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(54) **COMPOSITION GELATINEUSE DE POISSON UTILISEE
COMME INGREDIENT DANS DES COMPRIMES**

(54) **FISH GELATINOUS COMPOSITION FOR USE AS AN
INGREDIENT IN TABLETS**

(57) Particulate composition comprising one or more physiologically active substances and a fish gelatinous protective colloid containing at least 50 % by weight of fish gelatine, wherein the fish gelatine is at least partly composed of fish gelatine having a bloom strength of above 100, and wherein the composition is obtainable by a particle forming spraying or double emulsifying method.

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<p>(21) International Application Number: PCT/DK99/00446</p> <p>(22) International Filing Date: 23 August 1999 (23.08.99)</p> <p>(30) Priority Data: PA 1998 01065 25 August 1998 (25.08.98) DK</p> <p>(71) Applicant (for all designated States except US): BASF HEALTH & NUTRITION A/S [DK/DK]; P.O. Box 236, Malmparken 5, DK-2750 Ballerup (DK).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): MOHR HANSEN, Morten [DK/DK]; Callunavej 24, DK-3450 Allerød (DK). VILSTRUP, Per [DK/DK]; Skolevængets Allé 7, DK-3520 Farum (DK). MUSAEUS JENSEN, Nina [DK/DK]; Højsgaards Allé 47, DK-2900 Hellerup (DK).</p> <p>(74) Agent: HOFMAN-BANG A/S; Hans Bekkevolds Allé 7, DK-2900 Hellerup (DK).</p>	<p>(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report.</i></p> <p>(88) Date of publication of the international search report: 2 June 2000 (02.06.00)</p>	
<p>(54) Title: FISH GELATINOUS COMPOSITION FOR USE AS AN INGREDIENT IN TABLETS</p> <p>(57) Abstract</p> <p>Particulate composition comprising one or more physiologically active substances and a fish gelatinous protective colloid containing at least 50 % by weight of fish gelatine, wherein the fish gelatine is at least partly composed of fish gelatine having a bloom strength of above 100, and wherein the composition is obtainable by a particle forming spraying or double emulsifying method.</p>		

Fish gelatinous composition for use as an ingredient in tablets

The present invention relates to a particulate
5 composition comprising one or more physiologically active substances and a gelatinous protective colloid.

Physiologically active substances are enclosed in protective colloids, such as gelatines, i.a. to protect
10 them from influences inflicted during storage, transport, handling and use, e.g. influences from oxygen, moisture and light radiation and physical influences, in order to avoid physical and chemical decomposition of the substance. Furthermore, a protective colloid may be used
15 to prevent the active substance from reacting with other substances present in the composition or with substances with which it may come into contact during use. Also, a protective colloid is used to transform liquids and other substances, which are difficult to handle and process,
20 e.g. due to stickiness, into a solid form suitable for handling and processing during use, such as a powder of microcapsules.

Fish gelatine is used for dietary applications, where
25 mammalian gelatines are unacceptable on religious grounds. Fish gelatine is available as Kosher grade.

EP-A1-0 346 879 discloses a composition comprising a solid particulate water insoluble drug coated with a
30 solid fish gelatine coating, wherein the composition is produced by simple coacervation of the fish gelatine. The fish gelatine is soluble at 5-10 °C.

WO 96/20612 discloses a method of forming
35 microencapsulated food or flavor capsules as well as capsules produced by the method. The method includes

forming a mixture of a warm water fish gelatine and the food or flavor particles in aqueous media, and microencapsulating the particles with the gelatine at a temperature above 16-27 °C by complex coacervation to form microencapsulated capsules, and optionally separating the capsules. Preferably, the warm water fish gelatine used has a bloom of from about 150 to about 300.

Simple and complex coacervation techniques require the use of relatively low concentration solutions of gelatine, and hence the particles formed from the solutions have a relatively high content of water, which is difficult and expensive to remove. Both dried and non-dried particles produced by coacervation have a low ability to resist mechanical influences.

