A numerical range expressed using “to” includes the upper and lower limits of the numerical range.

[0011]

[Composition]

The composition of the invention includes a bacterial powder, a fatty oil, and at least one selected from the group consisting of a microscopic powder and a surfactant.

Hereinafter, the bacterial powder, the fatty oil, the microscopic powder, and the surfactant will be described in detail.

[0012]

<Bacterial powder>

“Bacterial powder” is a general term for dried bacterial cells.

The method for drying bacterial cells may be, but is not limited to, freeze-drying or spraydrying, for example.

Freeze-drying is a method in which drying is performed at a low temperature of about -20°C to -160°C using a freeze-dryer, liquid nitrogen, or the like usually at a reduced pressure of about 1 to 60 Pa.

Spray-drying is a method in which a liquid is formed into droplets using an atomizer, and the droplets are sprayed into a heated gas stream having a relatively high temperature to evaporate moisture, thereby performing drying.

The bacterial powder may contain only bacterial cells, or may also contain bacterial cells and components other than bacterial cells. Examples of the components other bacterial cells usable include cryoprotectants, freeze-drying protectants, spray-drying protectants, and carriers.

The bacterial powder may also be in the state of being dispersed in a triturate, an excipient, or a carrier that has been used as a material for pharmaceuticals or a material

SBT: MEGMILK Snow Brand Co., Ltd.

OLL: Meiji Co., Ltd.

R: LALLEMAND Inc.

[0038]

<<Probiotics>>

The bacterial powder may be live cells or killed cells. In the case where the bacterial powder is live cells, such a bacterial powder can be expected to function as a probiotic.

Incidentally, “probiotics” is a term proposed as opposed to “antibiotics”, and is derived from the term “probiosis”, which means to live together. The definition of probiotics currently accepted widely is “living microorganisms that improve the balance of intestinal flora and thereby beneficially affect the host’s health”.

[0039]

<<Content of Bacterial powder>>

The content of the bacterial powder in the composition of the invention is preferably 0.5 to 10 mass%, more preferably 1 to 5 mass%, based on the total mass of the composition.

When the content of the bacterial powder is 0.5 mass% or more based on the total mass of the composition, the advantageous effect of the presence of the bacterial powder in the composition of the invention can be more exerted.

When the content of the bacterial powder is 10 mass% or less based on the total mass of the composition, the advantageous effect of the presence of the bacterial powder in the composition of the invention and the cost are more balanced.

[0040]

<Fatty Oil>

The mixing method is not particularly limited. For example, the bacterial powder, fatty oil, and at least one selected from the group consisting of a microscopic powder and a surfactant can be mixed by stirring.

In the case where the composition contains additives, the order of mixing them is not particularly limited. The additives may be contained in a suspension containing a bacterial powder and a fatty oil, and it is also possible to add the additives at the time of mixing at least one selected from the group consisting of a microscopic powder and a surfactant.

[0056]

[Use]

The microscopic powder and surfactant described above are suitable for use as anti-caking agents.

[Examples]

[0057]

Hereinafter, the invention will be described in further detail with reference to examples. However, the invention is not limited to the following examples. Unless the gist of the invention is changed, various modifications are possible.

[0058]

[Preparation of Bacterial powder]

<Bacterial powder 1>

Bifidobacterium infantis NITE BP-02623 was inoculated into a medium containing a protein, an amino acid, and a sugar source, cultured at 32 to 41°C for 5 to 24 hours, and then centrifuged to harvest bacterial cells (wet bacterial cells) from the culture solution. Using a freeze-dryer (manufactured by Kyowa Vacuum Engineering Co., Ltd.), freeze-drying was performed for 18 to 96 hours, and the freeze-dried bacterial cell

mass was physically ground to give a freeze-dried powder. The obtained freeze-dried powder and tapioca starch were triturated in a ratio of 1:3 (w/w), thereby giving a Bifidobacterium bacteria bacterial powder.

