

(19) **DANMARK**

(10) **DK/EP 3218524 T3**



(12) **Oversættelse af
europæisk patentskrift**

Patent- og
Varemærkestyrelsen

-
- (51) Int.Cl.: **C 12 R 1/01 (2006.01)** **A 61 K 35/741 (2015.01)**
- (45) Oversættelsen bekendtgjort den: **2020-04-06**
- (80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2020-01-08**
- (86) Europæisk ansøgning nr.: **15797929.5**
- (86) Europæisk indleveringsdag: **2015-11-13**
- (87) Den europæiske ansøgnings publiceringsdag: **2017-09-20**
- (86) International ansøgning nr.: **EP2015076572**
- (87) Internationalt publikationsnr.: **WO2016075294**
- (30) Prioritet: **2014-11-13 EP 14306803**
- (84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
- (73) Patenthaver: **Institut national de recherche pour l'agriculture, l'alimentation et l'environnement, 147, rue de l'Université, 75338 Paris Cedex 07, Frankrig**
Institut National de la Santé et de la Recherche Médicale (INSERM), 101, rue de Tolbiac, 75013 Paris, Frankrig
Sorbonne Université, 21 rue de l'Ecole de Médecine, 75006 Paris, Frankrig
Ecole D'ingenieurs De Purpan, 75 voie du TOEC, 31076 Toulouse, Frankrig
Assistance Publique-Hôpitaux de Paris (APHP), 3, avenue Victoria, 75001 Paris, Frankrig
- (72) Opfinder: **MIQUEL, Sylvie, 1, rue de Ceyrat, 63110 Beaumont, Frankrig**
MARTIN ROSIQUE, Rebeca, 7 Allée du Josas, 78350 Jouy En Josas, Frankrig
BERMUDEZ HUMARAN, Luis, 50 ter rue Charles de Gaulle, Appt 14, 78350 Jouy en Josas, Frankrig
THOMAS, Muriel, 39 rue Jules Ferry, 91430 Igny, Frankrig
SOKOL, Harry, 9 rue du Docteur Finlay, 75015 PARIS, Frankrig
THEODOROU, Vassilia, 12 rue Roudoulouque, 31120 Portet Sur Garonne, Frankrig
CARVALHO, Frédéric, Résidence GALAXY, Bâtiment Aquilat, 66 Boulevard Berthelot, 63000 Clermont-Ferrand, Frankrig
LANGELLA, Philippe, 2, rue Henri Roubourdin, 78140 Vélizy, Frankrig
- (74) Fuldmægtig i Danmark: **RWS Group, Europa House, Chiltern Park, Chiltern Hill, Chalfont St Peter, Bucks SL9 9FG, Storbritannien**
- (54) Benævnelse: **FAECALIBACTERIUM PRAUSNITZII-STAMMER TIL BEHANDLING OG FOREBYGGELSE AF GASTROINTESTINALE SMERTE**
- (56) Fremdragne publikationer:
SOKOL HARRY ET AL: "Faecalibacterium prausnitzii is an anti-inflammatory commensal bacterium identified by gut microbiota analysis of Crohn disease patients", PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, NATIONAL ACADEMY OF SCIENCES, US, vol. 105, no. 43, 28 October 2008 (2008-10-28), pages 16731-16736, XP002579466, ISSN: 0027-8424, DOI: 10.1073/PNAS.0804812105 [retrieved on 2008-10-20]

Fortsættes ...

- DATABASE BIOSIS, [Online] 1 May 2012 (2012-05-01), ROSIQUE REBECA MARTIN ET AL: "Protective and Curative Effect of Faecalibacterium prausnitzii in a Chronic DNBS-Induced Murine Colitis", XP002695881, retrieved from BIOSIS Database accession no. PREV201200606260**
- MINGMING ZHANG ET AL: "Faecalibacterium prausnitzii Inhibits Interleukin-17 to Ameliorate Colorectal Colitis in Rats", PLOS ONE, vol. 9, no. 10, 2 October 2014 (2014-10-02), page e109146, XP055186076, DOI: 10.1371/journal.pone.0109146**
- DATABASE BIOSIS [Online] BIOSCIENCES INFORMATION SERVICE, PHILADELPHIA, PA, US; 1 January 2012 (2012-01-01), LOPEZ-SILES MIREIA ET AL: "Cultured Representatives of Two Major Phylogroups of Human Colonic Faecalibacterium prausnitzii Can Utilize Pectin, Uronic Acids, and Host-Derived Substrates for Growth", XP002694537, retrieved from BIOSIS Database accession no. PREV201200130128**
- S MIQUEL ET AL: "Faecalibacterium prausnitzii and human intestinal health", CURRENT OPINION IN MICROBIOLOGY, vol. 16, no. 3, 1 June 2013 (2013-06-01), pages 255-261, XP055185963, ISSN: 1369-5274, DOI: 10.1016/j.mib.2013.06.003**
- S. V. COUTINHO ET AL: "Neonatal maternal separation alters stress-induced responses to viscerosomatic nociceptive stimuli in rat", AMERICAN JOURNAL OF PHYSIOLOGY: GASTROINTESTINAL AND LIVER PHYSIOLOGY, vol. 282, no. 2, 3 October 2001 (2001-10-03), pages G307-G316, XP055185974, ISSN: 0193-1857, DOI: 10.1152/ajpgi.00240.2001**
- JULIE A CHRISTIANSON ET AL: "Assessment of colon sensitivity by luminal distension in mice", NATURE PROTOCOLS, vol. 2, no. 10, 1 October 2007 (2007-10-01), pages 2624-2631, XP055185976, ISSN: 1754-2189, DOI: 10.1038/nprot.2007.392**
- RANGEL I ET AL: "DIFFERENCES IN INTESTINAL MUCOSAL AND FAECAL MICROBIOTA IN PATIENTS WITH IRRITABLE BOWEL SYNDROME", CLINICAL NUTRITION, ABSTRACTS OF THE 35TH ESPEN CONGRESS, vol. 32, supplement 1, September 2013 (2013-09), page S71, XP028699245, ISSN: 0261-5614, DOI: 10.1016/S0261-5614(13)60175-2**

DESCRIPTION

Field of the invention

[0001] The present invention concerns *Faecalibacterium prausnitzii* strains for use in the treatment and prevention of visceral abdominal pain in an individual, in particular of gastrointestinal pain of non-inflammatory origin.

[0002] The present invention also concerns a composition, in particular an oral composition, comprising specific *Faecalibacterium prausnitzii* strains as well as new *Faecalibacterium prausnitzii* strains *per se*.

Prior art

[0003] Visceral abdominal pain, and in particular gastrointestinal pain, is a very common disorder that affects millions of people every year all over the world and is a leading cause of patient visits to clinics. Abdominal pain is present on questioning of 75 percent of otherwise healthy adolescent students (Hyams et al. J. Pediatr. 1996 ; 129:220) and in about half of all adults (Heading ; Scand J Gastroenterol Suppl. 1999; 231:3).

[0004] Such visceral pain can originate from various origins such as peptic disease, pancreatitis in alcoholics, inflammatory bowel disease, appendicitis, ruptured viscus, acute volvulus or even gastritis, biliary colic, gastroenteritis, splenic rupture, hepatic laceration or small bowel rupture.

[0005] However, gastrointestinal disorders, in particular non-inflammatory gastrointestinal disorders, and more particularly Irritable Bowel Syndrome (IBS), are the most frequent reasons for visceral abdominal pain in an individual.

[0006] IBS is one of the 25 most wide-spread recognized pathologies of the gastrointestinal tract. In the USA and in the first five European countries (France, Germany, the United Kingdom, Spain and Italy), in 2009, IBS affected more than 24 million persons. IBS accounts for 40 to 60% of referrals to gastroenterology outpatient clinics (Jones et al., Gut 2000; 47(Suppl 2): ii1-ii19).

[0007] Three subgroups of IBS patients have been defined based on the predominant bowel habit: constipation-predominant (c-IBS), diarrhea-predominant (d-IBS) or alternating between the two (a-IBS). The definition and diagnostic criteria for IBS have been formalized in the "Rome Criteria" (Drossman et al. 1999, Gut 45:Suppl II: 1-81).

[0008] The pathophysiology of IBS is believed to involve alterations in the brain-gut axis.

However, the mechanisms by which these changes lead to IBS remain poorly understood.

[0009] IBS is in particular characterized by a colonic hypersensitivity. This pain sensitivity is usually studied using variation of balloon distention in the rectum, a procedure in which a balloon is inserted into the rectum and slowly inflated. This common complaint is a crucial feature because of its significant impact on a patient's quality of life and lack of efficient therapies.

[0010] However, the current treatments against IBS and visceral abdominal pain are disappointing.

[0011] There is thus a need for new substances, in particular probiotics, or compositions for the treatment and/or prevention of visceral abdominal pain, in particular gastrointestinal pain, in an individual.

[0012] There is also a need for new substances, in particular probiotics, or compositions for preventing and/or treating visceral abdominal pain in an individual suffering from a non-inflammatory gastrointestinal disorder, in particular from an Irritable Bowel Syndrome (IBS).

[0013] More particularly, there is a need in the prior art for new substances, in particular probiotics, or compositions that are able to diminish the sensitivity of nociceptors in the gastrointestinal tract of an individual, in particular in individuals suffering from a colonic hypersensitivity.

Summary of the invention

[0014] The present invention aims to provide novel substances, in particular probiotics, and compositions for treating and/or preventing visceral abdominal pain in an individual, more particularly gastrointestinal pain of non-inflammatory origin.

[0015] According to the inventors' experimental results, specific *Faecalibacterium prausnitzii* (*F. prausnitzii*) strains, belonging to three particular phylogroups previously described (Lopez-Siles *et al.*, 2012), possess the unexpected ability to diminish visceral abdominal pain in an individual. As illustrated in the Examples and discussed further, the inventors have demonstrated that *F. prausnitzii* strains outside of these phylogroups, such as the strain CNCM 1-4541, do not possess such advantageous properties.

[0016] The properties of the *F. prausnitzii* strains of the invention have been demonstrated in the examples by the inventor's in two different models: a Neonatal Maternal Separation (NMS) colonic hypersensitivity (CHS) mouse model and a Partial Restraint Stress (PRS) rat model.

[0017] Strains according to the invention are more particularly able to diminish the sensitivity of nociceptors in the gastrointestinal tract of an individual and consequently to prevent and/or

reduce colonic hypersensitivity of said individual.

[0018] Accordingly, the present text describes a bacterial strain of the *Faecalibacterium prausnitzii* species selected from a bacterial strain belonging to one of the phylogroups I, II and III according to the present text, for use in the treatment and/or prevention of visceral abdominal pain in an individual.

[0019] These strains identified by the inventors are thus probiotics that can be used for the above-indicated purposes.

[0020] According to a first object, the present invention relates to a bacterial strain deposited to the CNCM under the accession number 1-4573, for use in the treatment and/or prevention of visceral abdominal pain in an individual.

[0021] An individual according to the invention is a mammal, in particular a human.

[0022] Visceral abdominal pain is pain associated with organs of the abdomen of the individual.

[0023] The visceral abdominal pain is in particular a gastrointestinal pain, in particular a colonic pain.

[0024] A bacterial strain of the *Faecalibacterium prausnitzii* species according to the invention is different from the strain A2-165.

[0025] Bacterial strains described in the text are selected from the group consisting of bacterial strains deposited to the CNCM under the accession numbers 1-4542, 1-4544, 1-4540, 1-4574, 1-4543, 1-4575, 1-4573, 1-4644 and 1-4546, and in particular the bacterial strain deposited to the CNCM under the accession number 1-4573.

[0026] According to an embodiment, the visceral pain according to the invention is caused by a gastrointestinal disorder, in particular a non-inflammatory gastrointestinal disorder.

[0027] A gastrointestinal disorder of the invention, in particular according to this embodiment, can be a gastrointestinal hypersensitivity, in particular a colonic hypersensitivity, and is preferably an Irritable Bowel Syndrome, in particular an alternating-type Irritable Bowel Syndrome.

[0028] In particular, such gastrointestinal disorder according to the invention can be selected from the group consisting of IBS and constipation.

[0029] According to another embodiment, a bacterial strain for use according to the invention is comprised in a composition comprising a physiologically acceptable medium, preferably in an oral composition, and most preferably in a food supplement.

[0030] Thus, the present text describes a composition comprising, in a physiologically acceptable medium, at least one bacterial strain of *Faecalibacterium prausnitzii* selected from the group consisting of bacterial strains deposited to the CNCM under the accession numbers 1-4542, 1-4544, 1-4540, 1-4574, 1-4543, 1-4575, 1-4573, 1-4644 and 1-4546.

[0031] According to another object, the present invention relates to a composition comprising, in a physiologically acceptable medium, at least one bacterial strain deposited to the CNCM under the accession number 1-4573.

[0032] According to the invention, said bacterial strain of the *Faecalibacterium prausnitzii* species is the bacterial strain deposited to the CNCM under the accession numbers 1-4573.

[0033] The term "*physiologically acceptable medium*" is understood to mean a medium that is compatible with the organism of the individual to whom said composition is intended to be administered. It can for example be any non-toxic solvent such as water. In particular, said medium is compatible with an oral administration.

[0034] A composition of the invention is preferably for the oral route and in particular in the form of a food supplement.

[0035] A composition of the invention for the oral route can be selected from the group consisting of a food product, a drink, a pharmaceutical, a nutraceutical, a food additive, a food supplement and a dairy product. It can in particular be a food supplement.

[0036] The inventors have also identified new *Faecalibacterium prausnitzii* strains having the specific abilities discussed previously.

[0037] Consequently, the present text also describes an isolated bacterial strain selected from the group consisting of bacterial strains deposited to the CNCM under the accession numbers 1-4542, 1-4544, 1-4540, 1-4574, 1-4543, 1-4575, 1-4573, 1-4644 and 1-4546.

[0038] A further object of the invention consists in an isolated bacterial strain deposited to the CNCM under the accession number 1-4573.

[0039] According to the invention, said bacterial strain is the bacterial strain deposited to the CNCM under the accession number 1-4573.

[0040] As demonstrated in the examples, a *Faecalibacterium prausnitzii* strain of the invention has no negative impact in an individual not suffering from visceral abdominal pain according to the invention and is thus perfectly safe for use.

Figures' legends

[0041]

Figure 1A illustrates the variation of the Vicerio Motrice Response (VMR - mV/s) of a colon depending on the Distension volume (μL) of a balloon inserted into the rectum and slowly inflated, in non-handled (NH) (normal lines) or Maternal separated (MS) (bold lines) mice pre-treated with PBS (dotted lines) or with CNCM 1-4573 (full lines) bacteria according to the invention.

Figure 1B illustrates the variation of the Vicerio Motrice Response (VMR - mV/s) of a colon depending on the Distension volume (μL) of a balloon inserted into the rectum and slowly inflated, in non-handled (NH) (normal lines) or Maternal separated (MS) (bold lines) mice pre-treated with PBS (dotted lines) or with CNCM 1-4541 (full lines) bacteria outside of the invention.

Figure 2 illustrates 35 *Faecalibacterium prausnitzii* strains and their distribution in or outside of the three phylogroups described in the text.

For illustrative purposes, *Faecalibacterium prausnitzii* strains CNCM 1-4541 (SEQ ID No: 16) and S13E3 (SEQ ID No: 17) are outside the three phylogroups described. The method for obtaining said distribution is discussed further below.

Figure 3A illustrates the effect of *F. prausnitzii* CNCM 1-4573 strain on the number of abdominal cramps/5 minutes in Partial Restraint Stress (PRS) (PRS-4573 - continuous slashed line; n = 12 rats) or basal rats models (Basal-4573 - continuous lines with circles; n = 12 rats) compared to PRS or basal rats treated with PBS (respectively PRS-PBS - dotted slashed lines and Basal-PBS - dotted lines with circles; n = 18 rats per group), depending on the Distension volume (mL) generated with an arterial embolectomy catheter introduced into the rectum of the rats.

Figure 3B illustrates the effect of *F. prausnitzii* CNCM 1-4541 strain outside of the invention on the number of abdominal cramps/5 minutes in Partial Restraint Stress (PRS) (PRS-4573 - continuous slashed line; n = 12 rats) or basal rats models (Basal-4573 - continuous lines with circles; n = 12 rats) compared to PRS or basal rats treated with PBS (respectively PRS-PBS - dotted slashed lines and Basal-PBS - dotted lines with circles; n = 18 rats per group), depending on the Distension volume (mL) generated with an arterial embolectomy catheter introduced into the rectum of the rats.

Detailed description of the invention

[0042] The present inventors have performed a huge amount of work with the view of identifying the ability of specific *Faecalibacterium prausnitzii* strains to treat and/or prevent visceral abdominal pain, and in particular gastrointestinal pain, in an individual.

[0043] The inventors have indeed unexpectedly determined that *Faecalibacterium prausnitzii* strains belonging to three phylogroups defined further exhibit the ability to diminish the sensitivity of nociceptors in the gastrointestinal tract of an individual.

[0044] The bacterial strains of the present text can prevent and/or reduce visceral abdominal pain, in particular gastrointestinal pain, in an individual, in particular in an individual suffering from a gastrointestinal non-inflammatory disorder, and in particular from a colonic hypersensitivity, such as in IBS.

[0045] It is demonstrated herein that bacterial strains of the text are in particular able to reduce the Vicerio Motrice Response (VMR) of a colon when a balloon inserted into the rectum is slowly inflated in an IBS mouse model pre-treated with a bacterial strain of the invention. Said VMR is brought back to a normal intensity, since the VMR level observed after administration of a strain according to the invention is similar to the VMR observed in mice not suffering from colonic hypersensitivity.

Faecalibacterium prausnitzii strains

[0046] *F. prausnitzii* is a major member of the *Firmicutes* phylum and is part of the most abundant commensal bacteria in the healthy human large intestine microbiota.

[0047] *F. prausnitzii* is an extremely oxygen sensitive (EOS) bacterium and is thus difficult to cultivate, even in anaerobic conditions (Duncan et al. 2002, Int. J. Syst. Evol. Microbiol. 52(Pt 6): 2141-6 and Lopez-Siles et al. Appl. Environ Microbiol. 2012 Jan;78(2):420-8). *F. prausnitzii* is in particular known as being one of the most abundant butyrate-producing bacterium in the human gastrointestinal tract, the short chain fatty acid butyrate being very important in gut physiology, systemic functions and beneficial effects for human health (Macfarlane and Macfarlane (2011), J. Clin. Gastroenterol. 45 Suppl: S120-7).

[0048] *F. prausnitzii* is also known for having anti-inflammatory and protective effects in murine models of acute and chronic colitis, i.e. in inflammatory disorders (Martin et al., Inflamm Bowel Dis. 2014 Mar;20(3):417-30 and Sokol et al., Proc Natl Acad Sci USA. 2008 Oct 28;105(43):16731-6).

[0049] Recently, diminished prevalence and abundance of *F. prausnitzii* have been reported in non-inflammatory intestinal disorders. A negative correlation has indeed been observed between the abundance of *F. prausnitzii* bacteria and IBS symptoms, in particular in alternating-type IBS.

