAUGAGG	[1952-1972]	[3504-3521]	[2088-2105]
Single Sp	21	CUCACCAACACCUUAAUGGUG	CACCAUUAAGGUGUUGGUGAG	[1893-1913]	[3445-3465]	[2029-2049]
Single Sp	21	CCCUCACCAACACCUUAAUGG	CCAUAAGGUGUUGGUGAGGG	[1891-1911]	[3443-3456]	[2027-2047]
Single Sp	21	CUUGUCUAUUGAGGUGUCUGA	UCAGACACCUCAAUAGACAAG	[1832-1852]	[3384-3400]	[1968-1984]
Single Sp	21	CCUCCCCACUUGUCUAUUGAG	CUCAUAGACAAGUGGGGAGG	[1824-1844]	[3376-3396]	[1960-1980]
Single Sp	21	CCUAAAAGAUUCUGUCUGGA	UCCAGACAGAUUCUUUAGG	[1802-1822]	-	-
Single Sp	21	GGUCCUAAAAGAUUCUGUCU	AGACAGAUUCUUUAGGACC	[1799-1819]	[3351-3363]	[1935-1946]
Single Sp	21	UGCUGGUCCUAAAAGAUUCU	AGAUUCUUUAGGACCAGCA	[1795-1815]	[3349-3363]	[1933-1946]
Single Sp	21	CAUACCCUUGUGGCUGAGAC	GUCUCAGCCACAAAGGUGAUG	[176-196]	[1730-1748]	[251-269]
Single Sp	21	GCUAACGGACGAAAAGCUCAU	AUGAGCUUUUCGUCCGUUAGC	[1730-1750]	-	-
Single Sp	21	CAGAAACAAGCUAACGGACGA	UCGUCCGUUAGCUUGUUUCUG	[1721-1741]	-	-
Single Sp	21	CCACAUCACCUUUGUGGCUGA	UCAGCCACAAAGGUGAUGUGG	[173-193]	[1730-1745]	[246-266]
Single Sp	21	AGCAAUUACAGAAACAAGCUA	UAGCUUGUUUCUGUAAUUGCU	[1713-1733]	-	[1849-1868]
Single Sp	21	UGCCCUACAGCAAUACAGAA	UUCUGUAAUUGCUGUAGGGCA	[1705-1725]	[3257-3275]	[1841-1859]
Single Sp	21	CUCUGCCCUACAGCAAUAC	GUAUUUGCUGUAGGGCAGGAG	[1701-1721]	[3256-3273]	[1840-1857]
Single Sp	21	GACCACAUCACCUUUGUGGCU	AGCCACAAAGGUGAUGUGGUC	[171-191]	[1730-1743]	[244-264]
Single Sp	21	UCCUCCUGCCCUACAGCAAUU	AAUUGCUGUAGGGCAGGAGGA	[1699-1719]	[3251-3268]	[1835-1855]
Single Sp	21	CUGGACUUUGGGAAGGAGACA	UGUCUCCUCCCAAAGUCCAG	[1668-1688]	-	-
Single Sp	21	GAACCUGGACUUUGGGAAGGA	UCCUCCCAAAGUCCAGGUUC	[1664-1684]	-	-

