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<p>(54) Title: FLAVOR ENHANCER</p> <p>(57) Abstract</p> <p>A process for the preparation of a natural cheese flavor enhancer which comprises incubating a protein, a fat, a protease and lipase in an aqueous medium under conditions suitable for producing a cheese flavor enhancer.</p>		

## FLAVOR ENHANCER

The present invention relates to a flavor enhancer and more particularly to a natural cheese flavor enhancer which boosts the cheese flavor in cheese containing products.

Currently, natural cheese flavors are made from starting materials such as aged cheese, cheese block or cheese curds which are expensive. Also, it is well known that cheese based raw materials are of variable and unreliable quality. Such starting materials are usually treated with enzymes such as proteases and it is well known that enzyme modified cheese products have an unpleasant bitter flavor. In addition, in some cases, incubation with microorganisms such as Penicillium roqueforti or lactic acid bacteria is carried out for up to 48 hours or more which increases the cost and makes the process rather complicated and time-consuming.

US patent no. 4,708,876 discloses a method for preparing a cheese flavor concentrate. As starting materials, there is provided an emulsion of a fat or oil containing butyric acid, a protein, a lactic bacteria which is assimilable with a saccharide and water. A lipolytic enzyme and a proteolytic enzyme is added to the emulsion, followed by a lactic bacteria and the resulting mixture is subjected to aging for a time sufficient to produce the cheese flavor concentrate.

US patent no. 4,752,483 describes a process for the rapid production of a flavored cheese ingredient in which cheese curd is intimately combined with water, a protease and a lipase to create a mixture. A temperature of the mixture is adjusted to between 75° to 95° F and the mixture is incubated for a time sufficient to produce a cheese flavored ingredient.

US patent no. 4,595,594 discloses a cheese flavor product which is prepared by incubating cheese or cheese curd with a lipase enzyme. The mixture is preincubated to partially digest the cheese or cheese curd and the partially digested cheese is then incubated to develop the flavor. After preincubation or incubation, the product is mixed with cream. The product has an intense cheese flavor.

US patent no. 5,455,051 describes a cheese flavor composition which is prepared by dispersing blue cheese in an aqueous medium containing a buffering agent.

The dispersion is then incubated with spores of the microorganism Penicillium roqueforti together with a lipase and a protease enzyme. The process hydrolyzes and metabolizes the cheese to produce the cheese flavor ingredient.

The reference in the Korean Journal of Food Science and Technology, Volume 5 17, No. 5 (1985), Hae-Dong Jang and Hyong-Joo Lee, discloses a method to shorten the processing of cheese slurry. The method employs, inter alia, preparing a cheese slurry from cream and Na-caseinate with a culture of a lactic acid bacteria together with a protease enzyme.

EP-A-0,469,857 describes a method of producing cheese in which ripening is 10 carried out under a pressure of 100-2500 kg/cm<sup>2</sup> in the presence of lactobacilli.

Any discussion of the prior art throughout the specification should in no way be considered as an admission that such prior art is widely known or forms part of common general knowledge in the field.