[0050] Emerging evidences suggest that perturbation of the gastrointestinal microbiota, and in particular dysbiosis, plays a role in the pathophysiology of IBS (Ringel and Maharshak, Am. J. Physiol. Gastrointest. Liver Physiol. 2013 Oct 15; 305(8): G529-41).

[0051] The ability of the *F. prausnitzii* strains of the text to prevent visceral abdominal pain, and in particular gastrointestinal pain, in an individual is specific to the strains identified by the inventors, and constituting the three phylogroups described.

[0052] Such specific antinociceptive activity is illustrated in the examples, wherein a comparative test has been performed with a *F. prausnitzii* strain not part of the three phylogroups described, i.e. the strain CNCM 1-4541. As demonstrated in these examples, this strain does not possess the antinociceptive activity of the strains of the invention.

Method for obtaining the described Phylogroups

[0053] Isolated *Faecalibacterium prausnitzii* strains have been classified by the inventors in three phylogroups illustrated in Figure 2 according to 16S rRNA sequences.

[0054] Full-length 16S rRNA gene sequences of each strain were obtained or determined and compared one to the other.

[0055] Full-length 16S rRNA sequences of 17 *F. prausnitzii* strains are indicated as sequences SEQ ID No: 1 to 17.

[0056] DNA was extracted from isolated colonies of the different *F. prausnitzii* strains by alkaline lysis in 50 µL of NaOH 0.5 M during 30 min and 50 µL of Tris 1M pH7 and 100 µL H₂O were added.

[0057] 16S rRNA sequences were amplified and PCR products purified with the Wizard SV Gel. PCR Clean-Up system (Promega) was used to obtain bidirectional partial 16S rRNA gene sequences by using primers. All DNA sequences were confirmed by sequencing (Eurofins MWG Operon, Ebersberg, Germany).

[0058] Multiple sequence alignment was performed with hierarchical clustering for 16S rRNA gene sequence full-length construction (<http://multalin.toulouse.inra.fr/multalin>) (CORpet F., Nucleic Acids Res. 1988;16:10881-10890).

[0059] Phylogenetic analysis of the 16S rRNA gene was then performed using MEGA6 software package (<http://www.megasoftware.net/>). The evolutionary history was inferred using the Neighbor-Joining method (Saitou N. and Nei M., Mol Biol Evol. 1987;4:406-425).

[0060] The optimal tree with the sum of branch length = 0.24930207 is shown in Figure 2. The percentage of replicate trees in which the associated taxa clustered together in the bootstrap test (500 replicates) are shown next to the branches (Zharkikh A. and Li WH, Mol Phylogenet Evol. 1995; 4:44-63).

[0061] The tree is drawn to scale, with branch lengths in the same units as those of the

evolutionary distances used to infer the phylogenetic tree. The evolutionary distances were computed using the Maximum Composite Likelihood method (Tamura et al., Proc Natl Acad Sci USA. 2004;101:11030-11035) and are in the units of the number of base substitutions per site.

[0062] The analysis involved 35 nucleotide sequences. Codon positions included were 1st+2nd+3rd+Non-coding. All positions containing gaps and missing data were eliminated.

[0063] There were a total of 1091 positions in the final dataset.

[0064] *Eubacterium desmolans* was used to root the tree (SEQ ID No: 18). In sequence SEQ ID No: 18, 'n' is used to represent any ambiguous nucleotides.

[0065] In order to verify if a given *F. prausnitzii* strain can be classified in one of the phylogroups I to III, its 16S rRNA sequence needs to be compared through the MEGA6 software package discussed here-above directly to the one of the present invention.

[0066] According to an embodiment, a bacterial strain described is selected from phylogroup I.

[0067] Bacterial strains belonging to phylogroup I can be represented by the strains consisting of:

- bacterial strains deposited to the CNCM under the accession numbers 1-4542, I-4544 and 1-4540; and
- bacterial strains of reference HTF-75H, S13A7, S3G1, L2-15, L2-39, L2-61 and L2-6.

[0068] Preferably, a bacterial strain belonging to phylogroup I is selected from the group consisting of bacterial strains deposited to the CNCM under the accession numbers 1-4542, I-4544 and 1-4540.

[0069] According to an embodiment, a bacterial strain described is selected from phylogroup II.

[0070] Bacterial strains belonging to phylogroup II can for example be selected from the group consisting of bacterial strains of reference HTF-60C, HTF-I, HTF-E, HTF-C, HTF-A, HTF-B and HTF-F.

[0071] According to an embodiment, a bacterial strain described is selected from phylogroup III.

[0072] Bacterial strains belonging to phylogroup III can be represented by the strains consisting of:

- bacterial strains deposited to the CNCM under the accession numbers 1-4574, I-4543, I-

4575, I-4573, I-4644 and 1-4546; and

- bacterial strains of reference S3C12, S9G3, S9D8, S3L/3, S4L/4, M21/2 and S10H3,

with the proviso that the bacterial strain is different from the bacterial strain A2-165.

[0073] Preferably, a bacterial strain belonging to phylogroup III is selected from the group consisting of bacterial strains deposited to the CNCM under the accession numbers I-4574, I-4543, I-4575, I-4573, I-4644 and 1-4546.

[0074] Bacterial strains of reference ATCC 27768, A2-165, L2-15, L2-39, L2-6, L2-61, M21/2, S3L/3, S4L/4, HTF-A, HTF-B, HTF-C, HTF-E, HTF-F, HTF-I, HTF-60C and HTF-75H can be obtained as indicated in Lopez-Siles et al., Appl. Environ. Microbiol. 2012, 78(2):420.

[0075] In an embodiment, a bacterial strain described is selected from phylogroups I and/or III. More particularly, a bacterial strain described is selected from phylogroups I and/or III with the proviso that the bacterial strain is different from the bacterial strain A2-165.

[0076] According to an embodiment, a bacterial strain described is selected from the group consisting of bacterial strains deposited to the CNCM under the accession numbers I-4542, 1-4544, 1-4540, 1-4574, 1-4543, 1-4575, 1-4573, 1-4644 and 1-4546.

[0077] The bacterial strain of the invention is the bacterial strain deposited to the CNCM under the accession number 1-4573.

[0078] The inventors have also identified new *Faecalibacterium prausnitzii* strains having the specific abilities discussed previously.

[0079] Consequently, the present text further describes an isolated bacterial strain selected from the group consisting of bacterial strains deposited to the CNCM under the accession numbers 1-4542, 1-4544, 1-4540, 1-4574, 1-4543, 1-4575, 1-4573, 1-4644 and 1-4546.

[0080] The bacterial strain of the invention is the bacterial strain deposited to the CNCM under the accession number 1-4573.

[0081] A suitable daily dose of a bacterial strain according to the invention is from 10^3 to 10^{12} colony forming units (cfu), more preferably from 10^7 to 10^{11} cfu as a medicament, for example as a daily dose equivalent to 10^{10} cfu.

[0082] A *Faecalibacterium prausnitzii* strain of the invention is for use in the treatment and/or prevention of visceral abdominal pain in an individual.

[0083] The strains of the text are probiotics whose activity lies in the gut. A probiotic bacterium according to the text denotes a bacterium which ingested live in adequate quantities can exert beneficial effects on the human health.

[0084] These strains consequently need to be administered alive to the gut.

[0085] The bacteria strains of the text can be administered to the gut of an individual to be treated by different ways, i.e. by the oral, rectal or parenteral route. A bacterium according to the text is preferably administered by the oral or rectal route, more preferably by the oral route.

[0086] According to a preferred embodiment, a bacterial strain of the invention is comprised in a composition comprising a physiologically acceptable medium. Such composition is preferably for the oral route, and in particular in the form of a food supplement.

Compositions

[0087] The present invention further concerns a composition comprising, in a physiologically acceptable medium, at least one bacterial strain of *Faecalibacterium prausnitzii* of the invention.

[0088] More particularly, according to an embodiment, the present invention relates to a composition comprising, in a physiologically acceptable medium, at least one bacterial strain deposited to the CNCM under the accession number 1-4573.

[0089] A composition according to the invention comprises at least one bacterial strain deposited to the CNCM under the accession number 1-4573.

[0090] A composition according to the invention is intended for the gastrointestinal tract, in particular the gut.

[0091] Consequently, a composition according to the invention is selected from an oral, rectal or parenteral composition. A composition of the invention is preferably an oral or rectal composition, more preferably an oral composition.

[0092] According to an embodiment, a composition of the invention is an oral composition, i.e. is intended for oral administration to a subject.

[0093] Such composition can be in the form of a suspension, tablet, pill, capsule, granulate or powder.

[0094] The composition according to the invention for the oral route can be selected from the group consisting of a food product, a drink, a pharmaceutical, a nutraceutical, a food additive, a food supplement or a dairy product, and is in particular a food supplement.

[0095] According to a preferred embodiment, a composition according to the invention is a food supplement.

[0096] Food supplement for oral administration may be present in capsules, gelatin capsules, soft capsules, tablets, sugar-coated tablets, pills, pastes, pastilles, gums, drinkable solutions or emulsions, a syrup or a gel.

[0097] Advantageously, a composition according to the invention, intended for oral administration, can be provided with a coating resistant to gastric juice, so as to ensure that the bacterial strain of the invention comprised in said composition can pass through the stomach undamaged. The release of the bacterial strain can thus take place for the first time in the upper intestinal tract.

[0098] A food supplement according to the invention can also include a sweetener, a stabilizer, an antioxidant, an additive, a flavouring agent and/or a colorant.

[0099] The formulation thereof is carried out by means of the usual methods for producing sugar-coated tablets, gel capsules, gels, hydrogels for controlled release, emulsions, tablets or capsules.

[0100] A composition according to the invention can also be in the form of a nutritional composition.

[0101] A nutritional composition according to the invention is in the form of a yogurt, a cereal bar, a breakfast cereal, a dessert, a frozen food, a soup, a pet food, a liquid suspension, a powder, a tablet, a gum or a candy.

[0102] In a further embodiment of the invention, a composition containing a bacterial strain of the invention is administered intrarectally.

[0103] A rectal administration preferably takes place in the form of a suppository, enema or foam.

[0104] A composition according to the invention contains an amount of bacterial strains of the invention equivalent to between 10^3 and 10^{12} cfu/g (dry weight basis), more preferably between 10^6 and 10^9 cfu/g.

[0105] A composition according to the invention can further comprise at least one of: antioxidants, fish oils, DHA, EPA, vitamins, minerals, phytonutrients, protein, fat, probiotics, and combinations thereof.

[0106] The present text further describes the use of at least one bacterial strain of the *Faecalibacterium prausnitzii* species selected from a bacterial strain belonging to at least one of the phylogroups I, II and III, for the treatment and/or prevention of visceral abdominal pain in an individual.

[0107] The present text also concerns the use of a composition, preferably an oral composition, comprising, in a physiologically acceptable medium, at least one bacterial strain of the *Faecalibacterium prausnitzii* species selected from a bacterial strain belonging to at least one of the phylogroups I, II and III, for the treatment and/or prevention of visceral abdominal pain in an individual.

[0108] The invention will be described below in greater details using the following examples which are given for illustrative purposes only.

[0109] All references to percentages are percentages by weight unless otherwise stated.

EXAMPLES

[0110] *F. prausnitzii* strains have been tested for their ability to have a direct impact on visceral pain, and more particularly on colonic hypersensitivity.

Bacterial strains isolation and growth conditions

[0111] The *F. prausnitzii* strains isolates used in the present example all are of human fecal origin from healthy patients. Said isolates were obtained from the highest countable dilution of human fecal samples in roll tubes of anaerobic M2GSC medium as discussed in Lopez-Siles et al. (Appl. Environ Microbiol. 2012; 78:420-428).

[0112] Tested *F. prausnitzii* strains isolates were grown in LYBHI medium (Brain-Heart infusion medium supplemented with 0.5% yeast extract) (DyfcO, Detroit, USA) supplemented with 1 mg/mL cellobiose (Sigma-Aldrich Chemie GmbH, Buchs, Switzerland), 1 mg/mL maltose (Sigma-Aldrich) and 0.5 mg/mL cystéine (Sigma-Aldrich) at 37°C in anaerobic chamber.

[0113] A. In a first series of tests, a Neonatal Maternal Separation (NMS) colonic hypersensitivity (CHS) mouse model is used.

a. NMS CHS mouse model

[0114] Pregnant C57Bl/6J mice have been purchased from Janvier laboratories (Le Genest Saint Isle, France).

[0115] After birth, wild-type C57Bl/6J were isolated from their mother from D2 to D14, three hours a day, from 9 a.m. to 12 a.m.. At nine-week old age, male mice were orally treated each day for nine days with 200 µL of 10×10^{10} CFU/mL of:

- the strain CNCM 1-4573 according to the invention;
- the strain CNCM 1-4541 outside the invention; or
- PBS as control.

[0116] All the experiments were performed on the last day of treatment at D10.

[0117] The same bacteria treatment was administered to non-NMS CHS mice as a control.

[0118] NMS treatment induced an increased Vicerio Motrice Response (VMR) in the absence of any significant alteration in gut wall macroscopic integrity or colonic mucosa inflammation (Coutinho et al. (2002), Am. J. Physiol. Gastrointest. Liver Physiol. 282(2): G307-16).

[0119] As described in Christianson et al. 2007 (Nat Protoc 2(10): 2624-31), colonic sensitivity was assessed by quantifying visceromotor response with abdominal electromyography (EMG) recordings in response to colorectal distension.

[0120] The inventors also validated this model as being non-inflammatory by checking the cytokines pattern by measurement of 13 types of cytokines in serum samples of stressed (MS : Maternal separated) and non-stressed (NH : Non-handled) mice.

[0121] It was observed that there are no differences in cytokine pattern induced by the chronic stress.

[0122] Moreover, NMS does not induce changes in colonic macroscopic damage, loss of architectural epithelium, goblet cell depletion, oedema/ulceration or inflammatory cell infiltrates.

[0123] Furthermore, NMS does not induce changes in body weight, colon weight and length and in spleen weight when stressed (MS) mice are compared to the control group (PBS).

b. Statistical analysis

[0124] Statistical analysis was completed using GraphPad software (GraphPad Software, La Jolla, CA, USA). All data were expressed as mean +/- SEM.

[0125] MS mice displaying VMR values lower than mean minus two SEM for all distension volumes were considered as non-sensitized and excluded from the analysis.

[0126] For VMR analysis in model validation, a two-way (Volume & Treatment) ANOVA followed by Bonferroni post-hoc test for multiple comparisons was used.

[0127] $P < 0.05$ was considered statistically significant.

c. Results

[0128] The results obtained are presented in Figures 1A and 1B.

[0129] As it can be seen in Figure 1A, control Maternal separated (MS) mice, to whom only PBS was administered, present a high VMR, two times higher than the VMR of the non-handled (NH) mice, treated with CNCM 1-4573 bacteria or only with PBS.

[0130] More importantly, it can be seen that MS mice to whom CNCM 1-4573 bacteria of the invention were administered possess a VMR statistically similar to the one of NH mice, all along the growth of the Volume Distension.

[0131] On the contrary, in Figure 1B, there is no statistical difference between the results obtained with MS mice only treated with PBS or treated with CNCM 1-4541 bacteria.

[0132] Treatment based on the administration of *F. prausnitzii* strain CNCM 1-4573 according to the invention led to a specific and significant decrease of the VMR in the tested mice as well as a prevention of the increase of the VMR.

[0133] On the contrary, the treatments based on the control tests (NH mice) and on the administration of *F. prausnitzii* strain CNCM 1-4541 present no effect on the VMR of all the tested mice.

[0134] The present results clearly demonstrate that *F. prausnitzii* strains according to the invention have a specific and unexpected beneficial effect on visceral abdominal pain.

[0135] B. In a second series of tests, a Partial Restraint Stress (PRS) rat model is used.

a. Partial Restraint Stress (PRS) rat model

[0136] Animal preparation was performed as previously described in Ait-Belgnaoui et al.; Gut 55, 1090-1094 (2006).

[0137] Briefly, under general anesthesia induced by *i.p.* administration of 0.6 mg/kg acepromazine (Calmivet, Vetoquinol, Lure, France) and 120 mg/kg ketamine (Imalgene 1000, Merial, Lyon, France), female Wistar rats (Rosztóczy, A. et al.; Neurogastroenterol. Motil. Off. J. Eur. Gastrointest. Motil. Soc. 15, 679-686 (2003)) were equipped with three groups of three NiCr wire electrodes (60 cm in length, 80 nm in diameter) implanted into the abdominal external oblique muscle, 2 cm above the inguinal ligament.

[0138] Electrodes were exteriorized at the neck level by a glass tube attached to the skin.

[0139] During the ten days previous to the stress, 1 ml of $\pm 1 \times 10^9$ CFU or PBS were daily intragastrically administrated.

[0140] The study groups are as follows:

- the strain CNCM 1-4573 according to the invention;
- the strain CNCM 1-4541 outside the invention; or
- PBS as control.

[0141] All stress sessions were performed at the same time of the day (between 10 am and 12 pm) to minimize any influence of circadian rhythms. Stresses were performed using the wrap partial restrain stress model which is a mild non-ulcerogenic stressor (Williams, C. L et al.; Am. J. Physiol. 253, G582-586 (1987)).

[0142] Animals were lightly anesthetized (as previously described in Lee B. et al.; J. Neurogastroenterol. Motil. 17, 252-266 (2011)), with ethyl-ether and their fore shoulders, upper forelimbs and thoracic trunk were draped in a confining harness of paper tape to restrict, but not to prevent, body movements.

[0143] Then rats were placed in their home cage for 2 h.

b. Rectal or colorectal distension and colonic hypersensitivity measurement

[0144] Rats colonic sensitivity induced by PRS was assessed by quantifying electrical response through an electroencephalograph Reega Mini-hui (ALVAR, France) and expressed as number of abdominal cramps for a five min period (as previously described in Eutamene, H. et al.; J. Physiol. 506 (Pt 1), 245-252 (1998)).

[0145] Briefly, rats were accustomed to be in polypropylene tunnels (diameter 7 cm, length 20 cm) several days before colorectal distension (CRD) in order to minimize recording artifacts.

[0146] CRD was performed with an arterial embolectomy catheter (Fogarty; Edwards Laboratoire, Inc., Santa Ana, CA, USA) introduced into the rectum (1 cm from the anus) and fixed at the base of the tail.

[0147] Distension of the colon was performed by connecting the catheter to a syringe and consecutive injections of different volumes (0.4, 0.8, 1.2 ml) with an interval of 5 minutes.

[0148] Each animal was recorded two days before the stress (basal measure) and just after the PRS (stress measure).

c. Statistical Analysis.

[0149] Statistical analysis was completed using GraphPad software (GraphPad Software, La Jolla, CA, USA).

[0150] Results are presented with means \pm SEM.

[0151] Differences in the number of abdominal cramps during 5 minutes to gradual CRD volumes were analyzed using a 2-way ANOVA (Treatment, Volume) followed by Bonferroni *post-hoc* test for multiple comparisons.

