

Title: Milk composition, use thereof and products based thereon,
formulation to be fed to mammals, and method for producing said milk
composition

The present invention relates to a specific milk composition, and especially to a specific cows' milk composition. In addition, the invention relates to the use of this milk composition for the production of dairy based products and to the products produced for food and feed applications and for
5 food and feed supplements. In a further aspect, the present invention relates to a formulation for milk producing animals and especially for dairy cattle and essentially for dairy cows; and to a method for producing said milk composition by milking said milk producing animals.

Animal milk and especially cows' milk forms an important source
10 for foodstuffs intended for human consumption. Not only is animal milk *per se* consumed, but it is also an important ingredient or source of ingredients for other products intended for consumption. Animal milk contains a large number of different fatty acids. These different fatty acids have different effects on the health of human consumers.

15 In the prior art, it is described that milk compositions and especially the fatty acid composition thereof should be adapted with an aim to provide compositions which are healthier to human consumers.

For instance, in EP-A-1 106 077 a cows' milk composition is described having a total saturated fatty acid content of between 60.30 and
20 68.15 g/100 g total fatty acids, a total long-chain fatty ($\geq C_{18}$) acid content between 40 and 51 g/100 g total fatty acids, a total monounsaturated fatty acid content between 28.68 and 39.20 g/100 g total fatty acids, a total polyunsaturated fatty acid amount between 3.15 and 4.65 g/100 g total fatty acid, the value of the ratio $C_{16:0}/C_{18:0}$ cis is between 0.68 and 1.20, the value

of the ratio ω -6/ ω -3 is between 2.5 and 5, while in addition for various individualized fatty acids a weight range is given. According to the inventors of this European patent application, this milk composition has a preventive effect on cardiovascular diseases and cancerogenesis. This milk
5 composition is obtained from cows fed on a food in extruded form comprising 50-99% linseed, and having a total fatty matter content between 23 and 30%.

One of the aims of the present invention is to provide a composition which is believed to be healthier for a large group of consumers.

10 As said, animal milk contains a large number of different fatty acids, and these different fatty acids have different effects on the health of human consumers. Although it is possible to adapt the fatty acids composition in dairy products by replacement of dairy fat with non dairy oils, such a replacement may lead to a number of problems including
15 stability and taste problems. Stability problems, associated with non dairy oils being used to replace milk fat, are, *e.g.* related to a high amount of fat that is liquid at room temperature, and to a different melting behavior, making the fat unusable for many applications. Furthermore, the addition of oils containing a high amount of (poly)unsaturated fatty acids leads to
20 oxidation of these (poly)unsaturated fatty acids in the end product. Additionally, taste problems occur associated with the source of the oils used for replacing milk fat, such as the presence of residual flavours caused by the addition of fish oils. Moreover, replacement of dairy fat results in a surplus of dairy fat that needs to be processed or discarded.

25 For the overall quality of the product, it is better to control the composition of milk by the food of the animal producing such a milk. The adaptation of a milk composition by feeding desired oils or fatty acids to a lactating animal is however not straight-forward in the sense that addition of a supplement to a feed for, for instance, a cow can result in an increase in
30 the concentration of some beneficial fatty acid or acids in milk, but might

have no or even a negative impact on the concentration of (other) beneficial fatty acids. Similarly, feeding a supplement can result in a decreased amount of some detrimental fatty acids, but also in no effect or even an increase in the amount of detrimental fatty acids. See, in this light, the
5 article of Glasser *et al.* in J. Dairy Sc. 91 (2008), 4687-4703, studying the use of oilseed supplements in cow diets to alter the milk fatty acid (FA) composition and stating that “Responses were non-significant, linear or quadratic, depending on the FA studied and the supplement”.

