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(54) **CREAMER COMPRISING VEGETABLE LIPIDS AND ALLULOSE**

(71) Applicants: **CJ CHEILJEDANG CORPORATION**, Seoul (KR); **KYUNGPOOK NATIONAL UNIVERSITY INDUSTRY-ACADEMIC COOPERATION FOUNDATION**, Daegu (KR)

(72) Inventors: **Young Mi LEE**, Suwon-si (KR); **Seong Bo KIM**, Seongnam-si (KR); **Yang Hee KIM**, Suwon-si (KR); **Seong Jun CHO**, Seoul (KR); **Myung Sook CHOI**, Daegu (KR); **Young Ji HAN**, Daegu (KR); **Ji Young CHOI**, Daegu (KR); **Su Jung CHO**, Daegu (KR); **Un Ju JUNG**, Busan (KR); **Eun Young KWON**, Goyang-si (KR)

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(57) **ABSTRACT**

The present application relates to creamer comprising vegetable lipids, casein, maltose, phosphates, and allulose.

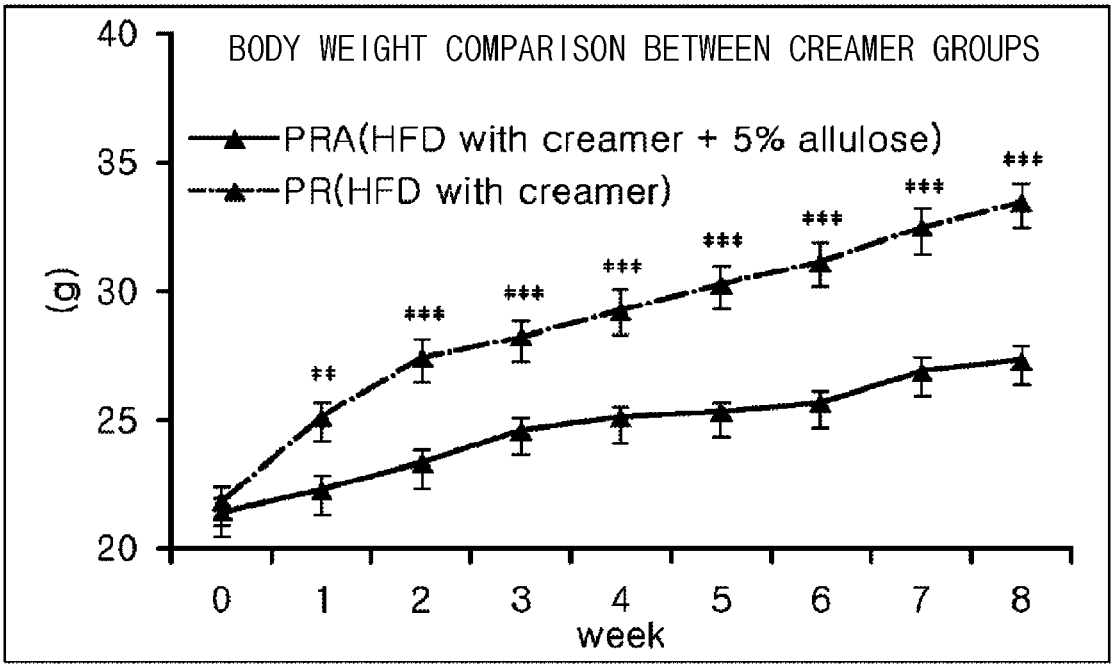

FIG.1

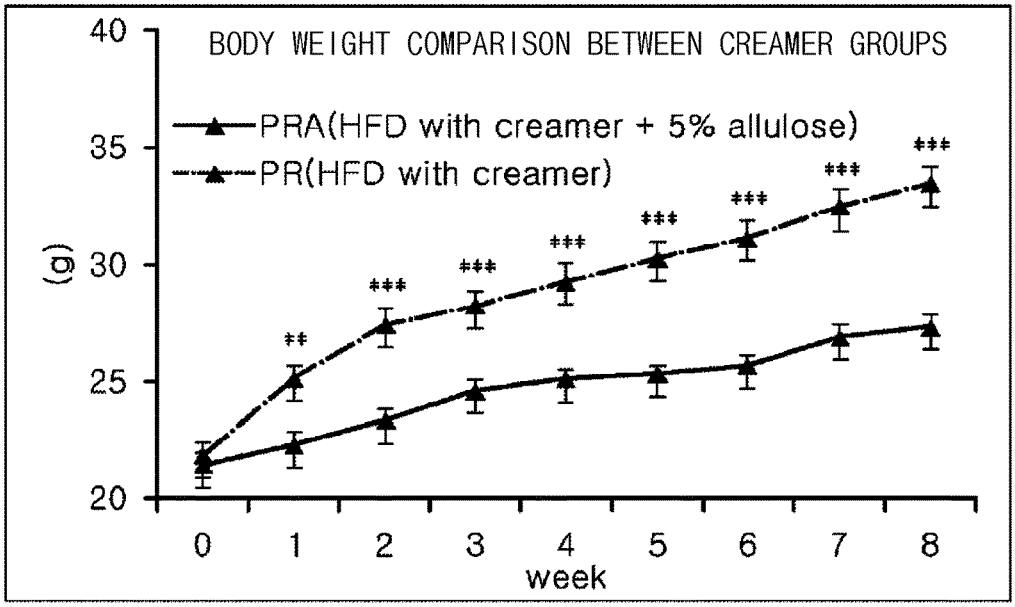
BODY WEIGHT COMPARISON BETWEEN CREAMER GROUPS
PRA(HFD with creamer + 5% allulose)
PR(HFD with creamer)
(g)
40
35
30
25
20
0
1
2
3
4
5
6
7
8
week
**
***
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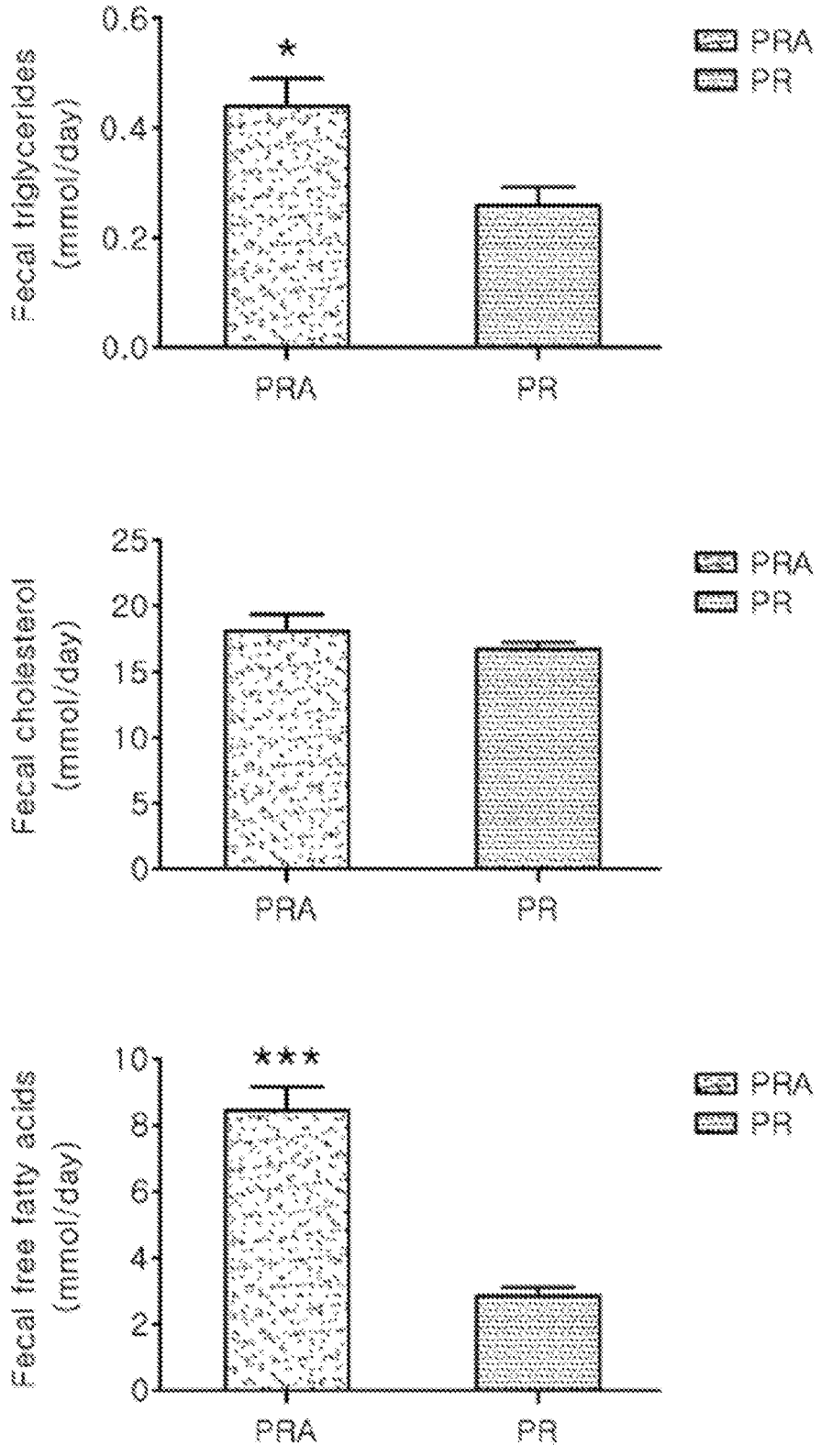
FIG.2