[0152] A *p* value of less than 0.05 was considered significant.

d. Results

[0153] To determine if *F. prausnitzii* CNCMI-4541 (outside of the invention) and CNCMI-4573 (according to the invention) strains are able to prevent acute stress generated symptoms on visceral sensitivity, both were tested on a model of Partial Restraint Stress (PRS).

[0154] PRS increased the number of abdominal cramps in response to CRD in a volume-dependent manner (**Figures 3A and 3B**).

[0155] In stressed rats treated with PBS, distensions at any volumes significantly increased the number of abdominal contractions compared to non-stressed animals ($p < 0.01$)

(**Figures 3A and 3B**).

[0156] *F. prausnitzii* CNCMI-4573 strain treatment prevented this stress-induced visceral hypersensitivity until 0.8ml distension volume ($p < 0.001$) (**Figure 3A**).

[0157] In basal conditions, no difference was observed in the VMR to CRD between the different treatments (**Figure 3A**).

[0158] In contrast, *F. prausnitzii* CNCMI-4541 strain did not show a protective effect (**Figure 3B**).

[0159] In conclusion, it appears that a *F. prausnitzii* strain according to the invention prevents visceral hypersensitivity in a model of Partial Restraint Stress (PRS).

SEQ ID No: 1: 16S rRNA sequence of *F. prausnitzii* CNCM 1-4540

AGAGTTTGATCCTGGCTCAGGACGAACGCTGGCGGCGCGCCTAACACA
 TGCAAGTCGAACGAGTGAGAGAGAGCTTGCTTTCTCGAGCGAGTGGCGAACGGG
 TGAGTAACGCGTGAGGAACCTGCCTCAAAGAGGGGGACAACAGTTGAAAACGAC
 TGCTAATACCGCATAAGCCCACGGCTCGGCATCGAGCAGAGGGAAAAGGAGTGA
 TCCGCTTTGAGATGGCCTCGCGTCCGATTAGCTAGTTGGTGAGGTAATGGCCAC
 CAAGGCGACGATCGGTAGCCGGACTGAGAGGTTGAACGGCCACATTGGGACTGA
 GACACGGCCCAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGCACAATGGGG
 GAAACCCTGATGCAGCGACGCCGCGTGGAGGAAGAAGGTCTTCGGATTGTAAAC
 TCCTGTTGTTGGGGAAGATAATGACGGTACCCAACAAGGAAGTGACGGCTAACT
 ACGTGCCAGCAGCCGCGGTAAAACGTAGGTCACAAGCGTTGTCCGGAATTACTG
 GGTGTAAGGGAGCGCAGGCCGGGAGACAAGTTGGAAGTGAATCTATGGGCTC
 AACCCATAAACTGCTTTCAAACCTGTTTTTCTTGAGTAGTGCAGAGGTAGGCGGA
 ATCCCGGTGTAGCGGTGGAATGCGTAGATATCGGGAGGAACACCAGTGGCGAA
 GGCGGCCTACTGGGCACCAACTGACGCTGAGGCTCGAAAGTGTGGGTAGCAAAC
 AGGATTAGATACCCTGGTAGTCCACACCGTAAACGATGATTACTAGGTGTTGGAG
 GATTGACCCCTTCAGTGCCCGCAGTTAACACAATAAGTAATCCACCTGGGGAGTAC
 GACCGCAAGGTTGAAACTCAAAGGAATTGACGGGGGCCGCACAAGCAGTGGAG
 TATGTGGTTTAATTCGACGCAACGCGAAGAACCTTACCAAGTCTTGACATCCCTT
 GACAGACATAGAAATATGTATTCTTTCGGAGCAAGGAGACAGGTGGTGCATGG
 TTGTCGTCAGCTCGTGTGCTGAGATGTTGGGTTAAGTCCCGCAACGAGCGCAACC
 CTTATGGTCAGTACTACGCAAGAGGACTCTGGCCAGACTGCCGTTGACAAAACG
 GAGGAAGGTGGGGATGACGTCAAATCATCATGCCCTTTATGACTTGGGCTACACA
 CGTACTACAATGGCGTTAAACAAAGAGAAGCAAGACCGCGAGGTGGAGCAAAAC
 TCAGAAACAACGTCCAGTTCGGACTGCAGGCTGCAACTCGCCTGCACGAAGTCG
 GAATTGCTAGTAATCGTGGATCAGCATGCCACGGTGAATACGTTCCCGGGCCTTG
 TACACACCGCCCGTCACACCATGAGAGCCGGGGGGACCCGAAGTCGGTAGTCTA
 ACCGCAAGGAGGACGCCGCCGAAGGTAAAACCTGGTGATTGGGGTGAAGTCGTAA
 CAAGGTAGCCGT

SEQ ID No: 2: 16S rRNA sequence of *F. prausnitzii* CNCM 1-4542

AGAGTTTGATCCTGGCTCAGGACGAACGCTGGCGGCGCGCCTAACACA
 TGCAAGTCGAACGAGCGAGAGAGAGCTTGCTTTCTCGAGCGAGTGGCGAACGGG
 TGAGTAACGCGTGAGGAACCTGCCTCAAAGAGGGGGACAACAGTTGAAAACGAC
 TGCTAATACCGCATAAGCCCACGGGTCGGCATCGACCAGAGGGAAAAGGAGCAA
 TCCGCTTTGAGATGGCCTCGCGTCCGATTAGCTAGTTGGTGAGGTAATGGCCAC
 CAAGGCAACGATCGGTAGCCGGACTGAGAGGTTGAACGGCCACATTGGGACTGA
 GACGCGGCCAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGCACAATGGGG
 GAAACCCTGATGCAGCGACGCCGCGTGGAGGAAGAAGGTCTTCGGATTGTAAAC
 TCCTGTTGTTGGGGAAGATAATGACGGTACCCAACAAGGAAGTGACGGCTAACT
 ACGTGCCAGCAGCCGCGGTAAAACGTAGGTCACAAGCGTTGTCCGGAATTACTG

GGTGTAAGGGAGCGCAGGCGGGAAGACAAGTTGGAAGTGAAATCTATGGGCTC
AACCATAAACTGCTTTCAAACCTGTTTTCTTGAGTAGTGCAGAGGTAGGCGGA
ATTCCCGGTGTAGCGGTGGAATGCGTAGATATCGGGAGGAACACCAGTGGCGAA
GGCGGCCTACTGGGCACCAACTGACGCTGAGGCTCGAAAGTGTGGGTAGCAAAC
AGGATTAGATACCCTGGTAGTCCACACCGTAAACGATGGTTACTAGGTGTTGGAG
GATTGACCCCTTCAGTGCCGAGTTAACACAATAAGTAATCCACCTGGGGAGTAC
GACCGCAAGGTTGAAACTCAAAGGAATTGACGGGGGCCCGCACAAGCAGTGGAG
TATGTGGTTTAATTCGACGCAACGCGAAGAACCTTACCAAGTCTTGACATCCCTT
GACAGACATAGAAATATGTAATCTCTTCGGAGCAAGGAGACAGGTGGTGCATGG
TTGTCGTCAGCTCGTGTCTGAGATGTTGGGTTAAGTCCCGCAACGAGCGCAACC
CTTATGGTCAGTTACTACGCAAGAGGACTCTGGCCAGACTGCCGTTGACAAAACG
GAGGAAGGTGGGGATGACGTCAAATCATCATGCCCTTTATGACTTGGGCTACACA
CGTACTACAATGGCGTTAAACAAAGAGAAGCAAGACCGCGAGGTGGAGCAAAAC
TCAGAAACAACGTCCAGTTCGGACTGCAGGCTGCAACTCGCCTGCACGAAGTCG
GAATTGCTAGTAATCGTGGATCAGCATGCCACGGTGAATACGTTCCCGGGCCTTG
TACACACCGCCCGTCACACCATGAGAGCCGGGGGGACCCGAAGTCGGTAGTCTA
ACCGCAAGGAGGACGCCGCCGAAGGTAAAACCTGGTGATTGGGGTGAAGTCGTAA
CAAGGTAGCCGT

SEQ ID No: 3: 16S rRNA sequence of *F. prausnitzii* S3C12

GCGAGAGAGAGCTTGCTTTCTCGAGCGAGTGGCGAACGGGTGAGTAA
CGCGTGAGGAACCTGCCTCAAAGAGGGGGACAACAGTTGGAAACGACTGCTAAT
ACCGCATAAGCCCACGGCCCGCATCGGGCAGAGGGAAAAGGAGCAATCCGCTT
TGAGATGGCCTCGCGTCCGATTAGCTAGTTGGTGAGGTAACGGCCCACCAAGGCG
ACGATCGGTAGCCGACTGAGAGGTTGAACGGCCACATTGGGACTGAGACACGG
CCCAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGCACAATGGGGGAAACCC
TGATGCAGCGACGCCGCGTGGAGGAAGAAGGTCTTCGGATTGTAAACTCCTGTTG
TTGAGGAAGATAATGACGGTACTCAACAAGGAAGTGACGGCTAACTACGTGCCA
GCAGCCGCGGTAAAACGTAGGTCACAAGCGTTGTCCGGAATTACTGGGTGTAAA
GGGAGCGCAGGCGGGAAGACAAGTTGGAAGTGAAATCCATGGGCTCAACCCATG
AACTGCTTTCAAACCTGTTTTCTTGAGTAGTGCAGAGGTAGGCGGAATTCCCGG
TGTAGCGGTGGAATGCGTAGATATCGGGAGGAACACCAGTGGCGAAGGCGGCCT
ACTGGGCACCAACTGACGCTGAGGCTCGAAAGTGTGGGTAGCAAACAGGATTAG
ATACCTGGTAGTCCACACCGTAAACGATGATTACTAGGTGTTGGAGGATTGACC
CCTTCAGTGCCGAGTTAACACAATAAGTAATCCACCTGGGGAGTACGACCGCAA
GGTTGAAACTCAAAGGAATTGACGGGGGCCCGCACAAGCAGTGGAGTATGTGGT
TTAATTCGACGCAACGCGAAGAACCTTACCAAGTCTTGACATCCTGCGACGGTTC
TGGAACAGAACTTTCCTTCGGGACGCAGAGACAGGTGGTGCATGGTTGTCGTCA
GCTCGTGTCTGAGATGTTGGGTTAAGTCCCGCAACGAGCGCAACCCCTTATGGTC

AGTTACTACGCAAGAGGACTCTGGCCAGACTGCCGTTGACAAAACGGAGGAAGG
 TGGGGATGACGTCAAATCATCATGCCCTTTATGACTTGGGCTACACACGTACTAC
 AATGGCGTTAAACAAAGAGAAGCAAGACCGCGAGGTGGAGCAAAACTCAGAAA
 CAACGTCCCAGTTCGGACTGCAGGCTGCAACTCGCCTGCACGAAGTCGGAATTGC
 TAGTAATCGTGGATCAGCATGCCACGGTGAATACGTTCCCGGGCCTTGTACACAC
 CGCCCGTCACACCATGAGAGCCGGGGGACCCGAAGTCGGTAGTCTAACCGCAA
 GGAGGACGCCGCCGAAGGTAAAACCTGGTGATTGGGGTGAAGTCGTAACAAGGTA
 G

SEQ ID No: 4: 16S rRNA sequence of *F. prausnitzii* S3G1

AGCGAGAGAGAGCTTGCTTCTCGAGCGAGTGGCGAACGGGTGAGTA
 ACGCGTGAGGAACTGCCTCAAAGAGGGGGACAACAGTTGAAAACGACTGCTAA
 TACCGCATAAGCCCACGGTGCCGCATGGCACAGAGGGAAAAGGAGCAATCCGCT
 TTGAGATGGCCTCGCGTCCGATTAGCTAGTTGGTGAGGTAACGGCCCACCAAGGC
 GACGATCGGTAGCCGGACTGAGAGGTTGAACGGCCACATTGGGACTGAGACACG
 GCCCAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGCACAATGGGGGAAACC
 CTGATGCAGCGACGCCGCGTGGAGGAAGAAGGTCTTCGGATTGTAAACTCCTGTT
 GTTGGGGAAGATAATGACGGTACCCAACAAGGAAGTGACGGCTAACTACGTGCC
 AGCAGCCGCGGTAAAACGTAGGTCACAAGCGTTGTCCGGAATTACTGGGTGTAA
 AGGGAGCGCAGGCGGGAAGACAAGTTGGAAGTGAAATCTATGGGCTCAACCCAT
 AAACCTGCTTTCAAAACTGTTTTTCTTGAGTAGTGCAGAGGTAGGCGGAATTCCCG
 GTGTAGCGGTGGAATGCGTAGATATCGGGAGGAACACCAGTGGCGAAGGCGGCC
 TACTGGGCACCAACTGACGCTGAGGCTCGAAAGTGTGGGTAGCAAACAGGATTA
 GATACCCTGGTAGTCCACACCGTAAACGATGATTACTAGGTGTTGGAGGATTGAC
 CCCTTCAGTGCCGCAGTTAACACAATAAGTAATCCACCTGGGGAGTACGACCGCA
 AGGTTGAAACTCAAAGGAATTGACGGGGGCCCGCACAAGCAGTGGAGTATGTGG
 TTTAATTCGACGCAACGCGAAGAACCTTACCAAGTCTTGACATCCCTTGACAGGC
 ATAGAAATATGTTTTCTCTTCGGAGCAAGGAGACAGGTGGTGCATGGTTGTCGTC
 AGCTCGTGTGCTGAGATGTTGGGTTAAGTCCCGCAACGAGCGCAACCCCTTATGGT
 CAGTTACTACGCAAGAGGACTCTGGCCAGACTGCCGTTGACAAAACGGAGGAAG
 GTGGGGATGACGTCAAATCATCATGCCCTTTATGACTTGGGCTACACACGTACTA
 CAATGGCGTTAAACAAAGAGAAGCAAGACCGCGAGGTGGAGCAAAACTCAGAA
 ACAACGTCCCAGTTCGGACTGCAGGCTGCAACTCGCCTGCACGAAGTCGGAATTG
 CTAGTAATCGTGGATCAGCATGCCACGGTGAATACGTTCCCGGGCCTTGTACACA
 CCGCCCGTCACACCATGAGAGCCGGGGGACCCGAAGTCGGTAGTCTAACCGCA
 AGGAGGACGCCGCCGAAGGTAAAACCTGGTGATTGGGGTGAAGTCGTAACAAG

SEQ ID No: 5: 16S rRNA sequence of *F. prausnitzii* CNCM 1-4574

CGAGTGGCGAACGGGTGAGTAACGCGTGAGGAACTGCCTCAAAGAG
 GGGGACAACAGTTGAAAACGACTGCTAATACCGCATAAGCCCACAGGTCGGCAT
 CGACCAGAGGGAAAAGGAGCAATCCGCTTTGAGATGGCCTCGCGTCCGATTAGC

TAGTTGGTGAGGTAATGGCCCACCAAGGCAACGATCGGTAGCCGGACTGAGAGG
 TTGAACGGCCACATTGGGACTGAGACACGGCCCAGACTCCTACGGGAGGCAGCA
 GTGGGGAATATTGCACAATGGGGGAAACCCTGATGCAGCGACGCCGCGTGGAGG
 AAGAAGGTCTTCGGATTGTAAACTCCTGTTGTTGAGGAAGATAATGACGGTACTC
 AACAAGGAAGTGACGGCTAACTACGTGCCAGCAGCCGCGGTAAACGTAGGTCA
 CAAGCGTTGTCCGGAATTACTGGGTGTAAAGGGAGCGCAGGCCGGAAGACAAGT
 TGGAAGTGAAATCTATGGGCTCAACCCATAAACTGCTTTCAAACCTGTTTTCTTG
 AGTAGTGCAGAGGTAGGCGGAATCCCCGGTGTAGCCGGTGAATGCGTAGATATC
 GGGAGGAACACCAGTGGCGAAGGCGGCCTACTGGGCACCAACTGACGCTGAGGC
 TCGAAAGTGTGGGTAGCAAACAGGATTAGATACCCTGGTAGTCCACACCGTAAA
 CGATGATTACTAGGTGTTGGAGGATTGACCCCTTCAGTGCCGCAGTTAACACAAT
 AAGTAATCCACCTGGGGAGTACGACCGCAAGGTTGAAACTCAAAGGAATTGACG
 GGGCCCCGCACAAGCAGTGGAGTATGTGGTTTAATTCGACGCAACGCGAAGAAC
 CTTACCAAGTCTTGACATCCTGTGACGATGCTGGAAACATGTTTTCTTCGGAAC
 GCAGAGACAGGTGGTGCATGGTTGTCGTCAGCTCGTGTGAGATGTTGGGTTA
 AGTCCCGCAACGAGCGCAACCCTTACTGTCAGTTACTACGCAAGAGGACTCTGGC
 AGGACTGCCGTTGACAAAACGGAGGAAGGTGGGGATGACGTCAAATCATCATGC
 CCTTTATGACTTGGGCTACACACGTACTACAATGGCGTTAAACAAAGAGAAGCAA
 GACCGCGAGGTGGAGCAAACTCAGAAACAACGTCCCAGTTCGGACTGCAGGCT
 GCAACTCGCTGCACGAAGTCGGAATTGCTAGTAATCGTGGATCAGCATGCCACG
 GTGAATACGTTCCCGGGCCTTGTACACACCGCCCGTCACACCATGAGAGCCGGGG
 GGACCCGAAGTCGGTAGTCTAACCGCAAGGAGGACGCCGCCGAAGGTAAAACGTG
 GTGATTGGGGTGAAGTCGTAACAAGGTAGCC

SEQ ID No: 6: 16S rRNA sequence of *F. prausnitzii* CNCM 1-4543

CGAGCGAGAGAGAGCTTGCTTTCTCAATCGAGTGGCGAACGGGTGAGT
 AACCGGTGAGGAACCTGCCTCAAAGAGGGGGACAACAGTTGGAAACGACTGCTA
 ATACCGCATAAGCCCACAGGTCGGCATCGACCAGAGGGAAAAGGAGCAATCCGC
 TTTGAGATGGCTCGCGTCCGATTAGCTAGTTGGTGAGGTAATGGCCCACCAAGG
 CAACGATCGGTAGCCGGACTGAGAGGTTGAACGGCCACATTGGGACTGAGACAC
 GGCCCAGACTCCTACGGGAGGCAGCAGTGGGGAAATATTGCACAATGGGGGAAAC
 CCTGATGCAGCGACGCCGCGTGGAGGAAGAAGGTCTTCGGATTGTAAACTCCTGT
 TGTTGAGGAAGATAATGACGGTACTCAACAAGGAAGTGACGGCTAACTACGTGC
 CAGCAGCCGCGGTAAAACGTAGGTCACAAGCGTTGTCCGGAATTACTGGGTGTA
 AAGGGAGCGCAGGCGGGAAGACAAGTTGGAAGTGAAATCTATGGGCTCAACCCA
 TAAACTGCTTTCAAACCTGTTTTCTTGAGTAGTGCAGAGGTAGGCGGAATCCC
 GGTGTAGCCGGTGAATGCGTAGATATCGGGAGGAACACCAGTGGCGAAGGCGGC
 CTAAGTGGGCACCAACTGACGCTGAGGCTCGAAAGTGTGGGTAGCAAACAGGATT
 AGATAACCCTGGTAGTCCACACCGTAAACGATGATTACTAGGTGTTGGAGGATTGA
 CCCCTTCAGTGCCGCAGTTAACACAATAAGTAATCCACCTGGGGAGTACGACCGC

