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(54) Title: FOLIC ACID PRODUCING *BIFIDOBACTERIUM* BACTERIAL STRAINS, FORMULATIONS AND USE THEREOF

(57) Abstract: The present invention relates to folic acid-producing bacterial strains belonging to the genus *Bifidobacterium*, pharmaceutical, veterinary or food formulations containing them and the use thereof. In particular, the invention relates to new bacterial strains of human origin belonging to the genus *Bifidobacterium*, *adolescentis* species (2), the genus *Bifidobacterium*, *breve* species (1) and the genus *Bifidobacterium*, *pseudocatenulatum* species (2) deposited in the DSMZ collection center (Deutsche Sammlung von Mikroorganismen und Zellkulturen GmbH; Braunschweig, Germany), in accordance with the Treaty of Budapest, on 21 July 2004.



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"FOLIC ACID PRODUCING BIFIDOBACTERIUM BACTERIAL STRAINS, FORMULATIONS AND USE THEREOF"

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SUMMARY OF THE INVENTION

- 5 The present invention relates to folic acid-producing bacterial strains belonging to the genus *Bifidobacterium*, pharmaceutical, veterinary or food formulations containing them and the use thereof.
- In particular, the invention relates to new bacterial
- 10 strains of human origin belonging to the genus *Bifidobacterium*, *adolescentis* species (2), the genus *Bifidobacterium*, *breve* species (1) and the genus *Bifidobacterium*, *pseudocatenulatum* species (2) deposited in the DSMZ collection center (Deutsche
- 15 Sammlung von Mikroorganismen und Zellkulturen GmbH; Braunschweig- Germany), in accordance with the Treaty of Budapest, on 21 July 2004.
- The aforesaid strains were respectively ascribed the following identification codes:
- 20 *Bifidobacterium*, *adolescentis* species, code DSM 16594;
- Bifidobacterium*, *adolescentis* species, code DSM 16595;
- Bifidobacterium*, *breve* species, code DSM 16596;
- 25 *Bifidobacterium*, *pseudocatenulatum* species, code DSM 16597;
- Bifidobacterium*, *pseudocatenulatum* species, code DSM 16598.

FIELD OF THE INVENTION

- 30 Folic acid is an important water-soluble B vitamin that accepts one unit of carbon from a donor molecule.
- Thanks to this characteristic, folic acid is central to a large number of essential cellular processes,

including, for example, the biogenesis of methyl groups and synthesis of nucleotides, vitamins and several amino acids.

In the body, DNA replication, repair and methylation
5 become more efficient as the availability of folic acid increases.

For this reason, tissues displaying a high proliferation and turnover rate, such as leukocytes, erythrocytes and enterocytes, require a large
10 quantity of folic acid, or at least a good, constant availability thereof.

In humans, folic acid deficiency has been associated with an elevated increase in the risk of cancer: for example, epidemiological studies have shown that the
15 risk of developing a breast tumor after menopause is higher in women with a low folic acid intake.

Conversely, high quantities of folic acid reduce the risk of colorectal cancer.

Folic acid (together with its salts, the folates)
20 plays, among other things, a fundamental role for the cells making up the colorectal mucous membrane, which undergoes a continuous process of epithelial renewal. The role played by folic acid in preventing colorectal cancer has been described in the
25 literature (Ref. 1). It has been demonstrated, in particular, that polymorphisms of genes responsible for the metabolism of the methyl group are associated with the familial risk of colorectal cancer and that the effect of these genes is modified by the
30 availability of folates (Ref. 2).

Consequently, a low or diminished local availability of folic acid may result in DNA hypomethylation, thus favoring, for example, the occurrence of colon cancer.

Furthermore, the availability of large quantities of folic acid is recommended for patients affected with inflammatory bowel diseases (IBD), since it helps regulate the proliferation of cells in the colon and
5 rectum.

It is thus of utmost importance to find a means by which to endow the body with a natural, non-toxic endogenous source capable of supplying the necessary quantity of folic acid on a continuous basis and thus
10 providing an alternative to the conventional systemic methods of administration of said substance, or the salts thereof.

Unfortunately, up to now no type of solution has been found to meet this necessity.

15 It is well known that the human colon is colonized by a complex and numerous microbial community that actively interacts with the host.

The concentration of bacteria in the colon is approximately 10^{11} - 10^{12} bacteria per gram of
20 intestinal content.

There are at least 400 bacterial species present, but 30-40 species on their own account for approximately 95-98% of total microflora.

Among these principal species, those belonging to the
25 genus *Bifidobacterium* represent one of the major intestinal microbial groups present in man.

Bifidobacterium is a genus known for its beneficial activity within the body. This activity translates, for example, into the following effects: ability to
30 replenish intestinal bacterial flora following antibiotic therapy, maintenance of a balance among the various intestinal microbial groups, reduction in serum cholesterol levels, production of vitamins,

alleviation of lactose intolerance and immunomodulation.

The bacteria belonging to the *Bifidobacterium* genus are therefore rightly considered probiotics and
5 commonly used as such in the pharmaceutical, veterinary and/or food sectors.

A probiotic is by definition a live microbial supplement whose activity is beneficial to human or animal health.

10 To date, no probiotic strains have been known to produce folic acid (folic acid-producing bacteria belonging to the genera *Lactobacillus* and *Lactococcus* have been described, but they have not been proposed as probiotics).

15 In particular, no probiotic bacteria of the *Bifidobacterium* genus have been known to develop in a culture medium completely devoid of folic acid and produce the latter in large quantities.

DESCRIPTION OF THE INVENTION

20 The Applicant unexpectedly found that strains of probiotic bacteria of human origin, belonging to the *Bifidobacterium* genus, are producers of folic acid.

Folic acid-producing strains belonging to the following species, for example, were identified:

25 *Bifidobacterium longum*, *Bifidobacterium infantis*,
Bifidobacterium adoloscentis, *Bifidobacterium bifidum*,
Bifidobacterium breve, *Bifidobacterium angulatum*,
Bifidobacterium catenulatum,
Bifidobacterium pseudocatenulatum, *Bifidobacterium gallicum*,
30 *Bifidobacterium dentium*, *Bifidobacterium denticolens*,
Bifidobacterium inopinatum, *Bifidobacterium animalis*, *Bifidobacterium lactis*.

Among these strains of bacteria, the species *Bifidobacterium adoloscentis*, *Bifidobacterium breve*

and *Bifidobacterium pseudocatenulatum* have shown to be particularly interesting, as described in detail below and in the appended claims.

More specifically, in a preferred aspect of the invention, as described in detail below and in the appended claims, the Applicant isolated and deposited in the DSMZ (Deutsche Sammlung von Mikroorganismen und Zellkulturen GmbH; Braunschweig-Germany), on 21 July 2004, five new bacterial strains of human origin belonging to the genus *Bifidobacterium*. Of these five new bacterial strains, two belong to the species *Bifidobacterium adoloscentis*, one to the species *Bifidobacterium breve*, and two to the species *Bifidobacterium pseudocatenulatum*. Said strains were respectively ascribed the following identification codes:

DSM 16594;
DSM 16595;
DSM 16596;
DSM 16597;
DSM 16598.

Said bacterial strains were taxonomically and technologically characterized, as described below, and showed to produce large quantities of folic acid. In fact, said strains are capable of developing in a culture medium devoid of folic acid.

In particular, said strains are capable of producing, respectively, the following quantities of folic acid: 56-62, 16-20, 6-9, 14-16 and 14-19 ng/ml of culture medium.

Furthermore, it was unexpectedly observed that the biosynthesis of folic acid by the bacterial strains of the invention is not subject to any negative regulation mechanism (negative feedback) on the part

of the resulting product, or any other product already present in the culture medium.

In other words, in physiological conditions, the production of folic acid remains constant regardless
5 of whether the latter is present in the environment.

Finally, it was also observed that changes in pH, typical of the ecosystem of the colon (pH values varying between approximately 7 and 5 are considered likely, in relation to certain pathologies or type of
10 diet), do not negatively impact the productivity of the strains of the present invention.

Microorganisms of this type are therefore able to combine their known probiotic characteristics (thus beneficial to the body) with a capacity for *in situ*
15 folic acid production (for example in the colon).

Consequently, these strains unexpectedly presented themselves as the desired solution for the technical problem of the present invention, as outlined above.

In fact, said microorganisms represent an ideal,
20 natural, non-toxic endogenous source of folic acid.

The use of suitable formulations containing the folic acid-producing bifidobacteria of the present invention may thus enable continuous *in situ* production of folic acid.

25 The probiotic bacteria of the present invention may be administered in a variety of ways, according to patient or consumer needs.

In a preferred aspect, the present invention is aimed at pharmaceutical, veterinary and/or food
30 formulations comprising at least one of the bacterial strains of the present invention or a mixture thereof.

Particularly preferred are formulations comprising at least one of the strains DSM 16594, DSM 16595, DSM

16596, DSM 16597 and DSM 16598 or any combination thereof.

In another preferred aspect, the strains of the present invention can also be formulated in
5 combination with other probiotic bacterial strains having complementary characteristics, i.e. different intrinsic properties.

An example, which should not be construed as limiting, of such formulations may be represented by
10 at least one of the bacterial strains of the present invention in a suitable mixture with a probiotic bacterial strain having the characteristic of strongly adhering to the intestinal mucous membrane.

The strains of the present invention may also be
15 formulated in combination with other strains that, in addition to the intrinsic beneficial characteristics associated with the bacterial genus to which they belong, display other peculiar characteristics useful for the host's health.

Said mixed formulations are able to combine a number
20 of probiotic properties in a single formulation, thereby providing the body with a plurality of benefits, as well as potential synergies deriving therefrom, in a single administration.

In light of the above considerations, it is evident
25 that those skilled in the art will be able to devise many combinations of probiotic bacteria based on their own experience.

Such combinations also fall, therefore, within the
30 scope of the present invention.

By way of example, without restricting the scope of the invention, said probiotic bacteria can be selected from, among others, the genus *Lactobacillus*, including such species as *Lactobacillus bulgaricus*,

- Lactobacillus acidophilus*, *Lactobacillus casei* subsp. *rhannosus*, *Lactobacillus casei* subsp. *paracasei*, *Lactobacillus plantarum*, *Lactobacillus fermentum*, *Lactobacillus salivarius* subsp. *salivarius* and
- 5 *Lactobacillus pentosus*, or from the genus *Streptococcus*, including such species as *Streptococcus delbrueckii* subsp. *Thermophilus*.
- Among these, the particularly preferred strains have shown to include, for example, the following:
- 10 - *Lactobacillus acidophilus* LMG P-21381 (deposited in the Belgian Coordinated Collections of Microorganisms - BCCM LMG Collection on 31 January 2002);
- *Lactobacillus casei* subsp. *paracasei* LMG P-21380
- 15 (deposited in the Belgian Coordinated Collections of Microorganisms - BCCM LMG Collection on 31 January 2002);
- *Lactobacillus plantarum* LMG P-21021 (deposited in the Belgian Coordinated Collections of
- 20 Microorganisms - BCCM LMG Collection on 16 October 2002);
- *Lactobacillus pentosus* LMG P-21019 (deposited in the Belgian Coordinated Collections of Microorganisms - BCCM LMG Collection on 16 October 2002);
- 25 - *Lactobacillus plantarum* LMG P-21020 (deposited in the Belgian Coordinated Collections of Microorganisms - BCCM LMG Collection on 16 October 2002);
- *Lactobacillus plantarum* LMG P-21022 (deposited
- 30 in the Belgian Coordinated Collections of Microorganisms - BCCM LMG Collection on 16 October 2002);
- *Lactobacillus plantarum* LMG P-21023 (deposited in the Belgian Coordinated Collections of

Microorganisms - BCCM LMG Collection on 16 October 2002);

- *Bifidobacterium lactis* LMG P-21384 (deposited in the Belgian Coordinated Collections of Microorganisms
- 5 - BCCM LMG Collection on 31 January 2002);
- *Streptococcus delbrueckii* subsp. *thermophilus* DSM 16506 (deposited in the DSMZ on 18 June 2004);
- *Streptococcus delbrueckii* subsp. *thermophilus* DSM 16507 (deposited in the DSMZ on 18 June 2004);
- 10 - *Bifidobacterium longum* DSM 16603 (deposited in the DSMZ on 20 July 2004);
- *Bifidobacterium breve* DSM 16604 (deposited in the DSMZ on 20 July 2004);
- *Lactobacillus casei* subsp. *rhamnosus* DSM 16605
- 15 (deposited in the DSMZ on 20 July 2004);

Consequently, particularly preferred mixed formulations of the invention will comprise at least one of the bacterial strains from DSM 16594 to DSM 16598, or any mixture thereof, appropriately

20 formulated in combination with at least one of the probiotic bacterial strains listed above, or any mixture thereof.