Fecal triglycerides (mmol/day)
0.6
0.4
0.2
0.0
*
PRA
PR
PRA
PR
Fecal cholesterol (mmol/day)
25
20
15
10
5
0
PRA
PR
PRA
PR
Fecal free fatty acids (mmol/day)
10
8
6
4
2
0
***
PRA
PR
PRA
PR

CREAMER COMPRISING VEGETABLE LIPIDS AND ALLULOSE

TECHNICAL FIELD

[0001] The present application relates to creamer containing vegetable lipid and allulose.

BACKGROUND ART

[0002] Coffee or tea (e.g., green tea, black tea, oolong tea, etc.) have strong bitter and sour tastes and are thus often supplemented with milk cream having an animal fat content of about 10-20% to reduce the bitter and sour tastes. However, milk cream is high in price, and thus liquid or powder type creamer containing low-cost vegetable lipid is commercially available. Although coffee itself has almost no calories, general coffee mix products containing commercially available creamer have a fat content of about 3 g per 1 bag (about 12 g), which corresponds to 25 kcal.

[0003] Allulose (D-psicose) is a C-3 epimer of D-fructose, which is a natural saccharide present in very small amounts in commercial mixtures of D-glucose and D-fructose obtained from hydrolysis of sucrose or isomerization of D-glucose. This was recognized as a Generally Recognized As Safe (GRAS) material by the United States Department of Agriculture (USDA). Since allulose is not metabolized in the human body, it has almost no calories. Allulose has 70% of sweetness compared to sugar and thus can be used as a sweetener to replace sugar. Therefore, the development of allulose is being actively carried out. Recently, it has been reported that allulose affects lipid metabolism (Yasuo nagata et al., *J. Agric, Food Chem.* 2015, 63, 3168-3176), however, the effects of allulose in association with the decrease in absorption and excretion of vegetable lipid have not been reported.

[0004] As such, the present inventors have confirmed that allulose has the effect of excreting the vegetable lipid in creamer as feces thereby completing the present application.

DISCLOSURE OF THE INVENTION

Technical Problem

[0005] An aspect of the present application provides creamer containing vegetable lipid, casein, maltose, phosphates, and allulose.

Technical Solution

[0006] Hereinafter, the present application will be described in detail.

[0007] Respective descriptions and embodiments disclosed in the present application may also be applied to other descriptions and embodiments. That is, all combinations of various elements disclosed in the present application fall within the scope of the present invention. Further, the scope of the present invention is not limited by the specific description below.

[0008] In addition, those skilled in the art will recognize, or be able to ascertain using no more than routine experimentation, many equivalents to the specific embodiments in accordance with the present application described herein. It is also intended that such equivalents be included in the present application.

