

## FORTIFICATION OF FOOD WITH A COMPLEX OF CALCIUM

### FIELD OF THE INVENTION

- 5     The present invention relates to the fortification of food and more particularly to the fortification of food with calcium.

### BACKGROUND OF THE INVENTION

- 10     Calcium is an important element in human diets for adequate bone formation and maintenance as well as other metabolic functions, e.g. nerve transmission, blood clotting, proper cell function and muscle contraction. It is common practice to fortify food products with calcium sources which are either insoluble or soluble at around neutral pH. Many of the calcium sources currently used for fortification  
15     which are insoluble or substantially insoluble at around neutral pH, e.g. calcium carbonate, calcium phosphates, calcium citrate and other organic acid salts of calcium, result in precipitation and a chalky mouth feel. Other calcium sources which are soluble or substantially soluble at around neutral pH such as calcium chloride, calcium hydroxide and a few organic acid salts of calcium react with  
20     milk proteins resulting in undesirable coagulation and sedimentation.

- It is also common practice to stabilize or reduce the sedimentation of the calcium and milk proteins in the milk beverages fortified with calcium sources by adding carrageenans, pectins and/or other gums, but such materials impart an undesirably  
25     high viscosity to milk. Protein destabilisation, e.g. precipitation and coagulation, is mainly attributed to free calcium ions in the system.

- It would be highly desirable to have a calcium source to fortify milk beverages and other dairy based products without coagulation and sedimentation, with improved  
30     palatability.

### SUMMARY OF THE INVENTION

- 35     We have developed a complex of calcium and a hydrolysed polysaccharide which may be added to a foodstuff to fortify it with calcium to provide a stable foodstuff, without coagulation and sedimentation, which has improved palatability.

According to the present invention, there is provided a fortified foodstuff comprising a fortifying amount of a complex of calcium and a hydrolysed polysaccharide.

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The foodstuff may be a dairy based product such as a milk beverage, a confectionery product, ice cream or another beverage such as a juice.

The complex may consist of calcium and a hydrolysed polysaccharide alone or together with an acid.

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#### DETAILED DESCRIPTION OF THE INVENTION

The hydrolysed polysaccharide may be derived from a negatively charged polysaccharide, e.g. carboxymethylcellulose, gums or carrageenans but it is advantageously a hydrolysed pectin. Pectins typically have a molecular weight of 10,000 to 150,000 with a Degree of Polymerisation (DP) of 50 to 800 and are methoxylated from 20 to 80%. Although pectins may theoretically be hydrolysed to a DP of 1 and demethoxylated to 0%, these levels are difficult to achieve.

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Preferably, the hydrolysed pectin has an average DP of from 1 to 25 and more preferably from 1 to 10. The hydrolysed pectin is conveniently demethoxylated to more than 50% and preferably more than 75%.

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The hydrolysis (and the demethoxylation when the polysaccharide is pectin) may be carried out by chemical, physical or enzymatic means or any combination thereof. The enzymatic hydrolysis may be carried out, for instance, by a process as described in our co-pending US Patent Application (NO5387/39). The chemical hydrolysis may be carried out by treatment with an acid but is preferably carried out by treatment with an alkali. The physical hydrolysis may be carried out by shear.

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The complex of calcium and the hydrolysed polysaccharide may be prepared by mixing an aqueous solution or suspension of a calcium compound with an aqueous solution or suspension of a hydrolysed polysaccharide. The calcium compound may be calcium hydroxide or it may be derived from one or more of several salts, e.g. the chloride, carbonate, phosphate, sulfate or citrate. When the

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complex consists of calcium and a hydrolysed polysaccharide together with an acid, the acid is preferably an organic acid, e.g. citric, malic, fumaric, tartaric, succinic or lactic acid. One or more acids may be used if desired.

- 5 The complex is formed as an aqueous solution or suspension and, if desired, may be dried, for instance to a powder, by various methods commonly known to those skilled in the art.

- 10 The fortified foodstuff comprising a fortifying amount of a complex of calcium and a hydrolysed polysaccharide may be prepared by mixing the foodstuff with the complex. The complex may be in the form of a solution or suspension or it may be in a dry form such as a powder.

- 15 The amount of complex present in the fortified foodstuff may be from 0.05 to 5%, preferably from 0.1 to 2.5%, and more preferably from 0.2 to 1.0% by weight based on the weight of the foodstuff.