Preferably, said probiotic bacterial strains are selected from the group comprising:

- 25 - *Lactobacillus acidophilus* LMG P-21381;
- *Lactobacillus casei* subsp. *paracasei* LMG P-21380;
- *Lactobacillus plantarum* LMG P-21021;
- *Lactobacillus pentosus* LMG P-21019;
- *Lactobacillus plantarum* LMG P-21020;
- 30 - *Lactobacillus plantarum* LMG P-21022;
- *Lactobacillus plantarum* LMG P-21023;
- *Bifidobacterium lactis* LMG P-21384;
- *Streptococcus delbrueckii* subsp. *thermophilus* DSM 16506;

- *Streptococcus delbrueckii* subsp. *thermophilus* DSM 16507;
- *Bifidobacterium longum* DSM 16603;
- *Bifidobacterium breve* DSM 16604;
- 5 - *Lactobacillus casei* subsp. *rhamnosus* DSM 16605.

The number and type of bacterial strains to be combined in said mixed formulations will be decided by those skilled in the art according to the type and severity of the pathology to be treated or prevented,
10 or the type of probiotic food product one wishes to obtain.

In another preferred aspect, the bacterial strains of the present invention, used singly or in combination with one another and/or with other probiotic
15 bacterial strains, may be further formulated in combination with other substances having prebiotic properties.

Preferably, said substances having prebiotic properties comprise, in particular, carbohydrates
20 that are not digested and absorbed by man and thus reach the colon completely intact, where they selectively stimulate the development and activity of a number of beneficial microbial groups, bifidobacteria in particular.

Particularly preferred among said prebiotic carbohydrates are those selected from the group comprising: fructo-oligosaccharides (FOS), in
25 particular inulin, isomalto-oligosaccharides, resistant starch, pectin, galacto-oligosaccharides (GOS), arabinogalactan, xylo-oligosaccharides (XOS),
30 chitosan oligosaccharides (COS) and glucomannan.

By way of example, without restricting the scope of the invention, preferred formulations comprise at least one of the bacterial strains from DSM 16594 to

- DSM 16598, or any mixture thereof, appropriately formulated in combination with at least one substance having prebiotic properties selected, for example, from among those listed above, i.e. fructo-
- 5 oligosaccharides (FOS), in particular inulin, isomalto-oligosaccharides, resistant starch, pectin, galacto-oligosaccharides (GOS), arabinogalactan, xylo-oligosaccharides (XOS), chitosan oligosaccharides (COS) and glucomannan.
- 10 Preferred formulations of the invention likewise comprise at least one of the bacterial strains from DSM 16594 to DSM 16598, or any mixture thereof, appropriately formulated in combination with at least one of the probiotic bacterial strains listed above,
- 15 or any mixture thereof, and with at least one substance having prebiotic properties selected, for example, from among those listed above, i.e. fructo-oligosaccharides (FOS), in particular inulin, isomalto-oligosaccharides, resistant starch, pectin,
- 20 galacto-oligosaccharides (GOS), arabinogalactan, xylo-oligosaccharides (XOS), chitosan oligosaccharides (COS) and glucomannan. Preferably, said probiotic bacterial strains are selected from the group comprising:
- 25 - *Lactobacillus acidophilus* LMG P-21381;
- *Lactobacillus casei* subsp. *paracasei* LMG P-21380;
- *Lactobacillus plantarum* LMG P-21021;
- *Lactobacillus pentosus* LMG P-21019;
- *Lactobacillus plantarum* LMG P-21020;
- 30 - *Lactobacillus plantarum* LMG P-21022;
- *Lactobacillus plantarum* LMG P-21023;
- *Bifidobacterium lactis* LMG P-21384;
- *Streptococcus delbrueckii* subsp. *thermophilus* DSM 16506;

- *Streptococcus delbrueckii* subsp. *thermophilus* DSM 16507;
- *Bifidobacterium longum* DSM 16603;
- *Bifidobacterium breve* DSM 16604;
- 5 - *Lactobacillus casei* subsp. *rhamnosus* DSM 16605.

The preferred embodiments of the present invention include those formulations wherein the strains of the invention are preferably employed in freeze-dried form.

- 10 The strains of the invention are preferably formulated in combination with appropriate vehicles, excipients, flavorings, stabilizers and additives, such as amino acids, vitamins, antioxidants and enzymes, commonly used in the preparation of pharmaceutical and/or food formulations.

15 Solely by way of example, without restricting the scope of the invention, among the particularly preferred additives there can be mentioned glutamine, arginine, superoxide dismutase and glutathione.

- 20 The formulations of the present invention may be administered orally, with suppositories, or with vaginal tablets or capsules, as such or in combination with food products like, for example, milk, yogurt, milk derivatives or fermented milk products, for the treatment and/or prevention of gastrointestinal disorders (diarrhea, antibiotic therapy, IBD, prevention of colon cancer) where it is desirable to administer an adequate quantity of folic acid.

- 25 30 As noted above, the formulations of the present invention can also be administered following or during antibiotic therapies in order to replenish and restore the balance of non-pathogenic intestinal flora.

Particularly preferred formulations are those to be administered orally, by means of suppositories or vaginal capsules or tablets.

Typical forms of formulation include, for example,
5 capsules, oral solutions or suspensions, powders contained in packets or analogous forms, tablets, suppositories and pessaries.

As to dosage, each formulation will normally contain from 10^5 to 10^{11} cells of each bacterial strain per
10 single dose, preferably from 10^6 to 10^{11} bacteria per dose, most preferably from 10^7 to 10^{10} bacteria per dose.

In general, the concentration of the active principle, or of the mixture of active principles,
15 may range from 10^8 cells of bacterial strain(s) per gram of formulation to 10^{11} cells per g; preferably from 10^9 cells per g to 10^{10} cells per g of formulation.

One example of the potential applications of the
20 present invention, which in no way restricts the scope thereof, regards a case in which the strains of the invention were administered to an adult patient undergoing antibiotic therapy.

For the entire duration of the antibiotic therapy and
25 for five days following its termination said patient received two packets per day of a freeze-dried formulation of DSM 16594 and DSM 16595 in combination with the probiotic strains DSM 16506 and LMG P-21380 and with glutamine.

30 The contents of each packet, administered in the form of an oral suspension in water, comprised approximately 10^{10} cells of each bacterial strain and, as excipients, starch, tween, dispersants mandarin

flavouring, acesulfame, saccharine, ascorbic acid and methyl parabene.

The bacterial strains of the present invention have also demonstrated to be particularly useful for enhancing the nutritional value of foodstuffs.

Particularly preferred foodstuffs are those derived from milk and/or its derivatives, for example yogurt and fermented milk as well as snack fillings, ice-cream and so forth.

10 DETAILED DESCRIPTION OF THE INVENTION

- ISOLATION OF THE STRAINS

The strain *Bifidobacterium adolescentis* DMS 16594 was isolated from the feces of an adult subject who had taken neither antibiotics nor probiotic preparations in the 3 months prior to the isolation.

A 10% suspension of fresh feces was prepared in Wilkins-Chalgren Anaerobe Broth (Oxoid Limited, Basingstoke, Hampshire, England, UK) at a concentration of 0.5 x, i.e. by preparing a 1:1 dilution of the medium obtained according to the directions on the package.

Serial dilutions up to 10^{-9} were made from the homogenate (1:10 dilutions, obtained by diluting 1 ml of the previous dilution in 9 ml of the same medium). 0.1 ml aliquots of the dilutions between 10^{-6} and 10^{-9} were plated in a selective medium for bifidobacteria, RB agar (Ref. 3).

The plates were incubated in anaerobiosis at 37 °C for 48 hours.

All the preparations were made in an anaerobic chamber (Equipment: Anaerobic System, Mod. 2028, Forma Scientific Co., Marietta, OH) in the following atmosphere: N₂ 85%, CO₂ 10%, H₂ 5%.

The colony corresponding to bacterial strain DMS 16594 was isolated among those producing a yellow halo, due to the acidification of the medium and color change of the indicator.

5 -ATTRIBUTION TO THE GENUS *Bifidobacterium* and to the species *Bifidobacterium adolescentis*

For the purpose of attributing DMS 16594 to the genus *Bifidobacterium*, genus-specific amplification was performed using 16S rDNA-targeted primers
10 Bif164/Bif662, from which corrected amplicon of 523 bp was obtained. In parallel, a biochemical assay was performed to identify the key enzyme of bifidobacteria carbohydrate metabolism, i.e. fructose-6-phosphate phosphoketolase.

15 The *adolescentis* species was identified by DNA-DNA hybridization, as described in the paper by Scardovi et al. (Ref. 4).

-CHARACTERISTICS OF STRAIN DMS 16594

Origin: human

20 Age: 39 Sex: F

Genus: *Bifidobacterium*

Species: *adolescentis*

Morphology: irregular rods, at times bifid in form, with protuberances and swellings

25 Folic acid production: between 56 and 62 ng/ml

Plasmids: no

The other bacterial strains, DSM 16595, DSM 16596, DSM 16597 and DSM 16598, were isolated using a procedure similar to the one described above.

30 -CHARACTERISTICS OF STRAIN DSM 16595

Origin: human

Age: 37 Sex: F

Genus: *Bifidobacterium*

Species: *adolescentis*

- Morphology: irregular rods, at times bifid in form,
with protuberances and swellings
Folic acid production: between 16 and 20 ng/ml
Plasmids: no
- 5 -CHARACTERISTICS OF STRAIN DMS 16596
Origin: human
Age: 39 Sex: F
Genus: *Bifidobacterium*
Species: *breve*
- 10 Morphology: short irregular rods
Folic acid production: between 6 and 9 ng/ml
Plasmids: no
-CHARACTERISTICS OF STRAIN DMS 16597
Origin: human
- 15 Age: 56 Sex: M
Genus: *Bifidobacterium*
Species: *pseudocatenulatum*
Morphology: irregular rods
Folic acid production: between 14 and 16 ng/ml
- 20 Plasmids: yes, one of approximately 9 kb
-CHARACTERISTICS OF STRAIN DMS 16598
Origin: human
Age: 56 Sex: M
Genus: *Bifidobacterium*
- 25 Species: *pseudocatenulatum*
Morphology: irregular rods
Folic acid production: between 14 and 19 ng/ml
Plasmids: yes, one of approximately 9 kb
-STRAIN DEVELOPMENT CONDITIONS
- 30 The preferred bacterial strains of the present invention, DSM 16594, DSM 16595, DSM 16596, DSM 16597 and DSM 16598, were preserved in stab cultures, i.e. agar stab cultures (10 ml tubes containing 10 ml of 0.9% agarized medium) or in MRS liquid cultures

(Bacto Lactobacilli MRS Broth [0881-17] Difco Laboratories, Division of Becton Dickinsons and Company, Sparks, Maryland 21152 USA) to which cysteine was added (0.05%).

- 5 The medium, prepared according to the directions on the package, was sterilized at 110 °C for 30'.

When the strains are cultured in an ambient without folic acid, a so-called *minimum* synthetic medium is used; it is identified as No. 7 and has the

- 10 composition described below.

