COATED ALGAE POWDER FOR ADDING TO DAIRY COW FEED AND DAIRY COW FEED

TECHNICAL FIELD

The present disclosure relates to the technical field of dairy cow feeds, and particularly to a coated algae powder for adding to dairy cow feed, a method for preparing the coated algae powder for adding to dairy cow feed, a dairy cow feed, a method for feeding a dairy cow, and a dairy product.

BACKGROUND ART

Cow milk is rich in various nutrients, and can provide some of the nutrients needed by human bodies in daily life, such as proteins and calcium. However, with the increasing incidence of sub-health, the nutrient ingredients in current cow milk cannot meet the need of human bodies, especially for DHA. The scientific name of DHA is docosahexaenoic acid, which is a polyunsaturated fatty acid, and is one of the essential fatty acids for human bodies. It has important physiological regulatory function and health care effect, and has various effects such as preventing cardiovascular and cerebrovascular diseases, promoting brain development, and improving memory.

Currently, the main means of increasing the DHA content in cow milk comprises a process of adding ingredients to the milk. The stability and mouth feel of the milk produced by such a process are both affected by the additives, which does not conform to the consumption trend of being pure natural and additive-free. Another process comprises adding a DHA-containing raw material to the feed for dairy cows, and the DHA-containing raw material will be converted into natural DHA through milk metabolism, thereby increasing the DHA content in the milk.

The currently existed feeding technologies comprise: feeding a coated algae powder to increase the DHA content. For example, CN111374226A discloses a feed additive, a feed containing the feed additive, and use thereof; CN105660520A discloses a feeding management method for cows; and CN104206701A discloses a dairy cow feed additive, use thereof and a DHA-containing dairy product obtained therefrom. Although the DHA content in the milks can be increased by the above methods, in practical processes, people do not

absorb the DHA in those milks well, with relatively low bioavailability, and a large amount of DHA is excreted, resulting in waste of resources and increased costs.

Therefore, how to facilitate the absorption of DHA in milks is still a technical problem to be solved by those skilled in the art.

SUMMARY

The technical problem to be solved by the present disclosure is how to overcome the defect of poor absorption of DHA from the milks in prior art. In view of this, the present disclosure provides a coated algae powder for adding to dairy cow feed, a method for preparing the coated algae powder for adding to dairy cow feed, a dairy cow feed, a method for feeding a dairy cow, and a dairy product.

Specifically, the present disclosure provides the following technical solutions.

In an aspect, the present disclosure provides a coated algae powder for adding to dairy cow feed, comprising a core material particle and an enteric coating layer coated on the core material particle, wherein a mass ratio of the core material particle to an enteric coating material in the enteric coating layer is 10: (2-4); and the core material particle comprises an algae powder, a binder and an emulsifier.

In some preferred embodiments, the coated algae powder for adding to dairy cow feed satisfies at least one of the followings conditions A-D:

A. the binder is at least one selected from the group consisting of starch, β-cyclodextrin, chitosan and sodium alginate; and/or the emulsifier is at least one selected from the group consisting of α-lauric acid monoglyceride and a sucrose fatty acid ester; and/or a mass ratio of the algae powder to the binder is 1: (0.0625-0.2); and/or the emulsifier comprises 0.1-0.3% of a total mass of the core material particle;

B. the enteric coating layer comprises an enteric coating material, a plasticizer and an antiadherent in a mass ratio of 1: (0.01-0.5): (0.02-0.5); the enteric coating material is at least one selected from the group consisting of polyacrylic resin II and polyacrylic resin III; the antiadherent is one or more of glycerol monostearate and glycerol monolaurate; and the plasticizer is one or more of polyethylene glycol and triethyl citrate;

C. the coated algae powder for adding to dairy cow feed further comprises an ethylcellulose coating layer between the core material particle and the enteric coating layer,

wherein a mass ratio of the ethylcellulose coating layer to the core material particle is (0.05-0.1): 10; and

D. a mass content of the algae powder in the coated algae powder is 30%-70%.

In some preferred embodiments, the core material particle further comprises an antioxidant; preferably, a mass ratio of the algae powder to the antioxidant is 10: (0.1-0.2); preferably, the antioxidant comprises at least one of vitamin C, vitamin A and magnolol.

