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(54) Title: FOAMING COMPOSITION		
(57) Abstract Foaming cleaning, personal-care, and food compositions, such a shampoo etc., contain a hexose fatty acid ester. The ester has an acyl group with 7 to 10 carbon atoms and shows improved foaming power.		

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FOAMING COMPOSITION

TECHNICAL FIELD

This invention relates to foaming cleaning and personal-care compositions, such as shampoo, shaving cream, 5 tooth paste, carpet shampoo, dish-washing liquid, foaming industrial cleaner, and liquid soap, and to foaming food compositions, such as sponge cake, whipping cream and ice cream.

BACKGROUND ART

10 The ability to create a voluminous foam is considered essential in the compositions to which the invention relates. A number of foaming agents are known, and can be incorporated to achieve the desired foaming.

Known foaming agents include anionics, nonionics 15 and amphoteric. Many of them are also active as surfactants and/or emulsifiers.

A representative example of anionic foaming agents is alkyl ether sulphate (AES), especially sodium lauryl ether sulphate, which is commonly incorporated in shampoo to 20 provide foaming and cleaning effect. An example of nonionic foaming agents is coconut fatty acid diethanol amide (CDE), which is commonly used together with AES in shampoo to increase the foaming.

Carbohydrate fatty acid esters are also known as 25 ingredients in some foaming personal-care, cleaning and food compositions, such as shampoo, tooth paste, shaving cream, sponge cake and whipping cream. Reference is made to EP 191,564, JP-A 51-93,913, JP-A 59-184,299, JP-A 53-88,807, JP-A 54-134,711, US 4,279,888, to "Ryoto Sugar Ester -

Technical Information" published by Mitsubishi Kasei Food Corp., Tokyo, Japan, and to "Application of Sucrose Fatty Acid Ester to Medicine and Cosmetics" published by Dai-Nippon Sugar Manufacturing Co.

5 More specifically, the carbohydrate fatty acid esters used in the above-mentioned prior art are mono-esters or mixtures of mono- and di-esters of sucrose or other oligosaccharides with fatty acids of 12-20 carbon atoms. The prior art indicates that incorporation of these esters
10 improves the foaming of some products, but that the foaming is in some cases less than desired. Additionally, the prior art indicates that in some cases the carbohydrate ester performs other useful functions, e.g. as an emulsifier or a surfactant.

15 It is the object of the invention to provide foaming cleaning and personal-care compositions and foaming food compositions comprising carbohydrate fatty acid ester with improved foaming.

STATEMENT OF THE INVENTION

20 We have found that a certain group of carbohydrate fatty acid esters have surprisingly good foaming properties. The group consists of the monoesters, wherein the carbohydrate is a hexose (monohexose) and the acyl group is straight-chain with 7-10 carbon atoms. The foaming ability of
25 these hexose esters is better than that of carbohydrate esters used in the prior art and better than similar hexose esters with a shorter or longer acyl group (acyl group with 6 or 12 carbon atoms).

Accordingly, the invention provides a foaming
30 personal-care or cleaning composition, containing as an essential ingredient therein a hexose fatty acid ester, said fatty acid being heptanoic, octanoic, nonanoic or decanoic acid.

The invention also provides a foaming food composition containing as an essential ingredient therein a hexose fatty acid ester, said fatty acid being heptanoic, octanoic, nonanoic or decanoic acid.

5 Some of the monohexose esters used in the invention are known. Thus, E. Reinefeld et al., Die Stärke, 20(6), 181-189 (1968) describes the synthesis of glucose esters with 6-18 carbon atoms in the acyl group. The article also reports surface tension data, showing that glucose-esters with 8 and
10 10 carbon atoms in the acyl group are less effective in lowering the surface tension than the ester with 12 carbon atoms in the acyl group.

DETAILED DESCRIPTION OF THE INVENTION

Hexose ester

15 The hexose esters of the invention contain a single acyl group attached to the oxygen atom of any hydroxyl group in a hexose (monohexose).

 The hexose may be an aldose or a ketose. Glucose, galactose or fructose (D-forms) are preferred for reasons of
20 economy.

 The acyl group has a straight chain with 7-10 carbon atoms. It is heptanoyl (enanthyl), octanoyl (caprylyl), nonanoyl (pelargonyl) or decanoyl (capryl). The acyl groups with an even number of carbon atoms (i.e.
25 octanoyl and decanoyl) are preferred due to raw material availability.

 Glucose esters with the acyl group attached in the 3- or 6-position (3-O-acyl-D-glucose or 6-O-acyl-D-glucose) are preferred due to ease of preparation.

30 Thus, two particularly preferred hexose esters are 6-O-octanoyl-D-glucose (D-glucosyl-6-octanoate) and 6-O-decanoyl-D-glucose (D-glucosyl-6-decanoate).