GB-1 200 906 discloses a process for preparing a composition in dry, particulate, free-flowing form and comprising cold water soluble or dispersable gelatine and fat-soluble vitamins, the process comprising partially hydrolysing a gelatine solution by treatment with base or acid at a temperature of 40 to 95 °C, neutralising the gelatine solution and finely dispersing therein the fat-soluble vitamin or vitamins, comminuting the emulsion to particles and solidifying the particles. The starting gelatine may be low or high bloom gelatine.

US-A-4,670,247 discloses a process for preparing fat-soluble vitamin beadlets including forming an aqueous emulsion of a fat-soluble vitamin-active material and a protective colloid comprising gelatine and a reducing sugar, and converting said emulsion to a dry particulate form, wherein the dry particulate form is subjected to heat treatment in order to obtain a cross-linking between the sugar and the gelatine molecules. The gelatine may be any gelatine having bloom of between about 0 and 300.

EP-B1-0 347 751 discloses a stable, cold water-
dispersable powder preparation of fat-soluble substances,
which are enveloped in a protective colloid in the form
5 of fish gelatine. The fish gelatine used is "Norland
HiPure Liquid Gelatin", which is a zero bloom gelatine.

The prior art fish gelatinous compositions may be used as
additives for a wide range of foods. However, the prior
10 art compositions suffer from the drawback that they are
not suitable for use as an ingredient in tablets, since
particles formed have insufficient strength to resist the
mechanical influence to which it is subjected during
tableting.

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US-A-4 892 889 discloses a process for making a directly-
compressible vitamin powder utilising a conventional
spray-drying method. The process comprises the steps of
(A) combining a fat-soluble vitamin, a gelatine having a
20 bloom number between 30 and 300, a water-soluble
carbohydrate, and water to form a mixture, and (B) spray-
drying the mixture in a conventional spray-drier to form
a powder, wherein the content of carbohydrate is
sufficient to prevent extrusion of the vitamin.

25

US-A-2 824 807 discloses a method of spray drying
solutions of gelatine containing e.g. vitamins comprising
the steps of atomising the solution in a cool air zone at
a temperature of 0-200 °F to form droplets and drying of
30 the droplets in a drying zone at a temperature of 250-
1000 °F to effect solidifying of the droplets.

US-A-4 519 961 discloses a process for pulverising
substances, which are sensitive to oxidation, e.g.
35 vitamins, comprising the steps of providing a dispersion
of the oxidation-sensitive substance in an aqueous

solution containing a film-forming colloid and a
saccharide, atomising said dispersion within the spraying
zone of a spraying tower to form discrete particles while
contacting the particles with a hydrophobic spraying
5 assistant at a temperature, at which the colloid does not
solidify/gelatinise, and drying the particles laden with
the spraying assistant in a fluid bed to solidify them.

Thus, the technical problem addressed by the present
10 invention is to provide a gelatinous composition, which
is Kosher acceptable, and which is suitable for use as an
ingredient in tablets.

The said technical problem is solved by the particulate
15 composition of the invention comprising one or more
physiologically active substances and a fish gelatinous
protective colloid containing at least 50 % by weight of
fish gelatine, wherein the fish gelatine is at least
partly composed of fish gelatine having a bloom strength
20 of above 100, and wherein the composition is obtainable
by a particle forming spray congelation method or a
double emulsifying method.

It has surprisingly been found that particles, which are
25 prepared using fish gelatine having a bloom strength of
above 100 and using as a particle forming method either a
spray congelation method or a double emulsifying method,
have physical properties with respect to resistance to
mechanical influences, such as pressure, shear force and
30 impact, which are far superior to those of the prior art
particles.