In some preferred embodiments, the emulsifier comprises α-lauric acid monoglyceride and a sucrose fatty acid ester in a mass ratio of (1.5-2.5): 1; and/or the enteric coating material comprises polyacrylic resin III and polyacrylic resin II in a mass ratio of (0.6-1): (2-3.3).

In a second aspect, the present disclosure provides a method for preparing a coated algae powder for adding to dairy cow feed, comprising the steps of:

Granulating Step: adding a binder into water to prepare a binder solution, mixing the binder solution with an emulsifier and an algae powder to obtain a mixture, and homogenizing, drying and granulating the mixture to obtain particles; and

Enteric Coating Step: dissolving a raw material for an enteric coating layer into an ethanol aqueous solution to prepare an enteric coating solution, and coating the particles obtained in the Granulating Step with the enteric coating solution to obtain the coated algae powder; or

or comprising the steps of:

Granulating Step: adding a binder into water to prepare a binder solution, mixing the binder solution with an emulsifier and an algae powder to obtain a mixture, and homogenizing, drying and granulating the mixture to obtain particles;

Ethylcellulose Coating Step: dissolving ethylcellulose into an ethanol aqueous solution to prepare an inner coating solution, and coating the particles obtained in the Granulating Step with the inner coating solution to obtain ethylcellulose-coated particles; and

Enteric Coating Step: dissolving a raw material for an enteric coating layer into an ethanol aqueous solution to prepare an enteric coating solution, and coating the ethylcellulose-coated particles with the enteric coating solution to obtain the coated algae powder.

In some preferred embodiments, in the Granulating Step, an antioxidant is firstly mixed with the algae powder, then mixed with the binder solution, and the emulsifier is then added in

to the mixture; and/or the homogenizing is carried out at a temperature of 40-50°C and a pressure of 160-180 bar; and/or the drying is carried out at a temperature of 70-90°C; and/or in the Ethylcellulose Coating Step, a flow rate of the inner coating solution is in a range of 0.05-3.5 L/min, an inlet air temperature is in a range of 45-55°C, an outlet air temperature is in a range of 20-30°C, and a coating time is in a range of 1-2 h; and/or in the Enteric Coating Step, a flow rate of the enteric coating solution is in a range of 0.05-3.5 L/min, an inlet air temperature is in a range of 55-85°C, an outlet air temperature is in a range of 20-30°C, and a coating time is in a range of 3-4 h.

In a third aspect, the present disclosure provides a dairy cow feed comprising the coated algae powder for adding to dairy cow feed as described above or the coated algae powder for adding to dairy cow feed prepared by the method as described above, preferably, the dairy cow feed further comprising a concentrate and/or a roughage, wherein the concentrate comprises at least one of rumen-protected choline, rumen-protected glucose, rumen-protected lysine, yeast powder, a vitamin, a mineral, corn flour, and soybean meal; and the roughage comprises at least one of corn silage, oat hay, alfalfa hay, and forage grass.

In some preferred embodiments, the dairy cow feed comprises the coated algae powder, the concentrate and the roughage in a mass ratio of (0.2-0.5): (10-30): (40-60).

In a fourth aspect, the present disclosure provides a method for feeding a dairy cow, comprising feeding a dairy cow with the dairy cow feed as described above, wherein an intake of the coated algae powder is in a range of 200-500 g/day/cow, preferably, the dairy cow is a dairy cow in a lactation period of 10-210 days.

In a fifth aspect, the present disclosure provides a dairy product which is prepared by sterilizing a raw milk produced by a dairy cow which is fed by the method as described above; preferably, the dairy cow is continuously fed by the method as described above for 15-25 days.

The technical solutions of the present disclosure have the following advantageous effects.

1. The coated algae powder for adding to dairy cow feed provided in the present disclosure comprises a core material particle and an enteric coating layer coated on the core material particle, wherein a mass ratio of the core material particle to an enteric coating material in the enteric coating layer is 10: (2-4); and the core material particle comprises an algae powder, a binder and an emulsifier. The particle is released by means of the dissolution of the enteric coating layer in a small intestine, and the algae powder is dispersed in the

particle under the action of the emulsifier and the binder. By controlling the mass ratio of the core material particle to the enteric coating layer within the above range, the coated algae powder added into the dairy cow feed arrives at the small intestine together with other feeds, and then the algae powder contained is released at an appropriate rate, thereby significantly increasing the absorption of DHA by small intestine.