The hexose esters of the invention can be prepared according to methods known in the art. See E. Reinefeld, supra; K. Yoshimoto et al., Chem.Pharm.Bull., 27(11), 2661-2674(1979).

5 Cleaning and personal-care compositions

Foaming, cleaning and personal-care compositions form a class of products where foaming is considered essential. Typical products in this class are shampoo, shaving cream, tooth paste, carpet shampoo, dish-washing liquid, foaming industrial cleaner or liquid soap. Concerning the importance of foaming in some of these products, see Journal of the Society of Cosmetic Chemists, vol. 10, pp. 390-414 (1960). Preferred ranges for the amount of hexose ester of the invention are as follows (% by weight):

15	Shaving cream	1-5%
	Dish-washing liquid	1-10%
	Industrial cleaner	2-20%
	Tooth paste	1-5%
	Carpet shampoo	1-5%
20	Shampoo (e.g. hair shampoo, body shampoo)	1-25%
	Liquid soap	2-20%

The shampoo of the invention may contain the hexose ester as the main surfactant, in which case the content is preferably 10-20%. Alternatively, the shampoo may contain a combination of the hexose ester (e.g. 1-10%) with anionic surfactant (e.g. 10-20%). The anionic may be linear alkyl benzene sulphonate (LAS) or alkyl ether sulphate (AES, especially sodium lauryl ether sulphate).

Additionally, the shampoo of the invention may contain a foam booster (e.g. 0.5-8%), such as a long-chain fatty acid dialkanol amide (e.g. the aforementioned CDE), a long-chain N-acyl amino acid (e.g. N-acyl-sarcosinate or N-5 acylglutamate) or a betain derivative..

The anionic surfactant may be linear alkyl benzene sulphonate (LAS) or alkyl ether anionic sulphate (AES). If shampoo with higher viscosity is desired, this can be obtained by incorporating a thickener known in the art such 10 as CMC (carboxy-methyl cellulose) or, in case AES is also used, it can be controlled by incorporation of salt.

Thus, particularly preferred shampoo compositions are formulated as follows:

	Hexose ester	1-10%
15	Anionic surfactant	10-20%
	Foam booster	0.5-8%
	Salt	0-5%
	Thickener	0-5%
	Acid, to adjust to	pH 4-7
20	Perfume	q.s.
	Preservative	q.s.
	Water	balance

Food composition

The foaming food composition of the invention may 25 be sponge cake, whipping cream or ice cream. These products form a class where foaming is considered essential.

The hexose ester of the invention is preferably incorporated in an amount of 0.1-2.0% (by weight), to improve the foaming. The hexose ester may also act as an emulsifier 30 in these compositions.

EXAMPLESTest compounds

In the following examples, the glucose esters used each consisted of approx 85% of 6-ester (ester with the acyl group in the 6-position of glucose) and approx 15% of 3-ester. AES (alkyl ether sulphate) denotes sodium lauryl ether sulphate (Berol 452, Berol Kemi AB, Sweden). CDE indicates coconut acid diethanolamide (Empilan CDE, Albright & Wilson, United Kingdom).

- 10 Three commercial sucrose esters from Mitsubishi Kasei Food Corporation, Japan were used. Their catalogue gives the composition as follows:

	<u>Trade name</u>	<u>Fatty acid</u>	<u>% monoester</u>	<u>% di,tri,polyester</u>
	Ryoto L595	95% dodecanoic	30%	70%
15	- L1570	70% -	70%	30%
	- L1695	95% -	80%	20%

Determination of foaming

- In the following foaming was determined by the method of L. Moldovanyi, W. Hungerbühler, B. Lange:
- 20 Kosmetika, vol. 5, pp. 37-42 (1977). In this method, air is bubbled through the test solution, and the time to fill a certain volume with foam is noted. Thus, a shorter filling time indicates better foaming.

The detailed conditions were as follows:

- Air flow: 15 liters/min
- Volume of test solution: 500 ml
- Inner diameter of air inlet tube: 5 mm
- Volume of foam collected: 2 liters
- 5 - Inner diameter of foam tube: 26 mm

EXAMPLE 1Foaming of single surfactants

Foaming was measured in solutions of 2% (as active material). Results were as follows:

	Surfactant	Filling time
10		
	glucosyl-octanoate	75 seconds
	glucosyl-decanoate	130 -
15	Reference	
	glucosyl-hexanoate	900 seconds
	glucosyl-dodecanoate	above 600 seconds
	Ryoto L595	*)
	Ryoto L1570	328 seconds
	Ryoto L1695	276 -
20	AES	175 -
	CDE	180 -

*) Measurement not possible, as surfactant not sufficiently soluble.