[0009] To achieve the objects of the present application, an aspect of the present application provides creamer containing vegetable lipid, casein, maltose, phosphates, and allulose.

[0010] As used herein, the term "casein" is a meaning which includes not only casein purified from milk, but also salts thereof (e.g., casein sodium).

[0011] In an embodiment, the phosphates of the present application may include all of the phosphates used in food, and specifically, may be potassium phosphate dibasic, calcium phosphate tribasic, potassium polyphosphate, or a combination thereof.

[0012] In an embodiment, the allulose of the present disclosure may be, but not limited to, one which is extracted directly from natural products, chemically synthesized, or produced by biological methods.

[0013] In an embodiment, the allulose to be contained in the creamer of the present application may be liquid or crystal allulose. Specifically, the allulose may be crystal allulose, and more specifically, the crystal allulose may have an allulose purity of 90-99.5%.

[0014] In addition, the creamer of the present application may be in the state of powder, and specifically, may have a water content of 0.5-5%.

[0015] In an embodiment, the creamer of the present application may be a coffee creamer or a tea creamer.

[0016] The vegetable lipid of the present application may be at least one selected from the group consisting of coconut oil, palm oil, hydrogenated coconut oil, and hydrogenated palm oil.

[0017] In the creamer of the present application, the allulose may be contained such that a dry solid content thereof is in an amount of 20-150 parts by weight relative to 100 parts by weight of the vegetable lipid. Specifically, the allulose may be contained such that a dry solid content thereof is in an amount of 20-100 parts by weight, 20-50 parts by weight, 20-40 parts by weight, 30-150 parts by weight, 30-100 parts by weight, 30-50 parts by weight, or 30-40 parts by weight relative to 100 parts by weight of the vegetable lipid.

[0018] In another embodiment, the vegetable lipid in the creamer of the present application may be contained in an amount of 20-50 parts by weight relative to 100 parts by weight of the creamer. Specifically, the vegetable lipid may be contained in an amount of 20-40 parts by weight, 30-50 parts by weight, or 30-40 parts by weight relative to 100 parts by weight of the creamer.

[0019] In addition, in the creamer of the present application, the allulose can promote the excretion of the vegetable lipid as feces. Specifically, the excretion may be a discharge of triglycerides, free fatty acids, or a combination thereof.

[0020] In an embodiment, the creamer of the present application may not comprise sugar.

[0021] In another embodiment, the creamer of the present application may further comprise food components (e.g., vitamins, electrolytes, flavoring agents, coloring agents, pectic acid and a salt thereof, alginic acid and a salt thereof, organic acids, pH adjusters, emulsifiers, stabilizers, preservatives, glycerin, carbonizing agents, etc.) in addition to the above-described components.

[0022] Still another aspect of the present application provides a method comprising a step of administering a creamer containing vegetable lipid, casein, maltose, and phosphate to a subject; and a step of administering allulose to the subject,

before, after, or simultaneously with the administration of the step of administering the creamer to the subject, wherein the method promotes the excretion of the vegetable lipid administered to the subject as feces, in which the subject refers to a human or animal.

[0023] In an embodiment of the present application, the step of administering the allulose to a subject may be performed simultaneously with the step of administering the creamer to a subject.

[0024] In addition, the administration may be performed orally.

[0025] In the method of the present application, the explanations of vegetable lipid, casein, phosphates, allulose, creamer, and excretion are as described in previous aspects.

[0026] In still another aspect, the present application relates to a use of allulose for promoting the excretion of vegetable lipid of the creamer containing vegetable lipid, casein, maltose, and phosphates, as feces.

[0027] In the use of the present application, the explanations of the vegetable lipid, casein, phosphates, allulose, creamer, and excretion are as described in previous aspects.

Advantageous Effects

[0028] The present application provides creamer in which allulose is contained, and thus has an effect of significantly increasing the vegetable lipid contained in the creamer as feces. In this regard, the creamer of the present application has the effect of improving sensory properties of coffee or tea while reducing consumer concerns on excessive intake of lipid at the time of creamer intake.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] FIG. **1** is a graph illustrating the changes in body weight in C57BL/6J mice fed with creamer-containing high fat diet (HFD) together with allulose for 8 weeks, in which PR of the control group represents the provision of HFD together with creamer, and PRA represents the provision of HFD+creamer+5% allulose (w/w).