Thus, the present invention is based on the recognition
that it is possible to produce a fish gelatinous
35 composition with high mechanical strength, and that such
a high strength composition may be used as an ingredient

in tablets, such as nutritional supplement tablets.
Therefore, the present invention has provided a
possibility of producing tablets containing
physiologically active substances protected by fish
5 gelatine.

Furthermore, the present invention has provided a
possibility of producing a Kosher and Halal acceptable
composition for use as an ingredient in tablets.
10

When the mechanical strength of gelatinous particles is
insufficient to resist the mechanical influences
inflicted during tableting, the particles will decompose
leading to extrusion of the active substance. Such
15 extrusion results in discolouring of the tablets, which
is not acceptable. Also, such extrusion leads to the
decomposition of the active substance, especially if the
active substance is sensitive to oxidation or may react
with other ingredients of the tablets.
20

A further advantage of the composition of the present
invention is that the technical problems of discolouring
of the tablets made therefrom and oxidation of the active
substance may be avoided.
25

Moreover, it has further been shown that the particulate
composition of the invention has improved storage
stability compared to prior art products. It is believed
that this fact is also due to the improved mechanical
30 strength of the particles resulting in a reduced
degradation of the active ingredient during storage.

In a preferred embodiment of the invention the fish
gelatinous protective colloid contains at least 70 % by
35 weight, preferably at least 90 % by weight, of fish
gelatine.

In a preferred embodiment of the invention, the fish gelatine contains at least 50 % by weight, more preferably at least 70 % by weight, and most preferably at least 90 % by weight, of fish gelatine having a bloom strength of above 100.

The fish gelatinous protective colloid may consist entirely of fish gelatine having a bloom strength of above 100 or it may be a mixture of such a fish gelatine and any other fish gelatine including a gelatine having a bloom strength of below 100. The fish gelatines, regardless of bloom strength, may be partly hydrolysed.

In a preferred embodiment of the invention the fish gelatine has a bloom strength of 100-300, preferably 120-300, more preferably 140-300, more preferably 160-280, more preferably 180-260, and most preferably 200-240.

Preferably, the fish gelatine has a gelation temperature of 10-30 °C, more preferably 11-29 °C, more preferably 12-28 °C, more preferably 13-27 °C, more preferably 14-26 °C, more preferably 14-24 °C, more preferably 15-23 °C, more preferably 16-22 °C, and most preferably 17-21°C.

In addition to the fish gelatine, the fish gelatinous protective colloid may comprise exudates, such as gum arabic, tragacanth, gum karaya and gum ghatti; extracts from seaweed, such as agar, alginate, carrageenan and furcellaran; extracts from plants, such as pectin, arabinogalactan and vegetable proteinaceous hydrocolloids; extracts from marine and terrestrial animals, such as kosher gelatines, casein and caseinate; flours from seeds, such as guar, locust bean and soya bean; proteins from seeds, such as soya bean protein; flours from cereals, such as starches and

microcrystalline cellulose; biosynthetic or fermentation
derived hydrocolloids, such as dextran, xanthan, and
curdlan; chemically modified hydrocolloids, such as
cellulose derivatives, including methyl cellulose,
5 carboxymethylcellulose and hydroxypropyl-cellulose, and
other derivatives, including modified starches and low
methoxyl pectin; synthetic hydrocolloids, such as
polyvinyl pyrrolidon, polyvinyl alcohol, carboxyvinyl
polymers etc. Also reference is made to R. A. Morton,
10 "Fat Soluble Vitamins", Intern. Encyclopedia of Food and
Nutrition, Vol. 9, Pergamon Press, pp. 128-131, 1970,
which is included herein by this reference. Preferred
additional colloids included in the fish gelatinous
protective colloid are gum arabic, vegetable
15 proteinaceous hydrocolloids, kosher gelatines, casein,
caseinate, soya bean protein, modified starches and
mixtures thereof.

In addition to the function as protective agent the fish
20 gelatinous protective agent also functions as an
emulsifier. However, the composition of the invention
may comprise further emulsifiers, e.g. ascorbyl
palmitate, mono- and diglycerides of fatty acids and
derivatives thereof, and lecithin.

25 The composition of the invention may include further
components conventionally used in gelatinous
compositions, such as antioxidants, e.g. t-
butylhydroxyloluene (BHT), t-butylhydroxyanisole (BHA),
30 ascorbic acid, ascorbyl palmitate, sodium ascorbate,
tocopherols, TBHQ, ethoxyquine, propyl gallate, and
extracts from herbs, i.a. rosemary extract; powdering
agents, e.g. starches, modified starches, tri-calcium
phosphate, lactose, mannitol, ethylcellulose, coagulated
35 albumin, hardened gelatine, casein, stearat-Ca, stearat-
Na, metal soaps, hydrogenated ricinus oil, polyoxide,

talcum, waxes and silicates; anti-caking agents, e.g. tri-calcium phosphate and silicates, i.a. silicon dioxide and sodium aluminium silicate; plasticisers, e.g. carbohydrates and carbohydrate alcohols, examples of
5 which are saccharose, glucose, fructose, lactose, invert sugar, sorbitol, mannitol, maltodextrin, glycerin and mixtures thereof, preferably saccharose, lactose, maltodextrin and mixtures thereof.

10 Following gelation, the fish gelatine of the composition of the invention may be cross-linked, which may be obtained by thermal and/or chemical treatment of the gelatine in the presence of a carbohydrate or an aldehyde or a combination thereof, and/or by enzymatic treatment.
15 The cross-linking may be carried out by any conventional method therefore.

Fish gelatine having a bloom strength of above 100 originates from a wide variety of warm water fish, e.g.
20 tuna and tilapia. Examples of suitable commercial products are gelling fish gelatines from Croda Colloids Ltd., England, and ROUSSELOT[®] FG, e.g. ROUSSELOT[®] 200 FG 30 from, SKW Biosystems, France.

25 The physiologically active substances of the present invention may be any substance, which during storage, transport, handling and use requires protection, e.g. from oxygen, moisture, light radiation, and physical influences, in order to avoid physical and chemical
30 decomposition of the substance. Furthermore, a protective colloid may be used to prevent the active substance from reacting with other substances present in the composition or with substances with which it may come into contact during use. Also, a protective colloid is used to
35 transform liquids and other substances, which are difficult to handle and process, e.g. due to stickiness,

into a solid form suitable for handling and processing during use, such as a powder of microcapsules.

5 Examples of physiologically active substances suitable for use in the present invention are fat-soluble substances, such as vitamins, fatty acids, e.g. mono- and polyunsaturated fatty acids, which may be added in the form of fish oil containing i.a. the (n-3) fatty acids docosaheptaenoic acid (DHA) and eicosapentaenoic acid
10 (EPA), and in the form of evening primrose oil and castor oil containing i.a. the (n-6) fatty acid γ -linolenic acid, carotenoides, e.g. β -caroten, lutein, lycopene, β -cryptoxanthin and zeaxanthin, oils and fats; water-soluble substances, such as vitamin C; enzymes, e.g.
15 amylase; pharmaceuticals, such as griseofulvin, ibuprofen, benzodiazepines, phenacetin, hormones and paracetamol; and other nutritional supplements, such as minerals.

20 The composition of the invention has the form of particles, such as a powder of microcapsules. The particles have the structure of a continuous matrix of the fish gelatinous protective colloid enclosing a number, usually several, cores of physiologically active
25 substances. The particulate composition of the invention is preferably free-flowing.