Said medium is prepared by mixing the components and solutions in the order indicated, under agitation, at room temperature.

The medium is prepared fresh each time.

- 15 MINIMUM CULTURE MEDIUM No. 7

Glucose 20 g/L

Vitamin Assay Casaminoacids

(DIFCO Laboratories, USA [0288-17] 5 g/L

Urea 2 g/L

- 20 Cysteine 0.5 g/L

Solution A 700 ml/L

Solution B 1 ml/L

Solution C 1 ml/L

Solution D 5 ml/L

- 25 Solutions A, B, C and D have the following composition:

Solution A

(NH₄)₂SO₄ 10 g

Sodium acetate 10 g

- 30 Ascorbic acid 10 g

KH₂PO₄ 1 g

MgSO₄ 0.7 g

NaCl 0.2 g

Tween 80 1 ml

The Tween 80 is dissolved in 700 ml of boiling distilled water; thereafter all the other components are added in sequence.

Solution B

5	Boric acid	25 mg
	CuSO ₄	2 mg
	KI	5 mg
	FeCl ₃	10 mg
	MnSO ₄	20 mg
10	Sodium molybdate	10 mg
	ZnSO ₄	20 mg

These components are dissolved in sequence in 50 ml of distilled water at room temperature.

Solution C

15	Biotin	0.2 mg
	Calcium pantothenate	40 mg
	Niacin	40 mg
	P-aminobenzoic acid	20 mg
	Pyridoxine	40 mg
20	Riboflavin	20 mg
	Thiamine	40 mg

These components are dissolved in 100 ml of distilled water at room temperature.

Solution D

25	FeSO ₄	50 mg
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The salt is dissolved in 25 ml of distilled water.

The medium is dispensed into 10 ml tubes and sterilized at 100 °C for 30'.

-MICROBIOLOGICAL ASSAY OF THE FOLIC ACID PRODUCED BY

30 STRAIN DSM 16594

The quantity of folic acid produced in fermentation by strain DSM 16594, as well as by the other strains of the invention, was determined by microbiological assay.

The cultures used for the determination of folic acid productivity were transplanted at least 3 times in minimum medium No.7, containing no folic acid.

The assay is based on a turbidimetric determination
5 of the development of *Enterococcus hirae* ATCC 8043, which varies according to the quantity of folic acid present in the culture broth.

The calibration curve necessary for quantitatively determining the folic acid produced is constructed by
10 culturing *Enterococcus hirae* ATCC 8043 in Bacto Folic AOAC Medium (Difco, USA [0967-15]).

To said medium, which contains all the nutrilites necessary for development, with the exception of folic acid, incremental quantities of folic acid are
15 added (0, 1, 2, 4, 6 and 8 ng per tube containing 10 ml of culture broth).

In parallel, *Enterococcus hirae* ATCC 8043 is inoculated into tubes of Bacto Folic AOAC Medium, to which different quantities of the surnatant of the
20 fermentation broth of strain DSM 16594 are added.

After all the tubes have been incubated at 37 °C for 16-18 hours, a turbidimetric reading is taken of the samples at 600 nm and a line graph is drawn on a semi-logarithmic scale by plotting the log of the
25 folic acid concentration according to the optical density of the sample.

Preparation of the standard solution (s.s.) of folic acid at a concentration of 2 µg/l, i.e. 2 ng/ml.

Dissolve 50 mg of folic acid in approximately 30 ml
30 of NaOH 0.01N and 300 ml of H₂O. Correct the pH to 7.5 using diluted HCl (0.1N) and bring the volume to 500 ml by adding H₂O. Add 2 ml of the above-described solution to 50 ml of H₂O, correct the pH to 7.5 and

bring the volume to 100 ml by adding H₂O (s.s. of 2 µg/ml).

Dilute 1 ml of this solution to 1 liter with H₂O so as to obtain the s.s. of 2 ng/ml (2 µg/l).

5 Preparation of tubes containing Bacto Folic Acid Medium

Dissolve 11 g of the starting powder in 100 ml of H₂O. To dissolve the components completely, boil the medium for 2-3 minutes. Dispense 5 ml aliquots into
10 the tubes after rinsing the latter several times with distilled water. Add different aliquots of the fermentation broth supernatant or the s.s. of folic acid (2 ng/ml) and then add H₂O to bring the final volume of each tube to 10 ml. Sterilize at 121° for
15 5'.

ng of folic acid per tube	0	1	2	4	6	8	10
ml of s.s. 2 ng/ml	0	0.5	1	2	3	4	5
ml of H ₂ O	5	4.5	4	3	2	1	0
µg of folic acid per l	0	0.1	0.2	0.4	0.6	0.8	1

4 ml of water and 1 ml of fermentation broth supernatant, obtained by centrifugation and filtration
20 with a 0.22 µ filter followed by appropriate dilution, are added to the other 2 tubes.

A tube containing no folic acid is prepared as a blank sample; it is not inoculated.

Preparation of the inoculum

25 Two days before the assay, a fresh stab culture of *Enterococcus hirae* ATCC 8043 is inoculated into a tube containing M17 liquid medium (Bacto M17 Broth,

Difco Laboratories, USA [1856-17])). To prepare the culture that will be used as inoculum, the culture in M17 is sterilely centrifuged, the supernatant is eliminated and the cells are washed 3 times with 9 ml of physiological solution. The cell pellet is again suspended in 9 ml of physiological solution and 1 ml of this bacterial suspension is added to 100 ml of sterile physiological solution contained inside an Erlenmeyer flask. One drop of this suspension is added to a tube of Bacto Folic AOAC Medium, to which 10 ng of folic acid is also added, and the tube is incubated at 37 °C without being shaken.

On the day of the test, the culture prepared according to the above-described procedure is used to prepare the test inoculum: the culture is sterilely centrifuged, the supernatant is eliminated and the cells are washed 3 times with 9 ml of physiological solution. The cells are again suspended in 9 ml of physiological solution and 1 ml of this bacterial suspension is added to 100 ml of sterile physiological solution contained inside an Erlenmeyer flask. To inoculate the test tubes, 1 drop of this suspension is added to all the tubes sterilized at 121 °C for 5'.

The tubes are subsequently incubated at 37 °C for 16-18 hours.

-PRODUCTIVITY IN PURE CULTURE

The folic acid produced by strain DSM 16594 in minimum medium No.7 amounts to 56-62 ng/ml.

The tests yield constant, reproducible results when conducted both on cultures in the absence of pH control and on cultures in bioreactors with a constant pH.

As a rule, the pH of the substances contained in the colon may vary considerably, in relation to certain pathologies or dietary factors. The production of folic acid by DSM 16594 showed be constant
5 (approximately 57-60 ng/ml) regardless of the measured pH value, which in this case ranged from 5.5 to 7.0.

It was also observed that strain DSM 16594 produces folic acid without being affected by negative
10 feedback, hence to a degree that is wholly independent of the concentration of folic acid present in intestinal contents. In fact, strain DSM 16594 was also cultured in minimum medium No.7 in the presence of increasing concentrations of folic acid
15 (0, 1, 2, 5, 10 and 20 ng/ml) and it was observed that the strain always synthesizes and secretes constant quantities of folic acid (58-61 ng/ml), which are thus added to those already present in the medium. This aspect is highly important because it
20 suggests that, after strain DSM 16594 is ingested as a probiotic, there may be, within the colon, a continuous supply of folic acid, a vitamin that is indispensable for the rapid turnover metabolism of enterocytes. The metabolic deregulation of strain DSM
25 16594, i.e. the absence of a control mechanism that blocks the biosynthesis of folic acid where sufficient quantities of the latter are already present, is confirmed by the fact that the quantity of folic acid produced is at least 50 times greater
30 than the amount necessary to assure the healthy development of bacteria which do not synthesize this vitamin and must thus obtain it from outside sources in order to develop adequately.

-EVALUATION OF THE CONTRIBUTION OF FOLIC ACID
PROVIDED BY STRAIN DSM 16594 IN FECAL CULTURES

In order to evaluate whether there was an effective
production of folic acid by strain DSM 16594 in mixed
5 cultures, i.e. cultures simulating the composition of
intestinal microflora, fecal cultures were prepared,
i.e. cultures inoculated with diluted fecal samples,
which may or may not have been inoculated with strain
DSM 16594; in said cultures the increase in folic
10 acid concentration was determined.

The mixed cultures used were inoculated with fecal
samples diluted so as to simulate the normal
microbial composition of intestinal contents. The
culture medium used contains 10 ng/ml of folic acid,
15 a quantity such as to ensure the development of the
entire inoculated microbial population. The medium
also contains peptones, vitamins and fructo-
oligosaccharides (FOS) as a source of carbon.

The choice of FOS is due to the fact that the intake
20 of a probiotic bifidobacterium in combination with
this prebiotic carbohydrate, i.e. one that is neither
digested nor absorbed and is thus able to reach the
colon, where it is prevalently metabolized by
bifidobacteria, favors the colonization of the
25 intestine by both the probiotic bifidobacterium and
endogenous bifidobacteria.

-FECAL CULTURES

The fecal cultures were grown in a medium prepared
according to the procedures described previously and
30 having the following composition:

Raftilose P95 (FOS)

(Orafti Group, Tienen, Belgium) 20 g/L

Vitamin Assay Casaminoacids

(DIFCO Laboratories, USA [0288-17] 5 g/L

	Cysteine	0.5 g/L
	Folic acid	10 µg/L
	Solution A	700 ml/L
	Solution B	1 ml/L
5	Solution C	1 ml/L
	Solution D	5 ml/L
	Solution E	10 ml/L

Solution A

	(NH ₄) ₂ SO ₄	10 g
10	Sodium acetate	10 g
	Ascorbic acid	10 g
	KH ₂ PO ₄	1 g
	MgSO ₄	0.7 g
	NaCl	0.2 g
15	Tween 80	1 ml

The Tween 80 is dissolved in 700 ml of boiling distilled water; thereafter all the other components are added in sequence.

Solution B

20	Boric acid	25 mg
	CuSO ₄	2 mg
	KI	5 mg
	FeCl ₃	10 mg
	MnSO ₄	20 mg
25	Sodium molybdate	10 mg
	ZnSO ₄	20 mg

These components are dissolved in sequence in 50 ml of distilled water at room temperature.

Solution C

30	Biotin	0.2 mg
	Calcium pantothenate	40 mg
	Niacin	40 mg
	P-aminobenzoic acid	20 mg
	Pyridoxine	40 mg

Riboflavin 20 mg

Thiamine 40 mg

These components are dissolved in sequence in 100 ml of distilled water at room temperature.

5 Solution D

FeSO₄ 50 mg

The salt is dissolved in 25 ml of distilled water at room temperature.

 Solution E

- 10 50 mg/L of hemin (Sigma-Aldrich SRL, Via Gallarate, Milan, Italy [H5533]) is dissolved in 5 ml of NaOH 1M and distilled water is added to bring the volume to 1 liter.

Method

- 15 40 ml aliquots of medium are dispensed into 100 cc bottles with a perforable rubber cap. The rubber caps are perforated with a needle and the bottles are placed in a boiling water bath. After 10 minutes of incubation at 100 °C the cap is punctured with a
- 20 second needle, through which nitrogen is insufflated into the bottle for 10 minutes at a pressure of 0.15 bars. Once the insufflation has been accomplished, both needles are removed and the bottles are sterilized at 110 °C for 30'.

25 Preparation of the inoculum

A fresh fecal sample is transferred into an anaerobic chamber (10% H₂, 10% CO₂, 80% N₂).

- A 10% suspension is then prepared in the above-described medium and homogenized with sterile glass
- 30 beads having a diameter of 3 mm.

From this suspension a 1:100 dilution is prepared in the same medium contained in the bottles. 0.4 ml of the latter dilution is inoculated with a syringe into

two sterile bottles containing 40 ml of culture medium.