AAGGTTGAAACTCAAAGGAATTGACGGGGGCCCGCACAAGCAGTGGAGTATGTG
 GTTTAATTCGACGCAACGCGAAGAACCCTTACCAAGTCTTGACATCCTGTGACGAA
 CCTGGAAATATGTTTTTCTTCGGAACGCAGAGACAGGTGGTGCATGGTTGTCTG
 CAGCTCGTGTCTGAGATGTTGGGTTAAGTCCCGCAACGAGCGCAACCCTTACTG
 TCAGTTACTACGCAAGAGGACTCTGGCAGGACTGCCGTTGACAAAACGGAGGAA
 GGTGGGGATGACGTCAAATCATCATGCCCTTTATGACTTGGGCTACACACGTACT
 ACAATGGCGTTAAACAAAGAGAAGCAAGACCCGCGAGGTGGAGCAAAACTCAGA
 AACACGTCCCAGTTCGGACTGCAGGCTGCAACTCGCCTGCACGAAGTCGGAATT
 GCTAGTAATCGTGGATCAGCATGCCACGGTGAATACGTTCCCGGGCCTTGTACAC
 ACCGCCCGTCACACCATGAGAGCCGGGGGACCCGAAGTCGGTAGTCTAACCCG
 AAGGAGGACGCCGCCGAAGGTAAAACCTGGTGATTGGGGTGAAGTCGTACAG

SEQ ID No: 7: 16S rRNA sequence of *F. prausnitzii* S9D8

AGAGTTTGATCCTGGCTCAGGACGAACGCTGGCGGCGCGCCTAACACA
 TGCAAGTCGAACGAGCGAGAGAGAGCTTGCTTTCTCGAGCGAGTGGCGAACGGG
 TGAGTAACGCGTGGGGAACCTGCCTCAAAGAGGGGGACAACAGTTGGAAACGAC
 TGCTAATACCGCATAAGCCCACGACCTGGCATCGGGTTGAGGGAAAAGGAGCAA
 TCCGCTTTGAGATGGCCTCGCGTCCGATTAGCTAGTTGGTGAGGTAATGGCCAC
 CAAGGCAACGATCGGTAGCCGGACTGAGAGGTTGAACGGCCACATTGGGACTGA
 GACACGGCCCAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGCACAATGGGG
 GAAACCCTGATGCAGCGACGCCGCGTGGAGGAAGAAGGTCTTCGGATTGTAAAC
 TCCTGTTGTTGAGGAAGATAATGACGGTACTCAACAAGGAAGTGACGGCTAACTA
 CGTGCCAGCAGCCGCGTAAAACGTAGGTCACAAGCGTTGTCCGGAATTACTGG
 GTGTAAAGGGAGCGCAGGCGGGAAGACAAGTTGGAAGTGAAATCCATGGGCTCA
 ACCCATGAACTGCTTTCAAACCTGTTTTTCTTGAGTAGTGCAGAGGTAGGCGGAA
 TCCCGGTGTAGCGGTGGAATGCGTAGATATCGGGAGGAACACCAGTGGCGAAG
 GCGGCCTACTGGGCACCAACTGACGCTGAGGCTCGAAAGTGTGGGTAGCAAACA
 GGATTAGATAACCCTGGTAGTCCACACCGTAAACGATGATTACTAGGTGTTGGAGG
 ATTGACCCCTTCAGTGCCGCAGTTAACACAATAAGTAATCCACCTGGGGAGTACG
 ACCGCAAGGTTGAAACTCAAAGGAATTGACGGGGGCCCGCACAAGCAGTGGAGT
 ATGTGGTTTTAATTCGACGCAACGCGAAGAACCCTTACCAAGTCTTGACATCCTGCG
 ACGGTGCTGGAAACAGTGCTTTCTTCGGGACGCAGAGACAGGTGGTGCATGGTT
 GTCGTCAGCTCGTGTCTGAGATGTTGGGTTAAGTCCCGCAACGAGCGCAACCCT
 TATGGTCAGTTACTACGCAAGAGGACTCTGGCCAGACTGCCGTTGACAAAACGGA
 GGAAGGTGGGGATGACGTCAAATCATCATGCCCTTTATGACTTGGGCTACACACG
 TACTACAATGGCGTTAAACAAAGAGAAGCAAGACCCGCGAGGTGGAGCAAAACTC
 AGAAACAACGTCCCAGTTCGGACTGCAGGCTGCAACTCGCCTGCACGAAGTCGG
 AATTGCTAGTAATCGTGGATCAGCATGCCACGGTGAATACGTTCCCGGGCCTTGT
 ACACACCCGCCGTACACCATGAGAGCCGGGGGACCCGAAGTCGGTAGTCTAA
 CCGCAAGGAGGACGCCGCCGAAGGTAAAACCTGGTGATTGGGGTGAAGTCGTAAAC

AAGGTAGCCGT

SEQ ID No: 8: 16S rRNA sequence of *F. prausnitzii* S9G3

GCATGCTCGAGCGGCCGCCAGTGTGATGGATATCTGCAGAATTCGCCC
 TTAGAGTTTGATCCTGGCTCAGGACGAACGCTGGCGGCGCGCCTAACACATGCAA
 GTCGAACGAGCGAGAGAGAGCTTGCTTTCTCGAGCGAGTGGCGAACGGGTGAGT
 AACGCGTGAGGAACCTGCCTCAAAGAGGGGGACAACAGTTGGAAACGACTGCTA
 ATACCGCATAAGCCCACGACCCGGCATCGGGTAGAGGGAAAAGGAGCAATCCGC
 TTTGAGATGGCCTCGCGTCCGATTAGCTAGTTGGTGAGGTAACGGCCACCAAGG
 CGACGATCGGTAGCCGACTGAGAGGTTGAACGGCCACATTGGGACTGAGACAC
 GGCCAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGCACAATGGGGGAAAC
 CCTGATGCAGCGACGCCGCGTGGAGGAAGAAGGTCTTCGGATTGTAACTCCTGT
 TGTGAGGAAGATAATGACGGTACTCAACAAGGAAGTGACGGCTAACTACGTGC
 CAGCAGCCGCGGTAAAACGTAGGTCACAAGCGTTGTCCGGAATTACTGGGTGTA
 AAGGGAGCGCAGGCGGGAAGACAAGTTGGAAGTGAAATCCATGGGCTCAACCCA
 TGAAGTCTTTCAAACCTGTTTTTCTTGAGTAGTGCAGAGGTAGGCCGAATTCCC
 GGTGTAGCGGTGGAATGCGTAGATATCGGGAGGAACACCAGTGGCGAAGGCGGC
 CTAAGTGGGCACCAACTGACGCTGAGGCTCGAAAGTGTGGGTAGCAAACAGGATT
 AGATAACCCTGGTAGTCCACACCGTAAACGATGATTACTAGGTGTTGGAGGATTGA
 CCCCTTCAGTGCCGCAGTTAACACAATAAGTAATCCACCTGGGGAGTACGACCGC
 AAGGTTGAAACTCAAAGGAATTGACGGGGGCCCGCACAAGCAGTGGAGTATGTG
 GTTTAATTCGACGCAACGCGAAGAACCCTTACCAAGTCTTGACATCCTGCGACGGT
 TCTGGAACAGAACTTTCCTTCGGGACGCAGAGACAGGTGGTGCATGGTTGTCGT
 CAGCTCGTGTGCGTGAGATGTTGGGTTAAGTCCCGCAACGAGCGCAACCCTTATGG
 TCAGTTACTACGCAAGAGGACTCTGGCCAGACTGCCGTTGACAAAACGGAGGAA
 GGTGGGGATGACGTCAAATCATCATGCCCTTTATGACTTGGGCTACACACGTACT
 ACAATGGCGTTAAACAAAGAGAAGCAAGACCGCGAGGTGGAGCAAAACTCAGA
 AACAAACGTCCCAGTTCGGACTGCAGGCTGCAACTCGCCTGCACGAAGTCGGAATT
 GCTAGTAATCGTGGATCAGCATGCCACGGTGAATACGTTCCCGGGCCTTGACAC
 ACCGCCCCTCACACCATGAGAGCCGGGGGACCCGAAGTCGGTAGTCTAACCGC
 AAGGAGGACGCCGCCGAAGGTAAAACCTGGTGATTGGGGTGAAGTCGTAACAAGG
 TAGCCGTAAGGGCGAA

SEQ ID No: 9: 16S rRNA sequence of *F. prausnitzii* CNCM 1-4644

GCATCGGGCAGAGGGAAAAGGAGCAATCCGCTTTGAGATGGCCTCGC
 GTCCGATTAGCTAGTTGGTGAGGTAATGGCCACCAAGGCGACGATCGGTAGCCG
 GACTGAGAGGTTGAACGGCCACATTGGGACTGAGACACGGCCAGACTCCTACG
 GGAGGCAGCAGTGGGGAATATTGCACAATGGGGGAAACCCTGATGCAGCGACGC
 CGCGTGGAGGAAGAAGGTCTTCGGATTGTAAACTCCTGTTGTTGAGGAAGATAAT
 GACGGTACTCAACAAGGAAGTGACGGCTAACTACGTGCCAGCAGCCGCGGTAAA

ACGTAGGTCACAAGCGTTGTCCGGAATTACTGGGTGTAAAGGGAGCGCAGGCCG
 GAAGACAAGTTGGAAGTGAAATCCATGGGCTCAACCCATGAACTGCTTTCAAAA
 CTGTTTTTCTTGAGTAGTGCAGAGGTAGGCGGAATTCCCGGTGTAGCGGTGGAAT
 GCGTAGATATCGGGAGGAACACCAGTGGCGAAGGCGGCCTACTGGGCACCAACT
 GACGCTGAGGCTCGAAAGTGTGGGTAGCAAACAGGATTAGATACCCTGGTAGTC
 CACACTGTAAACGATGATTACTAGGTGTTGGAGGATTGACCCCTTCAGTGCCGCA
 GTTAACACAATAAGTAATCCACCTGGGGAGTACGACCGCAAGGTTGAACTCAA
 AGGAATTGACGGGGGCCCGCACAAAGCAGTGGAGTATGTGGTTTAATTTCGACGCA
 ACGCGAAGAACCTTACCAAGTCTTGACATCCTGCGACGCACATAGAAATATGTGT
 TTCCTTCGGGACGCAGAGACAGGTGGTGCATGGTTGTCGTCAGCTCGTGTCTGTA
 GATGTTGGGTAAAGTCCCGCAACGAGCGCAACCCTTATGGTCAGTTACTACGCAA
 GAGGACTCTGGCCAGACTGCCGTTGACAAAACGGAGGAAGGTGGGGATGACGTC
 AAATCATCATGCCCTTTATGACTTGGGCTACACACGTACTACAATGGCGTTAAAC
 AAAGAGAAGCAAGACCGCGAGGTGGAGCAAAACTCAGAAACAACGTCCCAGTTC
 GGACTGCAGGCTGCAACTCGCCTGCACGAAGTCGGAATTGCTAGTAATCGCAGAT
 CAGCATGCTGCGGTGAATACGTTCCCGGGCCTTGTACACACCGCCCGTCACACCA
 TGAGAGCCGGGGGGACCCGAAGTCGGTAGTCTAACC GCAAGGAGGACGCCGCCG
 AAGGTAAACTGGTGATTGGGGTGAAGTCGTAACAAGGTAG

SEQ ID No: 10: 16S rRNA sequence of *F. prausnitzii* CNCM 1-4544

CGAGCGAGAGAGAGCTTGCTTTCTCGAGCGAGTGGCGAACGGGTGAG
 TAACGCGTGAGGAACCTGCCTCAAAGAGGGGGACAACAGTTGGAAACGACTGCT
 AATACCGCATAAGCCCACGGGTCCGCATCGACCAGAGGGAAAAGGAGCAATCCG
 CTTTGAGATGGCCTCGCGTCCGATTAGCTAGTTGGTGAGGTAACGGCCCACCAAG
 GCAACGATCGGTAGCCGACTGAGAGGTTGAACGGCCACATTGGGACTGAGACA
 CGGCCCAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGCACAATGGGGGAAA
 CCCTGATGCAGCGACGCCGCGTGGAGGAAGAAGGTCTTCGGATTGTAAACTCCTG
 TTGTTGGGGAAGATAATGACGGTACCCAACAAGGAAGTGACGGCTAACTACGTG
 CCAGCAGCCGCGGTAACACGTAGGTCACAAGCGTTGTCCGGAATTACTGGGTGTA
 AAGGGAGCGCAGGCGGGAAGACAAGTTGGAAGTGAAATCTATGGGCTCAACCCA
 TAAACTGCTTTCAAACTGTTTTTCTTGAGTAGTGCAGAGGTAGGCGGAATTCCC
 GGTGTAGCGGTGGAATGCGTAGATATCGGGAGGAACACCAGTGGCGAAGGCGGC
 CTACTGGGCACCAACTGACGCTGAGGCTCGAAAGTGTGGGTAGCAAACAGGATT
 AGATACCCTGGTAGTCCACACCGTAAACGATGATTACTAGGTGTTGGAGGATTGA
 CCCCTTCAGTGCCGCAGTTAACACAATAAGTAATCCACCTGGGGAGTACGACCGC
 AAGGTTGAAACTCAAAGGAATTGACGGGGGCCCGCACAAAGCAGTGGAGTATGTG
 GTTTAATTCGACGCAACGCGAAGAACCTTACCAAGTCTTGACATCCCTTGACAGA
 CATAGAAATATGTAATCTCTTCGGAGCAAGGAGACAGGTGGTGCATGGTTGTCGT
 CAGCTCGTGTCTGAGATGTTGGGTTAAGTCCCGCAACGAGCGCAACCCTTATGG
 TCAGTTACTACGCAAGAGGACTCTGGCCAGACTGCCGTTGACAAAACGGAGGAA

GGTGGGGATGACGTCAAATCATCATGCCCTTTATGACTTGGGCTACACACGTACT
 ACAATGGCGTTAAACAAAGAGAAGCAAGACCGCGAGGTGGAGCAAAACTCAGA
 AACACGTCCCAGTTCGGACTGCAGGCTGCAACTCGCCTGCACGAAGTCGGAATT
 GCTAGTAATCGTGGATCAGCATGCCACGGTGAATACGTTCCCGGGCCTTGTACAC
 ACCGCCCCTCACACCATGAGAGCCGGGGGGACCCGAAGTCGGTAGTCTAACCCG
 AAGGAGGACGCCGCCGAAGGTAAACTGGTGATTGGGGTGAAGTCGTAACAAG

SEQ ID No: 11: 16S rRNA sequence of *F. prausnitzii* S10H3

GAGCGAGTGGCGAACGGGTGAGTAACGCGTGAGGAACCTGCCTCAA
 GAGGGGGACAACAGTTGGAAACGACTGCTAATACCGCATAAGCCCACGACCCGG
 CATCGGGTAGAGGGAAAAGGAGCAATCCGCTTTGAGATGGCCTCGCGTCCGATT
 AGCTAGTTGGTGAGGTAATGGCCACCAAGGCGACGATCGGTAGCCGGACTGAG
 AGGTTGAACGGCCACATTGGGACTGAGACACGGCCAGACTCCTACGGGAGGCA
 GCAGTGGGGAATATTGCACAATGGGGGAAACCTGATGCAGCGACGCCGCGTGG
 AGGAAGAAGGTCTTCGGATTGTAAACTCCTGTTGTTGAGGAAGATAATGACGGTA
 CTCAACAAGGAAGTGACGGCTAACTACGTGCCAGCAGCCGCGGTAAAACGTAGG
 TCACAAGCGTTGTCCGGAATTACTGGGTGTAAAGGGAGCGCAGGCGGGAAGACA
 AGTTGGAAGTGAAATCCATGGGCTCAACCCATGAACTGCTTTCAAACTGTTTTT
 CTTGAGTAGTGCAGAGGTAGGCGGAATTCCTGGTGTAGCGGTGGAATGCGTAGA
 TATCGGGAGGAACACCAGTGGCGAAGGCGGCCTACTGGGCACCAACTGACGCTG
 AGGCTCGAAAGTGTGGGTAGCAAACAGGATTAGATACCCTGGTAGTCCACACTGT
 AAACGATGATTACTAGGTGTTGGAGGATTGACCCCTTCAGTGCCGCAGTTAACAC
 AATAAGTAATCCACCTGGGGAGTACGACCGCAAGGTTGAAACTCAAAGGAATTG
 ACGGGGGCCCGCACAAAGCAGTGGAGTATGTGGTTTAATTCGACGCAACGCGAAG
 AACCTTACCAAGTCTTGACATCCTGCGACGCACATAGAAATATGTGTTTCCTTCG
 GGACGCAGAGACAGGTGGTGCATGGTTGTCGTCAGCTCGTGTGTCGTGAGATGTTGG
 GTTAAGTCCCACAACGAGCGCAACCCTTATGGTCAGTACTACGCAAGAGGACTC
 TGGCCAGACTGCCGTTGACAAAACGGAGGAAGGTGGGGATGACGTCAAATCATC
 ATGCCCTTTATGACTTGGGCTACACACGTACTACAATGGCGTTAAACAAAGAGAA
 GCAAGACCGCGAGGTGGAGCAAAACTCAGAAACAACGTCCCAGTTCGGACTGCA
 GGCTGCAACTCGCCTGCACGAAGTCGGAATTGCTAGTAATCGCAGATCAGCATGC
 TGCGGTGAATACGTTCCCGGGCCTTGTACACACCCCGTCACACCATGAGAGCC
 GGGGGGACCCGAAGTCGGTAGTCTAACCCGAAGGAGGACGCCGCCGAAGGTAA
 ACTGGTGATTGGGGTGAAGTCGTAACAAG

SEQ ID No: 12: 16S rRNA sequence of *F. prausnitzii* S13A7

AGCTTGCTTTCTCGAGCGAGTGGCGAACGGGTGAGTAACCGCGTGAGGA
 ACCTGCCTCAAAGAGGGGGACAACAGTTGGAAACGACTGCTAATACCGCATAAG
 CCCACGGGTCCGCATCGACCAGAGGGAAAAGGAGCAATCCGCTTTGAGATGGCC
 TCGCGTCCGATTAGCTAGTTGGTGAGGTAACGGCCACCAAGGCGACGATCGGTA
 GCCGACTGAGAGGTTGAACGGCCACATTGGGACTGAGACACGGCCAGACTCC
 - - - - -

