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(54) Title: MINERAL ABSORPTION ACCELERATOR AND IRON DEFICIENCY ANEMIA IMPROVER OR FOOD COMPOSITION

(57) Abstract: A mineral absorption accelerator, and an anemia improving agent, food and drink or food and drink material containing the mineral absorption accelerator are provided, the mineral absorption accelerator including: an α -glucosidase inhibitory component.

DESCRIPTION

MINERAL ABSORPTION ACCELERATOR AND IRON DEFICIENCY ANEMIA
IMPROVER OR FOOD COMPOSITION

Technical Field

This invention relates to a mineral absorption accelerator and an iron deficiency anemia improver or a food composition, which comprises a component having α -glucosidase inhibitory action or a pulverized product or extract of a plant of the genus *Salacia*.

Background Art

In recent years, the food situation of the Japanese people has been improved to such a level that the average ingestion quantity of almost all nutrient substances satisfies the necessary nutritive quantity, but the ingestion quantity of iron, calcium, zinc, copper and the like minerals does not satisfy necessary levels (National Nutrition Survey, 2001).

Particularly in the case of iron, there is a possibility that when its insufficient ingestion continues, it causes iron deficiency anemia via a latent iron deficiency which does not show anemic symptoms. It is said that this iron deficiency anemia is frequently found mainly

in adult females and about half of the adult females are suffering from the latent iron deficiency or iron deficiency anemia.

In order to supplement the iron content run out in the body, it is necessary to ingest iron in an amount larger than the daily requirement or more, but since iron is poorly absorbable, a method for increasing absorption rate of the mineral is efficient rather than increasing its ingesting amount. Accordingly, great concern has been directed toward a food having high iron absorbability and a substance capable of accelerating absorption of iron, and 1 mg or more but 200 mg or less of iron is preferable as its ingesting amount for one day. On the other hand, various pharmaceutical preparations have been devised as the pharmaceutical preparations of iron compounds to be used for the prevention or treatment of anemia, but side effects for digestive organs caused by iron, such as loss of appetite, nausea, vomiting, abdominal pain, constipation, diarrhea and the like, are causing clinical problems.

So far, a finding that restoration of hemoglobin is accelerated when an iron preparation and proline are concomitantly administered to an anemia model rat (*J. Nutr. Sci. Vitaminol.*, 49, 7 - 12, 2003), a method which uses yeast cell wall polysaccharides (JP-A-2002-255832), a method which concomitantly use a group of isoleucine,

valine, leucine and arginine and an iron preparation (JP-A-2008-50277) and the like have been reported, and these have the effect to improve absorption of iron but do not improve the above-mentioned side effects.

Summary of the Invention

Accordingly, the invention aims at providing a food, a drink, a feed and a pharmaceutical composition, which are free from side effects, have high safety and are possessed of the actions to accelerate mineral absorption and to prevent or improve anemia.

During the process of carrying out a study on components having α -glucosidase inhibitory activity, the present inventors have found that these components have the effect to accelerate absorption of iron. This effect is a finding which has been completely unknown until now.

Thus, in order to solve the above-mentioned problems, a mineral absorption accelerating agent or anemia improving agent, which has no side effect and increases utilizing efficiency of minerals including iron, has been accomplished in the invention, by making use of a component having α -glucosidase inhibitory activity.

The invention includes the following constructions.

(1) A mineral absorption accelerator, which comprises:

an α -glucosidase inhibitory component.

(2) The mineral absorption accelerator as described in (1) above,

wherein the α -glucosidase inhibitory component is at least one selected from the group consisting of acarbose, voglibose, miglitol, a pulverized product or extract of a plant of the genus *Salacia*, deoxynojirimycin, a guava leaf polyphenol, a mulberry leaf extract, a green tea extract and a fermented black beans extract.

(3) The mineral absorption accelerator as described in (1) or (2) above,

wherein the α -glucosidase inhibitory component is at least one selected from the group consisting of salacinol and kotalanol.

(4) The mineral absorption accelerator as described in any one of (1) to (3) above, which accelerates absorption of iron, calcium, magnesium or zinc.

(5) The mineral absorption accelerator as described in any one of (1) to (4) above, which shows an activity as a sucrase 50% inhibition concentration (IC₅₀ value) of 0.01 μ g/ml or more but 800 μ g/ml or less.

(6) An agent for improving anemia, which comprises:
the mineral absorption accelerator as described in any one of (1) to (5) above.

(7) The agent for improving anemia as described in

(6) above, which is an agent for improving iron deficiency, the agent further comprising:

a compound equivalent to 1 mg or more of iron as ingesting amount for one day.

(8) A food and drink or food and drink material, which comprises:

the mineral absorption accelerator as described in any one of (1) to (5) above.

Description of Embodiments

The α -glucosidase inhibitory component to be used in the invention is not particularly limited, with the proviso that it is a component which inhibits the α -glucosidase that is present in the small intestinal epithelium. As its examples, acarbose, voglibose, miglitol, salacinol, kotalanol, deoxynojirimycin, acteoside, a guava leaf polyphenol, a fermented black beans extract, a licorice extract, wheat albumin, a Salacia extract (a pulverized product or extract of a plant of the genus *Salacia*), a mulberry leaf extract, a green tea extract, a rose flower extract, catechins, prickly shrubs of the family Araliaceae, a eucalyptus, cinnamon, leaf of a loquat and the like can be cited. Particularly, acarbose, voglibose, miglitol, deoxynojirimycin, a guava leaf polyphenol, a pulverized product or extract of a plant of the genus

Salacia, a mulberry leaf extract, a green tea extract and a fermented black beans extract are preferable.

Particularly preferred as the α -glucosidase inhibitory component is salacinol or kotalanol. It is desirable that these are contained as a pulverized product or extract of a plant of the genus *Salacia*, but these may also be chemically synthesized products.

The above described examples of the α -glucosidase inhibitory component may be used singly or in combination thereof.

The α -glucosidase inhibitory component of the invention has a sucrase 50% inhibition concentration (IC₅₀ value) of preferably 0.01 $\mu\text{g/ml}$ or more but 800 $\mu\text{g/ml}$ or less. Also, the sucrase 50% inhibition concentration is more preferably 0.1 $\mu\text{g/ml}$ or more but 600 $\mu\text{g/ml}$ or less, further preferably 0.5 $\mu\text{g/ml}$ or more but 450 $\mu\text{g/ml}$ or less.

The sucrase 50% inhibition concentration (IC₅₀ value) is measured by the following method.

[Test method 1] Measurement of sucrase IC₅₀ value

Preparation of sample solution: A 2 mg portion of a sample is weighed, put into a tube and suspended by adding 2 ml of water thereto, thereby preparing a sample solution having a concentration of 1 mg/ml. This is diluted with water to 0, 50, 100, 250 or 500 $\mu\text{g/ml}$.

Preparation of substrate liquid: Sucrose is dissolved

in 0.2 M maleate buffer (pH 6.0) to a sucrose concentration of 100 mM, and this is used as the substrate liquid.

Preparation of crude enzyme liquid: A 1 g portion of intestinal acetone powder rat (mfd. by SIGMA) is suspended in 10 ml of physiological saline and then centrifuged (3,000 rpm, 4°C, 5 min). The thus obtained supernatant is separated and used as the crude enzyme liquid.

A 400 μ l portion of the substrate liquid is added to 500 μ l of each of the aforementioned sample solutions having respective concentrations and preliminarily heated at 37°C for 5 minutes in a water bath. A 100 μ l portion of the crude enzyme liquid is added to each of them and allowed to undergo the reaction at 37°C for 60 minutes. After completion of the reaction, the reaction is terminated by deactivating the enzyme through heating at 95°C for 2 minutes. Determination of concentration of the thus formed glucose is carried out using a commercially available kit for mutarotase glucose oxidase method (Glucose CII Test Wako, mfd. by Wako Pure Chemical Industries).

Preparation of blank: A 200 μ l portion of the substrate liquid and 50 μ l of the crude enzyme liquid are added to 250 μ l of each of the aforementioned sample solutions having respective concentrations and immediately heated at 95°C for 2 minutes to effect thermal deactivation

of the enzyme, to be used as blank data.

By preparing a calibration curve from the thus obtained values, the concentration which inhibits 50% of the enzyme activity (IC₅₀ value) is calculated.

It is desirable that the mineral absorption accelerator of the invention accelerates absorption of iron, calcium, magnesium or zinc.

Also, it is desirable that the agent for improving anemia, which comprises the mineral absorption accelerator of the invention, is an agent for improving iron deficiency and further comprises a compound equivalent to 1 mg or more of iron as ingesting amount for one day. Examples of the compound include sodium ferrous citrate, ferric pyrophosphate, ferrous fumarate, ferrous chloride and heme iron.

In addition, it is desirable that the mineral absorption accelerator of the invention is contained in food and drink or food and drink materials.

The mineral absorption accelerator and anemia improving agent of the invention may be made into a drink, a liquid food such as yogurt, a jelly type food, a powdery food material and the like shapes or into tablets, hard capsules, soft capsules or granules. In the latter case, crystalline cellulose, magnesium stearate and the like fillers and corn starch, alginic acid and the like swelling

agents can be used. In addition, shellac or sugar, a film coating base material, YeastWrap and the like can be used as the coating agent of tablets, capsules or granules.

The plant of the genus *Salacia* of the invention is a plant of the family Celastraceae growing wild mainly in Sri Lanka, India and Southeast Asia regions, and more illustratively, one species or more of plants selected from *Salacia reticulata*, *S. oblonga*, *S. prinoidea* and *S. chinensis* are used. Pulverized products of these plants and extract powders extracted from roots, stems, leaves, flowers, fruits and the like edible parts thereof are used. One or more of these parts may be used by mixing them. More preferably, extract powders extracted from roots or stems are used.

In the case of extract powders of a plant of the genus *Salacia*, those which are obtained by a solvent extraction from the aforementioned edible parts are dried and used. As the extraction solvent, it may be selected from water, alcohols including methanol and ethanol and mixed solvents of water and alcohols or ketones such as acetone. Preferably, water, an alcohol or a hydrous alcohol is used. More preferably, hot water, ethanol or hydrous ethanol is used as the extraction solvent. Regarding the alcohol concentration of the aforementioned hydrous alcohol, those having a concentration of from 30 to 90%, preferably from

40 to 70% may be used.

Spray drying, freeze drying and the like can be cited as the drying method, though not limited thereto.

According to the invention, in order to improve periodical discoloration of the extraction extract powder of a plant of the genus *Salacia*, it is desirable to contain therein calcium carbonate or silicon dioxide in an amount of 1% or more of the weight when made into a shape of a tablet or hard capsule. In addition, it is possible to use a low moisture absorption material or moisture absorbent which can be used as a food or food additive. Preferably, cellulose, crystalline cellulose, powder cellulose, microcrystalline cellulose, lactose, an oligosaccharide, a sugar alcohol, trehalose, magnesium stearate, calcium stearate and the like are used as the low moisture absorption material. As the moisture absorbent, silicic acid salts, magnesium carbonate, a ferrocyanide, polysaccharides and the like are used. More preferably, crystalline cellulose, microcrystalline cellulose or lactose is used as the low moisture absorption material.

The term mineral as used herein means iron, calcium, magnesium, sodium, potassium, phosphorus, manganese, copper, zinc, molybdenum, manganese, cobalt, selenium, iodide, fluorine and the like which are required in the living body.

As the materials of calcium and magnesium, for example, dolomite can be cited, but there may be exemplified all of the natural calcium which can be used in food, such as egg shell calcium, coral calcium, sea urchin shell calcium, fossilized marine algal calcium, pearl calcium, cattle bone calcium, shell calcium, fish bone dust calcium, fish scale calcium, milk calcium and the like.

As the dolomite, a commercially available article obtained by pulverizing dolomite raw ore after its crude crushing and heat sterilization can be used in general.

Iron can be ingested from heme iron, iron yeast and the like. The heme iron occupies about 40% of the iron contained in meats, fishes and internal organs, and its intestinal absorption is good in comparison with non-heme iron. The heme iron is generally obtained by treating hemoglobin with an enzyme and then subjecting it to ultrafiltration or isoelectric precipitation and subsequent drying, but a commercially available article can also be used.

As the marine algae from which iodine can be obtained, brown algae, red algae and the like or a mixture thereof can be used, and these can be blended as dried products or pulverized products. Such dried products and their pulverized products are commercially available.

The term yeasts means yeast in which a mineral

(manganese, copper, molybdenum, iron, magnesium, zinc, selenium, chromium, iodine or the like) is accumulated into the cell by culturing the yeast using a medium to which the mineral is added in a high concentration. These are obtained via concentration, sterilization, drying and the like steps after culturing the yeast using a medium supplemented with a mineral and collecting the cells, and those which are on the market can be used.

As the yeast, baker's yeast and beer yeast are generally used widely. Illustratively, manganese yeast, copper yeast, molybdenum yeast, iron yeast, magnesium yeast, zinc yeast, selenium yeast, chromium yeast, iodine yeast and the like can be exemplified.

A compound necessary for forming into the powders, solid preparations or liquid preparations of the invention, and the like may be optionally included. As examples of such a compound, erythritol, maltitol, hydroxypropyl cellulose, kaolin, talk and the like can be cited.

The invention is described in the following using examples, but the invention is not limited to the following examples.

[EXAMPLES]

<Example 1>

Root and stem parts of *Salacia reticulata* and *Salacia*

oblonga were pulverized and then subjected to a hot water extraction process, and the thus obtained liquid was spray-dried to obtain a Salacia extract powder.

Also, 300 g of dry powder of mulberry leaves was extracted by adding 1 liter of 25% ethanol and the filtrate was dried by removing the solvent under a reduced pressure, thereby obtaining a mulberry leaf extract.

Dry powder of guava leaves was extracted by adding hot water of 95°C and the filtrate was dried by removing the solvent under a reduced pressure, thereby obtaining a guava leaf extract.

Powders having the formulations shown in Table 1 were prepared using the thus obtained extract powders, and their sucrose IC50 values were measured by the method described in [Test method 1].

In addition, by subjecting the formulated powders of Table 1 to tablet making, tablets of the sample 1 to sample 13 were prepared.

Table 1
 α -Glucosidase inhibitory component formulation example and sucrose IC₅₀ value

	Salacia extract powder	Mulberry leaf extract	Guava leaf extract	Green tea extract	Ferric pyrophosphate	Crystalline cellulose	Sucrose IC ₅₀ value (μ g/ml)
Sample 1	0 mg	0 mg	0 mg	0 mg	0 mg	250 mg	2000 or more
Sample 2	0 mg	0 mg	0 mg	0 mg	5 mg	250 mg	2000 or more
Sample 3	25 mg	0 mg	0 mg	0 mg	0 mg	225 mg	600
Sample 4	50 mg	0 mg	0 mg	0 mg	0 mg	200 mg	280
Sample 5	200 mg	0 mg	0 mg	0 mg	0 mg	50 mg	65
Sample 6	0 mg	100 mg	0 mg	0 mg	0 mg	150 mg	102
Sample 7	50 mg	0 mg	0 mg	50 mg	0 mg	150 mg	200
Sample 8	0 mg	0 mg	100 mg	0 mg	0 mg	150 mg	232
Sample 9	0 mg	100 mg	0 mg	50 mg	0 mg	100 mg	75
Sample 10	50 mg	0 mg	0 mg	0 mg	5 mg	200 mg	280
Sample 11	0 mg	100 mg	0 mg	0 mg	5 ng	150 mg	104
Sample 12	50 mg	0 mg	0 mg	50 mg	5 mg	150 mg	204
Sample 13	0 mg	0 mg	100 mg	0 mg	5 mg	150 mg	230

* Green tea extract: Sunfenon 100s, mfd. by Taiyo Kagaku was used.

Each group consisting of five adult women who answered a questionnaire carried out in advance that they have an anemic tendency was asked to orally ingest one tablet of the samples 1 to 13, respectively before meals every day, and this was repeated 30 days. Blood samples were collected on the day before the commencement of the ingestion and on the next day of the completion of the ingestion, and the number of red blood cells, hemoglobin, hematocrit and the amount of serum iron were measured. The results are shown in Table 2. Each value is average value of five volunteers, and relative values when the value of sample 1 was regarded as 100 are shown by Table 2.

Table 2
Effect of ingestion of samples 1 to 13

	Red blood cell count	Hematocrit	Hemoglobin	Serum iron	
Sample 1	100	100	100	100	Comparative example
Sample 2	102	101	102	102	Comparative example
Sample 3	103	103	104	104	Inventive
Sample 4	110	111	110	109	Inventive
Sample 5	113	112	112	112	Inventive
Sample 6	109	108	109	108	Inventive
Sample 7	113	114	113	113	Inventive
Sample 8	107	106	106	106	Inventive
Sample 9	112	112	111	110	Inventive
Sample 10	114	115	114	114	Inventive
Sample 11	113	112	112	111	Inventive
Sample 12	116	115	116	115	Inventive
Sample 13	112	111	112	112	Inventive

Since the values of red blood cell count, hematocrit

and serum iron significantly increased by the ingestion of the samples of the invention, it was revealed that absorption of iron is improved by the ingestion of the samples of the invention. It was found from the results of samples 3 to 9 that ingestion of even the component of the invention alone increases absorbed amount of iron obtained from everyday meals and therefore has the effect to improve anemia. In addition, it was found that the samples 10 to 13 to which iron pyrophosphate was added have particularly high effect to improve iron deficiency anemia.

According to the questionnaires carried out during the ingestion period, there was no one who complained of an unpleasant feeling in the stomach and intestines by the ingestion of the component of the invention, so that it was revealed also that the agent of the invention has a characteristic of being easily drinkable without unpleasant feeling in comparison with the conventional iron preparations.

<Example 2>

Salacinol was isolated from the Salacia extract powder prepared in Example 1 by the method of Yoshikawa described in *Bioorganic & Medicinal Chemistry*, 10 (2002) 1547 - 1554. Using this and α -glucosidase inhibitory agents, voglibose and acarbose, the following test was

carried out.

SD rats (males) of 4 weeks of age after birth were preliminarily reared for 1 week and then divided into a control group and 6 sample ingestion groups, each group consisting of 6 animals, at random based on body weight. In the rats of salacinol administration group, 0.1% salacinol aqueous solution was orally administered at a dose of 2.0 g/day per unit weight of rat. In the rats of voglibose administration group, 0.4% voglibose aqueous solution was orally administered at a dose of 2.0 g/day per unit weight of rat. In the rats of acarbose administration group, 0.4% acarbose aqueous solution was orally administered at a dose of 2.0 g/day per unit weight of rat. In the rats of Salacia extract powder administration group, 1% Salacia extract powder aqueous solution was orally administered at a dose of 2.0 g/day per unit weight of rat. In the rats of mulberry extract powder administration group, 1% mulberry extract powder aqueous solution was orally administered at a dose of 2.0 g/day per unit weight of rat. In the rats of Salacia extract powder + green tea extract administration group, 1% Salacia extract powder + 1% green tea extract mixed aqueous solution was orally administered at a dose of 2.0 g/day per unit weight of rat. In the rats of control group, water was orally administered at a dose of 2.0

g/day per unit weight of rat.

Each rat was reared with a solid feed (CRF-1 mfd. by Oriental Yeast) for 14 days and then transferred into a cage for metabolism analysis, and urine and feces were collected for a period of 4 days to measure concentrations of iron, calcium, magnesium and zinc. Detection of minerals from feces was carried out using inductively coupled plasma emission spectrometry, and those from urine and serum using atomic absorption method. Absorption rate and internal holding rate of each mineral were calculated using the following formulae.

$$\text{Absorbed amount} = \text{ingested amount} - \text{discharged amount into feces}$$
$$\text{Absorption rate (\%)} = \frac{\text{absorbed amount}}{\text{ingested amount}} \times 100$$
$$\text{Internally retained amount} = \text{absorbed amount} - \text{discharged amount into urine}$$
$$\text{Internal retention rate (\%)} = \frac{\text{internally retained amount}}{\text{ingested amount}} \times 100$$

Results of the absorption rate and internal retention rate of minerals and concentration of mineral in serum by the mineral balance test are respectively shown in Tables 3 to 5.

Table 3
Absorption rate of minerals

	Absorption rate of iron (%)	Absorption rate of calcium (%)	Absorption rate of magnesium (%)	Absorption rate of zinc (%)
Control group	24.8	21.0	10.8	7.2
Salacinol ingestion group	38.5	33.2	20.5	30.1
Voglibose ingestion group	37.8	32.5	21.2	29.8
Acarbose ingestion group	37.5	32.8	20.8	29.3
Salacia extract powder ingestion group	33.4	29.3	18.5	28.4
Mulberry extract powder ingestion group	31.2	28.2	18.2	27.2
Salacia + green tea ingestion group	35.0	31.4	20.4	30.7

Table 4
Internal retention rate of minerals

	Internal retention rate of iron (%)	Internal retention rate of calcium (%)	Internal retention rate of magnesium (%)	Internal retention rate of zinc (%)
Control group	21.4	20.1	10.1	5.8
Salacinol ingestion group	34.2	32.3	23.6	19.5
Voglibose ingestion group	33.9	32.1	24.0	18.6
Acarbose ingestion group	32.8	31.5	23.1	18.4
Salacia extract powder ingestion group	32.5	30.8	21.6	18.4
Mulberry extract powder ingestion group	30.4	29.1	20.7	17.2
Salacia + green tea ingestion group	33.6	32.4	22.9	19.9

Table 5
Concentration of minerals in serum

	Concentration of iron ($\mu\text{g}/\text{dl}$)	Concentration of calcium (mg/dl)	Concentration of magnesium (mg/dl)	Concentration of zinc ($\mu\text{g}/\text{dl}$)
Control group	184.5	10.2	1.85	106.8
Salacinol ingestion group	298.6	11.8	2.06	122.7
Voglibose ingestion group	292.5	10.9	2.04	120.2
Acarbose ingestion group	289.3	10.9	2.01	121.3
Salacia extract powder ingestion group	288.4	10.8	1.98	118.8
Mulberry extract powder ingestion group	276.1	10.8	1.98	118.2
Salacia + green tea ingestion group	296.8	11.1	2.04	120.5

It was revealed that absorption of iron, calcium, magnesium, zinc and the like minerals is sharply increased by the ingestion of the component of the invention, in comparison with the control group. Accordingly, it is considered that poor physical conditions and diseases accompanied by insufficient minerals can be prevented by the ingestion of the component of the invention.

<Example 3>

Preparation of tablets using *Salacia* extract powder

By preparing tablets using the formulation shown in Table 6, a supplement to which shellac coating was applied was prepared.

Table 6
Tablet formulation example using the *Salacia* extract powder of the invention

Raw material name	Blending amount (wt%)
<i>Salacia</i> extract powder	25.0
Red wine polyphenol	10.0
Onion outer skin extract powder	6.0
Green tea extract	15.0
Hematococcus algal pigment	1.0
Chrome yeast	4.0
Iron pyrophosphate	10.0
Crystalline cellulose	23.0
Sucrose fatty acid ester	2.0
Lactose	1.0
Calcium carbonate	1.0
Atomized silicon dioxide	2.0

The effect shown by Example 1 was obtained by the ingestion of tablets of this formulation. In addition, "physical conditions became lighter", "fatigue became less" and the like reports were obtained from the ingested volunteers.

Industrial Applicability

According to the invention, there is provided a food, a drink, a feed and a pharmaceutical composition, which are free from side effects, have high safety and are possessed of the actions to accelerate mineral absorption and to prevent or improve anemia.

The entire disclosure of each and every foreign patent application from which the benefit of foreign

priority has been claimed in the present application is incorporated herein by reference, as if fully set forth.

CLAIMS

1. A mineral absorption accelerator, which comprises:
an α -glucosidase inhibitory component.
2. The mineral absorption accelerator according to claim 1,
wherein the α -glucosidase inhibitory component is at least one selected from the group consisting of acarbose, voglibose, miglitol, a pulverized product or extract of a plant of the genus *Salacia*, deoxynojirimycin, a guava leaf polyphenol, a mulberry leaf extract, a green tea extract and a fermented black beans extract.
3. The mineral absorption accelerator according to claim 1 or 2,
wherein the α -glucosidase inhibitory component is at least one selected from the group consisting of salacinol and kotalanol.
4. The mineral absorption accelerator according to any one of claims 1 to 3, which accelerates absorption of iron, calcium, magnesium or zinc.

5. The mineral absorption accelerator according to any one of claims 1 to 4, which shows an activity as a sucrose 50% inhibition concentration (IC₅₀ value) of 0.01 µg/ml or more but 800 µg/ml or less.

6. An agent for improving anemia, which comprises:
the mineral absorption accelerator according to any one of claims 1 to 5.

7. The agent for improving anemia according to claim 6, which is an agent for improving iron deficiency, the agent further comprising:

a compound equivalent to 1 mg or more of iron as ingesting amount for one day.

8. A food and drink or food and drink material, which comprises:

the mineral absorption accelerator according to any one of claims 1 to 5.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/057300

A. CLASSIFICATION OF SUBJECT MATTER		
Int.Cl. See extra sheet		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
Int.Cl. A61K45/00, A23L1/30, A61K31/10, A61K31/133, A61K31/381, A61K31/445, A61K31/7034, A61K36/00, A61P3/02, A61P7/06, A61P43/00, C12N9/34, C12N9/99		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Published examined utility model applications of Japan 1922-1996 Published unexamined utility model applications of Japan 1971-2009 Registered utility model specifications of Japan 1996-2009 Published registered utility model applications of Japan 1994-2009		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
CAplus/MEDLINE/BIOSIS/EMBASE (STN), JSTPlus/JMEDPlus/JST7580 (JDream2)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	FAILLA, M.L. et al, The absorption and retention of dietary zinc by type I diabetic rats are increased by chronic treatment with acarbose, Drugs in Development, 1993, Vol.1, p.155-62	1, 2, 4, 5, 8 2, 3 6, 7
X Y	JP 2004-154126 A (ACCESS BUSINESS GROUP INT LLC) 2004.06.03, Claim2, column [0017] & US 2004/0091554 A1 & US 2005/0208161 A1 & KR 10-2004-0041026 A & CN 1498659 A	8 2
X Y	JP 2004-194635 A (ORBIS KK) 2004.07.15, Claim2, 3 (Family: none)	8 2
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "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) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "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 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "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 "&" document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
27.04.2009		19.05.2009
Name and mailing address of the ISA/JP		Authorized officer
Japan Patent Office		SATOSHI YASUKAWA
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INTERNATIONAL SEARCH REPORT

 International application No.
 PCT/JP2009/057300

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 2007-195510 A (SUNTREK KK) 2007.08.09, Claim2 (Family : none)	8 2, 3
X	JP 2004-175790 A (ARITA J) 2004.06.24, Claim9 (Family : none)	8
X	JP 2002-010752 A (MINAMI HEALTHY FOODS KK) 2002.01.15, Table1 (Family : none)	8
X	JP 2002-332236 A (SHINBIJUYUMU YG) 2002.11.22, Claim1, 4 (Family : none)	8
A	YOO,W.H. et al, Marked weight loss in a type 2 diabetic patient treated with acarbose, Diabetes care, 1999, Vol.22, No.4, p.645-6	6, 7
A	HOLLANDER,P. et al, Safety Profile of Acarbose, an α -Glucosidase Inhibitor, Drugs, 1992, Vol.44, No.Suppl 3, p.47-53	6, 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/057300

CLASSIFICATION OF SUBJECT MATTER

A61K45/00(2006.01) i, A23L1/30(2006.01) i, A61K31/10(2006.01) i,
A61K31/133(2006.01) i, A61K31/381(2006.01) i, A61K31/445(2006.01) i,
A61K31/7034(2006.01) i, A61K36/00(2006.01) i, A61P3/02(2006.01) i,
A61P7/06(2006.01) i, A61P43/00(2006.01) i, C12N9/34(2006.01) n,
C12N9/99(2006.01) n

<Restriction of the Subject of the International Search>

Claim1,4-8 are related to a mineral absorption accelerator, which comprises chemical compound defined by given properties as "α-Glucosidase inhibitory component". Although these claims comprehend any compounds with such properties, only a limited number of concrete compounds are disclosed in the meaning of Article 5 PCT. Therefore, these Claims are not supported by the description as required by Article 6 PCT.

Also, because the person skilled in the art cannot conceive the scope of the compound with such properties even by taking into consideration the common general knowledge as of the filing, these claims lack the clarity required by Article 6 PCT.

Therefore, the search was only carried out to a mineral absorption accelerator which comprises any of the compounds listed in claim2 or 3.