Source	Oligo Length	Sense siRNA	AntiSense siRNA	human 16445034	mouse 51712629	rat 34857657
Single Sp	21	GAUGAACCUUGGACUUUGGGAA	UCCCAAAGUCCAGGUUCAUC	[1661-1681]	-	-
Single Sp	21	AGUCCAGAACGACCAUCA	UGAUGUGGUCGUUCUGGGACU	[160-180]	-	-
Single Sp	21	CUUCUUUGCCCUUCCUGGAUC	GAUCCAGGAAGGGCAAAGAAG	[1420-1440]	-	-
Single Sp	21	GCUUCUUUGCCCUUCCUGGAU	AUCCAGGAAGGGCAAAGAAGC	[1419-1439]	-	-
Single Sp	21	UCAUGAAGGCUUCUCGAAAA	UUUCCGAGAAGCCUUCAUGA	[1381-1401]	-	-
Single Sp	21	CUUCAUGAAGGCUUCUCGGAA	UCCGAGAAGCCUUCAUGAAG	[1379-1399]	-	-
Single Sp	21	GCUCUACAAGUACCCAGAAG	CUUCUGGUUACUUGUAGGAGC	[1336-1356]	[2890-2908]	[1474-1492]
Single Sp	21	GAGAUCAAGCACAAGAUGGUG	CACCAUCUAGUGCUGAUCUC	[1287-1307]	-	-
Single Sp	21	GGAGAUCAAGCACAAGAUGGU	ACCAUCUAGUGCUGAUCUCC	[1286-1306]	-	-
Single Sp	21	CGAUGAAGUCAUUUGGCUCCU	AGGAGCCAAUAGACUUAUCG	[1211-1231]	-	-
Single Sp	21	CGCCGAUGAAGUCAUUUGGCU	AGCCAAUAGACUUAUCGGCG	[1208-1228]	-	-
Single Sp	21	UGAACGCCGAUGAAGUCAUUU	AAAUGACUUAUCGGCGUUA	[1204-1224]	-	-
Single Sp	21	AGGUGAACGCCGAUGAAGUCA	UGACUUAUCGGCGUUAACCU	[1201-1221]	-	-
Single Sp	21	CACCCUUUUUGUGUAUGCCGA	UCGGCAUACACAAAAGGGGUG	[1181-1201]	[2734-2750]	[1318-1328]
Single Sp	21	UAUGACACCCUUUUUGUGUAU	AUACACAAAAGGGGUGUCAUA	[1176-1196]	[2728-2748]	[1312-1328]
Single Sp	21	GCCUAUGACACCCUUUUUGUG	CACAAAAGGGGUGUCAUAGGC	[1173-1193]	[2726-2745]	[1310-1328]
Single Sp	21	GCUGGAUGAUCCGGAAGAUC	GAUCUUUCCGGAUCAUCCAGC	[1033-1053]	[2585-2603]	[1169-1187]
Single Sp	21	GGAAUGAGUGCUGGAUGAUCC	GGAUCAUCCAGCACUCAUCC	[1024-1044]	[2576-2595]	[1160-1179]
Single Sp	21	CGUCUGGAUAGUGCUGGAU	AUCCAGCACUCAUCCAGACG	[1019-1039]	[2571-2591]	[1156-1175]
Single Sp	21	ACUCCACGUCUGGAUAGAGU	ACUCAUCCAGACGUGGAAGU	[1012-1032]	[2564-2584]	-
Single Sp	21	AAACGAGACAAAUAUGGAAC	GUUCCAUUUUUGUCUCGUUU	[993-1013]	-	-
Single Sp	21	UGUCAACUCAGAAACGAGACA	UGUCUCGUUUCUGAGUUGACA	[982-1002]	-	-
Single Sp	21	AGAUGCUGUAACUCAGAAAC	GUUUCUGAGUUGACAGCAUCU	[976-996]	-	-
Single Sp	21	ACCGAAAUGCCGAGAUCCUGU	ACAGCAUUCGCGCAUUCGGU	[964-984]	-	-