[0059]

<Bacterial powder 2>

Bifidobacterium breve NITE BP-02622 was inoculated into a medium containing a protein, an amino acid, and a sugar source, cultured at 32 to 41°C for 5 to 24 hours, and then centrifuged to harvest bacterial cells (wet bacterial cells) from the culture solution. Using a freeze-dryer (manufactured by Kyowa Vacuum Engineering Co., Ltd.), freeze-drying was performed for 120 hours, and the freeze-dried bacterial cell mass was physically ground to give a freeze-dried powder. The obtained freeze-dried powder and tapioca starch were triturated in a ratio of 1:3 (w/w), thereby giving a Bifidobacterium bacteria bacterial powder.

[0060]

<Bacterial powder 3>

Bifidobacterium longum subsp. longum NITE BP-02621 was inoculated into a medium containing a protein, an amino acid, and a sugar source, cultured at 32 to 41°C for 5 to 24 hours, and then centrifuged to harvest bacterial cells (wet bacterial cells) from the culture solution. Using a freeze-dryer (manufactured by Kyowa Vacuum Engineering Co., Ltd.), freeze-drying was performed for 18 to 96 hours, and the freeze-dried bacterial cell mass was physically ground to give a freeze-dried powder. The obtained freeze-dried powder and corn starch were triturated in a ratio of 1:3 (w/w), thereby giving a Bifidobacterium bacteria bacterial powder.

[0061]

<Bacterial powder 4>

Bifidobacterium longum subsp. longum NITE BP-02621 was inoculated into a medium containing a protein, an amino acid, and a sugar source, cultured at 32 to 41°C for 5 to 24 hours, and then centrifuged to harvest bacterial cells (wet bacterial cells) from the culture solution. Using a freeze-dryer (manufactured by Kyowa Vacuum Engineering Co., Ltd.), freeze-drying was performed for 18 to 96 hours, and the freeze-dried bacterial cell mass was physically ground to give a freeze-dried powder. The obtained freeze-dried powder and potato starch were triturated in a ratio of 1:3 (w/w), thereby giving a Bifidobacterium bacteria bacterial powder.

[0062]

<Bacterial powder 5>

Lactobacillus gasseri NITE BP-01669 was inoculated into a medium containing a protein, an amino acid, and a sugar source, cultured at 32 to 41°C for 5 to 24 hours, and then centrifuged to harvest bacterial cells (wet bacterial cells) from the culture solution. Using a freeze-dryer (manufactured by Kyowa Vacuum Engineering Co., Ltd.), freeze-drying was performed for 18 to 96 hours, and the freeze-dried bacterial cell mass was physically ground to give a freeze-dried powder. The obtained freeze-dried powder and corn starch were triturated in a ratio of 1:3 (w/w), thereby giving a lactic acid bacterial powder.

[0063]

<Bacterial powder 6>

Lactobacillus acidophilus NITE BP-01695 was inoculated into a medium containing a protein, an amino acid, and a sugar source, cultured at 32 to 41°C for 5 to 24 hours, and then centrifuged to harvest bacterial cells (wet bacterial cells) from the culture solution. Using a freeze-dryer (manufactured by Kyowa Vacuum Engineering Co., Ltd.), freeze-drying was performed for 18 to 96 hours, and the freeze-dried bacterial cell mass

was physically ground to give a freeze-dried powder. The obtained freeze-dried powder and corn starch were triturated in a ratio of 1:3 (w/w), thereby giving a lactic acid bacterial powder.

[0064]

<Bacterial powder 7>

Lactobacillus paracasei NITE BP-01633 was inoculated into a medium containing a protein, an amino acid, and a sugar source, cultured at 32 to 41°C for 5 to 24 hours, and then centrifuged to harvest bacterial cells (wet bacterial cells) from the culture solution. Using a freeze-dryer (manufactured by Kyowa Vacuum Engineering Co., Ltd.), freeze-drying was performed for 18 to 96 hours, and the freeze-dried bacterial cell mass was physically ground to give a freeze-dried powder. The obtained freeze-dried powder and maltodextrin were triturated in a ratio of 1:3 (w/w), thereby giving a lactic acid bacterial powder.