It is seen that the two compounds of this invention show excellent foaming, even better than AES, the commonly used surfactant in shampoos.

Comparing the glucose esters, it is seen that hexanoic ester shows hardly any foaming, octanoic ester shows the best foaming of all, and decanoic ester the second best.

The commercial sucrose esters were chosen to represent the carbohydrate esters of prior-art shampoos, that are most similar to the esters of the invention, and to

represent various ratios of monoester to higher esters. It is seen that foaming of sucrose esters used in the prior art are far inferior to the invention.

EXAMPLE 2

5 Foaming of combinations with AES

Foaming was measured with 2% of AES and 0.4% of a test compound to show foam boosting effect (all % as active material). Results (filling times) were as follows:

Invention:	AES (2%) + glucosyl-octanoate (0.4%)	151 s
10 Reference:	AES (2%) + CDE (0.4%)	137 s
	AES (2%) + AES (0.4%)	160 s

It is seen that the ester of the invention is active as a foam booster, as it gives better foaming than AES alone used at the same concentration. However, CDE was more
15 effective as a foam booster.

EXAMPLE 3

Foaming of combinations with CDE

Foaming was measured in a solution of 2% of test compound + 0.4% of CDE (% as active material). Results were
20 as follows (some results from ex. 1 and 2 are included for comparison):

Invention:	Glucosyl-octanoate (2%)	75 s
	Glucosyl-octanoate + CDE (0.4%)	110 s
Reference:	AES (2%)	175 s
	AES + CDE (0.4%)	137 s

5 It is seen that addition of CDE decreases the foaming of the ester of the invention. However, it was observed that glucosyl-octanoate + CDE produced a particularly rich lather, that may be desirable in shampoos.

EXAMPLE 4

10 Shampoo formulation

A shampoo was formulated as follows (% as active matter):

	Glucosyl-octanoate	7.3%
	AES	14.4%
15	CDE	4.1%
	NaCl	4.4%
	Water	balance
	pH adjusted to	6.0

The shampoo was found to show good foaming when
20 used for washing of the hair by test persons.

EXAMPLE 5

Sponge cake

	Wheat flour	1000 g
	Egg	1000 -
5	Sugar	1000 -
	Baking powder	30 -
	Glucose ester	10 -

The ingredients are mixed with a whipper, and the batter is baked at 200°C for 25 min.

10 EXAMPLE 6

Tooth paste

Tooth pastes are prepared by kneading the following ingredients:

	<u>No. 1</u>	<u>No. 2</u>
15 Calcium carbonate	41.0	-
Dicalcium phosphate	-	50.0
Glycerol	20.0	-
Sorbitol	-	20.0
Carboxymethyl cellulose	-	1.0
20 Sodium alginate	2.0	-
Glucose ester	3.0	2.0
Flavoring	1.0	1.0
Sodium saccharin	0.1	0.1
Water	<u>balance</u>	<u>balance</u>
25	100.0%	100.0%

EXAMPLE 7

Whipping cream

	Vegetable oil	28%
	Sugar (sucrose)	10%
5	Salt	0.3%
	Carageenan	0.2%
	Sodium carboxy methyl cellulose	0.2%
	Lecithin	1.2%
	Glucosyl-decanoate	0.5%
10	Flavor	q.s.
	Water	<u>balance</u>
		100%

EXAMPLE 8

Ice cream

15	Milk fat	9%
	Skim milk powder	11%
	Sugar	12%
	Glucose ester	0.5-1.0%
	Flavor	q.s.
20	Color	q.s.
	Water	<u>balance</u>
		100%

EXAMPLE 9

Liquid soap

	Glucose ester	6%
	Sodium lauryl ether sulphate	36%
5	Cocamidopropyl betain	8%
	Perfume	q.s.
	Water	<u>balance</u>
		100%

EXAMPLE 10

10 Carpet shampoo

	Perchloro ethylene	7.5%
	Propellant	12.5%
	Glucose ester	3.0%
	Perfume	q.s.
15	Water	<u>balance</u>
		100%

EXAMPLE 11

Dish wash liquid

20	Sodium dodecyl benzene sulphonate (LAS)	20%
	CDE	5%
	Glucose ester	8%
	Latex	2%
	Perfume	q.s.
25	Water	<u>balance</u>
		100%

EXAMPLE 12

Shaving cream (aerosol)

	Stearic acid	7%
	Glycerol	3%
5	Coconut fatty acid	1%
	Glucose ester	2%
	KOH (34% solution)	5%
	NaOH (19% solution)	1%
	CDE	1%
10	Perfume	q.s.
	Water	<u>balance</u>
		100%

EXAMPLE 13

Foaming industrial cleaners

15	Glucose ester	3%
	Nitrilo tri-acetic acid (NTA)	2%
	n-hexyl-diglycol	5%
	iso-propanol	2%
	Additives	q.s.
20	Water	<u>balance</u>
		100%
	Glucose ester	15%
	NTA	1.2%
	Urea	2%
25	Additives	q.s.
	Water	<u>balance</u>
		100%

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Sodium alkyl-benzene sulphonate (LAS)	10%
Glucose ester	3%
Phosphonate (Sequion 40, product of Polygon, West Germany)	10%
5 Additives	q.s.
Water	<u>balance</u>

100%

Additives include coloring agent, perfume, and preservative.