2. The coated algae powder for adding to dairy cow feed provided in the present disclosure increases the coating effect and the absorption and utilization rate of DHA by adding an antioxidant.

3. The inventors have carried out investigation and found that in the coated algae powder for adding to dairy cow feed provided in the present disclosure, when starch is used as the binder, magnolol is used as the antioxidant, a mixture of a sucrose fatty acid ester and α-lauric acid monoglyceride in a ratio of (1.5-2.5): 1 (especially 1:2) is used as the emulsifier, and a mixture of polyacrylic resin III and polyacrylic resin II in a ratio of (0.6-1): (2-3.3) (especially 0.8:2.3) is used as the enteric coating material, the combination of those components can further increase the absorption of DHA by small intestine.

4. The coated algae powder for adding to dairy cow feed provided in the present disclosure further comprises an ethylcellulose coating layer between the core material particle and the enteric coating layer, wherein a mass ratio of the ethylcellulose coating layer to the core material particle is (0.05-0.1): 10, and the ethylcellulose coating layer can have functions of preventing moisture and covering up the unpleasant smell of the algae powder.

5. The method for preparing a dairy product provided in the present disclosure preferably comprises sterilization by steam injection which can reduce the heating of the milk, and a degassing treatment before and after the sterilization which can effectively reduce oxygen in the liquid material. The oxidation of the DHA in the milk can be effectively reduced by reducing the heating and the oxygen content, preserving the fresh flavor of the milk.

6. The DHA content of the cow milk produced according to the present disclosure can be up to 10-40 mg/100g, and preferably 20-40 mg/100g.

DESCRIPTION OF EMBODIMENTS

Specifically, the present disclosure provides a coated algae powder for adding to dairy cow feed, comprising a core material particle and an enteric coating layer coated on the core

material particle, wherein a mass ratio of the core material particle to an enteric coating material in the enteric coating layer is 10: (2-4); and the core material particle comprises an algae powder, a binder and an emulsifier.

The coated algae powder for adding to dairy cow feed satisfies at least one of the followings conditions A-D:

A. the binder is at least one selected from the group consisting of starch, β-cyclodextrin, chitosan and sodium alginate; and/or the emulsifier is at least one selected from the group consisting of α-lauric acid monoglyceride and a sucrose fatty acid ester; and/or a mass ratio of the algae powder to the binder is 1: (0.0625-0.2); and/or the emulsifier comprises 0.1-0.3% of a total mass of the core material particle;

B. the enteric coating layer comprises an enteric coating material, a plasticizer and an antiadherent in a mass ratio of 1: (0.01-0.5): (0.02-0.5), the enteric coating material is at least one selected from the group consisting of polyacrylic resin II and polyacrylic resin III, the antiadherent is one or more of glycerol monostearate and glycerol monolaurate, and the plasticizer is one or more of polyethylene glycol and triethyl citrate;

C. the coated algae powder for adding to dairy cow feed further comprises an ethylcellulose coating layer between the core material particle and the enteric coating layer, wherein a mass ratio of the ethylcellulose coating layer to the core material particle is (0.05-0.1): 10; and

D. a mass content of the algae powder in the coated algae powder is 30%-70%.

Further, the core material particle further comprises an antioxidant; preferably, a mass ratio of the algae powder to the antioxidant is 10: (0.1-0.2); preferably, the antioxidant comprises at least one of vitamin C, vitamin A and magnolol.

Further, the emulsifier comprises α-lauric acid monoglyceride and a sucrose fatty acid ester in a mass ratio of (1.5-2.5): 1; and/or the enteric coating material comprises polyacrylic resin III and polyacrylic resin II in a mass ratio of (0.6-1): (2-3.3).