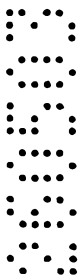
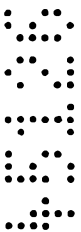
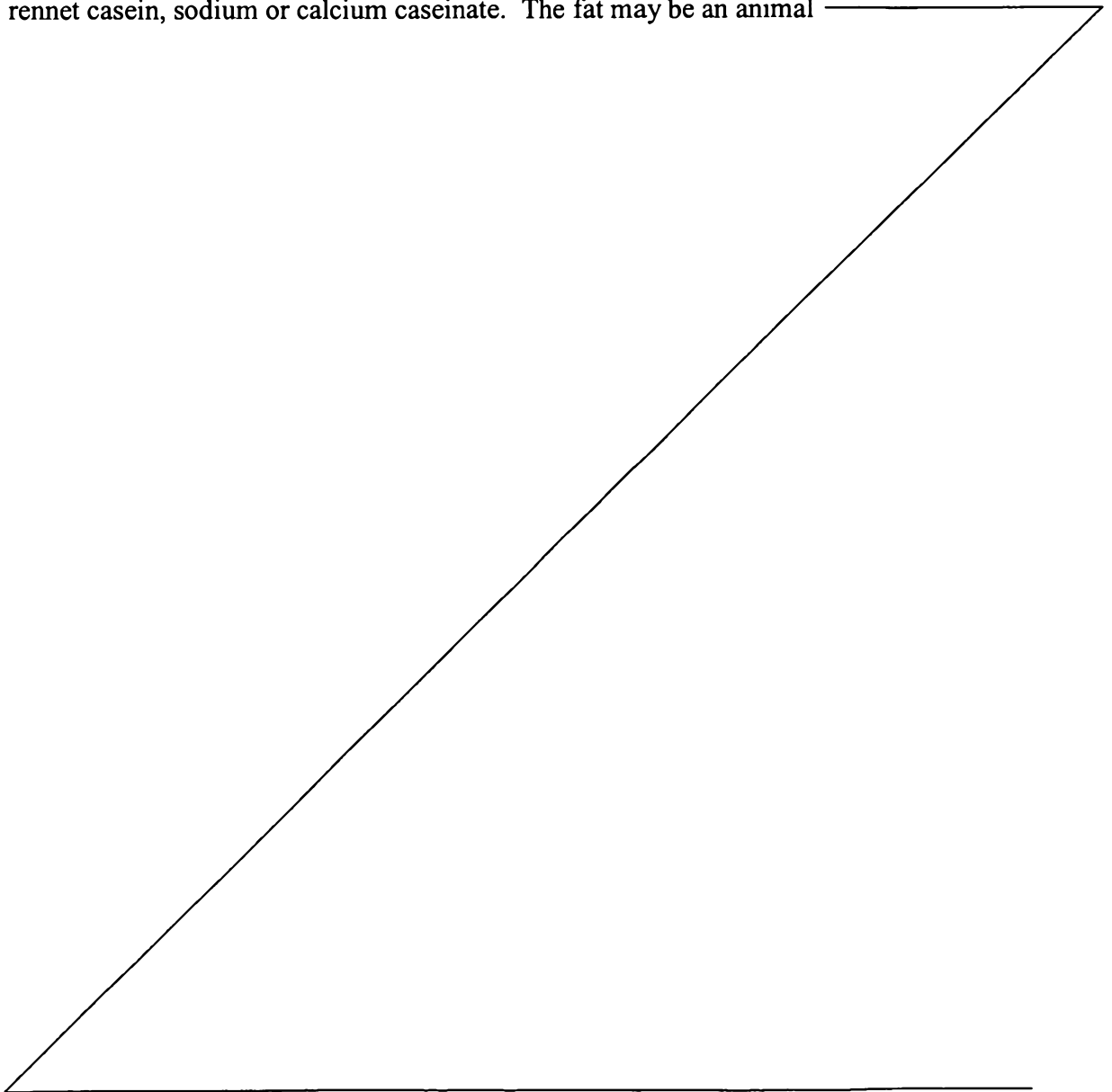
It is an object of the present invention to overcome or ameliorate at least one of 15 the disadvantages of the prior art, or to provide a useful alternative.

Unless the context clearly requires otherwise, throughout the description and the claims, the words 'comprise', 'comprising', and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in the sense of "including, but not limited to".

20 According to a first aspect of the present invention, there is provided a process for enhancing the cheese flavor of a cheese flavored product which comprises preparing a natural cheese flavor enhancer which comprises incubating a milk or cheese derived protein, a fat, a protease and a lipase in an aqueous medium for 12 to 48 hours at a temperature of between 37 and 48°C and at a pH of from 4 to 6, wherein the starting 25 materials do not comprise cheese or cheese curds and wherein the cheese flavor enhancer is prepared without microorganisms, under conditions suitable for producing a cheese flavor enhancer which is capable of enhancing the cheese flavor of food products that include a cheese flavor component but not of food products which do not contain a cheese flavor component; and adding the natural cheese flavor enhancer to a food 30 product that contains a cheese flavor component.

It should be understood that in this invention, the cheese flavor enhancer is not a cheese flavor in itself: if it is added to a bland product, it does not impart any specific flavor. On the other hand, when the cheese flavor enhancer is added to a cheese-containing product, it enhances the cheese flavor enabling the amount of expensive  
5 cheese normally present in the product to be reduced substantially.

Any edible protein or fat may be used in the process of the invention. Preferred examples of protein are whey protein concentrate, lactalbumin or casein, preferably rennet casein, sodium or calcium caseinate. The fat may be an animal



or vegetable fat but preferred examples of fats are corn oil, shortening<sup>®</sup> (partially hydrogenated soybean and cottonseed oils, mono- and diglycerides), heavy cream or butter. If desired, mixtures of proteins and/or mixtures of fats may be used.

5 The amount of protein used may be from 1 to 30%, preferably from 5 to 25% and more preferably from 10 to 16% by weight based on the total weight of the aqueous medium. The amount of fat may be from 5 to 50%, preferably from 10 to 40% and more preferably from 20 to 35% by weight based on the total weight of the aqueous medium.

10 If desired, a small amount of whey protein may be added to the aqueous medium, e.g. from 1 to 10% and preferably from 2 to 6% by weight based on the total weight of the aqueous medium. Whey protein is used as a filler and allows to increase the solid content of the cheese enhancer with a limited impact on the  
15 flavor and the cost.

Any protease or lipase may be used in the process of the invention. For example, the protease may be Protease 2A manufactured by Amano Enzyme Co., a neutral protease, e.g. Protease P Amano 6 manufactured by the Amano Enzyme Co., or  
20 Neutrase or Flavourzyme manufactured by Novo Nordisk, Inc. A mixture of one or more proteases may be used if desired. The amount of protease used may be from 0.05 to 1.0% and preferably from 0.1 to 0.75% by weight based on the total weight of the aqueous medium.

25 The lipase may be pancreatic lipase manufactured by Valley Research Inc., pregastric esterase manufactured by Amano Enzyme Co., or a fungal lipase such as Palatase 20,000L manufactured by Novo Nordisk Inc. or any mixture thereof. The amount of lipase used may be from 0.05 to 1.0% and preferably from 0.1 to 0.75% by weight based on the total weight of the aqueous medium.

30 The amount of water in the aqueous medium may be from 25 to 75%, preferably from 35 to 65% and more preferably from 40 to 60% by weight based on the total weight of the aqueous medium.

35 Salt may be added, if desired, e.g. in an amount of from 0.5 to 5%, preferably from 1 to 3.5% by weight based on the total weight of the aqueous medium.

Other ingredients conventionally used in cheese making may also be added to the aqueous medium, e.g. trisodium phosphate in an amount up to 2% and preferably from 0.5 to 1.5%, a fungicide such as sorbic acid or potassium sorbate in an amount up to 0.5% and preferably from 0.05 to 0.25% by weight, and a thickener or stabilizer such as xanthan gum, guar gum or carrageenan, etc. in an amount up to 0.50% and preferably from 0.02 to 0.2% all amounts being by weight based on the total weight of the aqueous medium.

The incubation is conveniently carried out in a reaction vessel, such as an incubator. The ingredients are loaded into the reaction vessel, preferably in the following order: the water is introduced first followed by the protease, then the proteins, then the lipase and finally the fats. Advantageously, the trisodium phosphate and the salt are added with the water while the fungicides, thickeners and/or stabilizers are preferably added after the addition of the proteins but before the addition of the fats.

The temperature of the incubation may be from 37° to 48°C (100° to 117°F) and preferably from 39° to 46°C (104° to 113°F).

The pH of the incubation may be from 4 to 6, preferably from 4.5 to 5.5.

The duration of the incubation may be from 12 to 48 hours, preferably from 18 to 36 hours. The incubation is carried out in the absence of any added microorganism.

After incubation, the pH may be adjusted to 4.2-4.4, preferably with phosphoric acid.

After incubation, the product is advantageously homogenized and then pasteurized, e.g. at a temperature from 90°C to 100°C for a period of from 2.5 to 10 minutes, preferably at a temperature from 94°C to 99°C for a period of from 4 to 8 minutes. After pasteurization, the product is conveniently cooled, e.g. to a temperature of from 4° to 10°C to give a product having the consistency of a paste.

The product may be used as a paste or dried and used as a powder. The drying is preferably achieved by spray drying, using a carrier, for instance, maltodextrin in an amount of from 20 to 40% by weight based on the weight of the paste. The moisture content of the final powder is usually from about 2.0 to 4.0% by weight.

5 The natural cheese flavor enhancer produced by the process of the present invention may be used to enhance the flavor of cheese-containing products such as cheese sauces, cheese dips and salad dressing.

According to a second aspect of the invention, there is provided a cheese-containing product having enhanced cheese flavor containing an effective amount of a  
10 natural cheese flavor enhancer obtained by a process according to the first aspect.

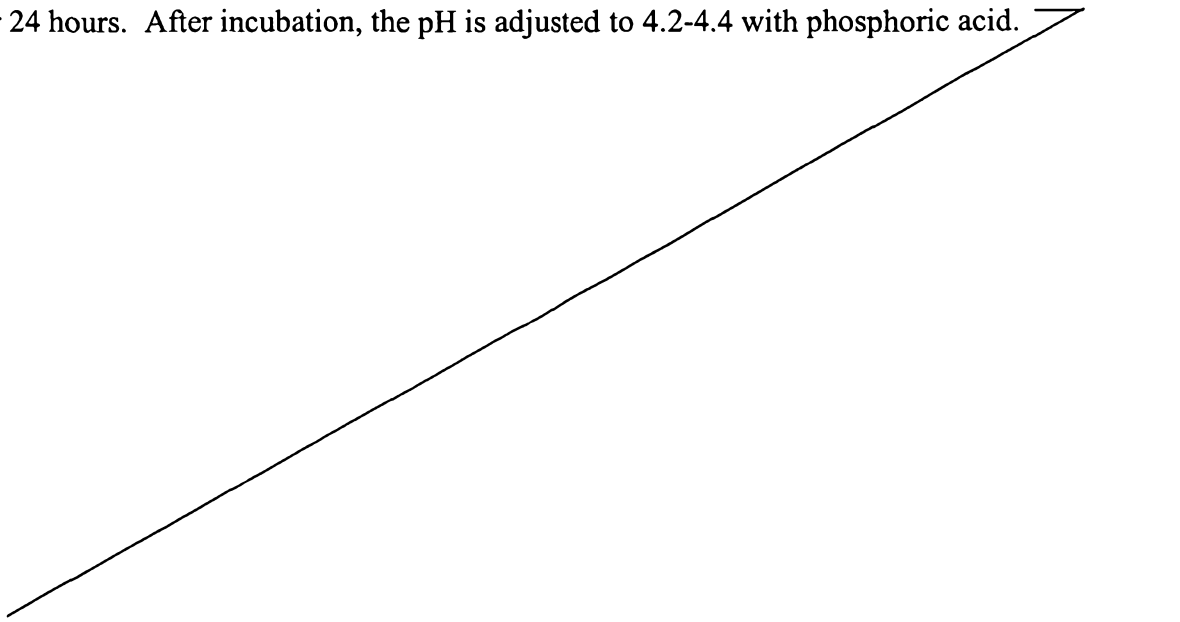
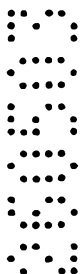
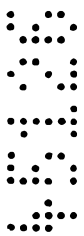
#### EXAMPLES

The following Examples further illustrate the present invention. Parts and percentages are given by weight except where stated.

15

##### Example 1

50 parts of water are mixed with 0.35 parts of Protease 2A, 2.229 parts of NaCl and then 1 part of trisodium phosphate and loaded into a 500 gallon liquefier. This is followed by in order of addition: 4.244 parts of sweet whey, 13.5 parts of rennet casein  
20 (30 mesh), 0.1 part of potassium sorbate, 0.05 parts of xanthan gum (Keltrol RD), 0.35 parts of pancreatic lipase and 28.177 parts of butter. The ingredients are ground and then pumped to a 300 gallon reaction tank jacketed with water at 45°C (113°F), and incubated for 24 hours. After incubation, the pH is adjusted to 4.2-4.4 with phosphoric acid.



5 The product is then piston homogenized at 500 psi. The homogenized mixture is pumped to a plate heat exchanger and pasteurized at 95°C (203°F) for 5 minutes in a holding tube, cooled to 4.5°C (40°F) and transported to a filler where it is packaged and stored at 5°C (41°F).

#### Example 2

10 The cheese content of a cheese sauce normally containing 33% of cheese is reduced to 25%. To 100 parts of the cheese sauce containing 25% of cheese is added 1 part of the natural cheese flavor enhancer prepared in Example 1. The cheese flavor of the cheese sauce containing the natural cheese flavor enhancer is as good as that of the cheese sauce containing 33% of cheese.

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THE CLAIMS OF THE PRESENT INVENTION ARE DEFINED AS FOLLOWS:

1. A process for enhancing the cheese flavor of a cheese flavored product which comprises preparing a natural cheese flavor enhancer which comprises incubating a milk  
5 or cheese derived protein, a fat, a protease and a lipase in an aqueous medium for 12 to 48 hours at a temperature of between 37 and 48°C and at a pH of from 4 to 6, wherein the starting materials do not comprise cheese or cheese curds and wherein the cheese flavor enhancer is prepared without microorganisms, under conditions suitable for producing a cheese flavor enhancer which is capable of enhancing the cheese flavor of  
10 food products that include a cheese flavor component but not of food products which do not contain a cheese flavor component; and adding the natural cheese flavor enhancer to a food product that contains a cheese flavor component.
2. A process according to claim 1 wherein the protein used is a casein, a whey  
15 protein concentrate or lactalbumin.
3. A process according to claim 1 or claim 2 wherein the fat used is a vegetable oil.
4. A process according to any one of claims 1 to 3 wherein the fat used is corn oil,  
20 heavy cream or butter.
5. A process according to any one of claims 1 to 4 wherein a mixture of proteins and/or of fats is used.
- 25 6. A process according to any one of claims 1 to 5 wherein the amount of protein used is from 1 to 30% by weight based on the total weight of the aqueous medium.
7. A process according to any one of claims 1 to 6 wherein the amount of fat is from  
5 to 50% by weight based on the total weight of the aqueous medium.

8. A process according to any one of claims 2 to 7 wherein from 1 to 10% of whey protein is added to the aqueous medium by weight based on the total weight of the aqueous medium.

5 9. A process according to any one of claims 1 to 8 wherein the amount of protease used is from 0.05 to 1.0% by weight based on the total weight of the aqueous medium.

10. A process according to any one of claims 1 to 9 wherein the amount of lipase used is from 0.05 to 1.0% by weight based on the total weight of the aqueous medium.

10

11. A process according to any one of claims 1 to 10 wherein the amount of water in the aqueous medium is from 25 to 75% by weight based on the total weight of the aqueous medium.

15 12. A process according to any one of claims 1 to 11 wherein the ingredients are loaded into the reaction vessel wherein the water is introduced first followed by the protease, then the proteins, then the lipase and finally the fats.

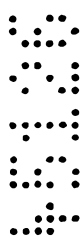
20 13. A process according to any one of claims 1 to 12 wherein, after incubation, the product is homogenized and then pasteurized before cooling to a temperature of from 4° to 10°C.

14. A process according to any one of claims 1 to 13 wherein the cheese flavor enhancer is made into a paste or powder.

25

15. A process according to any one of claims 1 to 14 wherein the moisture content of the final powder is from about 2.0 to 4.0% by weight.

30 16. A cheese-containing product having enhanced cheese flavor containing an effective amount of a natural cheese flavor enhancer obtained by the process of any one of the preceding claims.



17. A cheese-containing product according to claim 16 wherein the amount of the natural cheese flavor enhancer is from 0.1 to 5% by weight based on the total weight of the cheese-containing product.

5 18. A process for enhancing the cheese flavor of a cheese-flavored food product substantially as herein described with reference to any one of the examples but excluding comparative examples.

19. A cheese containing product substantially as herein described with reference to  
10 any one of the examples but excluding comparative examples.

DATED this 26<sup>th</sup> Day of May 2003  
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