One of the reasons why it is very difficult to predict the effect of
10 feed supplements on the fatty acid composition in the milk is that the animal has a large number of mechanisms to keep the fluidity of the milk fat within certain biological limit to be able to lactate. The fluidity is determined by the chain length, and the number, position and orientation (cis or trans) of the double bonds of the individual fatty acids but also by the
15 stereospecific arrangement of the different fatty acids in the triglyceride molecule. The animal has a wide range of possibilities (desaturating of fatty acids, producing fatty acids with different chain lengths, or esterification on specific position in the triglyceride) to counter balance changes in individual fatty acids while remaining fluidity of milk fat as a whole.

20 Moreover, it is observed that feed supplements intended to alter the fatty acid composition in milk, may also influence and negatively affect the health of the animal, the milk production parameters and may even lead to environmental pollution caused by the animals consuming the feed supplement.

25 This makes that the production of a milk with an adapted fatty acid composition in a sustainable way, requires the combination of feed supplements that also take into account the effects on the animal's, and especially the cow's health.

It was now found that a healthy milk, and even a milk with health
30 improvements relative to “natural” animal milk (that is, milk from animals

that do not receive any specific feed supplements) but also relative to the milk composition described in EP-A-1 106 077, can be obtained with specific requirements to the fatty acid composition, while in addition said milk can easily be produced by an animal, without negatively affecting the animal's health.

In a first aspect, the present invention therefore relates to a fatty acids comprising milk composition, having a total amount of saturated fatty acids of between 55.0 and 67.0 grams, preferably between 57.00 and 64 grams, per 100 grams total fatty acids, wherein the weight ratio ω -6/ ω -3 fatty acids is between 0.1 and 2.0, the content of C_{18:3}-cis 9,12,15 is between 1.0 and 8.0 g/100 g total fatty acids, and wherein the weight ratio fat/protein is between 1.05 and 1.45.

The identity and amount of the various fatty acids can be easily determined using conventional gas chromatography techniques. Particularly, the following method is used by the present inventors: milk fat is extracted from milk samples. Fatty acid methyl esters were prepared from fat fractions as described in ISO Standard 15884 (ISO-IDF 2002b). The methyl esters were analyzed according to ISO Standard 15885 (ISO-IDF 2002a) on a Trace GC Ultra chromatograph (Thermo Electron Corporation), using a Varian Fame Select column (100 m x 0.25 mm ID; Varian Inc.). The initial temperature was held at 70°C for 1 minute and raised to 225°C at 3°C/min and held at 225°C for 5 minutes. A volume of 1 μ l was injected. Each peak was identified and quantified using pure methyl ester samples (Sigma-Aldrich; Larodan). The fatty acids were expressed as a portion of total fat weight.

As to the fat/protein ratio, it is noted that this weight ratio is the wt.% fat divided by the protein weight percentage in milk, wherein the protein equals the sum of the true protein content and the non-protein nitrogen (N*6.38, as according to the Kjeldahl method). The fat and protein

percentages and the concentration of urea were determined by infrared spectroscopy using a MilkoScan FT6000 (Foss Electric).

The milk composition can be a milk originating from lactating animals, and especially of dairy cattle such as dairy cows.

5 The fat/protein ratio in milk is an indicator for milk fat depression and a negative energy balance, which are metabolic disorders in a lactating animal, and especially in a cow. Milk fat depression is a major problem caused by feeding too much unprotected oils to lactating animals. By keeping the fat/protein ratio in milk between 1.05 and 1.45 and preferably
10 between 1.15 and 1.30, the milk composition is obtained from a healthy lactating animal.

Roughly, more than 70 wt.% of the fatty acids in natural cows' milk are saturated, and hence less than 30 wt.% of the fatty acids are formed by mono- and poly-unsaturated fatty acids. The milk composition of the present
15 invention has a considerably lower amount of saturated fatty acids, which has a good effect on the quality of the blood lipids and a corresponding positive effect against cholesterol related diseases and other cardiovascular diseases. In the present description and the claims, "saturated fatty acids" is the sum of $C_{4:0} + C_{5:0} + C_{6:0} + C_{7:0} + C_{8:0} + C_{9:0} + C_{10:0} + C_{11:0} + C_{12:0} + C_{13:0} +$
20 $C_{14:0} + C_{14:0} \text{ iso} + C_{15:0} + C_{15:0} \text{ iso} + C_{15:0} \text{ ante iso} + C_{16:0} + C_{16:0} \text{ iso} + C_{17:0} + C_{17:0} \text{ iso} + C_{17:0} \text{ ante iso} + C_{18:0} + C_{20:0}$.