- 20 The foodstuff may subsequently be further stabilised by adding gums, e.g. carrageenans, gum arabic, guar gum, etc., or by adding emulsifiers, e.g. mono- or di-glycerides, lecithin, sodium stearyl lactate, or the citric acid ester of monoglyceride

The fortified foodstuff may be frozen, refrigerated or shelf-stable.

## 25 EXAMPLES

The following examples further illustrate the present invention.

### Example 1

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Two solutions/suspensions are prepared:

- A. 1.8g calcium chloride in 10mL water  
B. 4.0 grams of pectin hydrolysates consisting of approximately 77% DP 1-3 (the  
35 remainder being primarily insoluble matter and moisture) in 40mL water.

The solutions/suspensions are mixed and then added to 940mL skim milk. The milk is then homogenised and pasteurised, and stored in a refrigerator at 2-5°C. The milk was found to be stable, without sediment and of good flavour after 7 weeks.

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### Example 2

Three solutions/suspensions are prepared:

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A. 1.2g calcium chloride in 10mL water

B. 2.071g citric acid in 10mL water

C. 4.0 grams of pectin hydrolysates consisting of approximately 77% DP 1-3 (the remainder being primarily insoluble matter and moisture) in 40mL water.

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The solutions/suspensions A and B are mixed, then solution C is added. The final mixture is then added to 940mL skim milk. The milk is then homogenised and pasteurised, and stored in a refrigerator at 2-5°C. The milk was found to be stable, without sediment and of good flavour after 7 weeks.

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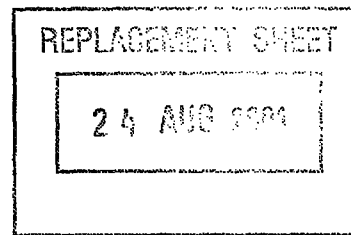
### Example 3

Fortified milk is prepared as in Example 2 except that instead of being pasteurised, it is ultra high temperature treated (UHT). After being stored in a refrigerator at 2-5°C for three weeks, the milk was found to be stable, without sediment and of good flavour.

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**CLAIMS**

1. A fortified foodstuff comprising a fortifying amount of a complex of calcium and a hydrolysed polysaccharide.
- 5 2. A fortified foodstuff according to claim 1 wherein the foodstuff is a dairy based product, a confectionery product, ice cream or a beverage.
3. A fortified foodstuff according to claim 1 wherein the complex consists of calcium and a hydrolysed polysaccharide together with an acid.
- 10 4. A fortified foodstuff according to claim 1 wherein the hydrolysed polysaccharide is a hydrolysed pectin.
- 15 5. A fortified foodstuff according to claim 4 wherein the hydrolysed pectin has a DP of from 1 to 25.
6. A fortified foodstuff according to claim 4 wherein the hydrolysed pectin is demethoxylated to more than 50%.
- 20 7. A fortified foodstuff according to claim 1 wherein the amount of complex present in the fortified foodstuff is from 0.05 to 5% by weight based on the weight of the foodstuff.
- 25 8. A fortified foodstuff according to claim 1 which is frozen, refrigerated or shelf-stable.
9. A process for preparing a fortified foodstuff comprising a fortifying amount of a complex of calcium and a hydrolysed polysaccharide which comprises mixing the foodstuff with the complex.
- 30 10. A process according to claim 9 wherein the complex is in the form of a solution or suspension or a dry form.
- 35 11. A fortified foodstuff according to claim 1 wherein there is also added a gum and/or an emulsifier.



According to the present invention, there is provided a fortified foodstuff comprising a foodstuff and a fortifying amount of a complex of calcium and a hydrolysed polysaccharide together with an acid.

The foodstuff may be a dairy based product such as a milk beverage, a confectionery product, ice cream or another beverage such as a juice.

## DETAILED DESCRIPTION OF THE INVENTION

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The hydrolysis (and the demethoxylation when the polysaccharide is pectin) may be carried out by chemical, physical or enzymatic means or any combination thereof. The enzymatic hydrolysis may be carried out, for instance, by a process as described in our co-pending US Patent Application (NO5387/39). The chemical hydrolysis may be carried out by treatment with an acid but is preferably carried out by treatment with an alkali. The physical hydrolysis may be carried out by shear.

The complex of calcium and the hydrolysed polysaccharide may be prepared by mixing an aqueous solution or suspension of a calcium compound with an aqueous solution or suspension of a hydrolysed polysaccharide. The calcium compound may be calcium hydroxide or it may be derived from one or more of several salts, e.g. the chloride, carbonate, phosphate, sulfate or citrate. When the

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complex consists of calcium and a hydrolysed polysaccharide together with an acid, the acid is preferably an organic acid, e.g. citric, malic, fumaric, tartaric, succinic or lactic acid. One or more acids may be used if desired.