[0065]

<Bacterial powder 8>

Lactobacillus helveticus NITE BP-01671 was inoculated into a medium containing a protein, an amino acid, and a sugar source, cultured at 32 to 41°C for 5 to 24 hours, and then centrifuged to harvest bacterial cells (wet bacterial cells) from the culture solution. A concentrated bacterial solution and a starch decomposed product were mixed in a ratio of 1:4 (on a solids basis, w/w) and then spray-dried using a spray dryer, thereby giving a lactic acid bacterial powder.

[0066]

<Bacterial powder 9>

Bifidobacterium longum subsp. infantis NITE BP-02623 was inoculated into a medium containing a protein, an amino acid, and a sugar source, cultured at 32 to 41°C

[0072]

[Table 2]

		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Bacterial powder	Bacterial powder 1	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Microscopic Powder or Surfactant	Microcrystalline cellulose		0.5	1.0	2.0						
	Fine silicon dioxide					0.5	1.0	2.0			
	Ca stearate								0.5	1.0	2.0
	B-100D										
	S-170										
	S-770										
	S-1570										
Fatty oil	S9013	97.5	97.0	96.5	95.5	97.0	96.5	95.5	97.0	96.5	95.5
Evaluation	Dispersibility	E	C	C	C	A	A	A	B	B	B

[0073]

[Table 3]

		A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22
Bacterial powder	Bacterial powder 1	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Microscopic Powder or Surfactant	Microcrystalline cellulose												
	Fine silicon dioxide												
	Ca stearate												
	B-100D	0.5	1.0	2.0									
	S-170				0.5	1.0	2.0						
	S-770							0.5	1.0	2.0			
	S-1570										0.5	1.0	2.0
Fatty oil	S9013	97.0	96.5	95.5	97.0	96.5	95.5	97.0	96.5	95.5	97.0	96.5	95.5
Evaluation	Dispersibility	A	A	A	C	C	C	D	D	D	D	D	D

[0076]

[Table 4]

		B1	B2	B3	B4	B5	B6	B7	B8	B9
Bacterial powder	Bacterial powder 1	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Microscopic Powder or Surfactant	Tri-Ca phosphate		1.0							
	Mg stearate			1.0						
	P-170				1.0					
	O-170					1.0				
	L-195						1.0			
	B-370F							1.0		
	ER-190								1.0	
	POS-135									1.0
Fatty oil	S9013	97.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5
Evaluation	Dispersibility	E	A	A	B	B	C	A	C	A

[0079]

[Table 5]

		C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Bacterial powder	Bacterial powder 2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Microscopic Powder or Surfactant	Microcrystalline cellulose		0.5	1.0	2.0							
	Tri-Ca phosphate					1.0						
	Ca stearate						1.0					
	Mg stearate							1.0				
	B-100D								1.0			
	S-170									1.0		
	P-170										1.0	
	B-370F											1.0
Fatty oil	S9013	97.5	97.0	96.5	95.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5
	Evaluation	E	D	C	C	A	B	B	A	C	B	A

[0082]

[Table 6]

		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12
Bacterial powder	Bacterial powder 3	2.5	2.5										
	Bacterial powder 4			2.5	2.5								
	Bacterial powder 5					2.5	2.5						
	Bacterial powder 6							2.5	2.5				
	Bacterial powder 7									2.5	2.5		
	Bacterial powder 8											2.5	2.5
Microscopic Powder or Surfactant	Ca stearate		1.0		1.0		1.0		1.0		1.0		1.0
Fatty oil	S9013	97.5	96.5	97.5	96.5	97.5	96.5	97.5	96.5	97.5	96.5	97.5	96.5
Evaluation	Dispersibility	E	A	E	B	E	A	E	B	E	B	E	B

[0083]

In Example D2, Example D4, Example D6, Example D8, Example D10, and Example D12 where Ca stearate was blended, the dispersibility ratings were A or B, that is, the dispersibility of the bacterial powder was excellent.

Between the examples using a freeze-dried bacterial powder (Example D2, Example D4, Example D6, Example D8, and Example D10) and the example using a spray-dried bacterial powder (Example D12), no significant difference was observed in dispersibility upon the addition of Ca stearate.

[0084]

<Example E1 and Example E2>

Example E1 is a comparative example, and Example E2 is inventive.