Comparison of folic acid present in fecal samples inoculated or not inoculated with strain DSM 16594.

5 One of the two identical samples inoculated with the diluted fecal sample is also inoculated with 0.4 ml of a culture of strain DSM 16594 made to develop for 24 hours in minimum medium no.7. Both fecal cultures, one of which is also inoculated with strain DSM 16594
10 and the other of which is not, are incubated at 37 °C for 24 hours.

After this time has elapsed, an aliquot of both cultures is centrifuged at 3500 g for 10' and the supernatant is filtered with a 0.4 µm filter. The
15 supernatants, diluted accordingly, are used for the microbiological assay of folic acid.

Folic acid productivity in the fecal cultures

The concentration of folic acid in the fecal cultures not inoculated with strain DSM 16594 ranges
20 approximately from 30 to 70 ng/ml.

The matching cultures inoculated with strain DSM 16594 showed a significant increase in folic acid concentration. Said increase ranged from 30 to 50 ng/ml, a quantity which was thus added to the
25 previously indicated 30-70 ng/ml.

This latter finding further demonstrates that the administration of the probiotic bacterial strain of the present invention, DSM 16594, can ensure the presence of high levels of folic acid in the colon
30 regardless of the patient's health condition.

As a result, the reestablishment and maintenance of an optimal balance of intestinal bacterial flora may be facilitated and assured.

The previous experimental section described in detail the use of one of the particularly preferred bacterial strains of the present invention, i.e. strain DSM 16594.

5 Identical trials were conducted, in the same experimental conditions and using the same quantities of reagents, also on the other four preferred bacterial strains of the present invention, namely DSM 16595, DSM 16596, DSM 16597 and DSM 16598.

10 It was demonstrated that these bacterial strains produce folic acid in the same manner and with the same characteristics as strain DSM 16594.

The productivity of *Bifidobacterium adolescentis* DSM 16595, *Bifidobacterium breve* DSM 16596, 15 *Bifidobacterium pseudocatenulatum* DSM 16597 and *Bifidobacterium pseudocatenulatum* DSM 16598 showed to be lower in comparison to that of *Bifidobacterium adolescentis* DSM 16594.

In particular, DSM 16595 produces approximately 20 30.5%, DSM 16596 approximately 13%, DSM 16597 25.5% and DSM 16598 28% of the amount of folic acid produced by DSM 16594.

Nonetheless, in these cases as well, the quantity of folic acid produced (amounting, respectively, to 25 approximately 16-20ng/ml for DSM 16595; 6-9 ng/ml for DSM 16596; 14-16 ng/ml for DSM 16597 and 14-19 ng/ml for DSM 16598) is significantly higher (approximately 14 to 16 times higher for DSM 16595; 5 to 7 times higher for DSM 16596; 12 to 13 times higher for DSM 30 16597 and 12 to 15 times higher for DSM 16598) than the amount needed to ensure the healthy development of other bacteria which require this vitamin for optimal development.

REFERENCES

1. Fuchs C.S. et al. (2002) The influence of folate and multivitamin use on the familial risk of colon cancer in women. *Cancer Epidemiol. Biomark. Prev.* 11, 227-234.
2. Ma J. et al. (1999) A polymorphism of the methionine synthase gene: association with plasma folate, vitamin B12, homocyst(e)ine, and colorectal cancer risk. *Cancer Epidemiol. Biomark. Prev.* 8, 825-829.
3. Hartemink R., Kok BIFIDOBACTERIUMJ. Weenk G.H., Rombouts F.M. (1996) Raffinose-Bifidobacterium (RB) agar, a new selective medium for bifidobacteria *J. Microbiol. Methods.* 27, 33-43.
4. Scardovi V. Crociani F. (1974) Bifidobacterium catenulatum, Bifidobacterium dentium, Bifidobacterium angulatum: three new species and their deoxyribonucleic acid homology relationships. *Int. J. Syst. Bacteriol.* 24, 6-20.

CLAIMS

What is claimed is:

1. Strains of probiotic bacteria of human origin, belonging to the genus *Bifidobacterium*, as
5 producers of folic acid.
2. Bacterial strains according to claim 1, belonging to the species:
Bifidobacterium longum, *Bifidobacterium infantis*, *Bifidobacterium adolescentis*,
10 *Bifidobacterium bifidum*, *Bifidobacterium breve*, *Bifidobacterium angulatum*, *Bifidobacterium catenulatum*, *Bifidobacterium lactis*, *Bifidobacterium pseudocatenulatum*, *Bifidobacterium gallicum*, *Bifidobacterium dentium*, *Bifidobacterium denticolens*,
15 *Bifidobacterium inopinatum* and *Bifidobacterium animalis*.
3. Bacterial strains according to claim 1, belonging to the species *Bifidobacterium adolescentis*.
20
4. Bacterial strains according to claim 1, belonging to the species *Bifidobacterium breve*.
5. Bacterial strains according to claim 1, belonging to the species *Bifidobacterium pseudocatenulatum*.
25
6. Strain according to claim 3, deposited in the DSMZ on 21 July 2004 and identified with the identification code DSM 16594.
7. Strain according to claim 3, deposited in the
30 DSMZ on 21 July 2004 and identified with the identification code DSM 16595.
8. Strain according to claim 4, deposited in the DSMZ on 21 July 2004 and identified with the identification code DSM 16596.

9. Strain according to claim 5, deposited in the DSMZ on 21 July 2004 and identified with the identification code DSM 16597.
- 5 10. Strain according to claim 5, deposited in the DSMZ on 21 July 2004 and identified with the identification code DSM 16598.
11. Pharmaceutical, veterinary and/or food formulations comprising at least one strain according to claim 1.
- 10 12. Pharmaceutical, veterinary and/or food formulations comprising at least one strain according to claim 2.
13. Pharmaceutical, veterinary and/or food formulations comprising at least one strain according to claim 3.
- 15 14. Pharmaceutical, veterinary and/or food formulations comprising at least one strain according to claim 4.
15. Pharmaceutical, veterinary and/or food formulations comprising at least one strain according to claim 5.
- 20 16. Formulations according to claim 13, comprising the bacterial strain *Bifidobacterium adolescentis* DSM 16594.
- 25 17. Formulations according to claim 13, comprising the bacterial strain *Bifidobacterium adolescentis* DSM 16595.
18. Formulations according to claim 14, comprising the bacterial strain *Bifidobacterium breve* DSM 16596.
- 30 19. Formulations according to claim 15, comprising the bacterial strain *Bifidobacterium pseudocatenulatum* DSM 16597.

20. Formulations according to claim 15, comprising the bacterial strain *Bifidobacterium pseudocatenulatum* DSM 16598.
- 5 21. Formulations according to claim 11, comprising a mixture of two or more strains selected from the group comprising: DSM 16594, DSM 16595, DSM 16596, DSM 16597 and DSM 16598.
- 10 22. Formulations according to claim 16, further comprising one or more probiotic bacterial strains having complementary characteristics.
23. Formulations according to claim 17, further comprising other probiotic bacterial strains having complementary characteristics.
- 15 24. Formulations according to claim 18, further comprising other probiotic bacterial strains having complementary characteristics.
25. Formulations according to claim 19, further comprising other probiotic bacterial strains having complementary characteristics.
- 20 26. Formulations according to claim 20, further comprising other probiotic bacterial strains having complementary characteristics.
27. Formulations according to claim 21, further comprising other probiotic bacterial strains having complementary characteristics.
- 25 28. Formulations according to claim 16, further comprising other substances having prebiotic characteristics.
29. Formulations according to claim 17, further comprising other substances having prebiotic characteristics.
- 30 30. Formulations according to claim 18, further comprising other substances having prebiotic characteristics.

31. Formulations according to claim 19, further comprising other substances having prebiotic characteristics.
- 5 32. Formulations according to claim 20, further comprising other substances having prebiotic characteristics.
33. Formulations according to claim 21, further comprising other substances having prebiotic characteristics.
- 10 34. Formulations according to claim 16, further comprising one or more probiotic bacterial strains having complementary characteristics and other substances having prebiotic characteristics.
- 15 35. Formulations according to claim 17, further comprising one or more probiotic bacterial strains having complementary characteristics and other substances having prebiotic characteristics.
- 20 36. Formulations according to claim 18, further comprising one or more probiotic bacterial strains having complementary characteristics and other substances having prebiotic characteristics.
- 25 37. Formulations according to claim 19, further comprising one or more probiotic bacterial strains having complementary characteristics and other substances having prebiotic characteristics.
- 30 38. Formulations according to claim 20, further comprising one or more probiotic bacterial strains having complementary characteristics and other substances having prebiotic characteristics.

39. Formulations according to claim 21, further comprising one or more probiotic bacterial strains having complementary characteristics and other substances having prebiotic characteristics.
40. Formulations according to any of the claims from 22 to 27, wherein said probiotic bacterial strains are selected from the group comprising:
- *Lactobacillus acidophilus* LMG P-21381;
 - *Lactobacillus casei* subsp. *paracasei* LMG P-21380;
 - *Lactobacillus plantarum* LMG P-21021;
 - *Lactobacillus pentosus* LMG P-21019;
 - *Lactobacillus plantarum* LMG P-21020;
 - *Lactobacillus plantarum* LMG P-21022;
 - *Lactobacillus plantarum* LMG P-21023;
 - *Bifidobacterium lactis* LMG P-21384;
 - *Streptococcus delbrueckii* subsp. *thermophilus* DSM 16506;
 - *Streptococcus delbrueckii* subsp. *thermophilus* DSM 16507;
 - *Bifidobacterium longum* DSM 16603;
 - *Bifidobacterium breve* DSM 16604;
 - *Lactobacillus casei* subsp. *rahamnosus* DSM 16605.
41. Formulations according to any of the claims from 28 to 33, wherein said substances having prebiotic characteristics are selected from the group comprising:
- fructo-oligosaccharides (FOS), inulin, isomalto-oligosaccharides, resistant starch, pectin, galacto-oligosaccharides, arabinogalactan, xylo-oligosaccharides, glucomannan and chitosan oligosaccharides.

42. Formulations according to claim 16, further comprising additives, vehicles, excipients, flavorings and stabilizers.
- 5 43. Formulations according to claim 42, wherein said additives are selected from the group comprising: amino acids, vitamins, antioxidants, enzymes, preferably glutamine, arginine, superoxide dismutase and glutathione.
- 10 44. Formulations according to claim 17, further comprising additives, vehicles, excipients, flavorings and stabilizers.
- 15 45. Formulations according to claim 44, wherein said additives are selected from the group comprising: amino acids, vitamins, antioxidants, enzymes, preferably glutamine, arginine, superoxide dismutase and glutathione.
46. Formulations according to claim 18, further comprising additives, vehicles, excipients, flavorings and stabilizers.
- 20 47. Formulations according to claim 46, wherein said additives are selected from the group comprising: amino acids, vitamins, antioxidants, enzymes, preferably glutamine, arginine, superoxide dismutase and glutathione.
- 25 48. Formulations according to claim 19, further comprising additives, vehicles, excipients, flavorings and stabilizers.
- 30 49. Formulations according to claim 48, wherein said additives are selected from the group comprising: amino acids, vitamins, antioxidants, enzymes, preferably glutamine, arginine, superoxide dismutase and glutathione.

50. Formulations according to claim 20, further comprising additives, vehicles, excipients, flavorings and stabilizers.
51. Formulations according to claim 50, wherein
5 said additives are selected from the group comprising: amino acids, vitamins, antioxidants, enzymes, preferably glutamine, arginine, superoxide dismutase and glutathione.
52. Formulations according to claim 21, further
10 comprising additives, vehicles, excipients, flavorings and stabilizers.
53. Formulations according to claim 52, wherein said additives are selected from the group comprising: amino acids, vitamins,
15 antioxidants, enzymes, preferably glutamine, arginine, superoxide dismutase and glutathione.
54. Formulations according to claim 16, wherein strain DSM 16594 is present in freeze-dried form.
- 20 55. Formulations according to claim 17, wherein strain DSM 16595 is present in freeze-dried form.
56. Formulations according to claim 18, wherein strain DSM 16596 is present in freeze-dried
25 form.
57. Formulations according to claim 19, wherein strain DSM 16597 is present in freeze-dried form.
58. Formulations according to claim 20, wherein
30 strain DSM 16598 is present in freeze-dried form.
59. Formulations according to claim 21, wherein said mixture of strains is present in freeze-dried form.

60. Formulations according to claim 16, in the form of capsules, oral solutions or suspensions, powder in packets, tablets, suppositories, vaginal tablets and suppositories.
- 5 61. Formulations according to claim 17, in the form of capsules, oral solutions or suspensions, powder in packets, tablets, suppositories, vaginal tablets and suppositories.
62. Formulations according to claim 18, in the form
10 of capsules, oral solutions or suspensions, powder in packets, tablets, suppositories, vaginal tablets and suppositories.
63. Formulations according to claim 19, in the form of capsules, oral solutions or suspensions,
15 powder in packets, tablets, suppositories, vaginal tablets and suppositories.
64. Formulations according to claim 20, in the form of capsules, oral solutions or suspensions, powder in packets, tablets, suppositories,
20 vaginal tablets and suppositories.
65. Formulations according to claim 21, in the form of capsules, oral solutions or suspensions, powder in packets, tablets, suppositories, vaginal tablets and suppositories.
- 25 66. Formulations according to claim 16, containing from 10^5 to 10^{11} of cells of each bacterial strain per single dose.
67. Formulations according to claim 17, containing from 10^5 to 10^{11} of cells of each bacterial
30 strain per single dose.
68. Formulations according to claim 18, containing from 10^5 to 10^{11} of cells of each bacterial strain per single dose.

69. Formulations according to claim 19, containing from 10^5 to 10^{11} of cells of each bacterial strain per single dose.
70. Formulations according to claim 20, containing
5 from 10^5 to 10^{11} of cells of each bacterial strain per single dose.
71. Formulations according to claim 21, containing from 10^5 to 10^{11} of cells of each bacterial strain per single dose.
- 10 72. Use of the bacterial strains according to claim 1, to prepare pharmaceutical formulations for the treatment or prevention of gastrointestinal disorders in which the administration of folic acid is desirable.
- 15 73. Use according to claim 72, for the prevention of colorectal cancer.
74. Use according to claim 72, for the prevention and treatment of IBD.
75. Use according to claim 72, for the prevention
20 and treatment of vaginal infections and inflammatory conditions in the vagina.
76. Use according to claim 72, to replenish and restore of balance of non-pathogenic intestinal bacterial flora.
- 25 77. Use of the bacterial strains according to claim 1, as probiotics in food products.
78. Use according to claim 77, for the preparation of products derived from milk or its derivatives.
- 30 79. Use according to claim 78, in combination with prebiotic substances.
80. Use of the bacterial strains according to claim 1, in combination with prebiotic substances,

for the preparation of symbiotic food preparations.

**INDICATIONS RELATING TO DEPOSITED MICROORGANISM
OR OTHER BIOLOGICAL MATERIAL**

(PCT Rule 13bis)

A. The indications made below relate to the deposited microorganism or other biological material referred to in the description on page <u>1</u> , line <u>22-23</u> .	
B. IDENTIFICATION OF DEPOSIT Further deposits are identified on an additional sheet ☐	
Name of depositary institution DSMZ (Deutsche Sammlung von Mikroorganismen und Zellkulturen GmbH)	
Address of depositary institution (including postal code and country) Mascheroder Weg 1b D-38124 Braunschweig GERMANY	
Date of deposit 21.7.2004	Accession Number DSM 16598
C. ADDITIONAL INDICATIONS (leave blank if not applicable) This information is continued on an additional sheet ☐	
D. DESIGNATED STATES FOR WHICH INDICATIONS ARE MADE (if the indications are not for all designated States)	
E. SEPARATE FURNISHING OF INDICATIONS (leave blank if not applicable)	
The indications listed below will be submitted to the International Bureau later (specify the general nature of the indications e.g., "Accession Number of Deposit")	

For receiving Office use only ☐ This sheet was received with the international application Authorized officer	For International Bureau use only ☐ This sheet was received by the International Bureau on: Authorized officer
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BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
FOR THE PURPOSES OF PATENT PROCEDURE

PCT/IT2004/000444

PCT/IT2004/000444

DSMZ

Deutsche Sammlung von
Mikroorganismen und
Zellkulturen GmbH



INTERNATIONAL FORM

ANIDRAL S.R.L.
Via Pietro Custodi 12
28100 Novara
Italy

RECEIPT IN THE CASE OF AN ORIGINAL DEPOSIT
issued pursuant to Rule 7.1 by the
INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. IDENTIFICATION OF THE MICROORGANISM	
Identification reference given by the DEPOSITOR: BA 03	Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16594
II. SCIENTIFIC DESCRIPTION AND/OR PROPOSED TAXONOMIC DESIGNATION	
The microorganism identified under I. above was accompanied by: (X) a scientific description (X) a proposed taxonomic designation (Mark with a cross where applicable).	
III. RECEIPT AND ACCEPTANCE	
This International Depositary Authority accepts the microorganism identified under I. above, which was received by it on 2004-07-21 (Date of the original deposit) ¹ .	
IV. RECEIPT OF REQUEST FOR CONVERSION	
The microorganism identified under I above was received by this International Depositary Authority on (date of original deposit) and a request to convert the original deposit to a deposit under the Budapest Treaty was received by it on (date of receipt of request for conversion).	
V. INTERNATIONAL DEPOSITARY AUTHORITY	
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig	Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s): Date: 2004-07-23

¹ Where Rule 6.4 (d) applies, such date is the date on which the status of international depositary authority was acquired.

BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
FOR THE PURPOSES OF PATENT PROCEDURE

PCT/IT2004/000444

PCT/IT2004/000444

DSMZ

Deutsche Sammlung von
Mikroorganismen und
Zellkulturen GmbH



INTERNATIONAL FORM

ANIDRAL S.R.L.
Via Pietro Custodi 12
28100 Novara
Italy

VIABILITY STATEMENT
issued pursuant to Rule 10.2 by the
INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. DEPOSITOR		II. IDENTIFICATION OF THE MICROORGANISM	
Name: ANIDRAL S.R.L. Via Pietro Custodi 12 Address: 28100 Novara Italy		Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16594 Date of the deposit or the transfer ¹ : 2004-07-21	
III. VIABILITY STATEMENT			
The viability of the microorganism identified under II above was tested on 2004-07-21 ² . On that date, the said microorganism was ☒ ³ viable ☐ ³ no longer viable			
IV. CONDITIONS UNDER WHICH THE VIABILITY TEST HAS BEEN PERFORMED ⁴			
V. INTERNATIONAL DEPOSITARY AUTHORITY			
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig		Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s):  Date: 2004-07-23	

- ¹ Indicate the date of original deposit or, where a new deposit or a transfer has been made, the most recent relevant date (date of the new deposit or date of the transfer).
² In the cases referred to in Rule 10.2(a) (ii) and (iii), refer to the most recent viability test.
³ Mark with a cross the applicable box.
⁴ Fill in if the information has been requested and if the results of the test were negative.

BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
FOR THE PURPOSES OF PATENT PROCEDURE

PCT/IT2004/000444

PCT/IT2004/000444

DSMZ

Deutsche Sammlung von
Mikroorganismen und
Zellkulturen GmbH



INTERNATIONAL FORM

ANIDRAL S.R.L.

Via Pietro Custodi 12

28100 Novara

Italy

RECEIPT IN THE CASE OF AN ORIGINAL DEPOSIT
issued pursuant to Rule 7.1 by the
INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. IDENTIFICATION OF THE MICROORGANISM	
Identification reference given by the DEPOSITOR: BA 04	Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16595
II. SCIENTIFIC DESCRIPTION AND/OR PROPOSED TAXONOMIC DESIGNATION	
The microorganism identified under I. above was accompanied by: (☒) a scientific description (☒) a proposed taxonomic designation (Mark with a cross where applicable).	
III. RECEIPT AND ACCEPTANCE	
This International Depositary Authority accepts the microorganism identified under I. above, which was received by it on 2004-07-21 (Date of the original deposit) ¹ .	
IV. RECEIPT OF REQUEST FOR CONVERSION	
The microorganism identified under I above was received by this International Depositary Authority on (date of original deposit) and a request to convert the original deposit to a deposit under the Budapest Treaty was received by it on (date of receipt of request for conversion).	
V. INTERNATIONAL DEPOSITARY AUTHORITY	
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig	Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s): Date: 2004-07-23

¹ Where Rule 6.4 (d) applies, such date is the date on which the status of international depositary authority was acquired.

BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
FOR THE PURPOSES OF PATENT PROCEDURE

PCT/IT2004/000444



INTERNATIONAL FORM

ANIDRAL S.R.L.
Via Pietro Custodi 12
28100 Novara
Italy

VIABILITY STATEMENT
issued pursuant to Rule 10.2 by the
INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. DEPOSITOR		II. IDENTIFICATION OF THE MICROORGANISM	
Name: ANIDRAL S.R.L. Via Pietro Custodi 12 Address: 28100 Novara Italy		Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16595 Date of the deposit or the transfer ¹ : 2004-07-21	
III. VIABILITY STATEMENT			
The viability of the microorganism identified under II above was tested on 2004-07-21 ² . On that date, the said microorganism was (☒) ³ viable () ³ no longer viable			
IV. CONDITIONS UNDER WHICH THE VIABILITY TEST HAS BEEN PERFORMED ⁴			
V. INTERNATIONAL DEPOSITARY AUTHORITY			
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig		Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s):  Date: 2004-07-23	

- ¹ Indicate the date of original deposit or, where a new deposit or a transfer has been made, the most recent relevant date (date of the new deposit or date of the transfer).
² In the cases referred to in Rule 10.2(a) (ii) and (iii), refer to the most recent viability test.
³ Mark with a cross the applicable box.
⁴ Fill in if the information has been requested and if the results of the test were negative.

BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
FOR THE PURPOSES OF PATENT PROCEDURE

PCT/IT2004/000444



INTERNATIONAL FORM

ANIDRAL S.R.L.
Via Pietro Custodi 12
28100 Novara
Italy

RECEIPT IN THE CASE OF AN ORIGINAL DEPOSIT
issued pursuant to Rule 7.1 by the
INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. IDENTIFICATION OF THE MICROORGANISM	
Identification reference given by the DEPOSITOR: BR 04	Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16596
II. SCIENTIFIC DESCRIPTION AND/OR PROPOSED TAXONOMIC DESIGNATION	
The microorganism identified under I. above was accompanied by: (X) a scientific description (X) a proposed taxonomic designation (Mark with a cross where applicable).	
III. RECEIPT AND ACCEPTANCE	
This International Depositary Authority accepts the microorganism identified under I. above, which was received by it on 2004-07-21 (Date of the original deposit) ¹ .	
IV. RECEIPT OF REQUEST FOR CONVERSION	
The microorganism identified under I above was received by this International Depositary Authority on _____ (date of original deposit) and a request to convert the original deposit to a deposit under the Budapest Treaty was received by it on _____ (date of receipt of request for conversion).	
V. INTERNATIONAL DEPOSITARY AUTHORITY	
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig	Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s):  Date: 2004-07-23

¹ Where Rule 6.4 (d) applies, such date is the date on which the status of international depositary authority was acquired.

BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
FOR THE PURPOSES OF PATENT PROCEDURE

INTERNATIONAL FORM

ANIDRAL S.R.L.
Via Pietro Custodi 12
28100 Novara
Italy

VIABILITY STATEMENT
issued pursuant to Rule 10.2 by the
INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. DEPOSITOR		II. IDENTIFICATION OF THE MICROORGANISM	
Name: ANIDRAL S.R.L. Via Pietro Custodi 12 Address: 28100 Novara Italy		Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16596 Date of the deposit or the transfer ¹ : 2004-07-21	
III. VIABILITY STATEMENT			
The viability of the microorganism identified under II above was tested on 2004-07-21 ² . On that date, the said microorganism was (X) ³ viable () ³ no longer viable			
IV. CONDITIONS UNDER WHICH THE VIABILITY TEST HAS BEEN PERFORMED ⁴			
V. INTERNATIONAL DEPOSITARY AUTHORITY			
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig		Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s):  Date: 2004-07-23	

¹ Indicate the date of original deposit or, where a new deposit or a transfer has been made, the most recent relevant date (date of the new deposit or date of the transfer).

² In the cases referred to in Rule 10.2(a) (ii) and (iii), refer to the most recent viability test.

³ Mark with a cross the applicable box.

⁴ Fill in if the information has been requested and if the results of the test were negative.

BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
FOR THE PURPOSES OF PATENT PROCEDURE

PCT/IT2004/000444

PCT/IT2004/000444

DSMZ

Deutsche Sammlung von
Mikroorganismen und
Zellkulturen GmbH



INTERNATIONAL FORM

ANIDRAL S.R.L.

Via Pietro Custodi 12

28100 Novara

Italy

RECEIPT IN THE CASE OF AN ORIGINAL DEPOSIT
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INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. IDENTIFICATION OF THE MICROORGANISM	
Identification reference given by the DEPOSITOR: BP 01	Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16597
II. SCIENTIFIC DESCRIPTION AND/OR PROPOSED TAXONOMIC DESIGNATION	
The microorganism identified under I. above was accompanied by: (X) a scientific description (X) a proposed taxonomic designation (Mark with a cross where applicable).	
III. RECEIPT AND ACCEPTANCE	
This International Depositary Authority accepts the microorganism identified under I. above, which was received by it on 2004-07-21 (Date of the original deposit) ¹ .	
IV. RECEIPT OF REQUEST FOR CONVERSION	
The microorganism identified under I above was received by this International Depositary Authority on (date of original deposit) and a request to convert the original deposit to a deposit under the Budapest Treaty was received by it on (date of receipt of request for conversion).	
V. INTERNATIONAL DEPOSITARY AUTHORITY	
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig	Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s): Date: 2004-07-23

¹ Where Rule 6.4 (d) applies, such date is the date on which the status of international depositary authority was acquired.

BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
FOR THE PURPOSES OF PATENT PROCEDURE



INTERNATIONAL FORM

ANIDRAL S.R.L.
Via Pietro Custodi 12
28100 Novara
Italy

VIABILITY STATEMENT
issued pursuant to Rule 10.2 by the
INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. DEPOSITOR	II. IDENTIFICATION OF THE MICROORGANISM
Name: ANIDRAL S.R.L. Via Pietro Custodi 12 Address: 28100 Novara Italy	Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16597 Date of the deposit or the transfer ¹ : 2004-07-21
III. VIABILITY STATEMENT	
The viability of the microorganism identified under II above was tested on 2004-07-21 On that date, the said microorganism was ☒ ² viable ☐ ² no longer viable	
IV. CONDITIONS UNDER WHICH THE VIABILITY TEST HAS BEEN PERFORMED ⁴	
V. INTERNATIONAL DEPOSITARY AUTHORITY	
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig	Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s): Date: 2004-07-23

¹ Indicate the date of original deposit or, where a new deposit or a transfer has been made, the most recent relevant date (date of the new deposit or date of the transfer).

² In the cases referred to in Rule 10.2(a) (ii) and (iii), refer to the most recent viability test.

³ Mark with a cross the applicable box.

⁴ Fill in if the information has been requested and if the results of the test were negative.

BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
FOR THE PURPOSES OF PATENT PROCEDURE

INTERNATIONAL FORM

ANIDRAL s.r.l.
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28100 Novara
ITALY

RECEIPT IN THE CASE OF AN ORIGINAL DEPOSIT
issued pursuant to Rule 7.1 by the
INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. IDENTIFICATION OF THE MICROORGANISM	
Identification reference given by the DEPOSITOR: GB1	Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16506
II. SCIENTIFIC DESCRIPTION AND/OR PROPOSED TAXONOMIC DESIGNATION	
The microorganism identified under I. above was accompanied by: (X) a scientific description (X) a proposed taxonomic designation (Mark with a cross where applicable).	
III. RECEIPT AND ACCEPTANCE	
This International Depositary Authority accepts the microorganism identified under I. above, which was received by it on 2004-06-18 (Date of the original deposit)¹.	
IV. RECEIPT OF REQUEST FOR CONVERSION	
The microorganism identified under I above was received by this International Depositary Authority on _____ (date of original deposit) and a request to convert the original deposit to a deposit under the Budapest Treaty was received by it on _____ (date of receipt of request for conversion).	
V. INTERNATIONAL DEPOSITARY AUTHORITY	
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig	Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s): <i>V. Wechs</i> Date: 2004-06-28

¹ Where Rule 6.4 (d) applies, such date is the date on which the status of international depositary authority was acquired.

BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
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INTERNATIONAL FORM

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Via Pietro Custodi 12
28100 Novara
ITALY

VIABILITY STATEMENT
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INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. DEPOSITOR		II. IDENTIFICATION OF THE MICROORGANISM			
Name:	ANIDRAL s.r.l. Via Pietro Custodi 12	Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY:			
Address:	28100 Novara ITALY	DSM 16506			
		Date of the deposit or the transfer ¹ :			
		2004-06-18			
III. VIABILITY STATEMENT					
The viability of the microorganism identified under II above was tested on 2004-06-23 ² . On that date, the said microorganism was					
☒ viable					
☐ no longer viable					
IV. CONDITIONS UNDER WHICH THE VIABILITY TEST HAS BEEN PERFORMED ⁴					
V. INTERNATIONAL DEPOSITARY AUTHORITY					
Name:	DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH	Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s):			
Address:	Mascheroder Weg 1b D-38124 Braunschweig				
		Date: 2004-06-28			

¹ Indicate the date of original deposit or, where a new deposit or a transfer has been made, the most recent relevant date (date of the new deposit or date of the transfer).

² In the cases referred to in Rule 10.2(a) (ii) and (iii), refer to the most recent viability test.

³ Mark with a cross the applicable box.

⁴ Fill in if the information has been requested and if the results of the test were negative.

BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
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28100 Novara
ITALY

RECEIPT IN THE CASE OF AN ORIGINAL DEPOSIT
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INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. IDENTIFICATION OF THE MICROORGANISM	
Identification reference given by the DEPOSITOR: GB5	Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16507
II. SCIENTIFIC DESCRIPTION AND/OR PROPOSED TAXONOMIC DESIGNATION	
The microorganism identified under I. above was accompanied by: (X) a scientific description (X) a proposed taxonomic designation (Mark with a cross where applicable).	
III. RECEIPT AND ACCEPTANCE	
This International Depositary Authority accepts the microorganism identified under I. above, which was received by it on 2004-06-18 (Date of the original deposit)¹.	
IV. RECEIPT OF REQUEST FOR CONVERSION	
The microorganism identified under I above was received by this International Depositary Authority on (date of original deposit) and a request to convert the original deposit to a deposit under the Budapest Treaty was received by it on (date of receipt of request for conversion).	
V. INTERNATIONAL DEPOSITARY AUTHORITY	
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig	Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s): Date: 2004-06-28

¹ Where Rule 6.4 (d) applies, such date is the date on which the status of international depositary authority was acquired.

BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
FOR THE PURPOSES OF PATENT PROCEDURE

INTERNATIONAL FORM

ANIDRAL s.r.l.
Via Pietro Custodi 12
28100 Novara
ITALY

VIABILITY STATEMENT
issued pursuant to Rule 10.2 by the
INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. DEPOSITOR	II. IDENTIFICATION OF THE MICROORGANISM
Name: ANIDRAL s.r.l. Via Pietro Custodi 12 Address: 28100 Novara ITALY	Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16507 Date of the deposit or the transfer ¹ : 2004-06-18
III. VIABILITY STATEMENT	
The viability of the microorganism identified under II above was tested on 2004-06-23 On that date, the said microorganism was ☒ ³ viable ☐ ³ no longer viable	
IV. CONDITIONS UNDER WHICH THE VIABILITY TEST HAS BEEN PERFORMED ⁴	
V. INTERNATIONAL DEPOSITARY AUTHORITY	
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig	Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s):  Date: 2004-06-28

¹ Indicate the date of original deposit or, where a new deposit or a transfer has been made, the most recent relevant date (date of the new deposit or date of the transfer).

² In the cases referred to in Rule 10.2(a) (ii) and (iii), refer to the most recent viability test.

³ Mark with a cross the applicable box.

⁴ Fill in if the information has been requested and if the results of the test were negative.

BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
FOR THE PURPOSES OF PATENT PROCEDURE

PCT/IT2004/000444

PCT/IT2004/000444

DSMZ

Deutsche Sammlung von
Mikroorganismen und
Zellkulturen GmbH



INTERNATIONAL FORM

ANIDRAL S.R.L.
Via Pietro Custodi 12
28100 Novara
Italy

VIABILITY STATEMENT
issued pursuant to Rule 10.2 by the
INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. DEPOSITOR		II. IDENTIFICATION OF THE MICROORGANISM	
Name: ANIDRAL S.R.L. Via Pietro Custodi 12 Address: 28100 Novara Italy		Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16603 Date of the deposit or the transfer ¹ : 2004-07-20	
III. VIABILITY STATEMENT			
The viability of the microorganism identified under II above was tested on 2004-07-21 ² . On that date, the said microorganism was (X) ³ viable () ³ no longer viable			
IV. CONDITIONS UNDER WHICH THE VIABILITY TEST HAS BEEN PERFORMED ⁴			
V. INTERNATIONAL DEPOSITARY AUTHORITY			
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig		Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s): Date: 2004-07-26	

- ¹ Indicate the date of original deposit or, where a new deposit or a transfer has been made, the most recent relevant date (date of the new deposit or date of the transfer).
² In the cases referred to in Rule 10.2(a) (ii) and (iii), refer to the most recent viability test.
³ Mark with a cross the applicable box.
⁴ Fill in if the information has been requested and if the results of the test were negative.

BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
FOR THE PURPOSES OF PATENT PROCEDURE

PCT/IT2004/000444

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INTERNATIONAL FORM

ANIDRAL S.R.L.
Via Pietro Custodi 12
28100 Novara
Italy

RECEIPT IN THE CASE OF AN ORIGINAL DEPOSIT
issued pursuant to Rule 7.1 by the
INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. IDENTIFICATION OF THE MICROORGANISM	
Identification reference given by the DEPOSITOR: BL 03	Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16603
II. SCIENTIFIC DESCRIPTION AND/OR PROPOSED TAXONOMIC DESIGNATION	
The microorganism identified under I. above was accompanied by: (☒) a scientific description (☒) a proposed taxonomic designation (Mark with a cross where applicable).	
III. RECEIPT AND ACCEPTANCE	
This International Depositary Authority accepts the microorganism identified under I. above, which was received by it on 2004-07-20 (Date of the original deposit) ¹ .	
IV. RECEIPT OF REQUEST FOR CONVERSION	
The microorganism identified under I above was received by this International Depositary Authority on _____ (date of original deposit) and a request to convert the original deposit to a deposit under the Budapest Treaty was received by it on _____ (date of receipt of request for conversion).	
V. INTERNATIONAL DEPOSITARY AUTHORITY	
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig	Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s): Date: 2004-07-26

¹ Where Rule 6.4 (d) applies, such date is the date on which the status of international depositary authority was acquired.

BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
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RECEIPT IN THE CASE OF AN ORIGINAL DEPOSIT
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INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. IDENTIFICATION OF THE MICROORGANISM	
Identification reference given by the DEPOSITOR: BR 03	Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16604
II. SCIENTIFIC DESCRIPTION AND/OR PROPOSED TAXONOMIC DESIGNATION	
The microorganism identified under I. above was accompanied by: (☒) a scientific description (☒) a proposed taxonomic designation (Mark with a cross where applicable).	
III. RECEIPT AND ACCEPTANCE	
This International Depositary Authority accepts the microorganism identified under I. above, which was received by it on 2004-07-20 (Date of the original deposit) ¹ .	
IV. RECEIPT OF REQUEST FOR CONVERSION	
The microorganism identified under I above was received by this International Depositary Authority on _____ (date of original deposit) and a request to convert the original deposit to a deposit under the Budapest Treaty was received by it on _____ (date of receipt of request for conversion).	
V. INTERNATIONAL DEPOSITARY AUTHORITY	
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig	Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s): Date: 2004-07-26

¹. Where Rule 6.4 (d) applies, such date is the date on which the status of international depositary authority was acquired.

BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
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DSMZ

Deutsche Sammlung von
Mikroorganismen und
Zellkulturen GmbH



INTERNATIONAL FORM

ANIDRAL S.R.L.
Via Pietro Custodi 12
28100 Novara
Italy

VIABILITY STATEMENT
issued pursuant to Rule 10.2 by the
INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. DEPOSITOR	II. IDENTIFICATION OF THE MICROORGANISM
Name: ANIDRAL S.R.L. Via Pietro Custodi 12 Address: 28100 Novara Italy	Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16604 Date of the deposit or the transfer ¹ : 2004-07-20
III. VIABILITY STATEMENT	
The viability of the microorganism identified under II above was tested on 2004-07-21 ² . On that date, the said microorganism was ☒ ³ viable ☐ ³ no longer viable	
IV. CONDITIONS UNDER WHICH THE VIABILITY TEST HAS BEEN PERFORMED ⁴	
V. INTERNATIONAL DEPOSITARY AUTHORITY	
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig	Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s):  Date: 2004-07-26

¹ Indicate the date of original deposit or, where a new deposit or a transfer has been made, the most recent relevant date (date of the new deposit or date of the transfer).

² In the cases referred to in Rule 10.2(a) (ii) and (iii), refer to the most recent viability test.

³ Mark with a cross the applicable box.

⁴ Fill in if the information has been requested and if the results of the test were negative.

BUDAPEST TREATY ON THE INTERNATIONAL
RECOGNITION OF THE DEPOSIT OF MICROORGANISMS
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PCT/IT2004/000444

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28100 Novara
Italy

RECEIPT IN THE CASE OF AN ORIGINAL DEPOSIT
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INTERNATIONAL DEPOSITARY AUTHORITY
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I. IDENTIFICATION OF THE MICROORGANISM	
Identification reference given by the DEPOSITOR: LR 04	Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16605
II. SCIENTIFIC DESCRIPTION AND/OR PROPOSED TAXONOMIC DESIGNATION	
The microorganism identified under I. above was accompanied by: (X) a scientific description (X) a proposed taxonomic designation (Mark with a cross where applicable).	
III. RECEIPT AND ACCEPTANCE	
This International Depositary Authority accepts the microorganism identified under I. above, which was received by it on 2004-07-20 (Date of the original deposit) ¹ .	
IV. RECEIPT OF REQUEST FOR CONVERSION	
The microorganism identified under I above was received by this International Depositary Authority on _____ (date of original deposit) and a request to convert the original deposit to a deposit under the Budapest Treaty was received by it on _____ (date of receipt of request for conversion).	
V. INTERNATIONAL DEPOSITARY AUTHORITY	
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig	Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s): Date: 2004-07-26

¹ Where Rule 6.4 (d) applies, such date is the date on which the status of international depositary authority was acquired.

BUDAPEST TREATY ON THE INTERNATIONAL
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28100 Novara

Italy

VIABILITY STATEMENT
issued pursuant to Rule 10.2 by the
INTERNATIONAL DEPOSITARY AUTHORITY
identified at the bottom of this page

I. DEPOSITOR	II. IDENTIFICATION OF THE MICROORGANISM
Name: ANIDRAL S.R.L. Via Pietro Custodi 12 Address: 28100 Novara Italy	Accession number given by the INTERNATIONAL DEPOSITARY AUTHORITY: DSM 16605 Date of the deposit or the transfer ¹ : 2004-07-20
III. VIABILITY STATEMENT	
The viability of the microorganism identified under II above was tested on 2004-07-21 ² . On that date, the said microorganism was ☒ ³ viable ☐ ³ no longer viable	
IV. CONDITIONS UNDER WHICH THE VIABILITY TEST HAS BEEN PERFORMED ⁴	
V. INTERNATIONAL DEPOSITARY AUTHORITY	
Name: DSMZ-DEUTSCHE SAMMLUNG VON MIKROORGANISMEN UND ZELLKULTUREN GmbH Address: Mascheroder Weg 1b D-38124 Braunschweig	Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s):  Date: 2004-07-26

¹ Indicate the date of original deposit or, where a new deposit or a transfer has been made, the most recent relevant date (date of the new deposit or date of the transfer).

² In the cases referred to in Rule 10.2(a) (ii) and (iii), refer to the most recent viability test.

³ Mark with a cross the applicable box.

⁴ Fill in if the information has been requested and if the results of the test were negative.

BELGIAN COORDINATED COLLECTIONS OF MICROORGANISMS - BCCM
LMG-COLLECTION

PCT/IT2004/000444

Page 1 of Form BCCM/LMG/BP/9/.....01-105..... Viability statement

**Budapest Treaty on the International Recognition of the Deposit of Microorganisms for
the Purposes of Patent Procedure**

**Viability statement issued pursuant to Rule 10.2 by the International Depositary
Authority BCCM/LMG identified on the following page**

International Form BCCM/LMG/BP/9/.....01-105.....

To: Party to whom the viability statement is issued:

Name : Laboratorio Microbiologico Grana Provolone SRL
Attn: Luigi Dell'era

Address : Via P. Custodi N. 12
I-28100 Novara
Italy

I. Depositor:

I.1 Name : Laboratorio Microbiologico Grana Provolone SRL

I.2 Address : Via P. Custodi N. 12
I-28100 Novara
Italy

II. Identification of the microorganism

II.1 Accession number given by the International Depositary Authority:

LMG P-21019

II.2 Date of the original deposit (or where a new deposit or a transfer has been made, the most recent relevant date) :

October 16, 2001

III. Viability statement.

The viability of the microorganism identified under II above was tested on

: October 17, 2001

(Give date. In the cases referred to in Rule 10.2(a)(ii) and (iii), refer to the most recent viability test).

On that date, the said microorganism was: (mark the applicable box with a cross)

☒ viable

☐ no longer viable

BELGIAN COORDINATED COLLECTIONS OF MICROORGANISMS - BCCM
LMG-COLLECTION

Page 2 of Form BCCM/LMG/BP/9/.....01-105 Viability statement

IV. Conditions under which the viability test has been performed:

(Fill in if the information has been requested and if the results of the test were negative).

V. International Depositary Authority

Belgian Coordinated Collections of Microorganisms (BCCM)
Laboratorium voor Microbiologie - Bacteriënverzameling (LMG)
Universiteit Gent
K.L. Ledeganckstraat 35
B-9000 Gent, Belgium

Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s) :



Dr. D. Janssens, curator IDA

Date : October 30, 2001

BELGIAN COORDINATED COLLECTIONS OF MICROORGANISMS - BCCM
LMG-COLLECTION

PCT/IT2004/000444

Page 1 of Form BCCM/LMG/BP/9/.....01-106 Viability statement

**Budapest Treaty on the International Recognition of the Deposit of Microorganisms for
the Purposes of Patent Procedure**

**Viability statement Issued pursuant to Rule 10.2 by the International Depositary
Authority BCCM/LMG Identified on the following page**

International Form BCCM/LMG/BP/9/.....01-106

To: Party to whom the viability statement is issued:

Name : Laboratorio Microbiologico Grana Provolone SRL
Attn: Luigi Dell'era

Address : Via P. Custodi N. 12
I-28100 Novara
Italy

I. Depositor:

I.1 Name : Laboratorio Microbiologico Grana Provolone SRL

I.2 Address : Via P. Custodi N. 12
I-28100 Novara
Italy

II. Identification of the microorganism

II.1 Accession number given by the International Depositary Authority:

LMG P-21020

II.2 Date of the original deposit (or where a new deposit or a transfer has been made, the most recent relevant date) :

October 16, 2001

III. Viability statement.

The viability of the microorganism identified under II above was tested on

: October 17, 2001

(Give date. In the cases referred to in Rule 10.2(a)(ii) and (iii), refer to the most recent viability test).

On that date, the said microorganism was: (mark the applicable box with a cross)

☒ viable

☐ no longer viable

BELGIAN COORDINATED COLLECTIONS OF MICROORGANISMS - BCCM
LMG-COLLECTION
Page 2 of Form BCCM/LMG/BP/9/.....01-106 Viability statement

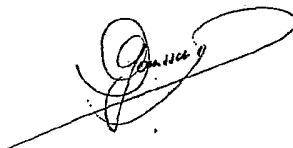
IV. Conditions under which the viability test has been performed:

(Fill in if the information has been requested and if the results of the test were negative).

V. International Depositary Authority

Belgian Coordinated Collections of Microorganisms (BCCM)
Laboratorium voor Microbiologie - Bacteriënverzameling (LMG)
Universiteit Gent
K.L. Ledeganckstraat 35
B-9000 Gent, Belgium

Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s) :



Dr. D. Janssens, curator IDA

Date : October 30, 2001

BELGIAN COORDINATED COLLECTIONS OF MICROORGANISMS - BCCM
LMG-COLLECTION

01-107

PCT/IT2004/000444

Page 1 of Form BCCM/LMG/BP/9/..... Viability statement

Budapest Treaty on the International Recognition of the Deposit of Microorganisms for the Purposes of Patent Procedure

Viability statement issued pursuant to Rule 10.2 by the International Depositary Authority BCCM/LMG identified on the following page

International Form BCCM/LMG/BP/9/.....⁰¹⁻¹⁰⁷

To: Party to whom the viability statement is issued:

Name : Laboratorio Microbiologico Grana Provolone SRL
Attn: Luigi Dell'era

Address : Via P. Custodi N. 12
I-28100 Novara
Italy

I. Depositor:

I.1 Name : Laboratorio Microbiologico Grana Provolone SRL

I.2 Address : Via P. Custodi N. 12
I-28100 Novara
Italy

II. Identification of the microorganism

II.1 Accession number given by the International Depositary Authority:

LMG P-21021

II.2 Date of the original deposit (or where a new deposit or a transfer has been made, the most recent relevant date) :

October 16, 2001

III. Viability statement.

The viability of the microorganism identified under II above was tested on

: October 17, 2001

(Give date. In the cases referred to in Rule 10.2(a)(ii) and (iii), refer to the most recent viability test).

On that date, the said microorganism was: (mark the applicable box with a cross)

☒ viable

☐ no longer viable

BELGIAN COORDINATED COLLECTIONS OF MICROORGANISMS - BCCM
LMG-COLLECTION
Page 2 of Form BCCM/LMG/BP/9/.....01-107 Viability statement

IV. Conditions under which the viability test has been performed:

(Fill in if the information has been requested and if the results of the test were negative).