CLAIMS

1. A foaming cleaning or personal-care composition, containing as an essential ingredient therein a hexose fatty acid ester, said fatty acid being heptanoic, octanoic, 5 nonanoic or decanoic acid.
2. A composition according to Claim 1 for a shampoo, shaving cream, tooth paste, carpet shampoo, dish-washing liquid, foaming industrial cleaner or liquid soap.
3. A shampoo composition according to Claim 2, containing 10 1-25% by weight of the hexose ester.
4. A shampoo composition according to Claim 3, containing 1-10% of the hexose ester, and further comprising 10-20% of an anionic surfactant.
5. The shampoo composition according to Claims 3 - 4, 15 further comprising 0.5-8% of fatty acid dialkanol amide or N-fatty acyl amino acid.
6. A tooth paste composition according to Claim 2, containing 1-5% by weight of the hexose ester.
7. A shaving cream composition according to Claim 2, 20 containing 1-5% by weight of the hexose ester.
8. A carpet shampoo composition according to Claim 2, containing 1-5% by weight of the hexose ester.

9. A dish-washing liquid composition according to Claim 2, containing 1-10% by weight of the hexose ester.
10. A foaming industrial cleaner composition according to Claim 2, containing 2-20% by weight of the hexose ester.
- 5 11. A liquid soap composition according to Claim 2, containing 2-20% by weight of the hexose ester.
12. The composition of Claims 1 - 11, wherein the hexose is glucose, galactose or fructose.
13. The composition of Claim 12, wherein the hexose ester
10 is 6-octanoyl-glucose or 6-decanoyl-glucose.
14. A foaming food composition containing as an essential ingredient therein a hexose fatty acid ester, said fatty acid being heptanoic, octanoic, nonanoic or decanoic acid.
15. The composition of Claim 14, wherein the food is sponge
15 cake, whipping cream or ice cream.
16. The composition of Claim 15, containing 0.1-2% by weight of the hexose ester.
17. The composition of Claim 16, wherein the hexose is glucose, galactose or fructose.
- 20 18. The composition of Claim 17, wherein the hexose ester is 6-octanoyl-glucose or 6-decanoyl-glucose.

INTERNATIONAL SEARCH REPORT

International Application No PCT/DK88/00099

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC 4		
B 01 F 17/00, C 07 H 13/06, A 61 K 7/075, 7/16, C 11 D 1/66, A 23 L 1/035		
II. FIELDS SEARCHED		
Minimum Documentation Searched †		
Classification System	Classification Symbols	
IPC 4	B 01 F 17/00; C 07 H 13/00 - 13/06; A 23 L 1/035; A 61 K; C 11 D	
US C1	252:319-321, 326, 327, 351, 352; 536:115, 119	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched †		
SE, NO, DK, FI classes as above. CHEMABS, CLAIMS		
III. DOCUMENTS CONSIDERED TO BE RELEVANT †		
Category *	Citation of Document, †† with indication, where appropriate, of the relevant passages †‡	Relevant to Claim No. †‡
X	US, 3 231 561 (T.E. BRUNELLE et al.)	14
Y	25 January 1966 see col. 1, lines 11-21 and claims 1-4	1-13
X	Chemical Abstracts, Vol. 100 (1984), abstract No. 108977 w, CS 206 143	1-2, 6, 14
Y	US, 2 973 353 (V.R. GAERTNER) 28 February 1961 see col. 1, lines 15-17, 28-29, 38, 63-64 and col. 2, line 10	1-2, 14
X	Derwent's abstract No. 79-86601 B/48, JP 54134711	1-2, 4
Y	US, 4 450 090 (CLAIROL INCORPORATED) 22 May 1984 & CA, 1214394 see col. 1, line 49 - col. 2, line 16	1-2
Y	Chemical Abstracts, Vol. 102 (1985), abstract No. 119422 d, JP 59 184 299	1-3, 6, 8
<p>* Special categories of cited documents: †‡</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
1988-09-21	1988 -09- 26	
International Searching Authority	Signature of Authorized Officer	
Swedish Patent Office	<i>Inga-Karin Petersson</i> Inga-Karin Petersson	