The present invention further relates to a process for preparing a particulate fish gelatinous composition, the
30 process comprising the steps of providing an aqueous solution of a fish gelatinous protective colloid at a temperature of above the gelation temperature of the said colloid, the said colloid containing at least 50 % by weight of fish gelatine, which is at least partly
35 composed of fish gelatine having a bloom strength of above 100, adding to the said solution one or more

5 physiologically active substances to obtain an aqueous mixture, subjecting the aqueous mixture to a spray
congelation method or a double emulsifying method to
transform the aqueous mixture to particles and to effect
a gelation of the particles by cooling them to a
temperature of below their gelation temperature to obtain
gelled particles, and removing any excess water from the
gelled particles to obtain dried particles.

10 The particles prepared with the method of the invention
has improved mechanical strength compared to the prior
art particles.

15 In both a spray congelation method and a double
emulsifying method, a gelation of the particles formed is
effected by lowering the temperature to below their
gelation temperature. This is contrary to other types of
spraying processes, such as conventional spray drying,
wherein the droplets formed in the spraying are not
20 gelatinised but solidified by drying. It is believed
that such a gelation of the particles contribute to the
improvement of the mechanical strength of the particles
obtained with the method of the invention.

25 Any water soluble additional ingredient is preferably
dissolved together with the gelatine. Alternatively,
additional ingredients are added together with the
physiologically active substance.

30 The removal of any excess water may be carried out by any
conventional method therefore, such as filtration, tray
drying, fluid bed drying, preferably in combination with
the spray congelation method in a suitable spraying
tower. Drying in a fluid bed is preferred.

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Spray congelation

In connection with the present invention the expression "a spray congelation method" includes any spraying
5 technique, wherein the particles formed in the spraying are substantially gelatinised by lowering of the temperature to below the gelation temperature of the particles prior to drying.

10 The spraying method may be carried out using any conventional equipment therefore, e.g. rotary atomisers, pressure nozzles, pneumatic nozzles and sonic nozzles.

In a spray congelation process, a suspension containing a
15 hydrocolloid having a temperature higher than the gelling/melting point of the emulsion, i.e. from about 30 ° C to about 95 °C, and a viscosity of preferably between 50 and 600 mPa.s, is preferably sprayed using an atomizing nozzle or an atomizing wheel into a spraying
20 chamber, wherein the temperature is from 0 ° to about 40 °C, thereby forming microcapsules of gelatinised hydrocolloid.

A powdery spraying excipient is preferably blown into the
25 spraying chamber in order to prevent agglomeration of the gelatinized microcapsules and to prevent adherence to the chamber wall. The spraying excipient is preferably supplied in an amount of from 0.5 to 50 percent by weight based on the weight of the final product.

30 The microcapsules are transferred to a fluid bed, wherein they may be dried to a residual water content of between 0 and 10 % (preferably from 2 to 5 %) and in which excessive spraying excipient is separated. The drying air
35 temperature is preferably from about 0 ° to about 60 °C.

Double emulsifying method

In connection with the present invention, the expression "double emulsifying method" means any method comprising the steps of forming a first, aqueous mixture of gelatine and a physiologically active substance, distributing the said first aqueous mixture as particles in a water immiscible medium to form a second mixture, and cooling the second mixture to a temperature of below the gelation temperature of the particles. The distribution of the first, aqueous medium in the water immiscible medium may be carried out by any conventional method therefore, such as spraying, stirring and liquid stream catch. The water immiscible medium may e.g. be mineral oil, castor oil or propylene glycol.

The present invention further relates to a tablet comprising conventional excipients and a composition comprising one or more physiologically active substances and a gelatinous protective colloid. The tablet of the invention is characterized in that the gelatinous protective colloid contains at least 50 % by weight of fish gelatine, which is at least partly composed of fish gelatine having a bloom strength of above 100, and that the composition is obtainable by a particle forming spray congelation method or a double emulsifying method.

Definitions

As used herein the expression "gelation temperature" means setting point as determined by the test method BS 757:1975, item 10. In the said standard test a 10 % solution of air dry gelatine is cooled from 45 °C to 20 °C. If the gelation temperature of the gelatine to be tested is less than 20 °C, the temperature is of course lowered until gelation is observed.