Single Sp	21	CUAUGACCGAAAUGCCGAGAU	AUCUCGGCAUUCGGUCAUAG	[959-979]	-	[1095-1105]
Single Sp	21	AUACGUACUAUGACCGAAAUG	CAUUUCGGUCAUAGUACGUU	[952-972]	-	[1093-1105]
Single Sp	21	UCGAUACGUACUAUGACCGAA	UUCGGUCAUAGUACGUUACGA	[949-969]	-	[1093-1105]
Single Sp	21	AUCGAUACGUACUAUGACCGA	UCGGUCAUAGUACGUUACGAU	[948-968]	-	[1084-1104]
Single Sp	21	ACCAUCGAUACGUACUAUGAC	GUCAUAGUACGUUACGAUGGU	[945-965]	-	-
Single Sp	21	UGACCAUCGAUACGUACUAUG	CAUAGUACGUUACGAUGGUCA	[943-963]	-	-
Single Sp	21	AGGAACUUGACCAUCGAUACG	CGUAUCGAUGGUCAAGUCCU	[936-956]	[2491-2504]	[1073-1088]
Single Sp	21	ACGUGGAUAGGAACUUGACCA	UGGUCAAGUCCUAUCCACGU	[928-948]	-	[1073-1084]
Single Sp	21	AACGUGGAUAGGAACUUGACC	GGUCAAGUCCUAUCCACGUU	[927-947]	-	[1073-1083]
Single Sp	21	UUCCAAUUUCCGUUCCGCGCA	UGCGCGGAACGGAAUUGGAA	[905-925]	[2457-2467]	[1041-1051]
Single Sp	21	UGUCCAACCCGUGUUGUUUC	GAAACAACACGGGUUGGAACA	[887-907]	[2439-2459]	[1023-1043]
Single Sp	21	UGUGCACCGUAAUGAGAUCCU	AGCAUCUCAUACGGUGCACA	[862-882]	[2414-2434]	[998-1018]
Single Sp	21	UAUGUGCACCGUAAUGAGAU	CAUCUCAUACGGUGCACAUA	[860-880]	[2412-2432]	[996-1016]
Single Sp	21	UGGGUCUUCGCCUCUGUUAUG	CAUAAACAGAGCGAAGACCCA	[843-863]	-	[979-999]
Single Sp	21	AGCCUGUGAAGUACGGACAGU	ACUGUCCGUACUUCACAGGCU	[820-840]	-	-
Single Sp	21	AGGACUACUCCAAAGGGGUCA	UGACCCCUUUGGAGUAGUCCU	[739-759]	-	-
Single Sp	21	AUGAUCAACAGCAACGAUGAC	GUCAUCGUUGCUGUUGAUCAU	[690-710]	[2242-2255]	[827-839]
Single Sp	21	AAGAACCCGGCCAAAGACUGU	ACAGUCUUUGCCGGGUUCUU	[624-644]	-	-
Single Sp	21	ACUUAAGAACCCGGCCAAAG	CUUUGGCCGGGUUCUUUAAGU	[619-639]	-	-
Single Sp	21	UCACUUAAGAACCCGGCCAA	UUGGCCGGGUUCUUUAAGUGA	[617-637]	-	-
Single Sp	21	AUCACUUAAGAACCCGGCCA	UGGCCGGGUUCUUUAAGUGAU	[616-636]	-	-
Single Sp	21	CUGUAUCACUUAAGAACCCG	CGGGUUCUUUAAGUGAUACAG	[612-632]	-	-
Single Sp	21	AAGAGCCUGUAUCACUUAAG	CUUUAAGUGAUACAGGCUCUU	[606-626]	-	[754-765]
Single Sp	21	UGAGAUCCUGAACCAAGAGCCU	AGGCUCUUGUUCAGGAUCUCA	[593-613]	[2145-2165]	[741-761]