[0030] FIG. **2** is a graph illustrating the changes in the amount of fecal lipid excretion in C57BL/6J mice fed with creamer containing HFD together with allulose after 8 weeks, in which data represents mean±SE. The effective values between the group with no allulose and the group with allulose are as follows: *p<0.05, **p<0.01, ***p<0.001. In FIG. **2**, PRA represents "HFD+creamer+5% allulose (w/w)" and PR represents "creamer+HFD".

MODE FOR CARRYING OUT THE INVENTION

[0031] Hereinafter, the present application will be described in more detail to allow for a clearer understanding of the present application. However, the following examples are provided for easier understanding of the present application, and the present application is not limited to the following examples.

Experimental Methods

[0032] 1. Breeding of Experimental Animals

[0033] 16 C57BL/6J mice (male, 4-week-old) were purchased from the Jackson Laboratory (USA) and used. The mice were allowed to adapt to the breeding environment with the lab-chow diet (Purina Co., USA) for 4 weeks. Then, the mice were divided, by using the randomized block design, into a negative control group (PR: 8 mice), in which allulose was not fed, and an experimental group (PRA: 8 mice), in which allulose was fed, and the mice were fed with diet for 8 weeks.

[0034] For the diet of the negative control group, AIN-76 diet and HFD were applied, in which creamer ["Prima", Dongsuh Foods Corporation, Korea; raw materials: 30-38 wt % of hydrogenated vegetable lipid (hydrogenated coconut oil, hydrogenated palm oil), starch syrup (including maltose), sodium caseinate, potassium phosphate dibasic, calcium phosphate tribasic] was used as the vegetable lipid. For the diet of the experimental group, 5 wt % of sugar among the components of the diet of the negative control group were replaced with allulose (crystal allulose, 98 wt % or higher of allulose based on dry solid content, CJ Cheiljedang) and used (Table 1). All animal experiments were conducted with the approval of the Ethical Commission for Animal Experimentation, Kyungpook National University (Approval No.: KNU-2013-18).

TABLE 1

Composition of experimental feeds (% of diet, w/w)

Groups	Negative Control Group (PR)	Experimental Group (PRA)
Casein	20	20
DL-Methionine	0.3	0.3
Corn starch	11.1	11.1
Sucrose	37	32
Cellulose	5	5
Creamer(Prima)	14.6	14.6
Lard	5.4	5.4
Mineral mix[1)]	4.2	4.2
Vitamin mix[2)]	1.2	1.2
Choline bitartrate	0.2	0.2
Cholesterol	1	1
tert-Butylhydroquinone	0.004	0.004
Allulose	—	5
Total (%)	100	100
kcal/g diet	4.047	4.847

Note

[1)]Mineral mix: AIN-76 mineral mixture (gram/kg): calcium phosphate, 500; sodium chloride, 74; potassium citrate, 2220; potassium sulfate, 52; magnesium oxide, 24; manganous carbonate, 3.5; ferric citrate, 6; zinc carbonate, 1.6; cupric carbonate, 0.3; potassium iodate, 0.01; sodium celenite, 0.01; chromium potassium sulfate, 0.55; sucrose 118.03

Note

[2)]Vitamin mix: AIN-76 vitamin mixture (gram/kg): thiamin HCL, 0.6; riboflavin, 0.6; pyridoxine HCL, 0.7; nicotinic acid, 0.003; D-calcium pantothenate, 0.0016; folate, 0.2; D-biotin, 0.02; cyanocobalamin (vitamin B12), 0.001; retinyl palmitate premix, 0.8; DL-alpha tocopheryl acetate, premix, 20; cholecalciferol (vitamin D3), 0.0025; menaquinone (vitamin K), 0.05; antioxidant, 0.01; sucrose, finely powdered, 972.8

[0035] Pair feeding was performed based on the experimental group so as to feed the same level of iso-energetic diet, and thereby the effect of calorie reduction by allulose was excluded. The diet was refrigerated at 4° C. during the breeding period. The mice were bred in individual cages under constant temperature (25±2° C.), constant humidity (50±5%), and dark-light cycles at 12 hour intervals.

[0036] 2. Measurement of Dietary Intake and Body Weight

[0037] Dietary intake was measured at constant time every day, and body weight was measured at constant time every week.

[0038] 3. Collection and Analysis of Fecal Samples

[0039] 3-1. Collection of Fecal Samples

[0040] The feces were collected for 84 hours (3.5 days) after termination of the breeding, dried, and stored frozen.

[0041] 3-2. Extraction of Fecal Lipid

[0042] The neutral lipid, cholesterol, and free fatty acids in the feces were extracted by modifying/remedying the method of Folch et al. (1957). Specifically, the dried feces were ground in a mortar and 0.5 g was collected therefrom. 5 mL of a chloroform:methanol (2:1, v/v) solution was then added thereto and lipid were extracted at 4° C. for 24 hours. The extract was centrifuged at 3000×g at 4° C. for 10 minutes, and then 3 mL of the supernatant was collected, dried under nitrogen gas at 37° C., and dissolved again in 1 mL of the same extraction solvent.

[0043] Among them, 200 μL each were collected for the measurement of cholesterol and free fatty acids and dried again under nitrogen gas, and those for the measurement of neutral lipid and total cholesterol were dissolved in 500 μL of ethanol. Those for the measurement of free fatty acids were dissolved in 2.25 mL NaOH and the pH was adjusted to pH 2 to pH 3 by adding 1 M HCl solution thereto. At the time of quantification of total cholesterol and neutral lipid, 3 mM cholic acid (sodium salt) as an emulsifier and 0.5% Triton X-100 (for removal of turbidity that occurs at the time of color development) were mixed and used.

[0044] 3-3. Quantification of Total Cholesterol in Feces

[0045] For the measurement of total cholesterol, 10 μL of the solution dissolved in ethanol (500 μL) and the emulsifier (690 μL) were mixed, and then 800 μL of a test solution (Asan Pharmaceutical kit) for measurement applying the enzyme method of Allain et al. (1974) was mixed. For quantification of both in forms of free cholesterol (FC) and cholesterol ester (CE), CE was converted to FC and fatty acid by cholesterol esterase. Among them, FC was reacted with cholesterol oxidase and converted to A^4-cholestenone. The obtained product and H_2O_2 as a substrate were reacted with peroxidase, phenol, and 4-amino-antipyrine to obtain a red coloring material, and then the absorbance was measured at 500 nm. The measured value was quantified by comparing with the cholesterol standard curve.

[0046] 3-4. Quantification of Neutral Lipid in Feces

[0047] For the measurement of neutral lipid, 10 μL of the solution dissolved in ethanol (500 μL) and the emulsifier (690 μL) were mixed, and then 800 μL of the test solution (Asan pharmaceutical kit) applying the enzyme method of McGowan et al. (1983) was mixed. Neutral lipid were decomposed by lipoprotein lipase (LPL) into glycerol and fatty acid. Among the decomposed products, glycerol forms L-α-glycerol phosphate by the action of ATP and glycerol kinase (GK), and this reacted with O_2 and glycerophosphate oxidase (GPO) to generate H_2O_2. Then, peroxidase and 4-amino-antipyran were treated thereto so as to develop a red color, and the absorbance was measured at 550 nm and the measured value was quantified by comparing with the standard curve of glycerol.

[0048] 3-5. Quantification of Free Fatty Acids in Feces

[0049] The concentration of free fatty acids was measured using a test solution for the measurement of free fatty acids (non-esterified fatty acid; NEFA kit, Wako, Japan) according to the principle of color development using the enzyme method. First, acyl coenzyme A synthase was acted on plasma free fatty acids and thereby producing acyl-CoA, AMP, and pyrophosphoric acid. Then, acyl coenzyme A oxidase was added thereto and thereby producing 2,3-trans-enolyl-CoA and H_2O_2. This was treated with peroxidase, 4-aminoantipyrine, and 1V-ethyl-N-(2-hydroxy-3-sulfopropyl)-m-toluidine to develop a red color, and then the absorbance was measured at 546 nm and the measured value was quantified by comparing with the standard curve of free fatty acids.