The present disclosure further provides a method for preparing a coated algae powder for adding to dairy cow feed, comprising the steps of:

Granulating Step: adding a binder into water to prepare a binder solution, mixing the binder solution with an emulsifier and an algae powder to obtain a mixture, and homogenizing, drying and granulating the mixture to obtain particles; and

Enteric Coating Step: dissolving a raw material for an enteric coating layer into an ethanol aqueous solution to prepare an enteric coating solution, and coating the particles obtained in the Granulating Step with the enteric coating solution to obtain the coated algae powder;

or comprising the steps of:

Granulating Step: adding a binder into water to prepare a binder solution, mixing the binder solution with an emulsifier and an algae powder to obtain a mixture, and homogenizing, drying and granulating the mixture to obtain particles;

Ethylcellulose Coating Step: dissolving ethylcellulose into an ethanol aqueous solution to prepare an inner coating solution, and coating the particles obtained in the Granulating Step with the inner coating solution to obtain ethylcellulose-coated particles; and

Enteric Coating Step: dissolving a raw material for an enteric coating layer into an ethanol aqueous solution to prepare an enteric coating solution, and coating the ethylcellulose-coated particles with the enteric coating solution to obtain the coated algae powder.

Further, in the Granulating Step, the antioxidant is firstly mixed with the algae powder, then mixed with the binder solution, and the emulsifier is then added in to the mixture; and/or the homogenizing is carried out at a temperature of 40-50°C and a pressure of 160-180 bar; and/or the drying is carried out at a temperature of 70-90°C; and/or in the Ethylcellulose Coating Step, a flow rate of the inner coating solution is in a range of 0.05-3.5 L/min, an inlet air temperature is in a range of 45-55°C, an outlet air temperature is in a range of 20-30°C, and a coating time is in a range of 1-2 h; and/or in the Enteric Coating Step, a flow rate of the enteric coating solution is in a range of 0.05-3.5 L/min, an inlet air temperature is in a range of 55-85°C, an outlet air temperature is in a range of 20-30°C, and a coating time is in a range of 3-4 h.

In the present disclosure, in the preparation of the enteric coating solution, the mass ratio of the raw material to the solution is 1: (5-15) (for example, 1:10). The ethanol aqueous solution used has an ethanol concentration of 75%-98% (for example, 95%).

The present disclosure also provides a dairy cow feed comprising any coated algae powder for adding to dairy cow feed as described above or the coated algae powder for adding to dairy cow feed prepared by the method as described above, preferably, the dairy cow feed

further comprising a concentrate and/or a roughage, wherein the concentrate comprises at least one of rumen-protected choline, rumen-protected glucose, rumen-protected lysine, yeast powder, a vitamin, a mineral, corn flour, and soybean meal; and the roughage comprises at least one of corn silage, oat hay, alfalfa hay, and forage grass.

Further, the dairy cow feed comprises the coated algae powder, the concentrate and the roughage in a mass ratio of (0.2-0.5): (10-30): (40-60).

The present disclosure further provides a method for feeding a dairy cow, comprising feeding a dairy cow with the dairy cow feed as described, wherein an intake of the coated algae powder is in a range of 200-500 g/day/cow, preferably, the dairy cow is a dairy cow in a lactation period of 10-210 days.

The present disclosure further provides a dairy product which is prepared by sterilizing a raw milk produced by a dairy cow which is fed by the method as described above; preferably, the dairy cow is continuously fed by the method as described above for 15-25 days.

Further, the algae powder is a *Schizochytrium* algae powder, which is a DHA-rich single feed produced by using *Schizochytrium sp.* as the raw material through conventional processes such as fermentation, separation and drying. The algae powder is preferably a *Schizochytrium* algae powder having a DHA content of 10 wt% - 30 wt%.

Examples

The technical solutions of the present disclosure will be clearly and completely described below. Obviously, the embodiments described are only a part of, but not all of the embodiments of the present disclosure. All other embodiments obtained by those skilled in the art based on the embodiments of the present disclosure, without inventive efforts, fall within the protection scope of the present invention.

In addition, the technical features involved in various embodiments of the present disclosure described below can be combined with each other, as long as they do not conflict with each other. Here, the *Schizochytrium* algae powder has a DHA content of 12 wt%. The polyacrylic resin II and the polyacrylic resin III are both pharmaceutically acceptable adjuvants. Specifically, the polyacrylic resin II is an anionic methacrylic copolymer obtained by copolymerizing methacrylic acid and methyl methacrylate in a ratio of 50:50, and the polyacrylic resin III is an anionic methacrylic copolymer obtained by copolymerizing

methacrylic acid and methyl methacrylate in a ratio of 35:65. Both of them are insoluble in a gastric juice, but only soluble in an intestinal juice, and mainly used as coating materials. The polyacrylic resin II and the polyacrylic resin III are described in detail in the Pharmacopoeia of the People's Republic of China. In each of the Examples and the Comparative Examples, the concentrate is soybean meal, and the roughage is alfalfa hay.

Example 1

(1) This example provides a coated algae powder for adding to dairy cow feed, wherein the algae powder percentage is > 60%, and its formulation and preparation are as follows:

Core material particles: 10 kg of *Schizochytrium* algae powder, 0.15 kg of magnolol, 1 kg of starch, 0.01 kg of α-lauric acid monoglyceride, and 0.005 kg of sucrose fatty acid ester.

Coating layer: inner coating: 0.09 kg of ethylcellulose; outer coating: 0.81 kg of polyacrylic resin III, 2.54 kg of polyacrylic resin II, 1.005 kg of glycerol monostearate, and 0.201 kg of triethyl citrate.

Preparation Method:

1) Preparation of the core material particles: *Schizochytrium* algae powder was mixed with magnolol; starch was dissolved in 10 kg water; the mixture of *Schizochytrium* algae powder and magnolol was added thereto, and then α-lauric acid monoglyceride and the sucrose fatty acid ester were added thereto; the resultant mixture was homogenized at 55°C and 170 bar; after being mixed uniformly, the mixture was dried at 80°C, granulated, and sorted by sieving (with a sieve of 80 meshes).

2) Preparation of the inner coating solution: ethylcellulose was fully dissolved in 95% ethanol in a mass ratio of 1:10 with stirring at 150 pm/min.

3) Preparation of the outer coating solution: the polyacrylic resin III, the polyacrylic resin II, glycerol monostearate and triethyl citrate were mixed to obtain a mixture, which was then fully dissolved in 95% ethanol in a mass ratio of 1:10 with stirring at 150 pm/min.

3) Coating process: the core material particles were sent to a coating device to complete the inner coating under the following conditions: an inner coating solution flow rate of 2 L/min, an inlet air temperature of 70°C, an outlet air temperature of 40°C, and a duration of 1.5 h; and then the particle with the inner coating was sent to the coating device to complete the outer coating under the following conditions: an outer coating solution flow rate of 2

L/min, an inlet air temperature of 70°C, an outlet air temperature of 40°C, and a duration of 4 h.

(2) This example further provides a dairy cow feed, and its formulation and preparation method are as follows:

Formulation: 2 kg of the coated algae powder of this example, 200 kg of the concentrate, and 300 kg of the roughage. Preparation Method: various raw materials were weighed according to the formulation and mixed uniformly.

(3) This example further provides a method for feeding a dairy cow, where the dairy cow in a lactation period of 150 days was continuously fed with the dairy cow feed of this example for 20 days, at an intake of the coated algae powder of about 239 g/day/cow.

(4) This example further provides a dairy product, which was prepared by using a milk produced by a dairy cow fed by the feeding method of this example as a raw material, through clarification, impurity removal, bacteria removal by micro-filtration, concentration through a RO membrane, sterilization by steam injection, and sterile filling.

The bacteria removal by micro-filtration was carried out with a ceramic membrane with a pore size of 1.4 μm at a temperature of 45°C. The concentration through a RO membrane resulted in a protein content up to 3.8 ± 0.02 g/100 g and a DHA content up to 35.8 ± 0.04 mg/100 g. The sterilization by steam injection was carried out at a temperature of 154°C for 0.25 s, where the preheating temperature was 78°C, the degassing vacuum before sterilization was -0.7 bar, and the degassing vacuum after sterilization was -0.85 bar.

Example 2

This example provides a coated algae powder for adding to dairy cow feed, a dairy cow feed, a method for feeding a dairy cow, and a dairy product. The raw materials and process conditions were substantially the same as those in Example 1, only except that in the formulation of the coated algae powder, “0.015 kg of α-lauric acid monoglyceride” was used in place of “0.01 kg of α-lauric acid monoglyceride and 0.005 kg of sucrose fatty acid ester” in Example 1.

Example 3

This example provides a coated algae powder for adding to dairy cow feed, a dairy cow

feed, a method for feeding a dairy cow, and a dairy product. The raw materials and process conditions were substantially the same as those in Example 1, only except that in the formulation of the coated algae powder, “1 kg of β-cyclodextrin” was used in place of “1 kg of starch” in Example 1.

Example 4

This example provides a coated algae powder for adding to dairy cow feed, a dairy cow feed, a method for feeding a dairy cow, and a dairy product. The raw materials and process conditions were substantially the same as those in Example 1, only except that in the formulation of the coated algae powder, “3.35 kg of polyacrylic resin III” was used in place of “0.81 kg of polyacrylic resin III and 2.54 kg of polyacrylic resin II” in Example 1.

Example 5

This example provides a coated algae powder for adding to dairy cow feed, a dairy cow feed, a method for feeding a dairy cow, and a dairy product. The raw materials and process conditions were substantially the same as those in Example 1, only except that in the formulation of the coated algae powder, “0.02 kg of α-lauric acid monoglyceride and 0.01 kg of the sucrose fatty acid ester” were used in place of “0.01 kg of α-lauric acid monoglyceride and 0.005 kg of sucrose fatty acid ester” in Example 1.

Comparative Example 1

This comparative example provides a coated algae powder for adding to dairy cow feed, a dairy cow feed, a method for feeding a dairy cow, and a dairy product. The raw materials and process conditions were substantially the same as those in Example 1, only except that in the formulation of the coated algae powder, “0.25 kg of polyacrylic resin III and 0.77 kg of polyacrylic resin II” were used in place of “0.81 kg of polyacrylic resin III and 2.54 kg of polyacrylic resin II” in Example 1.

Comparative Example 2

This comparative example provides a coated algae powder for adding to dairy cow feed, a dairy cow feed, a method for feeding a dairy cow, and a dairy product. The raw materials and

process conditions were substantially the same as those in Example 1, only except that in the formulation of the coated algae powder, “1.35kg of polyacrylic resin III and 1.23kg of polyacrylic resin II” were used in place of “0.81 kg of polyacrylic resin III and 2.54 kg of polyacrylic resin II” in Example 1.

Comparative Example 3

This comparative example provides a dairy cow feed, a dairy product prepared from a milk produced by a dairy cow fed with the feed, and a preparation method therefor, which were substantially the same as those in Example 1, only except that no coated algae powder was added to the dairy cow feed.

Comparative Example 4

This comparative example provides a dairy cow feed, a dairy product prepared from a milk produced by a dairy cow fed with the feed, and a preparation method therefor, which were substantially the same as those in Example 1, except that the algae powder added to the dairy cow feed was not treated by a coating process, that is, the algae powder was not coated, and meanwhile, the mass of the algae powder added was adjusted to 4 kg.

Experiment Example 1

The DHA contents of the dairy products obtained in the Examples and Comparative Examples were determined according to the Standard of GB 5413.27, and the results are as shown in the table below.

Table 1. The DHA contents in dairy products

Items	DHA Contents mg/100 g
Example 1	35.4 ± 0.01
Example 2	30.4 ± 1.62
Example 3	33.7 ± 0.04
Example 4	32.9 ± 0.07
Example 5	35.1 ± 0.04
Comparative Example 1	21.4 ± 0.08
Comparative Example 2	19.6 ± 0.05
Comparative Example 3	Not Detected
Comparative Example 4	22.1 ± 0.03

Conclusion: the DHA content in Comparative Example 3 is significantly lower than those in other groups, indicating that DHA is mainly derived from the conversion of DHA algae oil of the feed in the cow's body, and if the feed does not contain algae powder, then the DHA content in the milk will be very low (not detected). The DHA contents in the dairy products in Examples 1-5 of the present disclosure are significantly increased as compared to those in Comparative Examples 1-4, and Examples 1 and 5 have the best effects.

Experiment Example 2

6-8 week old female rats having a body weight of 350-400 g were used, and randomly divided into three groups, with 10 rats in each group. The rats in Experimental Group 1 were given 45 mL/kg of the dairy product of Example 1 through intragastric administration at one time. The rats in Control Groups 1 and 2 were respectively given exogenous DHA supplemented milk (with a DHA content of 59.1 ± 0.02 mg/100 g) and DHA dietary supplement (with a DHA content of 944 ± 0.07 mg/100 g) through intragastric administration at one time, with a dosage of 45 mL/kg for Control Group 1 and a dosage of 50 g/kg for Control Group 2. Here, the exogenous DHA supplemented milk was a milk produced by a dairy cow fed with a common feed, which was supplemented with a DHA stock solution and processed by a process the same as that for the dairy product in Example 1. Here, the DHA stock solution was provided by Xiamen Huison Biotech Co., Ltd. The DHA dietary supplement was prepared by adding a DHA stock solution to a rat diet, wherein the DHA stock solution was provided by Xiamen Huison Biotech Co., Ltd., and the feed was provided by Beijing Keao Xieli Feed Co., Ltd. Based on the DHA Contents, the rats in Experimental Group 1, Control Group 1 and Control Group 2 were fed in a ratio of 1:1.67:29.63.

Feces were collected using a metabolic cage 1-2 days before the intragastric administration. Blood was collected before the intragastric administration, and centrifuged. The DHA contents in the feces and blood were measured as baseline data. Feces were collected in batch for 24 h. The subject animals were finally intragastrically administered, and feces were collected with a metabolic cage. Blood samples were collected respectively at different time points of 0 h, 1 h, 2 h, 4 h, 8 h, 12 h, 16 h, and 24 h after the intragastric administration, and were centrifuged to collect serum. The DHA contents in the feces and

blood were respectively determined by an LC-MS biological sample analysis method. The pharmacokinetic parameters were calculated from the DHA contents in the blood, mainly including the maximum DHA concentration (C_{max}) and the DHA concentration within 24 hours (AUC). The average DHA excretion rate was calculated from the DHA contents in the feces, where the average DHA excretion rate = the DHA content / the DHA feeding amount. The results are as shown in Table 2.

Table 2

Items	C_{max} (Maximum Blood Concentration)	$AUC_{(0-t)}$ (Average Area Under the Curve)	Average DHA Excretion Rate
Experimental Group 1	263.5880 ± 114.9614	2667.0910 ± 1366.4233	0.0906 ± 0.0992
Control Group 1	129.0139 ± 33.6274	1742.3093 ± 498.4256	0.1866 ± 0.0777
Control Group 2	26.7979 ± 5.9742	218.8435 ± 49.6812	0.2247 ± 0.0634

Conclusion: as compared to Control Groups 1 and 2, the blood concentration and the AUC in Experimental Group 1 of the present disclosure are obviously increased, and the average excretion rate was obviously decreased, indicating that the absorption effect of DHA in the milk for the rats in Experimental Group 1 is obviously better than that in the Control Groups, and the DHA in the milk produced by the dairy cow fed with the *Schizochytrium* algae powder is more easily absorbed than the exogenous supplemented DHA or the DHA supplement.

Obviously, the above Examples are only intended to clearly illustrate the present disclosure, but not intended to limit the embodiments. Other different forms of changes or modifications can be made by those skilled in the art based on the above description. For example, the shape of a recess may have various options, or may be customized depending on the wishes of the consumers. All the embodiments have not to and cannot be provided exhaustively. Apparent changes or modifications derived therefrom fall within the protection scope of the present invention.

WHAT IS CLAIMED IS:

1. A coated algae powder for adding to dairy cow feed, comprising a core material particle and an enteric coating layer coated on the core material particle, wherein a mass ratio of the core material particle to an enteric coating material in the enteric coating layer is 10: (2-4); and the core material particle comprises an algae powder, a binder and an emulsifier.

2. The coated algae powder for adding to dairy cow feed according to claim 1, wherein the coated algae powder for adding to dairy cow feed satisfies at least one of the followings conditions A-D:

A. the binder is at least one selected from the group consisting of starch, β-cyclodextrin, chitosan and sodium alginate; and/or the emulsifier is at least one selected from the group consisting of α-lauric acid monoglyceride and a sucrose fatty acid ester; and/or a mass ratio of the algae powder to the binder is 1: (0.0625-0.2); and/or the emulsifier comprises 0.1-0.3% of a total mass of the core material particle;

B. the enteric coating layer comprises an enteric coating material, a plasticizer and an antiadherent in a mass ratio of 1: (0.01-0.5): (0.02-0.5); the enteric coating material is at least one selected from the group consisting of polyacrylic resin II and polyacrylic resin III; the antiadherent is one or more of glycerol monostearate and glycerol monolaurate; and the plasticizer is one or more of polyethylene glycol and triethyl citrate;

C. the coated algae powder for adding to dairy cow feed further comprises an ethylcellulose coating layer between the core material particle and the enteric coating layer, wherein a mass ratio of the ethylcellulose coating layer to the core material particle is (0.05-0.1) : 10; and

D. a mass content of the algae powder in the coated algae powder is 30%-70%.

3. The coated algae powder for adding to dairy cow feed according to claim 1 or 2, wherein the core material particle further comprises an antioxidant; preferably, a mass ratio of the algae powder to the antioxidant is 10: (0.1-0.2); preferably, the antioxidant comprises at least one of vitamin C, vitamin A and magnolol.

4. The coated algae powder for adding to dairy cow feed according to claim 1 or 2, wherein the emulsifier comprises α-lauric acid monoglyceride and a sucrose fatty acid ester in a mass ratio of (1.5-2.5) : 1; and/or the enteric coating material comprises polyacrylic resin III and polyacrylic resin II in a mass ratio of (0.6-1): (2-3.3).

5. A method for preparing a coated algae powder for adding to dairy cow feed, comprising the steps of:

Granulating Step: adding a binder into water to prepare a binder solution, mixing the binder solution with an emulsifier and an algae powder to obtain a mixture, and homogenizing, drying and granulating the mixture to obtain particles; and

Enteric Coating Step: dissolving a raw material for an enteric coating layer into an ethanol aqueous solution to prepare an enteric coating solution, and coating the particles obtained in the Granulating Step with the enteric coating solution to obtain the coated algae powder;

or comprising the steps of:

Granulating Step: adding a binder into water to prepare a binder solution, mixing the binder solution with an emulsifier and an algae powder to obtain a mixture, and homogenizing, drying and granulating the mixture to obtain particles;

Ethylcellulose Coating Step: dissolving ethylcellulose into an ethanol aqueous solution to prepare an inner coating solution, and coating the particles obtained in the Granulating Step with the inner coating solution to obtain ethylcellulose-coated particles; and

Enteric Coating Step: dissolving a raw material for an enteric coating layer into an ethanol aqueous solution to prepare an enteric coating solution, and coating the ethylcellulose-coated particles with the enteric coating solution to obtain the coated algae powder.

6. The method for preparing a coated algae powder for adding to dairy cow feed according to claim 5, wherein: in the Granulating Step, an antioxidant is firstly mixed with the algae powder, then mixed with the binder solution, and the emulsifier is then added in to the mixture; and/or the homogenizing is carried out at a temperature of 40-50°C and a pressure of 160-180 bar; and/or the drying is carried out at a temperature of 70-90°C; and/or in the

Ethylcellulose Coating Step, a flow rate of the inner coating solution is in a range of 0.05-3.5 L/min, an inlet air temperature is in a range of 45-55°C, an outlet air temperature is in a range of 20-30°C, and a coating time is in a range of 1-2 h; and/or in the Enteric Coating Step, a flow rate of the enteric coating solution is in a range of 0.05-3.5 L/min, an inlet air temperature is in a range of 55-85°C, an outlet air temperature is in a range of 20-30°C, and a coating time is in a range of 3-4 h.

7. A dairy cow feed comprising the coated algae powder for adding to dairy cow feed according to any one of claims 1-4 or the coated algae powder for adding to dairy cow feed prepared by the method according to claim 5 or 6, preferably, the dairy cow feed further comprising a concentrate and/or a roughage, wherein the concentrate comprises at least one of rumen-protected choline, rumen-protected glucose, rumen-protected lysine, yeast powder, a vitamin, a mineral, corn flour, and soybean meal; and the roughage comprises at least one of corn silage, oat hay, alfalfa hay, and forage grass.

8. The dairy cow feed according to claim 7, comprising the coated algae powder, the concentrate and the roughage in a mass ratio of (0.2-0.5): (10-30): (40-60).

9. A method for feeding a dairy cow, comprising feeding the dairy cow with the dairy cow feed according to claim 7 or 8, wherein an intake of the coated algae powder is in a range of 200-500 g/day/cow, preferably, the dairy cow is a dairy cow in a lactation period of 10-210 days.

10. A dairy product which is prepared by sterilizing a raw milk produced by a dairy cow which is fed by the method according to claim 9; preferably, the dairy cow is continuously fed by the method according to claim 9 for 15-25 days.