In a preferred embodiment, the total amount of saturated fatty acids is between 59.0 and 64.0, more preferably about 60-62 grams per 100 grams total fatty acids.

25 The milk composition has a weight ratio ω -6/ ω -3 fatty acids between 0.1 and 2.0. The term " ω -3 fatty acids" is, in the present description and the appending claims, the sum of $C_{18:3} \text{ cis } 9,12,15$ (ALA) + $C_{20:5} \text{ cis } 5,8,11,14,17$ (EPA) + $C_{22:5} \text{ cis } 7,10,13,16,19$ (DPA) + $C_{22:6} \text{ cis } 4,7,10,13,16,19$ (DHA), the term " ω -6 fatty acids" the sum of $C_{18:2} \text{ cis } 9,12 + C_{22:2} \text{ cis } 13,16$.

When in a composition the amount of ω -6 fatty acids, relative to the amount ω -3 fatty acids, is such that the weight ratio of ω -6/ ω -3 fatty acids is higher than 2, such a composition may promote the pathogenesis of many diseases including cardiovascular diseases, cancer, inflammatory diseases
5 and autoimmune diseases. In a preferred embodiment, the weight ratio of ω -6/ ω -3 fatty acids is between 1.0 and 1.5.

As said, the content of the ω -3 fatty acid C_{18:3}-cis 9,12,15 is between 1.0 and 8.0 g/100 g total fatty acids in the milk composition of the present invention, preferably between 1.2 and 4.0, and most preferably between 1.4
10 and 2.0, such as about 1.5.

In a further preferred embodiment, the milk composition according to the invention contains Conjugated Linoleic Acid (CLA; C_{18:2} trans 11 cis 9) preferentially is an amount of between 0.5 and 4.0 g/100 g total fatty acids, more preferably between 0.6 and 2.5, most preferably between 0.7 and 1.0
15 g/100 g total fatty acids. CLA is known to have an anti-carcinogenic effect.

Trans fatty acids are not considered particularly healthy and the content of these fatty acids (the sum of C_{16:1} trans 9 + C_{18:1} trans (4+5+6+7+8) + C_{18:1} trans 9 + C_{18:1} trans 10 + C_{18:1} trans 11) is preferably low; that is less than 8 g/100 g total fatty acids, more preferably less than 5
20 g/100 g total fatty acids.

The only exception is C_{18:1} trans 11. This trans fatty acid may be present in an amount up to 4 g/100 g total fatty acid; preferably between 1 and 3, more preferably between 1.2 and 1.9 g/100 g total fatty acids. This fatty acid can be converted in the human body to C_{18:2} cis 9, trans 11, (CLA)
25

In yet a further preferred embodiment, the milk composition has a combined content of the fatty acids C_{12:0}, C_{14:0} and C_{16:0} between 26.8 and 41.9 g/100 g total fatty acids. The content preferentially of C_{12:0} is between 1.8 and 3.4 g/100 g total fatty acid, preferably between 2.0 and 2.9 g/100 g total fatty acid. The content of C_{14:0} is preferably between 7.0 and 10.5 g/100

g total fatty acid, more preferably between 8.0 and 9.5 g/100 g total fatty acid. The content C_{16:0} is preferably between 18.0 and 28.0 g/100 g total fatty acid, more preferably between 19.0 and 25.0 g/100 g total fatty acid.

Preferably, the milk composition of the present invention has an
5 Atherogenic Index (AI) between 1 and 2.3; more preferably between 1.4 and 1.8, such as about 1.6. The AI index is defined as follows
(the sum of the proportion in wt.% of C_{12:0} + C_{16:0} + 4*C_{14:0} in the fat)
divided by (the proportion of total unsaturated fats); wherein the proportion
of unsaturated fatty acids equals (100% - the proportion of saturated fatty
10 acids). This index is a dietary risk indicator for cardiovascular diseases and
is described in more detail by Bobe *et al.* in J. Dairy Sc. 86 (2003), 3122-3127
and by Ulbricht and Southgate in The Lancet 338 (1991), 985-992.

C_{18:1} cis 9 (oleic acid) is an unsaturated ω-9 fatty acid that does not
disturb the ω-6/ω-3 weight ratio). Preferably the content of C_{18:1} cis 9 is
15 between 16.0 and 29.0 g/100 g total fatty acid.

C_{4:0} (Butyrate), a fatty acid associated with anti carcinogenic effects
is preferably present in an amount between 3.0 and 4.3 g/100 g total fatty
acid.

A number of fatty acids may be present in the milk composition of
20 the present invention without having a particular beneficial effect nor
having any adverse effect. To this group of fatty acids, the following fatty
acids belong: C_{6:0}; C_{8:0}; C_{10:0}; and C_{18:0}.

In a further aspect, the present invention relates to the use of the
milk composition of the invention for the preparation of a dairy based
25 composition, such as a cheese, a yoghurt, a cream composition, a dessert
product and so on. Furthermore, the invention relates to the products
produced using the milk composition, and especially those products wherein
the fatty acid composition of the milk composition is essentially maintained
in the final product. These products are for instance suitable for food and
30 feed applications or for food and feed supplements.

The milk composition according to the present invention can for instance be obtained by adding particular components to a base roughage and/or base concentrate. This base roughage can consist of maize silage and grass silage. The base concentrate can be any type of concentrate and is a conventional feedstuff having a dry matter content higher than 80 wt.% and a crude fat content lower than 10%. Grass and maize silage are typical components of a winter diet for Dutch cows. The ratio of maize silage to grass silage is important because maize mainly contains ω -6 fatty acids (C_{18:2} cis 9,12) while grass mainly contains ω -3 fatty acids (C_{18:3} cis 9,12,15). Feeding a cow too much maize compared to grass will result in a higher (negative for human health) ω -6 to ω -3 ratio in the milk. In the summer fresh grass will be the main roughage of Dutch cows. Fresh grass contains more ω -3 fatty acids than grass silage. In the summer the combination of supplements described will be added to a diet that contains fresh grass as the main roughage. These supplements (and the roughage) are exemplified in the following table A:

Table A

Component	kg dry matter (DM)	fat % (gram crude fat/100gram DM)	kg fat intake per day per animal
<i>Roughage</i>			
Grass silage	12	4.1	0.5
Maize silage	4	3.5	0.1
Concentrate	5	3.1	0.2
<i>Supplements</i>			
(1)unprotected oil	0.2	100	0.2
(2)protected oil	0.15	66	0.1
(3)completely hydrogenated fat	0.2	100	0.2
Total	21.6	6.0%	1.3

(1) Unprotected oil: oil of any type that consist of >30% C_{18:3} cis 9,12,15 (ALA) (e.g. linseed oil). Suitable supplements are described in, e.g. EP-A-

1 106 077. This oil is not protected to rumen biohydrogenation.

(2) Rumen protected oil feed supplement containing oil that is encapsulated or otherwise incorporated in a matrix material preferably based on protein; this encapsulated supplement contains >50% oil and this oil consist of

5 > 30% C_{18:3} cis 9, 12, 15, and the protection is such that less than 50 wt.% of the C_{18:3} cis 9, 12, 15 incorporated therein is converted in the area between the mouth and duodenum of the ruminant. This rumen protected supplement is prepared by *e.g.* the method described in EP-A-1 925 211.

(3) Completely hydrogenated fat. Completely hydrogenated oil that after
10 hydrogenation contains >60% C_{18:0} (stearic acid) and < 5 % unsaturated fatty acids; for example completely hydrogenated rapeseed oil, soybean oil, line seed oil, sunflower oil.

The feed in this invention is composed of a base roughage, base concentrate and specific combination of supplements. A combination of
15 supplements in which, on a fat base, between 20 and 90% of the fat is delivered by (1) an unprotected oil and this oils may comprise > 30% C_{18:3} cis 9,12, 15 and between 10 and 80% of the fat is delivered by a (2) protected oil that may comprise >30% C_{18:3} cis 9,12, 15. Preferably, the combination of supplements contains, on a fat base, between 50% and 80%
20 (1) unprotected oil that consists of >30% C_{18:3} cis 9,12, 15; and between 20% and 50% (2) protected oil that consists of >30% C_{18:3} cis 9,12, 15.

In yet a further preferred embodiment the combination of supplements, on a fat base may comprise between 20% - 90% (1) unprotected oil that consists of >30% C_{18:3} cis 9,12, 15; and between 10% and
25 80% (2) protected oil that consists of >30% C_{18:3} cis 9,12, 15 and between 10% and 80% (3) completely hydrogenated fat that contains >60% C_{18:0} and < 5 % unsaturated fatty acids. More preferably the combination of supplements, on a fat base consists of between 30% - 70% of (1) unprotected oil that consists of >30% C_{18:3} cis 9,12, 15, between 20% and 50% of (2)
30 protected oil that consists of >30% C_{18:3} cis 9,12, 15 and between 30% and

70% of (3) completely hydrogenated fat that contains >60% C_{18:0} and < 5 % unsaturated fatty acids.

The milk composition obtained as a result of feeding the combination of supplements in the quantities as stated in Table A differs for individual
5 cows and changes during the season. The fatty acid composition is also determined by the health status, lactation stage, parity and genetic background of the cow. Furthermore, the composition and quantity of the fatty acids supplied by the diet is, in addition to the supplements also depending on the fatty acid composition and fat % of the other components
10 in the diet of the cow (*e.g.* the roughage or the concentrate).

As said, especially the composition of the roughage varies greatly during the season. With the information provided the skilled person will however be able to prepare the milk composition according to the invention. In yet a further aspect, the present hence invention relates to a formulation
15 for lactating animals and preferably for dairy cows, based on a conventional roughage; said feed formulation comprising in the fatty phase 20-90 wt.%, preferably 50-80 wt.% (drawn to the fatty phase) native fat comprising at least 30 wt.% C_{18:3} cis 9, 12, 15; and 80-10 wt.%, preferably 50-20 wt.% rumen-protected fat, comprising at least 30 wt.% C_{18:3} cis 9, 12, 15.

20 In a preferred embodiment, said formulation of the invention comprises at least 10 wt.% of the rumen-protected fat, and in addition at least 10 wt.%, preferably between 30 and 70 wt.%, completely hydrogenated fat, comprising at least 60 wt.% C_{18:0}.

Such formulations are generally prepared by adding the essential
25 supplements, optionally in the form of rumen protected compositions, to a conventional base composition. Such a base composition may for instance be silage, and especially a grass silage or a maize silage, yet other suitable base compositions can equally well be used. Preferably, the formulation also contains added minerals and vitamins, and especially added selenium.
30 Preferably, 0.2 mg/kgDM (dry matter) organic selenium is added to the

formulation of the invention and to the composition illustrated in table A. In addition to the level of selenium added, the selenium concentration is also depending on the selenium concentration already present in the other feed components. Organic selenium is partly incorporated in the milk proteins. A
5 higher selenium concentration in dairy products is positive for human health. Furthermore, addition of selenium preferably in combination with vitamin E is beneficial for the oxidative stability of the feed stuff and the milk. This is especially important when the amounts of unsaturated fatty acids are raised, as for the milk according to the invention. Moreover
10 selenium and Vitamin E are important for the cow's health.

Preferably, the selenium content in the milk is between 1.8 and 6.1 $\mu\text{g}/100\text{g}$ milk.

The three types of feed supplements used in the present invention will now be discussed:

- 15 1) Rumen protected supplements are used to prevent biohydrogenation in the rumen. In this technique a (generally purified) oil is encapsulated, for example with protein. An example is described in EP-A-1 925 211. Advantages of this technique are that an increase in specific fatty acids (*e.g.* ω -3 or ω -6), no or only a limited increase in trans fatty acids, and a small
20 decrease in $\text{C}_{12:0}/\text{C}_{14:0}/\text{C}_{16:0}$ can be obtained.
- 2) Non rumen protected supplements have as an important advantage that CLA will be formed and the biohydrogenation intermediates will inhibit the *de novo* synthesis of fatty acids in the cow. The *de novo* synthesized fatty acids are saturated fatty acids ($\text{C}_{4:0}$ - $\text{C}_{16:0}$). The oils supplemented in this way
25 are not protected to biohydrogenation which leads to a large decrease in $\text{C}_{12:0}/\text{C}_{14:0}/\text{C}_{16:0}$, to a small increase in polyunsaturated fatty acids, and to a considerable increase in CLA.
- 3) Hardened fats are completely hydrogenated fats that only contain saturated fatty acids. They are a good source of energy for the cow because
30 saturated fat is not used by rumen bacteria and does not disturb rumen

bacteria metabolism. The addition of saturated fats to the diet of cows will result in an increase of these saturated fatty acids in the milk. However the cow is capable of desaturating saturated fatty acids to delta 9 unsaturated fatty acids by the stearoyl-CoA desaturase (SCD) enzyme, which catalyzes

5 the insertion of a double bond between carbon atoms 9 and 10 of a fatty acid. The extent to which fatty acids are unsaturated by this enzyme depends on the chain length of the fatty acids. For most fatty acids this unsaturation of the saturated precursor is below 50 % indicating that addition of such fatty acids to the diet will result in an increase of the total amount of saturated

10 fat in the milk. However, for C_{18:0} the SCD enzyme desaturates more than 50% of the saturated C_{18:0} to C_{18:1} cis 9. This indicates that addition of saturated C_{18:0} to the milk will result in an increase in the amount of unsaturated fat in the milk. Completely hydrogenated oils that contain mainly C₁₈ fatty acids before hydrogenation are a good source of C_{18:0}.

15 Hardened oil containing mainly C_{18:0} is a good fat source to increase C_{18:1} cis 9 in milk because C_{18:1} is partly saturated to C_{18:1} cis 9 in the mammary gland.

Stearic acid (C_{18:0}), a solid fat at room temperature, can be grinded and fed, mixed with other feed stuff in the ration. Alternatively, stearic acid

20 can be melted and used to coat other feed stuff in the ration. Coating other feed stuff might help to rumen protect these other feed stuff.

In yet a further preferred embodiment, the formulation of the invention contains added selenium. This selenium is partly incorporated in milk proteins and excreted in the milk. A higher selenium level in the milk

25 is good for human health, but also important for the cow's health. Selenium is an antioxidant preventing oxidation of polyunsaturated fatty acids in the milk and in the feed supplement.

A milk composition obtained by milking cows fed with the food composition described in Table A is given in Table B:

Table B:

	Fatty acid	minimum	maximum	average
	C4:0	3.0	4.3	3.5
	C6:0	1.5	2.5	2.0
5	C8:0	0.7	1.5	1.0
	C10:0	1.6	4.0	2.5
	C12:0	1.8	3.4	2.8
	C14:0	7.0	10.5	9.2
	C16:0	18.0	28.0	22.3
10	C18:0	10.0	20.0	15.8
	Saturated	55.0	67.0	60.9
	C18:3 cis 9,12,15 (omega 3)	1.0	8.0	1.9
15	Ratio omega6/omega3	0.1	2.0	1.5
	AI index	1	2.3	1.6
	C16:1 trans 9	0.05	0.5	0.28
20	C18:1 trans 4+5+6+7+8	0.20	1.0	0.45
	C18:1 trans 9	0.1	0.5	0.28
	C18:1 trans 10	0.2	2	0.61
	C18:1 trans 11	1	4	1.7
	Total trans	1.2	8	3.4
25	C18:1 cis 9	16	29	23.2
	C18:2 cis 9, trans 11 (CLA)	0.5	4	0.72
	Mono unsaturated fatty acids total	26.6	39.5	30.1
	Poly unsaturated fatty acids total	3	12	4
	Fat %	3	5	4.22
30	protein %	2.5	4	3.43
	Lactose %	4.3	4.9	4.53
	Ratio fat/protein	1.05	1.45	1.23
	Urea mg/100g milk	5	35	21
	Selenium µg/100 g milk	1.8	6.1	2.5

This milk composition has an increased amount of ω -3 fatty acids, CLA, oleic acid and preferably also of the mineral selenium that is also preferably added to the roughage. It has a lower content of saturated acids (compared to regular cows' milk) and especially a lower amount of those saturated fatty acids referred to in the AI ($C_{12:0}$, $C_{14:0}$ and $C_{16:0}$). The increase of trans fatty acids is rather limited and is primarily an increase of $C_{18:1}$ trans 11. The food does neither give the animal a negative energy balance nor a milk fat depression. The urea content in the milk composition of the invention is reduced, preferably to an amount in the range of 5-35 mg/100 g milk, and so is the nitrogen excretion in the urine.

In the last aspect, the present invention relates to a process for producing a milk composition according to the invention, comprising feeding a lactating animal, and preferable a cow, with a formulation of the invention, followed by milking said animal.

Claims

1. Fatty acids comprising milk composition, preferably a fatty acids comprising cow milk composition, having a total content of saturated fatty acids of between 55,0 and 67,0 grams per 100 grams total fatty acids, wherein the weight ratio ω -6/ ω -3 fatty acids is between 0,1 and 2,0, the
5 content of C_{18:3}-cis 9,12,15 is between 1,0 and 8,0 g/100 g total fatty acids, and wherein the weight ratio fat/protein is between 1,05 and 1,45.
2. The milk composition according to claim 1, wherein the content of C_{18:2}-cis 9, trans 11 is between 0,5 and 4 g/100 g total fatty acids.
3. The milk composition according to claim 1 or 2, wherein the
10 combined content of the fatty acids C_{12:0}, C_{14:0} en C_{16:0} is between 26,8 and 41,9 g/100 g total fatty acids.
4. The milk composition according to any of the preceding claims, wherein the Atherogenic Index AI is between 1 and 2,3.
5. The milk composition according to any of the preceding claims
15 having a selenium content between 1,8 and 6,1 μ g atomic Se per 100 g milk.
6. Use of the milk composition according to any of the preceding claims for the production of a dairy based product.
7. Product based on the milk composition according to any of claims 1-5 or obtainable by the use of claim 6.
- 20 8. Formulation for lactating animals, preferably dairy cows, based on a conventional roughage comprising in the fatty phase 20-90 wt%, preferably 50-80 wt.%, native fat comprising at least 30 wt.% C_{18:3} cis 9, 12, 15; and 80-10 wt.%, preferably 50-20 wt.%, rumen-protected fat, comprising at least 30 wt.%, C_{18:3} cis 9, 12, 15.
- 25 9. Formulation according to claim 8, comprising at least 20 wt.% native fat, at least 10 wt.% rumen-protected fat, and in addition at least 10

wt.%, preferably between 30 and 70 wt.%, completely hydrogenated fat comprising at least 60 wt.% C_{18:0}.

10. Formulation according to claim 8 or 9, comprising added minerals, preferably added selenium.

- 5 11. Method to produce a milk composition according to any of the claims 1-5 comprising feeding a lactating animal with the formulation according claim 8 or 9, followed by milking said animal.