Results of Experiments

[0050] 1. Confirmation of Inhibitory Effect Against Weight Gain by Allulose

[0051] At the time point of 0 week of the diet, the body weight of the negative control group (PR) and the experimental group (PRA) were at a similar level (Table 2). However, after 8 weeks of the diet, the body weight of the negative control group was significantly increased from week 1, whereas the body weight of the experimental group was significantly inhibited from the 1st week of the diet, and the significant inhibitory effect against weight gain in the experimental group was confirmed (Table 2 and FIG. **1**).

TABLE 2

		Without allulose (PR)	With allulose (PRA)	p-value** (t-test)
Body weight	0 week	21.93 ± 0.46	21.47 ± 0.50	0.517
	8th week	33.50 ± 0.69	27.41 ± 0.48	0.000

Data represents mean ± SE.

**t-test represents the comparison of values between PR without allulose and PRA with 5 wt % allulose in each group.

[0052] 2. Confirmation of Excretion Effect of Lipid in Creamer by Allulose

[0053] The effect of excretion of the lipid in creamer by allulose was confirmed by the amount of lipid excretion in the feces.

[0054] As a result, it was confirmed that the amounts of triglycerides and free fatty acids in the feces significantly increased in the experimental group compared to the negative control group. In particular, it was confirmed that the amount of free fatty acids was significantly higher than that of the negative control group (Table 3 and FIG. **2**).

TABLE 3

	PRA	PR
Triglycerides (mmol/day)	0.44 ± 0.053*	0.26 ± 0.032
cholesterol (mmol/day)	18.28 ± 0.97	16.81 ± 0.52
Free Fatty Acids (mmol/day)	8.39 ± 0.75***	2.78 ± 0.30

Data represents mean ± SE.

A significant difference was shown between PR and PRA: *$p < 0.05$, ***$p < 0.001$. PRA, HFD + creamer + 5% allulose; PR, HFD + creamer

[0055] Accordingly, it was confirmed that when allulose was ingested along with the vegetable lipid in creamer, the excretion of lipid as feces was promoted.

[0056] It should be understood that the foregoing description of the present application is for illustrative purposes only and that those of ordinary skill in the art to which the present application pertains will be able to understand that the present application can easily be modified into other specific forms without altering the technical idea or essential features of the present application. Therefore, it should be understood that the embodiments described above are illustrative in all aspects and not restrictive.

1. Creamer comprising vegetable lipid, casein, maltose, phosphate, and allulose.

2. The creamer of claim 1, wherein the allulose is crystal allulose.

3. The creamer of claim 1, wherein the creamer is in a powder state.

4. The creamer of claim 1, wherein the creamer has a water content of 0.5% to 5%.

5. The creamer of claim 1, wherein the creamer is a coffee creamer or a tea creamer.

6. The creamer of claim 1, wherein the vegetable lipid is at least one selected from coconut oil, palm oil, hydrogenated coconut oil, and hydrogenated palm oil.

7. The creamer of claim 1, wherein the allulose is contained such that a dry solid content thereof is in an amount of 20-150 parts by weight relative to 100 parts by weight of the vegetable lipid.

8. The creamer of claim 1, wherein the vegetable lipid is contained in an amount of 20-50 parts by weight relative to 100 parts by weight of the creamer.

9. The creamer of claim 1, wherein the allulose promotes the excretion of the vegetable lipid as feces.

10. The creamer of claim 9, wherein the excretion is an excretion of triglycerides, free fatty acids, or a combination thereof.

11. A method comprising:

a step of administering creamer comprising vegetable lipid, casein, maltose, and phosphate to a subject; and

a step of administering allulose to the subject, before, after, or simultaneously with the administration of the step of administering the creamer to the subject,

wherein the method promotes the excretion of the vegetable lipid administered to the subject as feces.

12. A use of allulose for promoting the excretion of vegetable lipid contained in creamer comprising vegetable lipid, casein, maltose, and phosphate, as feces.

* * * * *