In connection with the present invention the expression "bloom strength" means gel strength as determined in the test method BS 757:1975, item 7.

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The expression "aqueous mixture" means an aqueous solution, emulsion or suspension.

In the following the invention will be described in further detail with reference to the examples.

10

METHODS:

Extractability of Vitamin A before compression

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Principle:

A microcapsule powder containing Vitamin A as active substance is contacted with ether to extract active substance, and the amount extracted is determined by spectrophotometry. The total amount of active substance in the microcapsules is also determined by dissolving the microcapsules in water by heating, extracting the active substance with ether and measuring the content of active substance by spectrophotometry. Results are expressed as the ratio of extracted active substance to total active substance. The level of active substance, which may be extracted from the microcapsule powder, expresses the ability of the microcapsules to protect the active substance.

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Procedure:

1. Approximately 1 g of Vitamin A-containing microcapsule powder is weighed (2 decimals) and transferred quantitatively to a 100 ml measuring flask.
2. Approximately 50 ml ether is added, and the flask is shaken 2 minutes by hand. The flask is filled with ether

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to the 100 ml mark and the content of the flask is mixed. The solution is allowed to settle for 5 minutes.

3. A sample is taken from the solution, and the extinction at 326 nm (maximum) is measured using

5 isopropanol as a reference. The extinction should be in the range of 0.200 to 0.900. If this is not the case, the sample is diluted with isopropanol and measured again. In case of dilution, the measurement should be made within 15 minutes from the dilution with isopropanol.

10

Extractability of Vitamin A after compression

Principle:

A microcapsule powder containing Vitamin A as active

15 substance is subjected to a certain pressure in a pre-determined period of time to produce a tablet. The tablet is contacted with ether to extract active substance, and the amount extracted is determined by spectrophotometry. The total amount of active substance in the microcapsules

20 is also determined by dissolving the microcapsules in water by heating, extracting the active substance with ether and measuring the content of active substance by spectrophotometry. Results are expressed as the ratio of extracted active substance to total active substance. The

25 level of active substance, which may be extracted from the tablet, expresses the ability of the microcapsules to protect the active substance following a compression step.

Procedure:

1. Approximately 0.2 g of Vitamin A-containing microcapsule powder is weighed and placed in a cell between two pistons and subjected to a pressure of 1250 bar for five seconds to form a tablet.

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2. The tablet is transferred to a weighed paper, weighed (4 decimals) and transferred quantitatively to a 200 ml measuring flask.

3. Approximately 100 ml petroleum ether is added, and the flask is subjected to sonification for 10 minutes. The flask is filled with petroleum ether to the 200 ml mark and the content of the flask is mixed. The solution is allowed to stand for 5 minutes.

4. A 5 ml sample is taken from the solution and diluted with isopropanol to a concentration of approx. 10 IU Vitamin A/ml, and the extinction at 326 nm (maximum) is measured using isopropanol as a reference. The extinction should be in the range of 0.200 to 0.900. If this is not the case, the sample is further diluted with isopropanol and measured again. The measurement should be made within 15 minutes of the dilution with isopropanol.

Comparative Example 1:

2438 grams of fish gelatine (Norland Dry Non Gelling Fish Gelatine, lot # 7154 NGKD, 0 bloom, from Norland Products Inc., USA) and 2976 grams of saccharose was dissolved in 4.0 l demineralized water at 65°C in an emulsion tank. A mixture of 2000 grams of Vitamin A Acetate 2.8 million IU/g and 140 g t-butyl hydroxytoluene (BHT) was heated to 65°C in a beaker. The oily mixture was added to the aqueous solution of gelatine and saccharose under slow agitation, which was then vigorously agitated for 40 minutes at 65°C. Then the final emulsion was diluted with 2.75 l demineralized water to a viscosity of 168 cP. The mean oil droplet size was measured to be 0.28 µm.