GCATCGGGTAGAGGGAAAAGGAGCAA TCCGCTTGAGATGGCC TCGCGTCGGA T
 TAGCTAGTTGGTGAGGTAACGGCCCACCAAGGCGACGATCGGTAGCCGGACTGA
 GAGGTTGAACGGCCACATTGGGACTGAGACACGGCCCAGACTCCTACGGGAGGC
 AGCAGTGGGGAATATTGCACAATGGGGGAAACCCTGATGCAGCGACGCCGCGTG
 GAGGAAGAAGGTCTTCGGATTGTAAACTCCTGTTGTTGAGGAAGATAATGACGGT
 ACTCAACAAGGAAGTGACGGCTAACTACGTGCCAGCAGCCGCGGTAAAACGTAG
 GTCACAAGCGTTGTCCGGAATTACTGGGTGTAAAGGGAGCGCAGGCGGGAAGAC
 AAGTTGGAAGTGAAATCCATGGGCTCAACCCATGAACTGCTTTCAAACCTGTTTT
 TCTTGAGTAGTGCAGAGGTAGGCGGAATTCGCGGTGTAGCGGTGGAATGCGTAG
 ATATCGGGAGGAACACCAGTGGCGAAGGCGGCCTACTGGGCACCAACTGACGCT
 GAGGCTCGAAAGTGTGGGTAGCAAACAGGATTAGATACCCGTGGTAGTCCACACT
 GTAAACGATGATTACTAGGTGTTGGAGGATTGACCCCTTCAGTGCCGCAGTTAAC
 ACAATAAGTAATCCACCTGGGGAGTACGACCGCAAGGTTGAAACTCAAAGGAAT
 TGACGGGGGGCCCGCACAAGCAGTGGAGTATGTGGTTTAATTCGACGCAACGCGA
 AGAACCTTACCAAGTCTTGACATCCTGCGACGCACATAGAAATATGTGTTTCCTT
 CGGGACGCAGAGACAGGTGGTGCATGGTTGTCGTCAGCTCGTGTCTGTGAGATGTT
 GGGTTAAGTCCCGCAACGAGCGCAACCCTTATGGTCAGTTACTACGCAAGAGGAC
 TCTGGCCAGACTGCCGTTGACAAAACGGAGGAAGGTGGGGATGACGTCAAATCA
 TCATGCCCTTTATGACTTGGGCTACACACGTAACAATGGCGTTAAACAAAGAG
 AAGCAAGACCGCGAGGTGGAGCAAAACTCAGAAACAACGTCCCAGTTCGGACTG
 CAGGCTGCAACTCGCCTGCACGAAGTCGGAATTGCTAGTAATCGCAGATCAGCAT
 GCTGCGGTGAATACGTTCCCGGGCCTTGTACACACCGCCCGTCACACCATGAGAG
 CCGGGGGGACCCGAAGTCGGTAGTCTAACCGCAAGGAGGACGCCCGCCGAAGGTA
 AAACCTGGTGATTGGGGTGAAGTTCGTAACAAGGGTAG

SEQ ID No: 16: 16S rRNA sequence of *F. prausnitzii* CNCM 1-4541

AGAGTTTGATCCTGGCTCAGGACGAACGCTGGCGGGCGCGCCTAACACA
 TGCAAGTTCGAACGAGCGAGAGAGAGCTTGTCTTCTCGAGCGAGTGGCGAACGGG
 TGAGTAACGCGTGAGGAACCTGCCTCAAAGAGGGGGACAACAGTTGGAAACGAC
 TGCTAATACCGCATAAGCCCACGACCCGGCATCGGGTTGAGGGAAAAGGAGCAA
 TCCGCTTTGAGATGGCCTCGCGTCCGATTAGCTAGTTGGTGAGGTAACGGCCAC
 CAAGGCGACGATCGGTAGCCGGACTGAGAGGTTGAACGGCCACATTGGGACTGA
 GACACGGCCCAGACTCCTACGGGAGGCAGCAGTGGGGAATATTGCACAATGGGG
 GAAACCCTGATGCAGCGACGCCGCGTGGAGGAAGAAGGTCTTCGGATTGTAAAC
 TCCTGTTGTTGGGGAAGATAATGACGGTACCCAACAAGGAAGTGACGGCTAACT
 ACGTGCCAGCAGCCGCGGTAAAACGTAGGTCACAAGCGTTGTCCGGAATTACTG
 GGTGTAAAGGGAGCGCAGGCGGGAAGACAAGTTGGAAGTGAAATCCATGGGCTT
 AACCCATGAACTGCTTTCAAACCTGTTTTCTTGAGTAGTGCAGAGGTAGGCGGA
 ATTCCCGGTGTAGCGGTGGAATGCGTAGATATCGGGAGGAACACCAGTGGCGAA
 GGCGGCCTACTGGGCACCAACTGACGCTGAGGCTCGAAAGTGTGGGTAGCAAAC
 ACCATTACATACCCCTGCTACTGCAACCCCTAACCCATCATTACTACCCCTTCCAG

AGGATTAGATAACCC TGGTAGTCCACACCCGTA AACGATGAT TACTAGG TGTGGAG
 GATTGACCCCTTCAGTGCCGCAGTTAACACAATAAGTAATCCACCTGGGGAGTAC
 GACCGCAAGGTTGAAACTCAAAGGAATTGACGGGGGCCCGCACAAAGCAGTGGAG
 TATGTGGTTTAATTCGACGCAACGCGAAGAACCTTACCAAGTCTTGACATCCTGT
 GACAGACGTAGAAATACGTTCTTCCTTCGGGACACAGAGACAGGTGGTGCATGGT
 TGTCTGTCAGCTCGTGTCTGTGAGATGTTGGGTAAAGTCCCGCAACGAGCGCAACCC
 TTATGGTCAGTTACTACGCAAGAGGACTCTGGCCAGACTGCCGTTGACAAAACGG
 AGGAAGGTGGGGATGACGTCAAATCATCATGCCCTTTATGACTTGGGCTACACAC
 GTACTACAATGGCGTTAAACAAAGAGAAGCAAGACCGCGAGGTGGAGCAAACT
 CAGAAACAACGTCCCAGTTCGGACTGCAGGCTGCAACTCGCCTGCACGAAGTCG
 GAATTGCTAGTAATCGTGGATCAGCATGCCACGGTGAATACGTTCCCGGGCCTTG
 TACACACCGCCCGTCACACCATGAGAGCCGGGGGACCCGAAGTCGGTAGTCTA
 ACCGCAAGGAGGACGCCGCCGAAGGTAAACTGGTGATTGGGGTGAAGTCGTAA
 CAAGGTAGCCGT

SEQ ID No: 17: 16S rRNA sequence of *F. prausnitzii* S13E3

TTAGTGCCGAACGGGTGAGTAACGCGTGAGTAACCTGCCCTGGAGTGG
 GGGACAACAGTTGGAAACGACTGCTAATACCGCATAAGCCACGGCCCGGCATC
 GGGCTGCGGGAAAAGGATTTATTCGCTTCAGGATGGACTCGCGTCCAATTAGCTA
 GTTGGTGAGGTAACGGCCACCAAGGCGACGATTGGTAGCCGGACTGAGAGGTT
 GAACGGCCACATTGGGACTGAGACACGGCCAGACTCCTACGGGAGGCAGCAGT
 GGGGGATATTGCACAATGGGGGAAACCTGATGCAGCGACGCCGCGTGGAGGAA
 GAAGGTTTTCGGATTGTAAACTCCTGTCTGTTAGGGACGAATCATGACGGTACCTA
 ACAAGAAAGCACCGGCTAACTACGTGCCAGCAGCCGCGGTAAAACGTAGGGTGC
 AAGCGTTGTCCGGAATTAAGGTTGTAAGGGAGCGCAGGCGGACCGGCAAGTT
 GGAAGTGAAAACCATGGGCTCAACCCATGAATTGCTTTCAAACCTGCTGGCCTTG
 AGTAGTGCAGAGGTAGGTGGAATTCGCGGTGTAGCGGTGGAATGCGTAGATATC
 GGGAGGAACACCAGTGGCGAAGGCGACCTACTGGGCACCAACTGACGCTGAGGC
 TCGAAAGCATGGGTAGCAAACAGGATTAGATACCCTGGTAGTCCATGCCGTAAA
 CGATGATTACTAGGTGTTGGAGGATTGACCCCTTCAGTGCCGCAGTTAACACAAT
 AAGTAATCCACCTGGGGAGTACGACCGCAAGGTTGAAACTCAAAGGAATTGACG
 GGGGCCCGCACAAAGCAGTGGAGTATGTGGTTTAATTCGAAGCAACGCGAAGAAC
 CTTACCAGGTCTTGACATCCGATGCATAGTGCAGAGATGCATGAAGTCCTTCGGG
 ACATCGAGACAGGTGGTGCATGGTTGTCGTCAGCTCGTGTCTGTGAGATGTTGGGT
 TAAGTCCCGCAACGAGCGCAACCCTTATTGCCAGTTACTACGTAAGAGGACTCTG
 GCGAGACTGCCGTTGACAAAACGGAGGAAGGTGGGGATGACGTCAAATCATCAT
 GCCCTTTATGACCTGGGCTACACACGTACTACAATGGCGTTTAACAAAGAGAAGC
 AAGACCGCGAGGTGGAGCAAACTCAGAAACAACGTCTCAGTTCAGATTGCAGG
 CTGCAACTCGCCTGCATGAAGTCGGAATTGCTAGTAATCGCGGATCAGCATGCCG
 CGGTGAATACGTTCCCGGGCCTTGTACACACCGCCCGTCACACCATGAGAGCCGG

GGGGACCCGAAGTCGGTAGTCTA

SEQ ID No: 18: 16S rRNA sequence of *Eubacterium desmolans* ATCC 43058

TTTTTAGAGAGTTTGATCCTGGCTCAGGATNAACGCTGGCGGCGTGCC
 TAACACATGCAAGTCGAACGGAGTTATTTTGGAAATCTCTTCGGAGATGGAATC
 ATAACCTAGTGGCGGACGGGTGAGTAACGCGTGAGCAATCTGCCTTTAGGTGGGG
 GATAACAGTCGGAAACGGCTGCTAATACCGCATAATACGTTTTGGGGGCATCCTT
 GAAACGTCAAAGATTTATTGCCTTTAGATGAGCTCGCGTCTGATTAGCTGGTTGG
 CGGGGNAACGGCCCACCAAGGCGACGATCAGTAGCCGGACTGAGAGGTTGAACG
 GCCACATTGGGACTGAGACACGGCCAGACTCCTACGGGAGGCAGCAGTGGGGA
 ATATTGCGCAATGGGGGAAACCCNGACGCAGCAACGCCGCGTGATTGAAGAAGG
 CCTTCGGGTTGTAAAGATCTTTAATCAGGGACGAATTTTGACGGTACCTGAAGAA
 TAAGCTCCGGCTAACTACGTGCCAGCAGCCGCGTAATACGTAGGGAGCAAGCG
 TTATCCGGATTTACTGGGTGTAAAGGGCGCGCAGNCGGGNCGGCAAGTTGGGAG
 TGAAATCNGGGGGCTTAACCCCCGAACTGCTTTCAAACCTGCTGGTCTTGAGTGA
 TGGAGAGGCAGGCGGAATCCCGTGTGTAGCGGTGAAATGCGTAGATATACGGAG
 GAACACCAGTGGCGAAGGCGGCCTGCTGGACATTAACCTGACGCTGAGGCGCGAA
 AGCGTGGGGAGCAAACAGGATTAGATACCCTGGTAGTCCACGCGTAAACGATG
 GATACTAGGTGTGGGAGGTATTGACCCCTTCCGTGCCGCAGTTAACACAATAAGT
 ATCCCACCTGGGGAGTACGGCCGCAAGGTTGAAACTCAAAGGAATTGACGNNNG
 CCCGCACAAGCAGTGGAGTATGTGGTTTAATTCGAANNAACGCGAAGAACCTTA
 CCAGGNCTTGACATCCCGGTGACCGTCCTAGAGATAGGACTTNCCTTCGGGNCAA
 CGGTGACAGNTGGTGCATGGTTGTCGTCAGCTCGTGTCTGTGAGATGTTGGNTTAA
 GTCCCCGCAACGAGCGCAACCCTTACGGTTAGTTGATACGCAAGATCACTCTAGCC
 GGACTGCCGTTGACAAAACGGAGGAAGGTGGGGACGACGTNNAATCATCATGCC
 CCNTATGACCTGGGCTACACACGTACTACAATGGCAGTCATACAGAGGGAAGCA
 AAATCGCGAGGTGGAGCAAATCCCTAAAAGCTGTCCCAGTTCAGATTGCAGGCTG
 CAACCCGCCTGCATGAAGTCGGAATTGCTAGTAATCGCGGATCAGCATGCCGCGG
 TGAATACGTTCCCGGGNNTTGTACACACCGCCCGTCACACCATGAGAGCCGTCAA
 TACCCGAAGTCCGTAGCCTAACCGCAAGGGGGCGCGGCCGAAGGTAGGGGTGG
 TAAT

SEQUENCE LISTING

[0160]

<110> Institut National de la Recherche Agronomique (INRA) Institut National de la Sante et de la Recherche Medicale (INSERM) Université Pierre et Marie Curie Assistance Publique -

Hopitaux de Paris

<120> Faecalibacterium prausnitzii strains for treating and preventing gastrointestinal pain

<130> PR73790

<150> EP14306803.9

<151> 2014-11-13

<160> 18

<170> BiSSAP 1.3

<210> 1

<211> 1474

<212> RNA

<213> Faecalibacterium prausnitzii

<400> 1

```

agagtttgat cctggctcag gacgaacgct ggcggcgcgc ctaacacatg caagtccaac      60
gagtgagaga gagcttgctt tctcgagcga gtggcgaacg ggtgagtaac gcgtgaggaa     120
cctgcctcaa agagggggac aacagttgga aacgactgct aataccgcat aagcccacgg      180
ctcggcatcg agcagagggg aaaggagtga tccgcttga gatggcctcg cgtccgatta     240
gctagttagt gaggtaatgg cccaccaagg cgacgatcgg tagccggact gagaggttga     300
acggccacat tgggactgag acacggccca gactcctacg ggaggcagca gtggggaata     360
ttgcacaatg ggggaaacct tgatgcagcg acgccgcgtg gaggaagaag gtcttcggat     420
tgtaaacctc tgttgttggg gaagataatg acggtacca acaaggaagt gacggctaac     480
tacgtgccag cagccgcggt aaaacgtagg tcacaagcgt tgtccggaat tactgggtgt     540
aaagggagcg caggcgggga gacaagttgg aagtgaaatc tatgggctca acccataaac     600
tgctttcaaa actgtttttc ttgagtagtg cagaggtagg cgggaattccc ggtgtagcgg     660
tggaatgcgt agatatcggg aggaacacca gtggcgaagg cggcctactg ggcaccaact     720
gacgctgagg ctgaaaagtg tgggtagcaa acaggattag ataccctggt agtccacacc     780
gtaaaccgat attactaggt gttggaggat tgacccttc agtgccgag ttaacacaat     840
aagtaatcca cctggggagt acgaccgcaa ggttgaactc caaaggaatt gacgggggcc     900
cgcacaagca gtggagtatg tggtttaatt cgacgcaacg cgaagaacct taccaagtct     960
tgacatccct tgacagacat agaaatatgt attctcttcg gagcaaggag acaggtggtg    1020
catggttgtc gtcagctcgt gtcgtgagat gttgggttaa gtcccgaac gagcgcaacc    1080
cttatggtca gttactacgc aagaggactc tggccagact gccgttgaca aaacggagga    1140
aggtggggat gacgtcaaat catcatgccc tttatgactt gggctacaca cgtactacaa    1200
tggcgtaaaa caaagagaag caagaccgcg aggtggagca aaactcagaa acaacgtccc    1260
agttcggact gcaggctgca actgcctgcg acgaagtggg aattgctagt aatcgtggat    1320

```

cagcatgcca cggatgaatac gttcccgggc cttgtacaca ccgcccgtca caccatgaga 1380
gccgggggga cccgaagtcg gtagtctaac cgcaaggagg acgcccgcga aggtaaaact 1440
ggtgattggg gtgaagtcgt aacaaggtag ccgt 1474

<210> 2

<211> 1474

<212> RNA

<213> *Faecalibacterium prausnitzii*

<400> 2

agagtttgat cctggctcag gacgaacgct ggcggcgcgc ctaacacatg caagtccaac 60
gagcgagaga gagcttgctt tctcgagcga gtggcgaacg ggtgagtaac gcgtgaggaa 120
cctgcctcaa agagggggac aacagttgga aacgactgct aataccgcat aagcccacgg 180
gtcggcatcg accagagggg aaaggagcaa tccgcttga gatggcctcg cgtccgatta 240
gctagttggt gaggtaatgg cccaccaagg caacgatcgg tagccggact gagaggttga 300
acggccacat tgggactgag acgcccgcga gactcctacg ggaggcagca gtggggaata 360
ttgcacaatg ggggaaaccc tgatgcagcg acgcccgcgt gaggaagaag gtcttcggat 420
tgtaaaactcc tgttgttggg gaagataatg acggtacca acaaggaagt gacggctaac 480
tacgtgccag cagcccggtt aaaacgtagg tcacaagcgt tgtccggaat tactgggtgt 540
aaagggagcg caggggggaa gacaagttgg aagtgaatc tatgggctca acccataaac 600
tgctttcaaa actgtttttc ttgagtagtg cagaggtagg cgggaattccc ggtgtagcgg 660
tggaatgcgt agatatcggg aggaacacca gtggcgaagg cggcctactg ggcaccaact 720
gacgctgagg ctcgaaagtg tgggtagcaa acaggattag ataccctggt agtccacacc 780
gtaaacgatg gttactaggt gttggaggat tgacccttc agtgccgag ttaacacaat 840
aagtaatcca cctggggagt acgaccgcaa ggttgaaact caaaggaatt gacgggggcc 900
cgcacaagca gtggagtatg tggtttaatt cgacgcaacg cgaagaacct taccaagtct 960
tgacatccct tgacagacat agaaatatgt aatctcttcg gagcaaggag acaggtggtg 1020
catggttgtc gtcagctcgt gtcgtgagat gttgggttaa gtcccgaac gagcgcaacc 1080
cttatggtca gttactacgc aagaggactc tggccagact gccggtgaca aaacggagga 1140
aggtggggat gacgtcaaat catcatgcc tttatgactt gggctacaca cgtactaaa 1200
tggcgtaaa caaagagaag caagaccgag aggtggagca aaactcagaa acaacgtccc 1260
agttcggact gcaggetgca actcgcctgc acgaagtcgg aattgctagt aatcgtggat 1320
cagcatgcca cggatgaatac gttcccgggc cttgtacaca ccgcccgtca caccatgaga 1380
gccgggggga cccgaagtcg gtagtctaac cgcaaggagg acgcccgcga aggtaaaact 1440
ggtgattggg gtgaagtcgt aacaaggtag ccgt 1474

<210> 3

<211> 1408

<212> RNA

<213> *Faecalibacterium prausnitzii*

<400> 3

gcgagagaga gcttgctttc tcgagcgagt ggcgaacggg tgagtaacgc gtgaggaacc 60
 tgcctcaaag agggggacaa cagttggaaa cgactgctaa taccgcataa gccacaggcc 120
 cggcatcggg cagagggaaa aggagcaatc cgctttgaga tggcctcgcg tccgattagc 180
 tagttggtga ggtaacggcc caccaaggcg acgatcggta gccggactga gaggttgaac 240
 ggccacattg ggactgagac acggcccaga ctctacggg aggcagcagt ggggaatatt 300
 gcacaatggg ggaaccctg atgcagcgac gccgcgtgga ggaagaaggc cttcggattg 360
 taaactcctg ttgttgagga agataatgac ggtactcaac aaggaagtga cggctaacta 420
 cgtgccagca gcccggttaa aacgtagtc acaagcgttg tccggaatta ctgggtgtaa 480
 agggagcgcg gccgggaaga caagttggaa gtgaaatcca tgggctcaac ccatgaactg 540
 ctttcaaaac tgttttctt gagtagtgca gaggtaggcg gaattcccgg tgtagcggtg 600
 gaatgcgtag atatcgggag gaacaccagt ggcgaaggcg gcctactggg caccaactga 660
 cgctgaggct cgaagtgtg ggtagcaaac aggattagat accctggtag tccacaccgt 720
 aaacgatgat tactagggtg tggaggattg acccctcag tgcgcagtt aacacaataa 780
 gtaatccacc tggggagtag gaccgcaagg ttgaaactca aaggaattga cgggggcccg 840
 cacaagcagt ggagtatgtg gtttaattcg acgcaacgcg aagaacctta ccaagtcttg 900
 acatcctcgc acggttctgg aaacagaact ttccttcggg acgcagagac aggtggtgca 960
 tggttgctgt cagctcgtgt cgtgagatgt tgggttaagt cccgcaacga gcgcaaccct 1020
 tatggtcagt tactacgcaa gaggactctg gccagactgc cgttgacaaa acggaggaag 1080
 gtgggatga cgtcaaatca tcatgccctt tatgacttgg gctacacacg tactacaatg 1140
 gogttaaaca aagagaagca agaccgcgag gtggagcaaa actcagaaac aacgtcccag 1200
 ttcggactgc aggtgcaac tcgcctgcac gaagtggaa ttgctagtaa tcgtggatca 1260
 gcatgccacg gtgaatacgt tcccggcctt tgtacacacc gcccgtcaca ccatgagagc 1320
 cggggggacc cgaagtcggt agtctaaccg caaggaggac gccgccaag gtaaaactgg 1380
 tgattggggt gaagtcgtaa caaggtag 1408

<210> 4

<211> 1405

<212> RNA

<213> *Faecalibacterium prausnitzii*

<400> 4

agcgagagag agcttgcttt ctgagcgag tggcgaacgg gtgagtaacg cgtgaggaac 60
 ctgcctcaa gagggggaca acagttggaa acgactgcta ataccgcata agcccacggt 120
 gccgcatggc acagagggaa aaggagcaat ccgctttgag atggcctcgc gtccgattag 180
 ctagtgtgtg aggtaacggc ccaccaaggc gacgatcggg agccggactg agaggttga 240
 cggccacatt gggactgaga cacggcccag actcctacgg gaggcagcag tggggaatat 300
 tgcaaatgg gggaaacct gatgcagcga cgcccgctgg aggaagaagg tcttcggatt 360
 gtaaactcct gttgtgggg aagataatga cggtaaccaa caaggaagtg acggctaact 420

acgtgccagc agccgcggta aaacgtaggt cacaagcgtt gtccggaatt actgggtgta 480
 aagggagcgc aggcgggaag acaagttgga agtgaatct atgggctcaa ccataaact 540
 gctttcaaaa ctgtttttct tgagtagtgc agaggtaggc ggaattcccg gtgtagcggc 600
 ggaatgcgta gatatcggga ggaacaccag tggcgaaggc ggccactggt gcaccaactg 660
 acgctgaggc tcgaaagtgt gggtagcaaa caggattaga taccctggta gtccacaccg 720
 taaacgatga ttactaggtg ttggaggatt gaccccttca gtgccgcagt taacacaata 780
 agtaatccac ctggggagta cgaccgcaag gttgaaactc aaaggaattg acggggggccc 840
 gcacaagcag tggagtatgt ggtttaattc gacgcaacgc gaagaacctt accaagtctt 900
 gacatccctt gacaggcata gaaatatgtt ttctcttcgg agcaaggaga caggtggtgc 960
 atggttgcg tcagctcgtg tcgtgagatg ttgggttaag tcccgcacg agcgcaacc 1020
 ttatggtcag ttactacgca agaggactct ggccagactg ccggtgacaa aacggaggaa 1080
 ggtggggatg acgtcaaact atcatgccct ttatgacttg ggctacacac gtactacaat 1140
 ggcgttaaac aaagagaagc aagaccgca ggtggagcaa aactcagaaa caacgtccca 1200
 gttcggactg cagcctgcaa ctgcctgca cgaagtcgga attgctagta atcgtggatc 1260
 agcatgccac ggtgaatacg ttcccgggcc ttgtacacac cgcccgtcac accatgagag 1320
 cgggggggac ccgaagtcgg tagtctaacc gcaaggagga cgccgccgaa ggtaaaactg 1380
 gtgattgggg tgaagtcgta acaag 1405

<210> 5

<211> 1385

<212> RNA

<213> *Faecalibacterium prausnitzii*

<400> 5

cgagtggcga acgggtgagt aacgcgtgag gaacctgcct caaagagggg gacaacagtt 60
 ggaaacgact gctaataccg cataagccca caggtcggca tcgaccagag ggaaaaggag 120
 caatccgctt tgagatggcc tcgcgtccga ttagctagtt ggtgaggtaa tggcccacca 180
 aggcaacgat cggtagccgg actgagaggt tgaaccggca cattgggact gagacacggc 240
 ccagactcct acgggaggca gcagtgggga atattgcaca atgggggaaa ccctgatgca 300
 gcgacgccgc gtggaggaag aaggtcttcg gattgtaaac tcctgttgtt gaggaagata 360
 atgacggtac tcaacaagga agtgacggct aactacgtgc cagcagccgc ggtaaaactg 420
 aggtcacaag cgttgtccgg aattactggg tgtaaagga gcgcaggcgg gaagacaagt 480
 tggaaagtga atctatgggc tcaaccata aactgctttc aaaactgttt ttcttgagta 540
 gtgcagaggt aggcggaatt cccggtgtag cgggtggaatg cgtagatata gggaggaaca 600
 ccagtggcga aggcggccta ctgggcacca actgacgctg aggctcgaat gtgtgggtag 660
 caaacaggat tagataccct ggtagtccac accgtaaact atgattacta ggtgttggag 720
 gattgacccc ttcagtgccg cagttaacac aataagtaat ccacctgggg agtacgaccg 780
 caaggttga actcaaagga attgacgggg gcccgcaaa gcagtggagt atgtggttta 840
 attcagcca agcgaagaa ccttaccag tcttaccata ctctagcgtt actggaaca 900

```

.....
tgtttttcct tcggaacgca gagacaggtg gtgcatggtt gtcgtcagct cgtgtcgtga 960
gatgttgggt taagtccgc aacgagcgca acccttactg tcagttacta cgcaagagga 1020
ctctggcagg actgccgttg acaaaacgga ggaaggtggg gatgacgtca aatcatcatg 1080
ccctttatga cttgggctac acacgtacta caatggcggt aaacaaagag aagcaagacc 1140
gcgaggtgga gcaaaactca gaaacaacgt cccagttcgg actgcaggct gcaactcgcc 1200
tgcacgaagt cgaattgct agtaatcgtg gatcagcatg ccacggtgaa tacgttcccg 1260
ggccttgtag acaccgccc tcacaccatg agagccgggg ggacccgaag tcggtagtct 1320
aacgcgaagg aggacgccgc cgaaggtaaa actggtgatt ggggtgaagt cgtaacaagg 1380
tagcc 1385

```

<210> 6

<211> 1405

<212> RNA

<213> *Faecalibacterium prausnitzii*

<400> 6

```

cgagcgagag agagcttgct ttctcaatcg agtggcgaac gggtagtaaa cgcgtgagga 60
acctgcctca aagaggggga caacagttgg aaacgactgc taataccgca taagcccaca 120
ggtcggcatc gaccagaggg aaaaggagca atccgctttg agatggcctc gcgtccgatt 180
agctagttgg tgaggtaatg gccaccaag gcaacgatcg gtagccggac tgagaggttg 240
aacggccaca ttgggactga gacacggccc agactcctac gggaggcagc agtggggaat 300
attgcacaat ggggaaacc ctgatgcagc gacgccgct ggaggaagaa ggtcttcgga 360
ttgtaaactc ctgttgttga ggaagataat gacggtactc aacaaggaag tgacggctaa 420
ctacgtgcca gcagccgcg taaaacgtag gtcacaagcg ttgtccgga ttactgggtg 480
taaagggagc gcagcgggga agacaagttg gaagtgaat ctatgggctc aaccataaa 540
ctgctttcaa aactgttttt cttgagtagt gcagaggtag gcggaattcc cgggttagcg 600
gtggaatgag tagatatcg gaggaacacc agtggcgaag gcggcctact gggcaccaac 660
tgacgctgag gctcgaaagt gtgggtagca aacaggatta gataccctgg tagtccacac 720
cgtaaacgat gattactagg tggtggagga ttgaccctt cagtgccgca gttaacacaa 780
taagtaatcc acctggggag tacgaccgca aggttgaac tcaaaggaat tgacgggggc 840
ccgcacaagc agtggagtat gtggtttaat tcgacgcaac gcgaagaacc ttaccaagtc 900
ttgacatcct gtgacgaacc tggaaatatg ttttccctc ggaacgcaga gacaggtggt 960
gcatggttgt cgtcagctcg tgcgtgaga tggtgggta agtcccgcaa cgagcgcaac 1020
ccttactgtc agttactacg caagaggact ctggcaggac tgccgttgac aaaacggagg 1080
aaggtgggga tgacgtcaaa tcatcatgcc ctttatgact tgggctacac acgtactaca 1140
atggcgtaa acaaaagaa gcaagaccgc gaggtggagc aaaactcaga aacaacgtcc 1200
cagttcggac tgcaggctgc aactcgctg cacgaagtcg gaattgctag taatcgtgga 1260
tcagcatgcc acggtgaata cgttcccggg ccttgtagac accgcccgtc acaccatgag 1320

```

agccgggggg acccgaagtc ggtagtctaa ccgcaaggag gacgccgccg aaggtaaaac 1380
 tggtgattgg ggtgaagtcg tacag 1405

<210> 7

<211> 1474

<212> RNA

<213> *Faecalibacterium prausnitzii*

<400> 7

agagtttgat cctggctcag gacgaacgct ggcggcggcg ctaacacatg caagtcgaac 60
 gagcgagaga gagcttgctt tctcgagcga gtggcgaacg ggtgagtaac gcgtggggaa 120
 cctgcctcaa agagggggac aacagttgga aacgactgct aataccgcat aagcccacga 180
 cctggcatcg ggttgagggg aaaggagcaa tccgctttga gatggcctcg cgtccgatta 240
 gctagttggt gaggtaatgg cccaccaagg caacgatcgg tagccggact gagaggttga 300
 acggccacat tgggactgag acacggccca gactcctacg ggaggcagca gtggggaata 360
 ttgcacaatg ggggaaaccc tgatgcagcg acgcccgctg gaggaagaag gtcttcggat 420
 tgtaaaactcc tgttgttgag gaagataatg acggtactca acaaggaagt gacggctaac 480
 tacgtgccag cagcccggtt aaaacgtagg tcacaagcgt tgtccggaat tactgggtgt 540
 aaagggagcg caggcgggaa gacaagttgg aagtgaaatc catgggctca acccatgaac 600
 tgctttcaaa actgttttct ttgagtagtg cagaggtagg cggaattccc ggtgtagcgg 660
 tggaatgcgt agatatcggg aggaacacca gtggcgaagg cggcctactg ggcaccaact 720
 gacgctgagg ctcgaaagtg tgggtagcaa acaggattag ataccctggt agtccacacc 780
 gtaaacgatg attactaggt gttggaggat tgacccttc agtgccgag ttaacacaat 840
 aagtaatcca cctggggagt acgaccgcaa ggttgaact caaaggaatt gacgggggcc 900
 cgcacaagca gtggagtatg tggtttaatt cgacgcaacg cgaagaacct taccaagtct 960
 tgacatcctg cgacggtgct gaaacagtg ctttccttcg ggacgcagag acagtggtg 1020
 catggttgc gtcagctcgt gtcgtgagat gttgggttaa gtcccgcaac gagcgcaacc 1080
 cttatggtca gttactacgc aagaggactc tggccagact gccgttgaca aaacggagga 1140
 aggtggggat gacgtcaaat catcatgccc tttatgactt gggctacaca cgtactaaa 1200
 tggcgttaaa caaagagaag caagaccgcg aggtggagca aaactcagaa acaacgtccc 1260
 agttcggact gcaggctgca actcgcctgc acgaagtcgg aattgctagt aatcgtggat 1320
 cagcatgcca cggtaatac gttcccgggc cttgtacaca ccgccctca caccatgaga 1380
 gccgggggga cccgaagtcg gtagtctaac cgcaaggagg acgccgccga aggtaaaact 1440
 ggtgattggg gtgaagtcg aacaaggtag ccgt 1474

<210> 8

<211> 1533

<212> RNA

<213> *Faecalibacterium prausnitzii*

<400> 8

gcatgctcga gcggccgcca gtgtgatgga tatctgcaga attcgccctt agagtttgat 60
 cctggctcag gacgaacgct ggccggcgcg ctaacacatg caagtccaac gagcgagaga 120
 gagcttgctt tctcgagcga gtggcgaacg ggtgagtaac gcgtgaggaa cctgcctcaa 180
 agagggggac aacagttgga aacgactgct aataccgcat aagcccacga cccggcatcg 240
 ggtagaggga aaaggagcaa tccgctttga gatggcctcg cgtccgatta gctagtgggt 300
 gaggtaacgg cccaccaagg cgacgatcgg tagccggact gagaggttga acggccacat 360
 tgggactgag acacggccca gactcctacg ggaggcagca gtggggaata ttgcacaatg 420
 ggggaaaccc tgatgcagcg acgcccgtg gaggaagaag gtcttcggat tgtaaactcc 480
 tgttggtgag gaagataatg acgggtactca acaaggaagt gacggctaac tacgtgccag 540
 cagccgcggt aaaacgtagg tcacaagcgt tgtccggaat tactgggtgt aaagggagcg 600
 caggcgaggaa gacaagttgg aagtgaatc catgggctca acccatgaac tgctttcaaa 660
 actgtttttc ttgagtagtg cagaggtagg cggaaattccc ggtgtagcgg tggaatgcgt 720
 agatatcggg aggaacacca gtggcgaagg cggcctactg ggcaccaact gacgctgagg 780
 ctcgaaagtg tgggtagcaa acaggattag ataccctggg agtccacacc gtaaaccgatg 840
 attactaggt gttggaggat tgaccccttc agtgcgcgag ttaacacaat aagtaatcca 900
 cctggggagt acgaccgcaa ggttgaaact caaaggaatt gacggggggc cgcacaagca 960
 gtggagtatg tggtttaatt cgacgcaacg cgaagaacct taccaagtct tgacatcctg 1020
 cgacggttct ggaaacagaa ctttccttcg ggacgcagag acaggtgggtg catggttgtc 1080
 gtcagctcgt gtcgtgagat gttgggttaa gtcccgaac gagcgcaacc cttatggtca 1140
 gttactacgc aagaggactc tggccagact gccgttgaca aaacggagga aggtggggat 1200
 gacgtcaaat catcatgccc tttatgactt gggctacaca cgtactaaa tggcgtaaa 1260
 caaagagaag caagaccgcg aggtggagca aaactcagaa acaacgtccc agttcggact 1320
 gcaggctgca actcgcctgc acgaagtcgg aattgctagt aatcgtgat cagcatgcca 1380
 cgggtgaatac gttccggggc cttgtacaca ccgcccgtca caccatgaga gccgggggga 1440
 cccgaagtcg gtagtctaac cgcaaggagg acgcccgcga aggtaaaact ggtgattggg 1500
 gtgaagtcgt aacaaggtag ccgtaagggc gaa 1533

<210> 9

<211> 1286

<212> RNA

<213> *Faecalibacterium prausnitzii*

<400> 9

gcatcgggca gagggaaaag gagcaatccg ctttgagatg gcctcgcgtc cgattagcta 60
 gttggtgagg taatggccca ccaaggcgac gatcggtagc cggactgaga ggttgaacgg 120
 ccacattggg actgagacac ggcccagact cctacgggag gcagcagtgg ggaatattgc 180
 acaatggggg aaaccctgat gcagcgacgc cgcgtggagg aagaaggtct tcgattgta 240
 aactcctggt gttgaggaag ataatgacgg tactcaaaa ggaagtgacg gctaactacg 300
 tgccagcagc cgcggtaaaa cgtaggtcac aagcgttgtc cggaattact ggggtgaaag 360

ggagcgcagg cggaagaca agttggaagt gaaatccatg ggctcaacc atgaactgct 420
 ttcaaaaactg tttttcttga gtagtgcaga ggtaggcggga attcccgggtg tagcgggtgga 480
 atgcgtagat atcgggagga acaccagtgg cgaaggcggc ctactgggca ccaactgacg 540
 ctgaggctcg aaagtgtggg tagcaaacag gattagatac cctggtagtc cactctgtaa 600
 acgatgatta ctagggtgtg gaggattgac cccttcagtg ccgcagttaa cacaataagt 660
 aatccacctg gggagtacga ccgcaaggtt gaaactcaaa ggaattgacg ggggcccgca 720
 caagcagtgg agtatgtggt ttaattcgac gcaacgcgaa gaaccttacc aagtcttgac 780
 atcctgcgac gcacatagaa atatgtgttt ccttcgggac gcagagacag gtggtgcatg 840
 gttgtcgtca gctcgtgtcg tgagatgttg ggttaagtcc cgcaacgagc gcaaccctta 900
 tggtcagtta ctacgcaaga ggactctggc cagactgccg ttgacaaaac ggaggaaggt 960
 ggggatgacg tcaaatcatc atgcccttta tgacttgggc tacacacgta ctacaatggc 1020
 gttaaacaaa gagaagcaag accgcgaggt ggagcaaac tcagaaacaa cgtcccagtt 1080
 cggactgcag gctcaactc gcctgcacga agtcggaatt gctagtaatc gcagatcagc 1140
 atgctgcggt gaatacgttc ccgggccttg tacacaccgc ccgtcacacc atgagagccg 1200
 gggggaccgc aagtcggtag tctaaccgca aggaggacgc cgccgaaggt aaaactggtg 1260
 attggggtga agtcgtaaca aggtag 1286

<210> 10

<211> 1407

<212> RNA

<213> *Faecalibacterium prausnitzii*

<400> 10

cgagcgcagag agagcttgct ttctcgagcg agtggcgaac gggtgagtaa cgcgtgagga 60
 acctgcctca aagaggggga caacagttgg aaacgactgc taataccgca taagcccacg 120
 ggtcggcatc gaccagaggg aaaaggagca atccgctttg agatggcctc gcgtccgatt 180
 agctagttgg tgaggtaacg gccaccaag gcaacgatcg gtagccggac tgagaggttg 240
 aacggccaca ttgggactga gacacggccc agactcctac gggaggcagc agtggggaat 300
 attgcacaat ggggaaacc ctgatgcagc gacgcgcggt ggaggaagaa ggtcttcgga 360
 ttgtaaactc ctgttgttg ggaagataat gacggtacc aacaaggaag tgacggctaa 420
 ctacgtgcca gcagccgagg taaaacgtag gtcacaagcg ttgtccgga ttactgggtg 480
 taaaggagc gcaggcggga agacaagttg gaagtgaat ctatgggctc aaccataaa 540
 ctgctttcaa aactgttttt cttgagtagt gcagaggtag gcggaattcc cgggtgtagc 600
 gtggaatgag tagatatcgg gaggaacacc agtggcgaag gcggcctact gggcaccaac 660
 tgacgctgag gctcgaaggt gtgggtagca aacaggatta gataccctgg tagtccacac 720
 cgtaaacgat gattactagg tggtggagga ttgaccctt cagtgccgca gttaacacaa 780
 taagtaatcc acctggggag tacgaccgca aggttgaaac tcaaaggaat tgacgggggc 840
 ccgcacaagc agtggagtat gtggtttaat tcgacgcaac gcgaagaacc ttaccaagtc 900
 960

ttgacatccc ttgacagaca tagaaatag taatctcttc ggagcaagga gacaggtggt 960
 gcatggttgt cgtcagctcg tgtcgtgaga tgttgggtta agtcccgcaa cgagcgcaac 1020
 ccttatggtc agttactacg caagaggact ctggccagac tgccgttgac aaaacggagg 1080
 aaggtgggga tgacgtcaaa tcatcatgcc ctttatgact tgggctacac acgtactaca 1140
 atggcgtaa acaagagaa gcaagaccgc gaggtggagc aaaactcaga aacaacgtcc 1200
 cagttcggac tgcaggctgc aactcgcctg cacgaagtcg gaattgctag taatcgtgga 1260
 tcagcatgcc acggtgaata cgttcccggg ccttgtacac accgcccgtc acaccatgag 1320
 agccgggggg acccgaagtc ggtagtctaa ccgcaaggag gacgccgccg aaggtaaaac 1380
 tggtgattgg ggtgaagtcg taacaag 1407

<210> 11

<211> 1382

<212> RNA

<213> *Faecalibacterium prausnitzii*

<400> 11

gagcgagtgg cgaacgggtg agtaacgcgt gaggaacctg cctcaaagag ggggacaaca 60
 gttgaaaacg actgctaata ccgcataagc ccacgacccg gcatcgggta gagggaaaag 120
 gagcaatccg ctttgagatg gcctcgcgtc cgattagcta gttggtgagg taatggccca 180
 ccaaggcgac gatcggtagc cggactgaga ggttgaacgg ccacattggg actgagacac 240
 ggcccagact cctacgggag gcagcagtggt ggaatattgc acaatggggg aaaccctgat 300
 gcagcgacgc cgcgtggagg aagaaggtct tcggtattgta aactcctgtt gttgaggaag 360
 ataatgacgg tactcaacaa ggaagtgacg gctaactacg tgccagcagc cgcgtaaaa 420
 cgtaggtcac aagcgttgct cgggaattact ggggtgtaaag ggagcgcagg cgggaagaca 480
 agttggaagt gaaatccatg ggctcaacc c atgaactgct ttcaaaactg tttttcttga 540
 gtagtgacga ggtaggcgga attcccgtg tagcgtgga atgcgtagat atcgggagga 600
 acaccagtgg cgaaggcggc ctactgggca ccaactgacg ctgaggctcg aaagtgtggg 660
 tagcaaacag gattagatac cctggtagtc cacactgtaa acgatgatta ctagggtgtg 720
 gaggattgac cccttcagtg ccgcagttaa cacaataagt aatccacctg gggagtacga 780
 ccgcaaggtt gaaactcaaa ggaattgacg ggggcccgca caagcagtg agtatgtggt 840
 ttaattcgac gcaacgcgaa gaaccttacc aagtcttgac atcctgcgac gcacatagaa 900
 atatgtgttt ccttcgggac gcagagacag gtggtgcatg gttgtcgtca gctcgtgtcg 960
 tgagatgttg ggttaagtc ccgaacgagc gcaaccctta tggtcagtta ctacgcaaga 1020
 ggactctggc cagactgccg ttgacaaaac ggaggaagggt ggggatgacg tcaaatcatc 1080
 atgcccttta tgacttgggc tacacacgta ctacaatggc gttaaacaaa gagaagcaag 1140
 accgcgaggt ggagcaaac tcagaaacaa cgtcccagtt cggactgcag gctgcaactc 1200
 gcctgcacga agtcggaatt gctagtaatc gcagatcagc atgctgcggt gaatacgttc 1260
 ccgggccttg tacacaccgc ccgtcacacc atgagagccg gggggaccgg aagtcggtag 1320
 tctaaccgca aggaggacgc cgccgaagggt aaaactggtg attggggtga agtcgtaaca 1380

ag

1382

<210> 12

<211> 1395

<212> RNA

<213> *Faecalibacterium prausnitzii*

<400> 12

```

agcttgcttt ctcgagcgag tggcgaacgg gtgagtaacg cgtgaggaaac ctgcctcaaa      60
gagggggaca acagttggaa acgactgcta ataccgcata agcccacggg tcggcatcga      120
ccagagggaa aaggagcaat ccgctttgag atggcctcgc gtccgattag ctagttagtg      180
aggtaacggc ccaccaaggc gacgatcggg agccggactg agagggtgaa cggccacatt      240
gggactgaga cacggcccag actcctacgg gaggcagcag tggggaatat tgcacaatgg      300
gggaaaccct gatgcagcga cgccgcgtgg aggaagaagg tcttcggatt gtaaactcct      360
gttgttgggg aagataatga cggtagccaa caaggaagtg acgggctaact acgtgccagc      420
agccgcggta aacgtaggt cacaagcgtt gtccggaatt actgggtgta aaggagcgc      480
aggcgggaag acaagttgga agtgaaatct atgggctcaa ccataaaact gctttcaaaa      540
ctgtttttct tgagtagtgc agaggtaggc ggaattcccg gtgtagcggg ggaatgcgta      600
gatatcggga ggaacaccag tggcgaaggc ggcctactgg gcaccaactg acgctgaggg      660
tcgaaagtgt gggtagcaaa caggattaga taccctggta gtccacaccg taaacgatga      720
ttactagggtg ttggaggatt gacccttca gtgccgcagt taacacaata agtaatccac      780
ctggggagta cgaccgcaag gttgaaactc aaaggaattg acggggggcc gcacaagcag      840
tggagtatgt ggtttaattc gacgcaacgc gaagaacctt accaagtctt gacatccctt      900
gacagacata gaaatatgta ttctcttcgg agcaaggaga cagggtggtgc atggttgtcg      960
tcagctcgtg tcgtgagatg ttgggttaag tcccgcaacg agcgcaacc ttatggtcag     1020
ttactacgca agaggactct ggccgactg ccgttgacaa aacggaggaa ggtggggatg     1080
acgtcaaatc atcatgccct ttatgacttg ggctacacac gtactacaat ggcgttaaac     1140
aaagagaagc aagaccgca ggtggagcaa aactcagaaa caacgtcca gttcggactg     1200
caggctgcaa ctcgcctgca cgaagtcgga attgctagta atcgtggatc agcatgccac     1260
ggtgaatacg tccccgggcc ttgtacacac cgcccgtcac accatgagag cgggggggac     1320
ccgaagtcgg tagtctaacc gcaaggagga cgccgcgaa ggtaaaactg gtgattgggg     1380
tgaagtcgta acaag                                           1395

```

<210> 13

<211> 1390

<212> RNA

<213> *Faecalibacterium prausnitzii*

<400> 13

```

atcagtgggc gaacgggtga gtaacgcgtg aggaacctgc ctcaaagagg gggacaacag      60
ttggaacga ctgctaatac cgcataagcc cacggctcgg catcgagcag agggaaaagg     120

```

agcaatccgc tttgagatgg cctcgcgtcc gattagctag ttggtgaggt aatggcccac 180
 caaggcgacg atcggtagcc ggactgagag gttgaacggc cacattggga ctgagacacg 240
 gccagactc ctacgggagg cagcagtggg gaatattgca caatggggga aacctgatg 300
 cagcgacgcc gcgtggagga agaaggtctt cggattgtaa actcctgttg ttgaggaaga 360
 taatgacggt actcaacaag gaagtgacgg ctaactacgt gccagcagcc gcggtaaaac 420
 gtaggtcaca agcgttgtcc ggaattactg ggtgtaaagg gagcgcaggc gggcgatcaa 480
 gttggaagtg aaatccatgg gctcaaccca tgaactgctt tcaaaactga ttgtcttgag 540
 tagtgcagag gtaggcggaa ttcccgtgt agcggtgga tgcgtagata tcgggaggaa 600
 caccagtggc gaaggcggcc tactgggcaac caactgacgc tgaggctcga aagtgtgggt 660
 agcaaacagg attagatacc ctggtagtcc acaccgtaa cgatgattac taggtgttgg 720
 aggattgacc ccttcagtgc cgcagttaac acaataagta atccacctgg ggagtacgac 780
 cgcaaggtg aaactcaaag gaattgacgg gggcccgcac aagcagtgga gtatgtggtt 840
 taattcgacg caacgcgaag aaccttacca agtcttgaca tctcgcgacg atgctagaaa 900
 tagtattttc cttcgggacg cagagacagg tgggtgatgg ttgtcgtcag ctcgtgtcgt 960
 gagatgttgg gttaagtccc gcaacgagcg caacccttat ggtcagttac tacgcaagag 1020
 gactctggcc agactgccgt tgacaaaacg gaggaagggtg gggatgacgt caaatcatca 1080
 tgccctttat gacttgggct acacacgtac tacaatggcg ttaaacaaaag agaagcaaga 1140
 ccgcgaggtg gagcaaaact cagaaacaac gtcccagttc ggactgcagc ctgcaactcg 1200
 cctgcacgaa gtcggaattg ctagtaatcg cagatcagca tgctcgggtg aatacgttcc 1260
 cgggccttgt acacaccgcc cgtcacacca tgagagccgg ggggaccga agtcggtagt 1320
 ctaaccgcaa ggaggacgcc gccgaagta aaactggtga ttggggtgaa gtcgtaacaa 1380
 ggtagccgtc 1390

<210> 14

<211> 1400

<212> RNA

<213> *Faecalibacterium prausnitzii*

<400> 14

gagagagctt gctttctcaa gcgagtggcg aacgggtgag taacgcgtga ggaacctgcc 60
 tcaaagaggg ggacaacagt tggaaacgac tgctaatacc gcataagccc acgaccoggc 120
 atcgggtaga gggaaaagga gcaatccgct ttgagatggc ctcgcgtccg attagctagt 180
 tgggtgaggt acggcccacc aaggcgacga tcggtagccg gactgagagg ttgaacggcc 240
 acattgggac tgagacacgg cccagactcc tacgggaggc agcagtgggg aatattgcac 300
 aatgggggaa acctgatgc agcgacgccg cgtggaggaa gaaggtcttc ggattgtaaa 360
 ctctgttgt tgaggaagat aatgacggta ctcaacaagg aagtgacggc taactacgtg 420
 ccagcagccg cggtaaaacg taggtcacia gcgttgtccg gaattactgg gtgtaaaggg 480
 agcgcaggcg ggaagacaag ttggaagtga aatccatggg ctcaaccat gaactgcttt 540
 caaaactttt ttttttgagt actgcagagg taggggaat tcccgtata ccggtggaat 600

```

.....
gcgtagatat cgggaggaac accagtggcg aaggcggcct actgggcacc aactgacgct 660
gaggctcгаа agtgtgggta gcaaacagga ttagataccc tggtagtcca cactgtaaac 720
gatgattact aggtgttggа ggattgaccc cttcagtgcc gcagttaaca caataagtaa 780
tccacctggg gagtacgacc gcaaggttga aactcaaagg aattgacggg ggccccгсaсa 840
agcagtgгag tatgtggttt aattcgacgc aacgcgaaga acdttaccaа gtcttgacat 900
cctgcgacgg tgctggaaac agtgctttcc ttcgggacgc agagacaggt ggtgcatggt 960
tgtcgtcagc tcgtgtcgtg agatgttggg ttaagtcccг caacgagcgc aacccttatg 1020
gtcagttact acgcaagagg actctggcca gactgcсgtt gacaaaacgg aggaaggtgg 1080
ggatgacgtc ааatcatcat gccctttatg acttgggcta cacacgtact аcaatggcgt 1140
taaаcaаaga гааgcaаgac cgcgaggtgg agcaaaactc agaaacaacg tcccagttcg 1200
gactgcaggc tgcaactcgc ctgcacgaag tcggaattgc tagtaatcgc agatcagcat 1260
gctgcggtga atacgttccc gggccttgta cacaccgcc gtсacaccat gagagccggg 1320
gggacccгаа gtcggtagtc таaccгaaг gaggacгccг ccgaaggtaa aactggtgat 1380
tggggtgaag tcgтааcaаg 1400

```

<210> 15

<211> 1388

<212> RNA

<213> *Faecalibacterium prausnitzii*

<400> 15

```

caagcгagtg gcгaaсgggt gagtaacгcг tgaggaaсct gcctcaaaga gggggacaac 60
agttgгaaac gactgctaаt accgcataаg cccacgaccc ggcatcgggt agagggaaaa 120
ggagcaatcc gctttgagat ggcctcгcgt ccgattagct agttggtgag gtaacggccc 180
accaaggcга cгatcгgtag ccggactgag aggttgaacг gccacattgg gactgagaca 240
cggcccagac tcctacggga ggcagcagtg gggaatattg cacaatgggг gaaaccctga 300
tgcagcгacг ccгcgtggag gaаgaagtc ttcggattgt aaactcctgt tгttgaggaa 360
gataatgacг gtactcaaca aggaagtгac ggctaactac gtгccagcag ccгcгgтаaa 420
acgtaggtca caagcгttgt ccggaattac tgggtgтаaa gggagcгcag гcгggгaaгac 480
aagttgгaaг tгaaatccat gggctcaacc catgaaсtгc tttcaaaact gtttttcttg 540
agtagtgсag aggtaggcгg aattcccgtg gtagcгgtgg аatгcгtaga tatcгggagг 600
aacaccagtg gcгaaггcгg cctactgggc accaaсtгac gctgaggctc gaaagtгtgg 660
gtagcaaaсa ggattagata ccctggtagt ccacactgта аacгatgatt actaggtгtt 720
ggaggattga ccccttcagt gcгcгcagtta acacaataаg таatccacct ggggagtagc 780
accгcaаggt tгaaactcaа aggaattгac gggggcccгc аcaаgсagtg gagtatгtgg 840
tttaattcга cгcaacгcга agaaccttac caagtcttга catcctгcга cгcacatага 900
aatatgtгtt tccttcggga cгcagagaca ggtggtгcat gttgtcгtc агctcгtгtc 960
gtgagatгtt gggтаaгtc ccгcaacгag cгcaaccctt atggtcagtt actacгaaг 1020

```

| | |
|---|------|
| aggactctgg ccagactgcc gttgacaaaa cggaggaagg tggggatgac gtcaaatcat | 1080 |
| catgcccttt atgacttggg ctacacacgt actacaatgg cgtaaaciaa agagaagcaa | 1140 |
| gaccgcgagg tggagcaaaa ctcagaaaca acgtcccagt tgggactgca ggctgcaact | 1200 |
| cgctgcacg aagtcggaat tgctagtaat cgcagatcag catgctgcgg tgaatacgtt | 1260 |
| cccgggcctt gtacacaccg cccgtcacac catgagagcc ggggggaccc gaagtcggta | 1320 |
| gtctaaccgc aaggaggacg ccgcccgaag taaaactggt gattggggtg aagtcgtaac | 1380 |
| aagggtag | 1388 |

<210> 16

<211> 1474

<212> RNA

<213> *Faecalibacterium prausnitzii*

<400> 16

| | |
|--|------|
| agagtttgat cctggctcag gacgaacgct ggcgvcgvc ctaacacatg caagtcgaac | 60 |
| gagcgagaga gagcttgctt tctcgagcga gtggcgaacg ggtgagtaac gcgtgaggaa | 120 |
| cctgcctcaa agagggggac aacagttgga aacgactgct aataccgat aagcccacga | 180 |
| cccggcatcg ggttgaggga aaaggagcaa tccgcttga gatggcctcg cgtccgatta | 240 |
| gctagttggt gagtaacgg cccaccaagg cgacgatcgg tagccggact gagagttga | 300 |
| acggccacat tgggactgag acacggccca gactcctacg ggaggcagca gtggggaata | 360 |
| ttgcacaatg ggggaaaccc tgatgcagcg acgcccgtg gaggaagaag gtcttcggat | 420 |
| tgtaactcc tgttgttggg gaagataatg acggtacca acaaggaagt gacggctaac | 480 |
| tacgtgccag cagccgvcgt aaaacgtagg tcacaagcgt tgtccggaat tactgggtgt | 540 |
| aaagggagcg caggcgggaa gacaagttgg aagtgaaatc catgggctta acccatgaac | 600 |
| tgctttcaaa actgttttcc ttgagtagtg cagaggtagg cgggaattccc ggtgtagcgg | 660 |
| tggaatgvcgt agatatcggg aggaacacca gtggcgaagg cggcctactg ggcaccaact | 720 |
| gacgctgagg ctgaaagtg tgggtagcaa acaggattag ataccctggt agtccacacc | 780 |
| gtaaacgatg attactaggt gttggaggat tgacccttc agtgccvcag ttaacacaat | 840 |
| aagtaatcca cctggggagt acgaccgcaa ggttgaact caaaggaatt gacgggggvc | 900 |
| vcgcaagca gtcgagatg tggtttaatt cgacvcacg cgaagaacct taccaagtct | 960 |
| tgacatcctg tgacagacgt agaaatacgt tcttccttcg ggacacagag acagtggtg | 1020 |
| catggttgc gtcagctcgt gtcgtgagat gttgggttaa gtcccvcac gagvcgaacc | 1080 |
| cttatggtca gttactacgc aagaggactc tggccagact gccgttgaca aaacvcgagga | 1140 |
| aggtggggat gacgtcaaat catcatgccc tttatgactt gggctacaca cgtactacaa | 1200 |
| tggvcgtaaa caaagagaag caagaccvcg aggtggagca aaactcagaa acaacgtccc | 1260 |
| agttvcgact gcaggctgca actvcvcctgc acgaagtcgg aattgctagt aatvcgtggt | 1320 |
| cagcatgcca cvgtgaatac gttcccggvc cttgtacaca ccgcccgtca caccatgaga | 1380 |
| gcccggggga cccgaagtcg gtagtctaac vcgcaaggagg acgcccvcga aggtaaaact | 1440 |
| ggtgattggg gtgaagtcgt aacaaggtag cvgt | 1474 |