EXAMPLE 2**Testing the siRNA compounds for inhibition of TGase activity**5 I. Preparation of working solutions of siRNAs (double-stranded oligonucleotides)

Lyophilized oligonucleotides were dissolved in RNase-free double-distilled water to produce a final concentration of 100uM. The diluted oligonucleotides were kept at room temperature for 15 min and immediately frozen in liquid nitrogen.

10 The oligonucleotides were stored at -80°C and diluted before use with PBS.

II. Activity assay for siRNA against TGase in vitro.

The enzymatic activity of TGase is measured. The activity of siRNA against TGase
15 polypeptide is manifested by reduction in TGase enzymatic activity in transfected cells as compared to control cells.

III. Transfection by siRNA oligonucleotides using Lipofectamine2000 reagent

20 2×10^5 cells are seeded per well in 6 well-plates. After 24 hrs, the cells are transfected with TGase specific siRNA oligonucleotides with or without TGase 1 or TGase 3 or TGase 5 or TGase 7 expression plasmid using Lipofectamine2000 reagent (Invitrogen) according to the following procedure:

- 25 1. Before transfection, the cell medium is replaced with 1500 ul of fresh medium without antibiotics.
2. In a sterile plastic tube, Lipofectamine2000 reagent (the amount is calculated according to 5ul per well) is added to 250ul of serum-free medium, and incubated for 5 min at room temperature.
3. In another tube, the siRNA oligonucleotides (varying amounts to fit the
30 desired final concentration per well) with or without a tested expression plasmid are added to 250ul of serum-free medium.
4. Lipofectamine2000 complex is combined with the siRNA solution and incubated for 20 min at room temperature.
- 35 5. The resulting mixture is added dropwise to the cells, and the cells are incubated at 37°C until analysis of siRNA activity.

EXAMPLE 3

Animal model systems of kidney fibrosis

Testing the active siRNA may be done in the following systems which have been studied as
5 described below. The models are systems for testing the therapeutic efficacy of the inhibitors.

A. ZDF rats

Samples of 9-month-old ZDF rats (Zucker diabetic fatty rats) presented hydronephrotic kidneys with dilated calyces. Microscopically these samples presented a picture of glomerulosclerosis and tubulointerstitial fibrosis. In accordance with these morphological
10 changes, the expression of marker genes as measured by *in situ* hybridization (osteopontin (OPN), transforming growth factor β 1 (TGF- β 1) and procollagen α 1(I) (Col1)) was significantly changed when compared to normal kidneys. Strong OPN expression was detectable in all tubular structures in both cortex and medulla. The TGF- β 1 expression was widespread throughout interstitial cells. Some epithelial cells also showed TGF- β 1
15 expression. Col1 expression was detectable by *in situ* hybridization in most interstitial cells within the medulla, while cortical expression was "focal".

B. Aged fa/fa (obese Zucker) rats

Samples of 12-month-old fa/fa rats presented strong glomerulosclerosis and diffuse
20 tubulointerstitial fibrosis throughout the cortex and the medulla. The pattern of marker gene expression corresponded to morphological changes. OPN was expressed by tubular structures in the cortex and the medulla. Multiple interstitial cells expressed TGF- β 1. Significantly, multiple foci and single interstitial cells showed strong Col1 expression in both cortex and medulla so that the number of Col1-expressing cells appeared to be higher in fa/fa samples than in ZDF
25 samples.

Interestingly, Col1 expression was not detected in glomeruli of either ZDF or fa/fa rats in spite of the prominent accumulation of collagen, as revealed by Sirius Red staining. This suggested a low steady state level of Col1 mRNA in glomerular cells.

C. Aged SD (normal) rats

Samples of aged SD rats showed increased accumulation of collagen in glomeruli and interstitial space and increased expression of the marker genes. Significantly, the intensity of fibrotic change varied among samples so that one of four samples studied displayed very few changes compared with young animals; fibrotic change in another sample was confined to “polar” regions, and two samples showed uniform accumulation of collagen and elevated expression of marker genes throughout the sections.

D. Goto Kakizaki (GK)/Wistar (normal) 48-week-old rats

Samples of both GK and Wistar 48-week-old rats showed an accumulation of collagen in glomeruli and interstitial space. This accumulation was more pronounced in the GK samples. Two samples were used for mRNA isolation: C9 and GK9. Both were hybridized to the probe specific for IGFBP4. The *in situ* hybridization results showed that the GK sample demonstrated elevated expression of this gene.

E. Permanent UUO

Another known animal model in which mainly kidney fibrosis is evident, but without a background of diabetes, is unilateral ureteral obstruction (UUO) in which interstitial fibrosis is rapid and occurs within days following the obstruction.

A known model for fibrosis was employed- unilateral urethra occlusion (UUO). One of the ureters was occluded (see below) and animals were sacrificed 1,5,10,15,20 and 25 days following occlusion.

Permanent UUO resulted in rapid activation (5 days of UUO) of collagen synthesis by interstitial cells in both medulla and cortex. By 20-25 days of UUO, significant amounts of interstitial collagen were deposited in the interstitial space while glomerular accumulation of collagen was confined to the outer capsule. Thus, permanent UUO samples provided an acute model of tubulointerstitial renal fibrosis without prominent glomerulosclerotic changes.

F. 5/6 nephrectomy

5/6 nephrectomy is another useful animal model for chronic renal insufficiency (CRI) in which fibrosis is evident.

What is claimed is:

1. A compound having the structure:

$$\begin{array}{l} 5' (N)_x - Z \text{ 3' antisense strand} \\ 3' Z' - (N')_y \text{ 5' sense strand} \end{array}$$

wherein each N and N' is a ribonucleotide which may be modified or unmodified in its sugar residue and (N)_x and (N')_y is an oligomer in which each consecutive N or N' is joined to the next N or N' by covalent bond ;

wherein each of x and y is an integer between 17 and 40;

wherein each of Z and Z' may be present or absent, but if present is dTdT and is covalently attached at the 3' terminus;
and wherein the sequence of (N)_x comprises any one of the antisense sequences present in Tables A through I.
2. The compound of claim 1, wherein the covalent bond is a phosphodiester bond.
3. The compound of claim 2, wherein x = y.
4. The compound of claim 2, wherein x = y = 19.
5. The compound of claim 1, 2, 3 or 4, wherein Z and Z' are both absent.
6. The compound of claim 1, 2, 3 or 4, wherein Z or Z' is present.
7. The compound of any of claims 1-6, wherein all of the ribonucleotides are unmodified in their sugar residues.
8. The compound of any of claims 1-6, wherein at least one ribonucleotide is modified in its sugar residue.
9. The compound of claim 8, wherein the modification of the sugar residue comprises a modification at the 2' position.
10. The compound of claim 9, wherein the modification at the 2' position is selected from the group comprising amino, fluoro, methoxy, alkoxy and alkyl.
11. The compound of claim 10, wherein the modification at the 2' position is methoxy (2'-O-methyl).

12. The compound of any of claims 1-6 or 8-11, wherein alternating ribonucleotides are modified in both the antisense and the sense strands.
- 5 13. The compound of any of claims 1-6 or 8-12 wherein the ribonucleotides at the 5' and 3' termini of the antisense strand are modified in their sugar residues, and the ribonucleotides at the 5' and 3' termini of the sense strand are unmodified in their sugar residues.
- 10 14. The compound of any of claims 1-13 wherein the antisense strand is phosphorylated at the 5'terminus, and may or may not be phosphorylated at the 3'terminus; and wherein the sense strand may or may not be phosphorylated at the 5'terminus and at the 3'terminus
- 15 15. A vector capable of expressing the compound of any of claims 1-7.
16. A composition comprising the compound of any of claims 1-14 or the vector of claim 15 and a carrier.
- 20 17. A composition of claim 16, wherein the carrier comprises a pharmaceutically acceptable carrier.
- 25 18. A composition comprising a carrier and the compound of claim 1 in an amount effective to down-regulate expression in a cell of a TGase gene which comprises a sequence substantially complementary to the sequence of (N)_x.
- 30 19. A composition comprising a carrier and the compound of claim 5 in an amount effective to down-regulate expression in a cell of a gene of the TGase family which comprises a sequence substantially complementary to the sequence of (N)_x.
20. A method of down-regulating the expression of a gene of the TGase family by at least 50% as compared to a control comprising contacting an mRNA transcript of the gene with a compound of any of claims 1-14.
- 35 21. A method of treating a patient suffering from fibrosis –related pathology comprising administering to the patient a composition of any of claims 16-19 in a therapeutically effective dose so as to thereby treat the patient.
- 40 22. Use of a therapeutically effective amount of a compound of any of claims 1-14 or the vector of claim 15 for the preparation of a composition for promoting recovery in a patient suffering from fibrosis–related pathology, in particular kidney and liver fibrosis, ocular scarring, cataract and glaucoma.
- 45 23. A method of treating a patient suffering from fibrosis –related pathology comprising administering to the patient a composition comprising an inhibitor of the TGase family in a therapeutically effective dose so as to thereby treat the patient.