V. International Depositary Authority

Belgian Coordinated Collections of Microorganisms (BCCM)
Laboratorium voor Microbiologie - Bacteriënverzameling (LMG)
Universiteit Gent
K.L. Ledeganckstraat 35
B-9000 Gent, Belgium

Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s) :



Dr. D. Janssens, curator IDA

Date : October 30, 2001

BELGIAN COORDINATED COLLECTIONS OF MICROORGANISMS - BCCM
LMG-COLLECTION
Page 1 of Form BCCM/LMG/BP/9/.....01-108 Viability statement

**Budapest Treaty on the International Recognition of the Deposit of Microorganisms for
the Purposes of Patent Procedure**

**Viability statement issued pursuant to Rule 10.2 by the International Depositary
Authority BCCM/LMG identified on the following page**

International Form BCCM/LMG/BP/9/.....01-108

To: Party to whom the viability statement is issued:

Name : Laboratorio Microbiologico Grana Provolone SRL
Attn: Luigi Dell'era

Address : Via P. Custodi N. 12
I-28100 Novara
Italy

I. Depositor:

I.1 Name : Laboratorio Microbiologico Grana Provolone SRL

I.2 Address : Via P. Custodi N. 12
I-28100 Novara
Italy

II. Identification of the microorganism

II.1 Accession number given by the International Depositary Authority:

LMG P-21022

II.2 Date of the original deposit (or where a new deposit or a transfer has been made, the most recent relevant date) :

October 16, 2001

III. Viability statement.

The viability of the microorganism identified under II above was tested on

: October 17, 2001

(Give date. In the cases referred to in Rule 10.2(a)(ii) and (iii), refer to the most recent viability test).

On that date, the said microorganism was: (mark the applicable box with a cross)

☒ viable

☐ no longer viable

BELGIAN COORDINATED COLLECTIONS OF MICROORGANISMS - BCCM
LMG-COLLECTION

PCT/IT2004/000444

Page 2 of Form BCCM/LMG/BP/9/01-108 Viability statement

IV. Conditions under which the viability test has been performed:

(Fill in if the information has been requested and if the results of the test were negative).

V. International Depositary Authority

Belgian Coordinated Collections of Microorganisms (BCCM)
Laboratorium voor Microbiologie - Bacteriënverzameling (LMG)
Universiteit Gent
K.L. Ledeganckstraat 35
B-9000 Gent, Belgium

Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s) :



Dr. D. Janssens, curator IDA

Date : October 30, 2001

Budapest Treaty on the International Recognition of the Deposit of Microorganisms for the Purposes of Patent Procedure

Viability statement Issued pursuant to Rule 10.2 by the International Depositary Authority BCCM/LMG Identified on the following page

International Form BCCM/LMG/BP/9/...01-109...

To: Party to whom the viability statement is issued:

Name : Laboratorio Microbiologico Grana Provolone SRL
Attn: Luigi Dell'era

Address : Via P. Custodi N. 12
I-28100 Novara
Italy

I. Depositor:

I.1 Name : Laboratorio Microbiologico Grana Provolone SRL

I.2 Address : Via P. Custodi N. 12
I-28100 Novara
Italy

II. Identification of the microorganism

II.1 Accession number given by the International Depositary Authority:

LMG P- 21023

II.2 Date of the original deposit (or where a new deposit or a transfer has been made, the most recent relevant date) :

October 16, 2001

III. Viability statement.

The viability of the microorganism identified under II above was tested on

: October 17, 2001

(Give date. In the cases referred to in Rule 10.2(a)(ii) and (iii), refer to the most recent viability test).

On that date, the said microorganism was: (mark the applicable box with a cross)

☒ viable

☐ no longer viable

BELGIAN COORDINATED COLLECTIONS OF MICROORGANISMS - BCCM
LMG-COLLECTION PCT/IT2004/000444
Page 2 of Form BCCM/LMG/BP/9/01-109 Viability statement

IV. Conditions under which the viability test has been performed:

(Fill in if the information has been requested and if the results of the test were negative).

V. International Depositary Authority

Belgian Coordinated Collections of Microorganisms (BCCM)
Laboratorium voor Microbiologie - Bacteriënverzameling (LMG)
Universiteit Gent
K.L. Ledeganckstraat 35
B-9000 Gent, Belgium

Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s) :



Dr. D. Janssens, curator IDA

Date : October 30, 2001

**BELGIAN COORDINATED COLLECTIONS OF MICROORGANISMS - BCCM
LMG-COLLECTION**

Page 1 of Form BCCM/LMG/BP/9/...02-111... Viability statement

**Budapest Treaty on the International Recognition of the Deposit of Microorganisms for
the Purposes of Patent Procedure****Viability statement issued pursuant to Rule 10.2 by the International Depositary
Authority BCCM/LMG identified on the following page*****International Form BCCM/LMG/BP/9/...02-111...*****To: Party to whom the viability statement is issued:**

Name : Dr. Cesare Schiavi - Amministratore unico

Address : Anidral Srl
Via P. Custodi N. 12
28100 Novara - Italy**I. Depositor:**

I.1 Name : Anidral Srl

I.2 Address : Via P. Custodi N. 12
28100 Novara - Italy**II. Identification of the microorganism**

II.1 Accession number given by the International Depositary Authority:

LMG P-21380

II.2 Date of the original deposit (or where a new deposit or a transfer has been made, the most recent relevant date) :

January 31, 2002

III. Viability statement.**The viability of the microorganism identified under II above was tested on**

: January 31, 2002

(Give date. In the cases referred to in Rule 10.2(a)(ii) and (iii), refer to the most recent viability test).

On that date, the said microorganism was: (mark the applicable box with a cross)☒ viable☐ no longer viable

**BELGIAN COORDINATED COLLECTIONS OF MICROORGANISMS - BCCM
LMG-COLLECTION**

Page 2 of Form BCCM/LMG/BP/9/.....02-111 Viability statement

IV. Conditions under which the viability test has been performed:

(Fill in if the information has been requested and if the results of the test were negative).

V. International Depositary Authority

Belgian Coordinated Collections of Microorganisms (BCCM)
Laboratorium voor Microbiologie - Bacteriënverzameling (LMG)
Universiteit Gent
K.L. Ledeganckstraat 35
B-9000 Gent, Belgium

Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s) :



Dr. D. Janssens, Curator I.D.A.

Date : February 14th, 2002

BELGIAN COORDINATED COLLECTIONS OF MICROORGANISMS - BCCM
LMG-COLLECTION

Page 1 of Form BCCM/LMG/BP/9/.....02-112 Viability statement

Budapest Treaty on the International Recognition of the Deposit of Microorganisms for
the Purposes of Patent ProcedureViability statement issued pursuant to Rule 10.2 by the International Depositary
Authority BCCM/LMG identified on the following page*International Form BCCM/LMG/BP/9/02-112....***To: Party to whom the viability statement is issued:**

Name : Dr. Cesare Schiavi - Amministratore unico

Address : Anidral Srl
Via P. Custodi N. 12
28100 Novara - Italy**I. Depositor:**

I.1 Name : Anidral Srl

I.2 Address : Via P. Custodi N. 12
28100 Novara - Italy**II. Identification of the microorganism**

II.1 Accession number given by the International Depositary Authority:

LMG P-21381

II.2 Date of the original deposit (or where a new deposit or a transfer has been made, the most
recent relevant date) :

January 31, 2002

III. Viability statement.

The viability of the microorganism identified under II above was tested on

: January 31, 2002

(Give date. In the cases referred to in Rule 10.2(a)(ii) and (iii), refer to the most recent viability test).

On that date, the said microorganism was: (mark the applicable box with a cross)

☒ viable☐ no longer viable

BELGIAN COORDINATED COLLECTIONS OF MICROORGANISMS - BCCM/IT2004/000444
LMG-COLLECTION
Page 2 of Form BCCM/LMG/BP/9/..... Viability statement

IV. Conditions under which the viability test has been performed:

(Fill in if the information has been requested and if the results of the test were negative).

V. International Depositary Authority

Belgian Coordinated Collections of Microorganisms (BCCM)
Laboratorium voor Microbiologie - Bacteriënverzameling (LMG)
Universiteit Gent
K.L. Ledeganckstraat 35
B-9000 Gent, Belgium

Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s) :



Dr. D. Janssens, Curator I.D.A.

Date : February 14th, 2002

BELGIAN COORDINATED COLLECTIONS OF MICROORGANISMS - LMG-COLLECTION

Page 1 of Form BCCM/LMG/BP/9/.....02-115 Viability statement

Budapest Treaty on the International Recognition of the Deposit of Microorganisms for the Purposes of Patent Procedure

Viability statement Issued pursuant to Rule 10.2 by the International Depositary Authority BCCM/LMG Identified on the following page

*International Form BCCM/LMG/BP/9/.....02-115***To: Party to whom the viability statement is issued:**

Name : Dr. Cesare Schiavi - Amministratore unico

Address : Anidral Srl
Via P. Custodi N. 12
28100 Novara - Italy**I. Depositor:**

I.1 Name : Anidral Srl

I.2 Address : Via P. Custodi N. 12
28100 Novara - Italy**II. Identification of the microorganism**

II.1 Accession number given by the International Depositary Authority:

LMG P-21384

II.2 Date of the original deposit (or where a new deposit or a transfer has been made, the most recent relevant date) :

January 31, 2002

III. Viability statement.

The viability of the microorganism Identified under II above was tested on

: January 31, 2002

(Give date. In the cases referred to in Rule 10.2(a)(ii) and (iii), refer to the most recent viability test).

On that date, the said microorganism was: (mark the applicable box with a cross)

☒ viable☐ no longer viable

BELGIAN COORDINATED COLLECTIONS OF MICROORGANISMS - ECCM
LMG-COLLECTION

PCT/IT2004/000444

Page 2 of Form BCCM/LMG/BP/9/.....⁰²⁻¹¹⁵ Viability statement

IV. Conditions under which the viability test has been performed:

(Fill in if the information has been requested and if the results of the test were negative).

V. International Depositary Authority

Belgian Coordinated Collections of Microorganisms (BCCM)
Laboratorium voor Microbiologie - Bacteriënverzameling (LMG)
Universiteit Gent
K.L. Ledeganckstraat 35
B-9000 Gent, Belgium

Signature(s) of person(s) having the power to represent the International Depositary Authority or of authorized official(s) :



Dr. D. Janssens, Curator I.D.A.

Date : February 14th, 2002

INTERNATIONAL SEARCH REPORT

Int Application No
PCT/IT2004/000444

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61K35/74 A23C9/127

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61K A23L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, BIOSIS, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DEGUCHI Y ET AL: "COMPARATIVE STUDIES ON SYNTHESIS OF WATER-SOLUBLE VITAMINS AMONG HUMAN SPECIES OF BIFIDOBACTERIA" AGRICULTURAL AND BIOLOGICAL CHEMISTRY, vol. 49, no. 1, 1985, pages 13-20, XP009040803 ISSN: 0002-1369 abstract; figure 3; p.19 last paragraph ----- -/-	1-5, 11-15, 72-80

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *Z* document member of the same patent family

Date of the actual completion of the international search

3 December 2004

Date of mailing of the international search report

14/12/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Krueger, J

INTERNATIONAL SEARCH REPORT

Inter al Application No
PCT/IT2004/000444

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KRAUSE LINDA J ET AL: "Feeding human milk to rats increases Bifidobacterium in the cecum and colon which correlates with enhanced folate status" JOURNAL OF NUTRITION, vol. 126, no. 5, 1996, pages 1505-1511, XP009040718 ISSN: 0022-3166 *abstract, p.1508, right column, lines 3-7; figure 1*	1-5, 11-15, 72-80
A	WO 99/59413 A (CHEN BINHUA ; YAO YIGIANG (CN); SHANGHAI SINE PHARMACEUTICAL C (CN); I) 25 November 1999 (1999-11-25) page 1, column 2, line 1 - line 16	1-80
A	SYBESMA WILBERT ET AL: "Effects of cultivation conditions on folate production by lactic acid bacteria." APPLIED AND ENVIRONMENTAL MICROBIOLOGY. AUG 2003, vol. 69, no. 8, August 2003 (2003-08), pages 4542-4548, XP002308563 ISSN: 0099-2240	1-80

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inten Application No
PCT/IT2004/000444

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9959413	A	25-11-1999	US 2001014322 A1	16-08-2001
			AU 760398 B2	15-05-2003
			AU 3995699 A	06-12-1999
			CA 2333205 A1	25-11-1999
			WO 9959413 A1	25-11-1999