<210> 17

<211> 1323

<212> RNA

<213> *Faecalibacterium prausnitzii*

<400> 17

```

ttagtggcga acgggtgagt aacgcgtgag taacctgccc tggagtgggg gacaacagtt      60
ggaaacgact gctaataaccg cataagccca cggcccggca tcgggctgcg ggaaaaggat      120
ttattcgctt caggatggac tcgcgccaa ttagctagtt ggtgaggtaa cggcccacca      180
aggcgacgat tggtagccgg actgagaggt tgaacggcca cattgggact gagacacggc      240
ccagactcct acgggaggca gcagtggggg atattgcaca atgggggaaa ccctgatgca      300
gcgacgccgc gtggaggaag aaggttttcg gattgtaaac tcctgtcgtt agggacgaat      360
catgacggta cctaacaaga aagcaccggc taactacgtg ccagcagccg cggtaaaacg      420
tagggtgcaa gcgttgtccg gaattactgg gtgtaaaggg agcgcaggcg gaccggcaag      480
ttggaagtga aaaccatggg ctcaaccat gaattgcttt caaaactgct ggccttgagt      540
agtgcagagg taggtggaat tcccgggtga gcggtggaat gcgtagatat cgggaggaac      600
accagtggcg aaggcgacct actgggcacc aactgacgct gaggctcgaa agcatgggta      660
gcaaacagga ttagataccc tggtagtcca tgccgtaaac gatgattact aggtgttggg      720
ggattgaccc cttcagtgcc gcagttaaca caataagtaa tccacctggg gagtacgacc      780
gcaaggttga aactcaaagg aattgacggg ggcccgcaca agcagtggag tatgtggttt      840
aattcgaagc aacgcgaaga acctaccag gtcttgacat ccgatgcata gtgcagagat      900
gcatgaagtc cttcgggaca tcgagacagg tgggtgatgg ttgtcgtcag ctcgtgtcgt      960

gagatgttgg gttaagtccc gcaacgagcg caacccttat tgccagttac tacgtaagag     1020
gactctggcg agactgccgt tgacaaaacg gaggaagggtg gggatgacgt caaatcatca     1080
tgccctttat gacctgggct acacacgtac tacaatggcg ttaacaaaag agaagcaaga     1140
ccgcgaggtg gagcaaaact cagaaacaac gtctcagttc agattgcagg ctgcaactcg     1200
cctgcatgaa gtcggaattg ctagtaatcg cggatcagca tgccgcggtg aatacgttcc     1260
cgggccttgt acacaccgcc cgtcacacca tgagagccgg ggggaccgga agtcggtagt     1320
cta                                                                                   1323

```

<210> 18

<211> 1469

<212> RNA

<213> *Eubacterium desmolans*

<220>

<223> n represents an ambiguous nucleotide

<400> 18

```

tttttagaga gtttgcctct ggctcaggat naacgctggc ggcgctgcta acacatgcaa      60
-----

```

| | |
|--|------|
| gtcgaacgga gttatcttgg aaatctcttc ggagatggaa ttcataactt agtggcggac | 120 |
| gggtgagtaa cgcgtgagca atctgccttt aggtggggga taacagtccg aaacggctgc | 180 |
| taataaccgca taatacgttt tgggggcatc cttgaaacgt caaagattta ttgcctttag | 240 |
| atgagctcgc gtctgattag ctggttgccg gggnaacggc ccaccaaggc gacgatcagt | 300 |
| agccggactg agaggttgaa cggccacatt gggactgaga cacggcccag actcctacgg | 360 |
| gaggcagcag tggggaatat tgcgcaatgg gggaaaccn gacgcagcaa cgccgcgtga | 420 |
| ttgaagaagg ccttcggggtt gtaaagatct ttaatcaggg acgaattttg acggtacctg | 480 |
| aagaataagc tccggctaac tacgtgccag cagcccggtt aatacgtagg gagcaagcgt | 540 |
| tatccggatt tactgggtgt aaagggcgcg cagncgggnc ggcaagttgg gagtgaatc | 600 |
| ngggggctta acccccgaac tgctttcaaa actgctggtc ttgagtgatg gagaggcagg | 660 |
| cgggaattccg tgtgtagcgg tgaaatgcgt agatatacgg aggaacacca gtggcgaagg | 720 |
| cggcctgctg gacattaact gacgctgagg cgcgaaagcg tggggagcaa acaggattag | 780 |
| ataccctggt agtccacgcc gtaaacgatg gatactaggt gtgggaggta ttgaccctt | 840 |
| ccgtgccgca gttaacacaa taagtatccc acctggggag tacggccgca aggttgaaac | 900 |
| tcaaaggaat tgacgnnngc ccgcacaagc agtggagtat gtggtttaat tcgaannaac | 960 |
| gcgaagaacc ttaccaggnc ttgacatccc ggtgaccgtc ctagagatag gacttncctt | 1020 |
| cgggncaacg gtgacagntg gtgcatggtt gtcgtcagct cgtgtcgtga gatgttgnt | 1080 |
| taagtccgc aacgagcga acccttacgg ttagttgata cgcaagatca ctctagccgg | 1140 |
| actgccgttg acaaaacgga ggaaggtggg gacgacgtnn aatcatcatg cccntatga | 1200 |
| cctgggctac acacgtacta caatggcagt catacagagg gaagcaaaat cgcgaggtgg | 1260 |
| agcaaatccc taaaagctgt cccagttcag attgcaggct gcaaccgcc tgcatgaagt | 1320 |
| cgggaattgct agtaatcgcg gatcagcatg ccgcggtgaa tacgttcccg ggnntgtac | 1380 |
| acaccgcccg tcacaccatg agagccgtca ataccgaag tccgtagcct aaccgcaagg | 1440 |
| ggggcgcggc cgaaggtagg ggtggtaat | 1469 |

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- [EP14306803 \[0160\]](#)

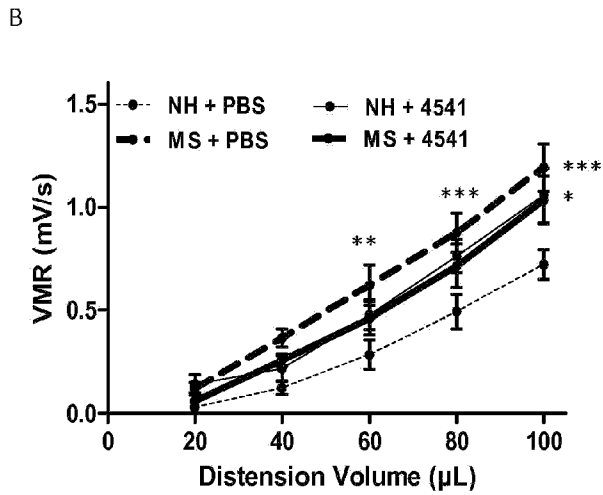
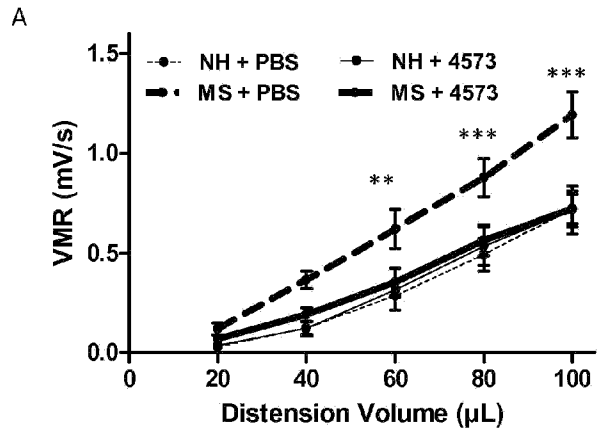
Non-patent literature cited in the description

- HYAMS et al. *J. Pediatr.*, 1996, vol. 129, 220- [\[0003\]](#)
- HEADINGS *Scand J Gastroenterol*, 1999, vol. 231, 3- [\[0003\]](#)
- JONES et al. *Gut*, 2000, vol. 47, 2ii1-ii19 [\[0006\]](#)
- DROSSMAN et al. *Gut*, 1999, vol. 45, 111-81 [\[0007\]](#)
- DUNCAN et al. *Int. J. Syst. Evol. Microbiol.*, 2002, vol. 52, 2141-6 [\[0047\]](#)
- LOPEZ-SILES et al. *Appl. Environ Microbiol.*, 2012, vol. 78, 2420-8 [\[0047\]](#)
- MACFARLANE MACFARLANE *J. Clin. Gastroenterol.*, 2011, vol. 45, S120-7 [\[0047\]](#)
- MARTIN et al. *Inflamm Bowel Dis.*, 2014, vol. 20, 3417-30 [\[0048\]](#)
- SOKOL et al. *Proc Natl Acad Sci USA.*, 2008, vol. 105, 4316731-6 [\[0048\]](#)
- RINGELMAHARSHAK *Am. J. Physiol. Gastrointest. Liver Physiol.*, 2013, vol. 305, 8G529-41 [\[0050\]](#)
- CORPET F. *Nucleic Acids Res.*, 1988, vol. 16, 10881-10890 [\[0058\]](#)
- SAITOU N. NEI M. *Mol Biol Evol.*, 1987, vol. 4, 406-425 [\[0059\]](#)
- ZHARKIKH A. LI WH *Mol Phylogenet Evol.*, 1995, vol. 4, 44-63 [\[0060\]](#)
- TAMURA et al. *Proc Natl Acad Sci USA.*, 2004, vol. 101, 11030-11035 [\[0061\]](#)
- LOPEZ-SILES et al. *Appl. Environ. Microbiol.*, 2012, vol. 78, 2420- [\[0074\]](#)
- LOPEZ-SILES et al. *Appl. Environ Microbiol.*, 2012, vol. 78, 420-428 [\[0111\]](#)
- COUTINHO et al. *Am. J. Physiol. Gastrointest. Liver Physiol.*, 2002, vol. 282, 2G307-16 [\[0118\]](#)
- CHRISTIANSON et al. *Nat Protoc*, 2007, vol. 2, 102624-31 [\[0119\]](#)
- AIT-BELGNAOUI et al. *Gut*, 2006, vol. 55, 1090-1094 [\[0136\]](#)
- ROSZTÓCZY, A. et al. *Neurogastroenterol. Motil. Off. J. Eur. Gastrointest. Motil. Soc.*, 2003, vol. 15, 679-686 [\[0137\]](#)
- WILLIAMS, C. L et al. *Am. J. Physiol.*, 1987, vol. 253, G582-586 [\[0141\]](#)
- LEE B. et al. *J. Neurogastroenterol. Motil.*, 2011, vol. 17, 252-266 [\[0142\]](#)
- EUTAMENE, H. et al. *J. Physiol.*, 1998, vol. 506, 245-252 [\[0144\]](#)

Patentkrav

1. Bakteriestamme, som er deponeret hos CNCM under
accessionsnummeret I-4573, til anvendelse ved behandling
5 og/eller forebyggelse af visceral abdominal smerte hos et
individ.
2. Bakteriestamme til anvendelse ifølge krav 1, hvor den
viscerale abdominal smerte er en gastrointestinal smerte, navnlig
10 en smerte i colon.
3. Bakteriestamme til anvendelse ifølge krav 1 eller 2, hvor
den viscerale smerte er forårsaget af en gastrointestinal
lidelse, navnlig en ikke-inflammatorisk gastrointestinal
15 lidelse.
4. Bakteriestamme til anvendelse ifølge krav 3, hvor den
gastrointestinale lidelse er en gastrointestinal overfølsomhed,
navnlig en overfølsomhed i colon, og fortrinsvis er colon
20 irritable, navnlig colon irritable af alternerende type.
5. Bakteriestamme til anvendelse ifølge et hvilket som helst
af kravene 1-4, hvor bakteriestammen indgår i en sammensætning,
som omfatter et fysiologisk acceptabelt medium, fortrinsvis i
25 en oral sammensætning, og mest fortrinsvis i et kosttilskud.
6. Sammensætning, som i et fysiologisk acceptabelt medium
omfatter mindst én bakteriestamme, der er deponeret hos CNCM
under accessionsnummeret I-4573.
30
7. Sammensætning ifølge krav 6, som er beregnet til den orale
vej og er valgt fra gruppen bestående af en fødevarer, en drik,
et lægemiddel, et nutraceutikum, et tilsætningsstof til
fødevarer, et kosttilskud og et mejeriprodukt, og som navnlig
35 er et kosttilskud.
8. Isoleret bakteriestamme, som er den bakteriestamme, der er
deponeret hos CNCM under accessionsnummeret I-4573.

DRAWINGS

**FIGURE 1**

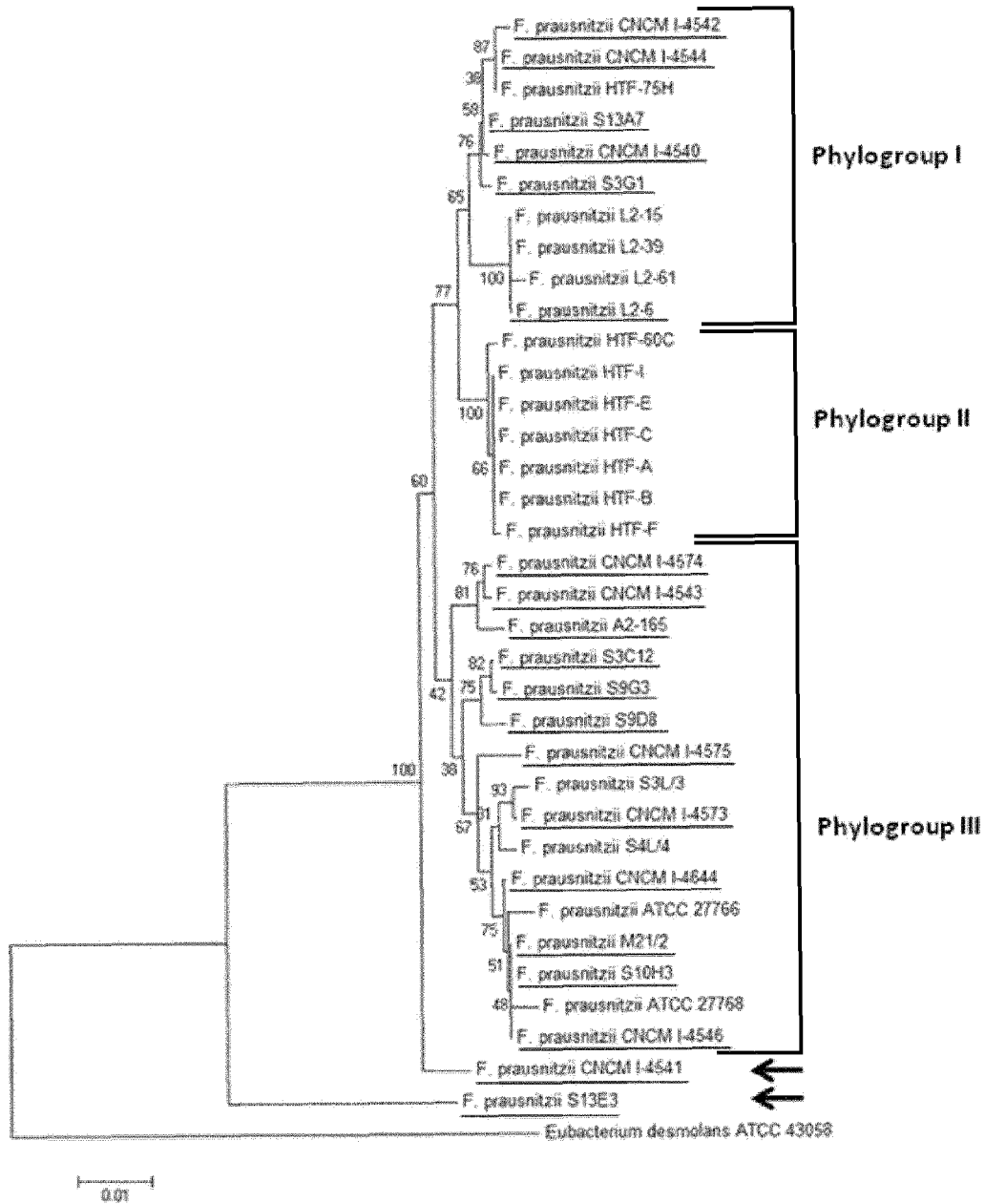
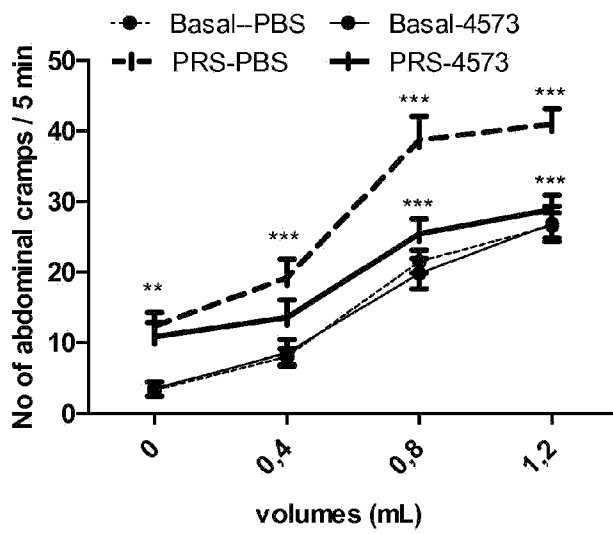
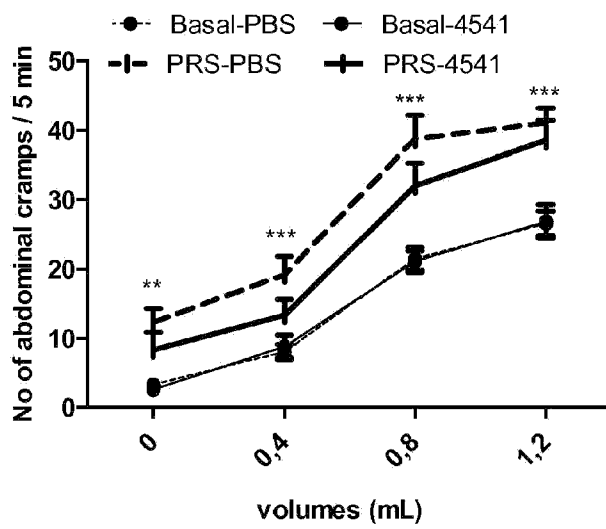


FIGURE 2

A**B****FIGURE 3**