24. A method of claim 23 wherein the inhibitor is an siRNA.
25. A method of claims 23 or 24 wherein the inhibitor is an antibody
26. A method of claim 23 wherein the TGase is TGase 1, TGase 3, TGase 5 or TGase7.
- 5 27. A method of claim 26 wherein the inhibitor is an siRNA which specifically inhibits TGase.
28. A method of claims 23 or 24 wherein the inhibitor is an antibody which specifically inhibits the TGase polypeptide.

FIGURE 1 OF 2

ATGGCCGAGG AGCTGGTCTT AGAGAGGTGT GATCTGGAGC TGGAGACCAA TGGCCGAGAC CACCACACGG 70
CCGACCTGTG CCGGGAGAAG CTGGTGGTGC GACGGGGCCA GCCCTTCTGG CTGACCTGCG ACTTTGAGGG 140
CCGCAACTAC GAGGCCAGTG TAGACAGTCT CACCTTCAGT GTCGTGACCG GCCCAGCCCC TAGCCAGGAG 210
GCCGGGACCA AGGCCCCGTTT TCCACTAAGA GATGCTGTGG AGGAGGGTGA CTGGACAGCC ACCGTGGTGG 280
ACCAGCAAGA CTGCACCCTC TCGCTGCAGC TCACCACCCC GGCCAACGCC CCCATCGGCC TGTATCGCCT 350
CAGCCTGGAG GCCTCCACTG GCTACCAGGG ATCCAGCTTT GTGCTGGGCC ACTTCATTTT GCTCTTCAAC 420
GCCTGGTGCC CAGCGGATGC TGTGTACCTG GACTCGGAAG AGGAGCGGCA GGAGTATGTC CTCACCCAGC 490
AGGGCTTTAT CTACCAGGGC TCGGCCAAGT TCATCAAGAA CATACTTGG AATTTTGGGC AGTTTGAAGA 560
TGGGATCCTA GACATCTGCC TGATCCTTCT AGATGTCAAC CCCAAGTTCC TGAAGAACGC CGGCCGTGAC 630
TGCTCCCGCC GCAGCAGCCC CGTCTACGTG GGCCGGGTGG TGAGTGGCAT GGTCAACTGC AACGATGACC 700
AGGGTGTGCT GCTGGGACGC TGGGACAACA ACTACGGGGA CGGCGTCAGC CCCATGTCCT GGATCGGCAG 770
CGTGGACATC CTGCGGCGCT GGAAGAACCA CGGCTGCCAG CGCGTCAAGT ATGGCCAGTG CTGGGTCTTC 840
GCCGCCGTGG CCTGCACAGT GCTGAGGTGC CTGGGCATCC CTACCCGCGT CGTGACCAAC TACAACCTCG 910
CCCATGACCA GAACAGCAAC CTTCTCATCG AGTACTTCCG CAATGAGTTT GGGGAGATCC AGGGTGACAA 980
GAGCGAGATG ATCTGGAAct TCCACTGCTG GGTGGAGTCG TGGATGACCA GGCCGGACCT GCAGCCGGGG 1050
TACGAGGGCT GGCAGGCCCT GGACCCAACG CCCAGGAGA AGAGCGAAGG GACGTACTGC TGTGGCCCAG 1120
TTCCAGTTCG TGCCATCAAG GAGGGCGACC TGAGCACCAA GTACGATGCG CCCTTTGTCT TTGCGGAGGT 1190
CAATGCCGAC GTGGTAGACT GGATCCAGCA GGACGATGGG TCTGTGCACA AATCCATCAA CCGTTCCCTG 1260
ATCGTTGGGC TGAAGATCAG CACTAAGAGC GTGGGCCGAG ACGAGCGGGA GGATATCACC CACACCTACA 1330
AATACCCAGA GGGGTCCTCA GAGGAGAGGG AGGCCTTCAC AAGGGCGAAC CACCTGAACA AACTGGCCGA 1400
GAAGGAGGAG ACAGGGATGG CCATGCGGAT CCGTGTGGGC CAGAGCATGA ACATGGGAGG TGACTTTGAC 1470
GTCTTTGCCC ACATCACCAA CAACACCGCT GAGGAGTACG TCTGCCGCTT CCTGCTCTGT GCCCGCACCG 1540
TCAGCTACAA TGGGATCTTG GGGCCCGAGT GTGGCACCAA GTACCTGCTC AACCTCAACC TGGAGCCTTT 1610
CTCTGAGAAG AGCGTTCCTC TTGTCATCCT CTATGAGAAA TACCGTGA CTCTTACGGA GTCCAACCTC 1680
ATCAAGGTGC GGGCCCTCCT CGTGGAGCCA GTTATCAACA GCTACCTGCT GGCTGAGAGG GACCTCTACC 1750
TGGAGAATCC AGAAATCAAG ATCCGGATCC TTGGGGAGCC CAAGCAGAAA CGCAAGCTGG TGGCTGAGGT 1820
GTCCCTGCAG AACCCGCTCC CTGTGGCCCT GGAAGGCTGC ACCTTCACTG TGGAGGGGGC CGGCCTGACT 1890
GAGGAGCAGA AGACGGTGGA GATCCCAGAC CCCGTGGAGG CAGGGGAGGA AGTTAAGGTG AGAATGGACC 1960
TGCTGCCGCT CCACATGGGC CTCCACAAGC TGGTGGTGAA CTTGAGAGC GACAAGCTGA AGGCTGTGAA 2030
GGGCTTCCGG AATGTCATCA TTGGCCCCGC CTAA 2064