(0.168 Pa·s)

Subsequently the emulsion was atomized in a spray tower, where the droplets were covered with starch and dried. Only part of the emulsion was sprayed. This yielded after screening on mesh 30/120 approx. 1 kg of a particulate product with a potency of 570,000 IU/g, an extractability

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before compression of 0.1% of the total Vitamin A content and an extractability after compression of 35.6% of the total vitamin A content.

5 Comparative Example 2

2438 grams of fish gelatine (200 bloom, Rousselot 200 FG 30 from SKW Biosystems, France) and 2976 grams of saccharose were dissolved in 6.0 l demineralized water at 10 65°C in an emulsion tank and stored overnight to remove trapped air bubbles. A mixture of 2000 grams of Vitamin A Acetate 2.8 million IU/g and 140 g butylated hydroxytoluene (BHT) was heated to 65°C in a beaker. The oily mixture was added to the aqueous solution of 15 gelatine and saccharose under slow agitation, which was then vigorously agitated for 40 minutes at 65°C. Then the final emulsion was diluted with 1.5 l demineralized water (0.164 Pa.s) to a viscosity of 164 cP. The mean oil droplet size was measured to be 0.29 µm.

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Subsequently, the emulsion was atomized in a spray tower, where the droplets were covered with starch and dried. Only part of the emulsion was sprayed. This yielded after screening on mesh 30/120 approx. 1 kg of a particulate 25 product with a potency of 552,000 IU/g, an extractability before compression of 0.1% of the total Vitamin A content and an extractability after compression of 29.5 % of the total vitamin A content.

30 Example 3:

2438 grams of fish gelatine (200 bloom, from Croda Colloids Ltd., UK) and 2976 grams of saccharose were dissolved in 5.0 l demineralized water at 65°C in an 35 emulsion tank and stored overnight to remove trapped air bubbles. A mixture of 2000 grams of Vitamin A Acetate 2.8

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million IU/g and 140 g t-butyl hydroxytoluene (BHT) was heated to 65°C in a beaker. The oily mixture was added to the aqueous solution of gelatine and saccharose under slow agitation, which was then vigorously agitated for 40 minutes at 65°C. Then the final emulsion was diluted with (0.172 Pa.s) 2.45 l demineralized water to a viscosity of 172 cP. The mean oil droplet size was measured to be 0.29 µm.

Subsequently the emulsion was atomized in a spray tower, where the droplets were covered with starch and dried. Only part of the emulsion was sprayed. This yielded after screening on mesh 30/120 approx. 1 kg of a particulate product with a potency of 593,000 IU/g, an extractability before compression of 0.1% of the total Vitamin A content and an extractability after compression of 7,9 % of the total vitamin A content. As will appear from the results the extractability after compression of the composition of the invention is far superior to that of the prior art composition of Comparative Example 1 and 2.

20 Example 4:

2438 grams of fish gelatine (200 bloom, Rousselot 200 FG 30 from SKW Biosystems, France) and 2976 grams of saccharose were dissolved in 5.0 l demineralized water at 65°C in an emulsion tank and stored overnight to remove trapped air bubbles. A mixture of 2000 grams of Vitamin A Acetate 2.8 million IU/g and 140 g t-butyl hydroxytoluene (BHT) was heated to 65°C in a beaker. The oily mixture was added to the aqueous solution of gelatine and saccharose under slow agitation, which was then vigorously agitated for 40 minutes at 65°C. Then the final emulsion was diluted with 3.5 l demineralized water (0.168 Pa.s) to a viscosity of 168 cP. The mean oil droplet size was measured to be 0.29 µm. Subsequently the emulsion was atomized in a spray tower, where the droplets were covered with starch and dried. Only part of the emulsion

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was sprayed. This yielded after screening on mesh 30/120 approx. 1 kg of a particulate product with a potency of 584,000 IU/g, an extractability before compression of 0.1% of the total Vitamin A content and an extractability after compression of 12,1 % of the total vitamin A content. As will appear from the results the extractability after compression of the composition of the invention is far superior to that of the prior art composition of Comparative Example 1 and 2.