In the ratio shown in Table 7 (unit: mass%), a bacterial powder, a microscopic powder or a surfactant, and a fatty oil were mixed and formed into a homogeneous dispersion liquid using a magnetic stirrer.

Using the prepared compositions, dispersibility was evaluated according to the evaluation method described above. The evaluation results are shown in Table 7.

[0085]

[Table 7]

		E1	E2
Bacterial Powder	Bacterial powder 9	2.5	2.5
Microscopic Powder or Surfactant	Ca stearate		1.0
Fatty oil	S9013	97.5	96.5
Evaluation	Dispersibility	E	B

The terms in Table 2 to Table 7 have the following meanings.

(Bacterial powder)

Bacterial powder 1: Bacterial powder 1 prepared as above

Bacterial powder 2: Bacterial powder 2 prepared as above

Bacterial powder 3: Bacterial powder 3 prepared as above

Bacterial powder 4: Bacterial powder 4 prepared as above

Bacterial powder 5: Bacterial powder 5 prepared as above

Bacterial powder 6: Bacterial powder 6 prepared as above

Bacterial powder 7: Bacterial powder 7 prepared as above

Bacterial powder 8: Bacterial powder 8 prepared as above

Bacterial powder 9: Bacterial powder 9 prepared as above

[0091]

(Fatty Oil)

S9013: Medium chain triglyceride (MCT Oil S9013, manufactured by Taiyo Yushi Corp.)

[0092]

(Microscopic Powder)

Microcrystalline cellulose: CEOLUS FD-F20 (manufactured by Asahi Kasei Corporation)

Tri-Ca phosphate: Tricalcium phosphate (manufactured by Taihei Chemical Industrial Co., Ltd.)

Fine silicon dioxide: SYLOPAGE 720 (manufactured by Fuji Silysia Chemical Ltd.)

[0093]

(Surfactant)

[CLAIMS]

[Claim 1]

A composition comprising:

a bacterial powder;

a fatty oil; and

at least one selected from the group consisting of a microscopic powder and a surfactant, wherein the microscopic powder contains at least one selected from the group consisting of microcrystalline cellulose and tricalcium phosphate,

wherein the surfactant contains at least one selected from the group consisting of an anionic surfactant and a nonionic surfactant having an HLB value of 3 or less, and

wherein total content of the microscopic powder and the surfactant is 0.01 to 10 mass% based on the total mass of the composition.

[Claim 2]

The composition according to claim 1, being a suspension.

[Claim 3]

The composition according to claim 1 or 2, wherein the bacterial powder contains at least one selected from the group consisting of live cells of lactic acid bacteria, killed cells of lactic acid bacteria, live cells of bacteria of the genus Bifidobacterium, and killed cells of bacteria of the genus Bifidobacterium.

[Claim 4]

The composition according to any one of claims 1 to 3, wherein the anionic surfactant contains at least one selected from the group consisting of metal stearates, and the nonionic surfactant having an HLB value of 3 or less contains at least one selected from the group consisting of sucrose fatty acid esters having an HLB value of

3 or less and glycerine fatty acid esters having an HLB value of 3 or less.

[Claim 5]

The composition according to any one of claims 1 to 4, wherein the bacterial powder is contained in an amount of 0.5 to 10 mass% based on the total mass of the composition.

[Claim 6]

The composition according to any one of claims 1 to 5, further comprising an additive.

[Claim 7]

A method for producing the composition according to any one of claims 1 to 6, comprising:

mixing a bacterial powder, a fatty oil, and at least one selected from the group consisting of a microscopic powder and a surfactant in an arbitrary order; or

mixing a suspension containing a bacterial powder and a fatty oil with at least one selected from the group consisting of a microscopic powder and a surfactant.

[Claim 8]

Use of at least one selected from the group consisting of a microscopic powder and a surfactant as an anti-caking agent for a bacterial powder in a composition containing a fatty oil,

wherein the microscopic powder contains at least one selected from the group consisting of microcrystalline cellulose and tricalcium phosphate, and

wherein the surfactant contains at least one selected from the group consisting of an anionic surfactant and a nonionic surfactant having an HLB value of 3 or less.