FIGURE 2 OF 2

MAEELVLERC DLELETNGRD HHTADLCREK LVVRRGQPFW LTLHFEGRNY EASVDSLTF S VVTGPAPSQE 70
AGTKARFPLR DAVEEGDWTA TVVDQQDCTL SLQLTTPANA PIGLYRLSLE ASTGYQGSSF VLGHFILLFN 140
AWCPADAVYL DSEEEERQEYV LTQQGFIYQG SAKFIKNIPW NFGQFEDGIL DICLILLDVN PKFLKNAGRD 210
CSRRSSPVYV GRVVGSMVNC NDDQGVLLGR WDNNGDGVS PMSWIGSVDI LRRWKNHGCQ RVKYQCWVF 280
AAVACTVLRC LGIPTRVVTN YNSAHDQNSN LLIEYFRNEF GEIQGDKSEM IWNFHCWVES WMTRPDLQPG 350
YEGWQALDPT PQEKSEGTYC CGPVPVRAIK EGDLSKYDA PFVFAEVNAD VVDWQQDDG SVHKSINRSL 420
IVGLKISTKS VGRDEREDIT HTYKYPEGSS EEREAFTRAN HLNKLAEKEE TGMAMRIRVG QSMNMGSDFD 490
VFAHITNNTA BEYVCRLLLC ARTVSYNGIL GPECCTKYL NNLLEPFSEK SVPLCILYEK YRDCLTESNL 560
IKVRALLVEP VINSYLLAER DLYLENPEIK IRILGEPKQK RKLVAEVSQ NPLPVALEG C TFTVEGAGLT 630
EEQKTVEIPD PVEAGEEVKV RMDLLPLHMG LHKLVVNFES DKLKAVKGFR NVIIGPA 687