- 5 The complex is formed as an aqueous solution or suspension and, if desired, may be dried, for instance to a powder, by various methods commonly known to those skilled in the art.

- 10 The fortified foodstuff comprising a fortifying amount of a complex of calcium and a hydrolysed polysaccharide together with an acid may be prepared by mixing the foodstuff with the complex. The complex may be in the form of a solution or suspension or it may be in a dry form such as a powder.

- 15 The amount of complex present in the fortified foodstuff may be from 0.05 to 5%, preferably from 0.1 to 2.5%, and more preferably from 0.2 to 1.0% by weight based on the weight of the foodstuff.

- 20 The foodstuff may subsequently be further stabilised by adding gums, e.g. carrageenans, gum arabic, guar gum, etc., or by adding emulsifiers, e.g. mono- or di-glycerides, lecithin, sodium stearyl lactate, or the citric acid ester of monoglyceride

The fortified foodstuff may be frozen, refrigerated or shelf-stable.

## 25 **EXAMPLES**

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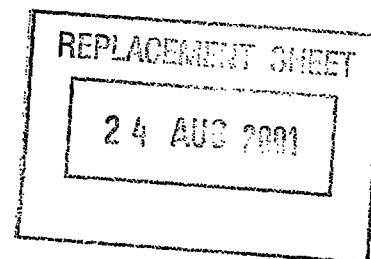
### Example 1

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## CLAIMS

1. A fortified foodstuff comprising a foodstuff and a fortifying amount of a complex of calcium and a hydrolysed polysaccharide together with an acid.
2. A fortified foodstuff according to claim 1 wherein the foodstuff is a dairy based product, a confectionery product, ice cream or a beverage.
3. A fortified foodstuff according to claim 1 wherein the hydrolysed polysaccharide is a hydrolysed pectin.
4. A fortified foodstuff according to claim 3 wherein the hydrolysed pectin has a DP of from 1 to 25.
5. A fortified foodstuff according to claim 3 wherein the hydrolysed pectin is demethoxylated to more than 50%.
6. A fortified foodstuff according to claim 1 wherein the amount of complex present in the fortified foodstuff is from 0.05 to 5% by weight based on the weight of the foodstuff.
7. A fortified foodstuff according to claim 1 which is frozen, refrigerated or shelf-stable.
8. A process for preparing a fortified foodstuff comprising a fortifying amount of a complex of calcium and a hydrolysed polysaccharide together with an acid which comprises mixing the foodstuff with the complex.
9. A process according to claim 8 wherein the complex is in the form of a solution or suspension or a dry form.
10. A fortified foodstuff according to claim 1 wherein there is also added a gum and/or an emulsifier.

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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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| <b>(21) International Application Number:</b> PCT/EP97/05192<br><b>(22) International Filing Date:</b> 22 September 1997 (22.09.97)<br><br><b>(30) Priority Data:</b><br>08/739,070                      28 October 1996 (28.10.96)                      US<br><br><b>(71) Applicant:</b> SOCIETE DES PRODUITS NESTLE S.A.<br>[CH/CH]; P.O. Box 353, CH-1800 Vevey (CH).<br><br><b>(72) Inventors:</b> REDDY, Sekhar; 2 Briar Lane, New Milford, CT 06776 (US). JACOBSON, Mark, Randolph; 27 Candlewood Springs, New Milford, CT 06776 (US). VADEHRA, Dharam, Vir; 6 Halletts Road, New Milford, CT 06776 (US). WEDRAL, Elaine, Regina; Chestnut Hill Road, R.R.2, P.O. Box 480 A, Sherman, CT 06784 (US).<br><br><b>(74) Agent:</b> PATE, Frederick, George; Avenue Nestlé 55, CH-1800 Vevey (CH). |           | <b>(81) Designated States:</b> AL, AM, AU, AZ, BB, BG, BR, BY, CA, CN, CZ, EE, ES, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LV, MD, MG, MK, MN, MW, MX, NZ, PL, RO, RU, SD, <del>SG</del> SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).<br><br><b>Published</b><br><i>With international search report.</i> |
| <b>(54) Title:</b> FORTIFICATION OF FOOD WITH A COMPLEX OF CALCIUM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>(57) Abstract</b><br><p>A fortified foodstuff comprising a fortifying amount of a complex of calcium and a hydrolysed polysaccharide. The foodstuff may be a dairy-based product such as milk or a milk product.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |