

DESCRIPTION

FERMENTED MILK CONTAINING COLLAGEN AND METHOD FOR PRODUCING SAME

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Technical Field
[0001]

The present invention relates to fermented milk containing collagen and a method for producing the same.

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Background Art
[0002]

It has been well known that fermented milk represented by yogurt has effects of maintaining or promoting health. In recent years, in expectation of attaining further special improvements, there has been a tendency of allowing fermented milk to have some functionalities. For example, JP-A-2008-283948 (Patent Document 1) discloses a method for producing a fermented milk product in which fermentative bacteria and protease are acted on a raw material that contains milk and collagens. In this document, flavor, texture or the like are evaluated for a fermented milk product containing collagens. However, as for the method for producing thereof, only a general description is made.

20

Related Art Document
Patent Document
[0003]

25 Patent Document 1: JP-A-2008-283948

Summary of Invention
[0004]

An object of the present invention is to provide an efficient method for producing fermented milk containing collagens.

30

Solution to Problem
[0005]

In order to attain the above-mentioned object, the inventor of the present invention made studies. As a result, a phenomenon was confirmed that fermentation delay occurred at the time of fermenting starting milk to which collagen was blended at a high concentration. In producing fermented milk using starting milk to which collagen was blended at a high concentration, the inventor of the present invention made studies on a method for solving the problem of fermentation delay, and a method for producing

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fermented milk having excellent flavor by eliminating deterioration in flavor caused by fermentation delay. As a result of the studies, the inventor has found that, by adding yeast extract and/or whey-derived peptide to starting milk to which collagen was blended at a high concentration, fermented milk can be produced without causing fermentation
5 delay. The present invention has been attained based on this finding.

[0006]

That is, the invention according to claim 1 is a method for producing fermented milk that comprises collagen, the method comprising adding yeast extract and/or whey-derived peptide.

10 [0007]

The invention according to claim 2 is a method for producing fermented milk that comprises collagen according to claim 1, wherein the concentration of yeast extract added in starting milk is 0.001 wt% or more and 0.3 wt% or less.

[0008]

15 The invention according to claim 3 is a method for producing fermented milk that comprises collagen according to claim 1, wherein the concentration of whey-derived peptide added in starting milk is 0.01 wt% or more and 0.4 wt% or less.

[0009]

The invention according to claim 4 is a method for producing fermented milk that
20 comprises collagen according to claim 1, wherein the concentration of yeast extract added in starting milk is 0.001 wt% or more and 0.3 wt% or less, and the concentration of whey-derived peptide added in starting milk is 0.01 wt% or more and 0.4 wt% or less.

[0010]

The invention according to claim 5 is a method for producing fermented milk that
25 comprises collagen according to any one of claims 1 to 4, wherein the concentration of collagen in starting milk is 0.4 wt% or more and 7 wt% or less.

[0011]

The invention according to claim 6 is a method for producing fermented milk that comprises collagen according to any one of claims 1 to 5, wherein the pH at the time of
30 fermentation becomes 4.7 or less within 4 hours from the start of the fermentation.

[0012]

The invention according to claim 7 is fermented milk that is produced by the method according to any one of claims 1 to 6.

[0013]

35 The inventor of the present invention has found that, by conventional methods, there are serious problems that, if starting milk that contains collagens at a high concentration is fermented, fermentation delay occurs, thereby causing lowering in production efficiency of fermented milk, and as a result, the entire production process of fermented milk is adversely affected. In contrast, the present invention can provide a
40 method for producing fermented milk which does not encounter the problem of

fermentation delay even if fermented milk is produced by using starting milk containing collagens at a high concentration.

Brief Description of Drawings

5 [0014]

FIG. 1 is a view showing the effect of suppressing fermentation delay attained by whey-derived peptide or yeast extract;

FIG. 2 is a view showing the effect of suppressing fermentation delay attained by whey-derived peptide and yeast extract;

10 FIG. 3 is a view showing the difference of the effect of suppressing fermentation delay in terms of the concentration of whey-derived peptide and yeast extract; and

FIG. 4 is a view showing the influence of difference in type of collagen on the effect of suppressing fermentation delay of whey-derived peptide and yeast extract.

15 Description of Embodiments

[0015]

With an aim of producing fermented milk to which a function such as beauty promotion is added, the inventor blended collagen at a high concentration to starting milk and allowed the resulting mixture to be fermented. As a result, it was revealed that the
20 time required for lowering in pH was significantly increased, and fermentation was delayed. In this fermentation delay phenomenon, since the fermentation time is prolonged with an increase in concentration of collagen blended. Therefore, the primary cause of the fermentation delay was considered to be blending (addition) of collagen. If fermentation delay occurs, it becomes difficult to produce fermented milk
25 continuously, resulting in significant lowering in production efficiency thereof.

[0016]

In order to solve the above-mentioned problem, the inventor made various studies on a method for eliminating or suppressing fermentation delay. As a result, it has been revealed that, by adding (blending) yeast extract to starting milk that contains
30 collagen at a high concentration, fermentation delay can be eliminated or suppressed. Further, it has also been revealed that, as for the effect of suppressing fermentation delay by addition of yeast extract, the effect is exhibited in proportion to the concentration of yeast extract added if yeast extract is added at predetermined concentrations.

35 [0017]

Further, it has been found that, since yeast extract has unique flavor, if it is added at an excessively high concentration, the flavor of fermented milk (final product) is largely affected, and as a result, it is hard to obtain fermented milk having favorable flavor.

40 [0018]

As a preferred embodiment of the present invention, the inventor of the present invention made various studies on the method for eliminating or suppressing fermentation delay in order to obtain fermented milk having good flavor without suffering deterioration of flavor when collagen is blended at a high concentration. The inventor
5 has found that fermentation delay can be eliminated or suppressed while maintaining good flavor of fermented milk by adding whey-derived peptide to starting milk containing collagen at a high concentration. The inventor has further found that, by adding yeast extract and then by adding whey-derived peptide to starting milk that contains collagen at a high concentration, fermentation delay can be eliminated or suppressed while masking
10 unique flavor of yeast extract to keep the good favor of fermented milk without impairing the effect of suppressing fermentation delay caused by yeast extract.

[0019]

In the present invention, the term "fermented milk" includes, for example, "fermented milk" defined in "Ministerial Ordinance on Milk and Milk products Concerning
15 Compositional Standards, etc." (Ministerial Ordinance on Milk, etc.) that is a ministerial ordinance based on the Food Sanitation Act of Japan. The fermented milk includes solid fermented milk (set type yogurt) such as yogurt, paste-like fermented milk (soft type yogurt), liquid fermented milk (drink type yogurt) or the like.

[0020]

"Collagen" is a type of proteins that make up tissues of bones, cartilages, ligaments, tendons, skin or the like, and the amount thereof is believed to occupy about one-third (1/3) of the proteins in the human body. In addition to functioning as a protein in the human body, collagen is also used as a raw material of foods, drinks, medicines, and cosmetics. Collagen is thought to have a function of moisturizing, promoting
20 beauty, relieving arthralgia, promoting bone formation, etc. In the present invention, "collagen" also includes collagen peptide, amino-collagen or the like, and it may be commonly-available one. For example, "Ikuosu HDL" and "SCP-5200" sold by Nitta Gelatin Inc., "PS-1" and "FCP" sold by Nippi. Inc. can be given. In the present invention, the concentration of collagen blended in starting milk is preferably 0.4 to 7 wt%,
25 more preferably 0.8 to 5 wt%, further preferably 1.5 to 4 wt%.

Here, in the present specification, the term "starting milk" refers to a mixture of all raw materials used in the method for producing fermented milk containing collagen according to the present invention. For example, the starting milk includes collagen, yeast extract, whey-derived peptide and the following raw materials that are required to
30 produce common fermented milk or conventional fermented milk.

[0021]

As for the "yeast extract", a liquid extracted by a hot water treatment or the like from yeast such as *Saccharomyces cerevisiae* can be given. Yeast extract may be one that is extracted from yeast, or may be one obtained by a process in which yeast is
40 collected and pulverized and the pulverized yeast is then subjected to autolysis by the

action of digestive enzymes contained in the yeast itself. Yeast extract contains peptides, amino acids, nucleic acids, minerals and vitamins, and yeast extract is used in a seasoning or the like. In the invention, the "yeast extract" includes an extract of a yeast component, and is not particularly restricted as long as it is a

5 commercially-available yeast extract. For example, "Meast P2G" sold by Asahi Food & Health Care, Ltd. or the like can be given. In the present invention, the concentration of yeast extract added to starting milk is preferably 0.001 to 0.3 wt%, more preferably 0.005 to 0.2 wt%, and further preferably 0.015 to 0.1 wt%.

[0022]

10 As the "whey-derived peptide", peptide contained in an aqueous solution part (whey) obtained by removing fat and casein mainly from milk or a milk component can be given. Here, whey is obtained as a by-product separated from a solid product (curd) at the time of producing cheese. Being high in protein and low in fat, whey is a material having a high nutritive value and being easily digestible. In the invention, the
15 "whey-derived peptide" includes an enzyme (protease) degradation product of whey protein, and it may be whey-derived peptide (degradation product of whey protein) that is available on the commercial basis. "LE80GF-US" sold by DMV Co. or the like can be given, for example. In the present invention, the concentration of whey-derived peptide added in starting milk is preferably 0.01 to 0.4 wt%, more preferably 0.02 to 0.3 wt%, and
20 further preferably 0.03 to 0.2 wt%.

[0023]

In the present invention, as for the matters other than those mentioned above, similar methods or raw materials required for producing common fermented milk or conventional fermented milk can be applied. For example, in the present invention, as
25 the raw material for fermented milk, starting milk such as milk, sterilized milk, skim milk, whole powder milk, powdered skim milk, whole condensed milk, skimmed condensed milk, cream, butter, buttermilk, whey, whey protein concentrate (WPC), whey protein isolate (WPI), α -lactalbumin (α -La) and β -lactoglobulin (β -Lg); sugars; sweeteners; saccharides; aroma chemicals; water or the like can be given. Further, as the raw
30 material of fermented milk, gelling agents, thickening agents and stabilizers such as gelatin, agar, pectin and carboxymethyl cellulose (CMC) can also be mentioned.

[0024]

As the starter, one or two or more of lactic acid bacterium or a yeast that is commonly used in the production of fermented milk such as *Lactobacillus bulgaricus*,
35 *Streptococcus thermophilus* and *Lactobacillus lactis* can be selected and used. In the present invention, the number (concentration) of the bacteria in the mixed starter is preferably 10^6 to 10^{12} cfu/mL, more preferably 10^7 to 10^{11} cfu/mL, and further preferably 10^8 to 10^{10} cfu/mL. The amount of the mixed starter added to starting milk is preferably 0.05 to 8 wt%, more preferably 0.075 to 7 wt% and further preferably 0.1 to 5 wt%. One
40 or two or more of probiotics such as *Lactobacillus gasseri* and *Bifidobacterium* can also

be selected and used.

[0025]

In the present invention, in preparation (formulation) of starting milk, various raw materials are mixed (dissolved and dispersed). Then, after homogenizing and/or
5 sterilizing as needed, the mixture is cooled to a predetermined temperature (fermentation temperature, for example). Subsequently, a starter is inoculated (added) to this starting milk at a predetermined concentration, and the resultant is mixed (stirred) as needed, and then fermented. At this time, in the case of the so-called pre-fermented type (such as soft-type yogurt, drink-type yogurt, etc.), fermentation is conducted in a
10 large-sized tank. Further, in the case of a post-fermented type (set-type yogurt), fermentation is conducted in a container that is used when actually sold in a store, or the like.

[0026]

In the present invention, it is preferred that the pH at the time of fermentation be
15 4.7 or less, more preferably 4.65 or less and further preferably 4.6 or less, within 4 hours from the start of fermentation. In the present invention, the fermentation temperature is preferably 30 to 50°C, more preferably 35 to 47°C, further preferably 40 to 45°C, and particularly preferably 42 to 44°C. The fermentation time is preferably 2 to 24 hours, more preferably 2 to 12 hours, further preferably 3 to 7 hours, and particularly preferably
20 3 to 5 hours.

Examples

[0027]

The present invention will be explained in more detail with reference to the
25 Examples, which should not be construed as limiting the scope of the invention.

[0028]

[Example 1]

34.6 kg of milk (manufactured by Meiji Co., Ltd.), 5.89 kg of powdered skim milk (manufactured by Meiji Co., Ltd.) and 53.35 kg of water were mixed. To this mixture,
30 3.06 kg of collagen and 0.1 kg of whey-derived peptide were added and mixed, and sterilized by heating at a reaching temperature of 95°C. Then, the mixture was cooled to 43°C.

Subsequently, 3.0 kg of a lactic acid bacterium starter (a mixed starter of Lactobacillus bulgaricus and Streptococcus thermophiles separated from Bulgaria Yogurt
35 manufactured by Meiji Co., Ltd.) was inoculated. 80 g of the mixture was put in each of 100 mL-containers. The appropriate numbers of the containers filled with the mixture were prepared and fermentation was conducted by allowing them to stand in a thermostatic chamber of 43°C. At this time, the sample was collected (sampling) every 30 minutes from 1 hour after the start of fermentation to 6 hours after the start of
40 fermentation (excluding 5.5 hours after the start of fermentation), and the pH thereof was

measured.

[0029]

[Example 2]

34.6 kg of milk (manufactured by Meiji Co., Ltd.), 5.89 kg of powdered skim milk
5 (manufactured by Meiji Co., Ltd.) and 53.25 kg of water were mixed. To this mixture,
3.06 kg of collagen and 0.2 kg of yeast extract were added and mixed, and sterilized by
heating at a reaching temperature of 95°C. Then, the mixture was cooled to 43°C.
Subsequently, 3.0 kg of a lactic acid bacterium starter (a mixed starter of *Lactobacillus*
10 *bulgaricus* and *Streptococcus thermophiles* separated from Bulgaria Yogurt
manufactured by Meiji Co., Ltd.) was inoculated.

Filling and fermentation were conducted in the same manner as in Example 1,
and the sample was collected (sampling) and the pH thereof was measured.

[0030]

[Comparative Example 1]

15 34.6 kg of milk (manufactured by Meiji Co., Ltd.), 5.89 kg of powdered skim milk
(manufactured by Meiji Co., Ltd.) and 53.45 kg of water were mixed. To this mixture,
3.06 kg of collagen was added and mixed, and sterilized by heating at a reaching
temperature of 95°C. Then, the mixture was cooled to 43°C. Subsequently, 3.0 kg of
a lactic acid bacterium starter (a mixed starter of *Lactobacillus bulgaricus* and
20 *Streptococcus thermophiles* separated from Bulgaria Yogurt manufactured by Meiji Co.,
Ltd.) was inoculated. Filling and fermentation were conducted in the same manner as
in Example 1, and the sample was collected (sampling) and the pH thereof was
measured.

The results of measuring the pH in Examples 1 and 2 and Comparative Example
25 1 are shown in Table 1 and FIG. 1.

[0031]

TABLE 1

Sampling time	Example 1	Example 2	Comp. Ex. 1
After 1 hour	6.26	6.07	6.40
After 1 hours and 30 minutes	5.86	5.30	6.14
After 2 hours	5.35	4.87	5.90
After 2 hours and 30 minutes	5.08	4.72	5.69
After 3 hours	4.87	4.60	5.54
After 3 hours and 30 minutes	4.69	4.52	5.35
After 4 hours	4.57	4.41	5.18
After 4 hours and 30 minutes	4.50	4.36	5.02
After 5 hours	4.42	4.33	4.91
After 6 hours	4.30	4.21	4.65

[0032]

The fermented milk obtained in Example 1 was one containing 0.1% of whey-derived peptide, and the fermented milk obtained in Example 2 was one containing 0.2% of yeast extract. On the other hand, the fermented milk obtained in Comparative Example 1 did not contain yeast extract and whey-derived peptide. From the measurement results of pH, it was found that in the fermented milk to which only collagen was blended (added) in Comparative Example 1, the pH was lowered slowly, and the phenomenon of fermentation delay was clearly observed. In contrast, in the fermented milk obtained in Examples 1 and 2, in which not only collagen but also yeast extract or whey-derived peptide was blended (added), the pH was lowered quickly, and it was admitted that the yeast extract or the whey-derived peptide had the effect of suppressing fermentation delay. As a result of sensory evaluation of the fermented milk of Examples 1 and 2, it was found that the fermented milk of Example 2 had unique flavor derived from the yeast extract.

[0033]

15 [Example 3]

34.6 kg of milk (manufactured by Meiji Co., Ltd.), 5.89 kg of powdered skim milk (manufactured by Meiji Co., Ltd.) and 53.3 kg of water were mixed. To this mixture, 3.06 kg of collagen, 0.05 kg of yeast extract and 0.1 kg of whey-derived peptide were added and mixed, and sterilized by heating at a reaching temperature of 95°C. Then, the mixture was cooled to 43°C. Subsequently, 3.0 kg of a lactic acid bacterium starter (a mixed starter of *Lactobacillus bulgaricus* and *Streptococcus thermophiles* separated from Bulgaria Yogurt manufactured by Meiji Co., Ltd.) was inoculated. 80 g of the mixture was put in each of 100 mL-containers. The appropriate numbers of the containers filled with the mixture were prepared and fermentation was conducted by allowing them to stand in a thermostatic chamber of 43°C. At this time, the sample was collected (sampling) every 30 minutes from 1 hour after the start of fermentation to 6 hours after the start of fermentation (excluding 3 hours and 4 hours after the start of fermentation), and the pH thereof was measured.

[0034]

30 [Example 4]

34.6 kg of milk (manufactured by Meiji Co., Ltd.), 5.89 kg of powdered skim milk (manufactured by Meiji Co., Ltd.) and 51.26 kg of water were mixed. To this mixture, 5.1 kg of collagen, 0.05 kg of yeast extract and 0.1 kg of whey-derived peptide were added and mixed, and sterilized by heating at a reaching temperature of 95°C. Then, the mixture was cooled to 43°C. Subsequently, 3.0 kg of a lactic acid bacterium starter (a mixed starter of *Lactobacillus bulgaricus* and *Streptococcus thermophiles* separated from Bulgaria Yogurt manufactured by Meiji Co., Ltd.) was inoculated. Filling and fermentation were conducted in the same manner as in Example 3, and the sample was collected (sampling) and the pH thereof was measured.

40 [0035]

[Comparative Example 2]

34.6 kg of milk (manufactured by Meiji Co., Ltd.), 5.89 kg of powdered skim milk (manufactured by Meiji Co., Ltd.) and 53.45 kg of water were mixed. To this mixture, 3.06 kg of collagen was added and mixed, and sterilized by heating at a reaching
5 temperature of 95°C. Then, the mixture was cooled to 43°C. Subsequently, 3.0 kg of a lactic acid bacterium starter (a mixed starter of *Lactobacillus bulgaricus* and *Streptococcus thermophiles* separated from Bulgaria Yogurt manufactured by Meiji Co., Ltd.) was inoculated. Filling and fermentation were conducted in the same manner as in Example 3, and the sample was collected (sampling) and the pH thereof was
10 measured.

[0036]

[Comparative Example 3]

34.6 kg of milk (manufactured by Meiji Co., Ltd.), 5.89 kg of powdered skim milk (manufactured by Meiji Co., Ltd.) and 51.41 kg of water were mixed. To this mixture,
15 5.1 kg of collagen was added and mixed, and sterilized by heating at a reaching temperature of 95°C. Then, the mixture was cooled to 43°C. Then, 3.0 kg of a lactic acid bacterium starter (a mixed starter of *Lactobacillus bulgaricus* and *Streptococcus thermophiles* separated from Bulgaria Yogurt manufactured by Meiji Co., Ltd.) was inoculated. Filling and fermentation were conducted in the same manner as in Example
20 3, and the sample was collected (sampling) and the pH thereof was measured.

The results of measuring the pH in Examples 3 and 4 and Comparative Examples 2 and 3 are shown in Table 2 and FIG. 2.

[0037]

TABLE 2

Sampling hours	Example 3	Example 4	Comp. Ex. 2	Comp. Ex. 3
After 1 hour	6.02	6.11	6.26	6.35
After 1 hour and 30 minutes	5.39	5.59	6.14	6.22
After 2 hours	4.94	5.09	5.96	6.09
After 2 hours and 30 minutes	4.65	4.79	5.81	5.96
After 3 hours and 30 minutes	4.44	4.55	5.48	5.62
After 4 hours and 30 minutes	4.34	4.45	5.12	5.47
After 5 hours	4.28	4.40	4.92	5.33
After 5 hours and 30 minutes	4.24	4.32	4.73	5.24
After 6 hours	4.20	4.31	4.61	5.13

25

[0038]

The fermented milk obtained in Example 3 was one containing 3.06% of collagen and the fermented milk obtained in Example 4 was one containing 5.1% of collagen, and each contained yeast extract and whey-derived peptide. On the other hand, the
30 fermented milk obtained in Comparative Example 2 was one containing 3.06% of

collagen and the fermented milk obtained in Comparative Example 3 was one containing 5.1% of collagen and each contained no yeast extract and whey-derived peptide. From the measurement results of pH, it was found that in the fermented milk to which only collagen was blended (mixed) in Comparative Examples 2 and 3, the pH was lowered slowly, and the phenomenon of fermentation delay was clearly observed. In contrast, in the fermented milk of Examples 3 and 4, in which not only collagen but also yeast extract and whey-derived peptide were blended (added), the pH was lowered quickly, and it was admitted that yeast extract and whey-derived peptide had the effect of suppressing fermentation delay. As a result of sensory evaluation, it was found that the fermented milk of Examples 3 and 4 did not have unique flavor derived from yeast extract, and had good flavor and texture intrinsic to fermented milk, demonstrating the effect of masking by whey-derived peptide. It was revealed that, by the preferable embodiment of the present invention, fermentation delay caused by addition of collagen to fermented milk can be suppressed, and fermented milk having excellent flavor and texture can be produced.

[0039]

[Example 5]

34.6 kg of milk (manufactured by Meiji Co., Ltd.), 5.89 kg of powdered skim milk (manufactured by Meiji Co., Ltd.) and 53.405 kg of water were mixed. To this mixture, 3.06 kg of collagen, 0.015 kg of yeast extract and 0.03 kg of whey-derived peptide were added and mixed, and sterilized by heating at a reaching temperature of 95°C. Then, the mixture was cooled to 43°C. Subsequently, 3.0 kg of a lactic acid bacterium starter (a mixed starter of *Lactobacillus bulgaricus* and *Streptococcus thermophiles* separated from Bulgaria Yogurt manufactured by Meiji Co., Ltd.) was inoculated. Filling and fermentation were conducted in the same manner as in Example 3, and the sample was collected (sampling) and the pH thereof was measured. At this time, the sample was collected after 1 hour, 1 hour and 30 minutes, 2 hours, 2 hours and 30 minutes, 3 hours, 3 hours and 15 minutes, 4 hours, 4 hours and 30 minutes, 4 hours and 45 minutes, 5 hours and 5 hours and 40 minutes from the start of fermentation.

[0040]

[Example 6]

34.6 kg of milk (manufactured by Meiji Co., Ltd.), 5.89 kg of powdered skim milk (manufactured by Meiji Co., Ltd.) and 53.375 kg of water were mixed. To this mixture, 3.06 kg of collagen, 0.025 kg of yeast extract and 0.05 kg of whey-derived peptide were added and mixed, and sterilized by heating at a reaching temperature of 95°C. Then, the mixture was cooled to 43°C. Subsequently, 3.0 kg of a lactic acid bacterium starter (a mixed starter of *Lactobacillus bulgaricus* and *Streptococcus thermophiles* separated from Bulgaria Yogurt manufactured by Meiji Co., Ltd.) was inoculated. Filling and fermentation were conducted in the same manner as in Example 5, and the sample was collected (sampling) and the pH thereof was measured.

[0041]

[Comparative Example 4]

34.6 kg of milk (manufactured by Meiji Co., Ltd.), 5.89 kg of powdered skim milk (manufactured by Meiji Co., Ltd.) and 53.45 kg of water were mixed. To this mixture, 5 3.06 kg of collagen was added and mixed, and sterilized by heating at a reaching temperature of 95°C. Then, the mixture was cooled to 43°C. Subsequently, 3.0 kg of a lactic acid bacterium starter (a mixed starter of *Lactobacillus bulgaricus* and *Streptococcus thermophiles* separated from Bulgaria Yogurt manufactured by Meiji Co., Ltd.) was inoculated. Filling and fermentation were conducted in the same manner as 10 in Example 5, and the sample was collected (sampling) and the pH thereof was measured.

The results of measuring the pH in Examples 5 and 6 and Comparative Example 4 are shown in Table 3 and FIG. 3.

[0042]

15 TABLE 3

Sampling time	Example 5	Example 6	Comp. Ex. 4
After 1 hour	6.28	6.11	6.37
After 1 hour and 30 minutes	5.64	5.47	6.20
After 2 hours	5.33	5.08	6.05
After 2 hours and 30 minutes	4.94	4.82	5.73
After 3 hours	4.73	4.62	5.48
After 3 hours and 15 minutes	4.63	4.54	5.36
After 4 hours	4.50	4.43	5.03
After 4 hours and 30 minutes	4.42	4.37	4.81
After 4 hours and 45 minutes	4.38	4.31	4.70
After 5 hours	4.34	4.28	4.60
After 5 hours and 40 minutes	4.24	4.19	4.52

[0043]

As compared with the fermented milk obtained in Comparative Example 3, the fermented milk obtained in Examples 5 and 6 was one containing yeast extract and 20 whey-derived peptide at a low concentration. Even in these Examples 5 and 6, as compared with the fermented milk obtained in Comparative Example 4 that did not contain yeast extract and whey-derived peptide, the pH was lowered quickly, and effects of suppressing fermentation delay were observed even if the concentrations of yeast extract and whey-derived peptide were low. As a result of sensory evaluation, it was 25 found that the fermented milk of Examples 5 and 6 did not have unique flavor derived from yeast extract, and had good flavor and texture intrinsic to fermented milk. It was revealed that, by the preferable embodiment of the present invention, fermentation delay caused by addition of collagen to fermented milk can be suppressed, and fermented milk

having excellent flavor and texture can be produced.

[0044]

[Example 7]

34.6 kg of milk (manufactured by Meiji Co., Ltd.), 5.89 kg of powdered skim milk
5 (manufactured by Meiji Co., Ltd.) and 53.3 kg of water were mixed. To this mixture,
3.06 kg of collagen (HDL-50SP, derived from fish, manufactured by Nitta Gelatin, Inc.),
0.05 kg of yeast extract and 0.1 kg of whey-derived peptide were added and mixed, and
sterilized by heating at a reaching temperature of 95°C. Then, the mixture was cooled
to 43°C. Subsequently, 3.0 kg of a lactic acid bacterium starter (a mixed starter of
10 *Lactobacillus bulgaricus* and *Streptococcus thermophiles* separated from Bulgaria Yogurt
manufactured by Meiji Co., Ltd.) was inoculated. 80 g of the mixture was put in each of
100 mL-containers. The appropriate numbers of the containers filled with the mixture
were prepared and fermentation was conducted by allowing them to stand in a
thermostatic chamber of 43°C. At this time, the sample was collected (sampling) every
15 30 minutes from 1 hour after the start of fermentation to 5.5 hours after the start of
fermentation (excluding 1.5 hours and 3.5 hours after the start of fermentation), and the
pH thereof was measured.

[0045]

[Example 8]

20 34.6 kg of milk (manufactured by Meiji Co., Ltd.), 5.89 kg of powdered skim milk
(manufactured by Meiji Co., Ltd.) and 53.3 kg of water were mixed. To this mixture,
3.06 kg of collagen (SCP-5200, derived from pig skins, manufactured by Nitta Gelatin,
Inc.), 0.05 kg of yeast extract and 0.1 kg of whey-derived peptide were added and mixed,
and sterilized by heating at a reaching temperature of 95°C. Then, the mixture was
25 cooled to 43°C. Subsequently, 3.0 kg of a lactic acid bacterium starter (a mixed starter
of *Lactobacillus bulgaricus* and *Streptococcus thermophiles* separated from Bulgaria
Yogurt manufactured by Meiji Co., Ltd.) was inoculated. Filling and fermentation were
conducted in the same manner as in Example 7, and the sample was collected
(sampling) and the pH thereof was measured.

30 [0046]

[Comparative Example 5]

34.6 kg of milk (manufactured by Meiji Co., Ltd.), 5.89 kg of powdered skim milk
(manufactured by Meiji Co., Ltd.) and 53.3 kg of water were mixed. To this mixture,
3.06 kg of collagen (HDL-50SP, derived from fish, manufactured by Nitta Gelatin, Inc.)
35 was added and mixed, and sterilized by heating at a reaching temperature of 95°C.
Then, the mixture was cooled to 43°C. Subsequently, 3.0 kg of a lactic acid bacterium
starter (a mixed starter of *Lactobacillus bulgaricus* and *Streptococcus thermophiles*
separated from Bulgaria Yogurt manufactured by Meiji Co., Ltd.) was inoculated. Filling
and fermentation were conducted in the same manner as in Example 7, and the sample
40 was collected (sampling) and the pH thereof was measured.

[0047]

[Comparative Example 6]

34.6 kg of milk (manufactured by Meiji Co., Ltd.), 5.89 kg of powdered skim milk (manufactured by Meiji Co., Ltd.) and 53.3 kg of water were mixed. To this mixture, 5 3.06 kg of collagen (SCP-5200, derived from pig skins, manufactured by Nitta Gelatin, Inc.) was added and mixed, and sterilized by heating at a reaching temperature of 95°C. Then, the mixture was cooled to 43°C. Subsequently, 3.0 kg of a lactic acid bacterium starter (a mixed starter of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* separated from Bulgaria Yogurt manufactured by Meiji Co., Ltd.) was inoculated. 10 and fermentation were conducted in the same manner as in Example 7, and the sample was collected (sampling) and the pH thereof was measured.

The results of measuring the pH in Examples 7 and 8 and Comparative Examples 5 and 6 are shown in Table 4 and FIG. 4.

[0048]

15 TABLE 4

Sampling time	Example 7	Example 8	Comp. Ex. 5	Comp. Ex. 6
After 1 hour	6.10	6.10	6.29	6.24
After 1 hour and 30 minutes	4.96	4.91	5.98	5.68
After 2 hours	4.69	4.66	5.74	5.37
After 2 hours and 30 minutes	4.55	4.51	5.57	5.12
After 3 hours and 30 minutes	4.36	4.35	5.14	4.77
After 4 hours and 30 minutes	4.32	4.31	4.94	4.61
After 5 hours	4.26	4.27	4.76	4.49
After 5 hours and 30 minutes	4.20	4.23	4.61	4.45

[0049]

In Examples 7 and 8, different types of collagen were added (mixed). However, the fermented milk prepared in both examples contained yeast extract and whey-derived 20 peptide. On the other hand, in Comparative Examples 5 and 6, the type of collagen added was different, and the fermented milk prepared in both comparative examples did not contain yeast extract and whey-derived peptide. In Examples 7 and 8, as compared with the fermented milk in Comparative Examples 5 and 6 which did not contain yeast extract and whey-derived peptide, the pH was lowered quickly, and the effect of 25 suppressing fermentation delay was observed even if the type of collagen was different. As a result of sensory evaluation, it was found that the fermented milk of Examples 7 and 8 did not have unique flavor derived from yeast extract, and had good flavor and texture intrinsic to fermented milk. It was revealed that, by the preferable embodiment of the present invention, fermentation delay caused by addition of collagen to fermented milk 30 can be suppressed, and fermented milk having excellent flavor and texture can be produced.

Industrial Applicability

[0050]

According to the present invention, even if fermented milk is produced by using
5 starting milk in which collagen is blended at a high concentration, fermented milk can be
produced without causing the problem of fermentation delay. Further, according to the
preferred embodiment of the present invention, even if fermented milk is produced by
using starting milk in which collagen is blended at a high concentration, the problem of
fermentation delay does not occur, and fermented milk having good flavor or texture can
10 be produced.

[0051]

Although only some exemplary embodiments and/or examples of this invention
have been described in detail above, those skilled in the art will readily appreciate that
many modifications are possible in the exemplary embodiments and/or examples without
15 materially departing from the novel teachings and advantages of this invention.
Accordingly, all such modifications are intended to be included within the scope of this
invention.

The documents described in the specification and the Japanese application
specification claiming priority under the Paris Convention are incorporated herein by
20 reference in its entirety.

CLAIMS

1. A method for producing fermented milk that comprises collagen, the method comprising adding yeast extract and/or whey-derived peptide.
5
2. The method for producing fermented milk that comprises collagen according to claim 1, wherein the concentration of yeast extract added in starting milk is 0.001 wt% or more and 0.3 wt% or less.
- 10 3. The method for producing fermented milk that comprises collagen according to claim 1, wherein the concentration of whey-derived peptide added in starting milk is 0.01 wt% or more and 0.4 wt% or less.
4. The method for producing fermented milk that comprises collagen according to
15 claim 1, wherein the concentration of yeast extract added in starting milk is 0.001 wt% or more and 0.3 wt% or less, and the concentration of whey-derived peptide in starting milk is 0.01 wt% or more and 0.4 wt% or less.
5. The method for producing fermented milk that comprises collagen according to
20 any one of claims 1 to 4, wherein the concentration of collagen in starting milk is 0.4 wt% or more and 7 wt% or less.
6. The method for producing fermented milk that comprises collagen according to any one of claims 1 to 5, wherein the pH at the time of fermentation becomes 4.7 or less
25 within 4 hours from the start of the fermentation.
7. Fermented milk that is produced by the method according to any one of claims 1 to 6.