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Example 5:

2250 grams of fish gelatine (200 bloom, Rousselot 200 FG 30 from SKW Biosystems, France) and 3375 grams of saccharose were dissolved in 5.0 l demineralized water at 65°C in an emulsion tank and stored overnight to remove trapped air bubbles. A mixture of 1500 grams of Vitamin A Palmitate 1.7 million IU/g and 93 g dl- α -tocopherol was heated to 65°C in a beaker. The oily mixture was added to the aqueous solution of gelatine and saccharose under slow agitation, which was then vigorously agitated for 40 minutes at 65°C. Then the final emulsion was diluted with 4.55 l demineralized water to a viscosity of 168 cP. The mean oil droplet size was measured to be 0.29 μ m.

{(0.168 Pa.s)}

Subsequently the emulsion was atomized in a spray tower, where the droplets were covered with starch and dried. Only part of the emulsion was sprayed. This yielded after screening on mesh 30/120 approx. 1 kg of a particulate product with a potency of 287,000 IU/g, an extractability before compression of 0.04% of the total Vitamin A content and an extractability after compression of 11,4 % of the total vitamin A content. As will appear from the results the extractability after compression of the composition of the invention is far superior to that of the prior art composition of Comparative Example 1 and 2.

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CLAIMS:

1. A particulate composition comprising one or more physiologically active substances and a fish gelatinous protective colloid containing at least 50 % by weight of fish gelatine, wherein the fish gelatine is at least partly composed of fish gelatine having a bloom strength of above 100, and wherein the composition is obtainable by a particle forming spray congelation method or a double emulsifying method.

2. A composition according to claim 1, characterized in that the fish gelatinous protective colloid contains at least 70 % by weight of fish gelatine.

3. A composition according to claim 2, characterized in that the fish gelatinous protective colloid contains at least 90 % by weight of fish gelatine.

4. A composition according to any of the preceding claims, characterized in that the fish gelatinous protective colloid further contains gum arabic, vegetable proteinaceous hydrocolloids, kosher gelatines, casein, caseinate, soya bean protein, and/or modified starches.

5. A composition according to any of the preceding claims, characterized in that the fish gelatine contains at least 50 % by weight of fish gelatine having a bloom strength of above 100.

6. A composition according to claim 5, characterized in that the fish gelatine contains at least 70 % by weight of fish gelatine having a bloom strength of above 100.

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7. A composition according to any of the preceding claims, characterized in that the fish gelatine has a bloom strength of 180-260.

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5 8. A composition according to any of the preceding claims, characterized in that the fish gelatine has a gelation temperature of 15-25 °C.

10 9. A process for preparing a particulate fish gelatinous composition, the process comprising the steps of providing an aqueous solution of a fish gelatinous protective colloid at a temperature of above the gelation temperature of the said colloid, the said colloid containing at least 50 % by weight of fish gelatine, 15 which is at least partly composed of fish gelatine having a bloom strength of above 100, adding to the said solution one or more physiologically active substances to obtain an aqueous mixture, subjecting the aqueous mixture to a spray congelation method or a double emulsifying 20 method to transform it to particles and to effect a gelation of the particles by cooling them to a temperature of below their gelation temperature to obtain gelled particles, and removing any excess water from the gelled particles to obtain dried particles.

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30 10. A tablet comprising conventional excipients and a composition comprising one or more physiologically active substances and a gelatinous protective colloid, wherein the gelatinous protective colloid contains at least 50 % by weight of fish gelatine, which is at least partly composed of fish gelatine having a bloom strength of above 100, and wherein the composition is obtainable by a particle forming spray congelation method or a double emulsifying method.