A food composition comprising a cellodextrin material, wherein the cellodextrin material comprises a principal cellodextrin with a degree of polymerisation (DP) value of at least 4. Food products comprising the composition, and cellodextrin materials used in the preparation of the composition as well as method for preparing these form further aspects of the invention.
LOW CALORIE FOOD COMPOSITIONS

[0001] The present invention relates to food compositions, in particular, low calorie food compositions as well as to materials for use therein, as well as their method of production and use in the production of food products.

BACKGROUND OF THE INVENTION


[0003] There is a need, therefore, to produce low calorific alternatives to high calorific food products. Confectionery products such as chocolate products (whether with or without fillings) typically have a relative high calorific content compared to other foods. There is a desire from consumers to have lower calorific alternatives to such confectionery products yet with the taste and mouth-feel of the original product.

[0004] Many attempts have been made to replace sucrose in such products with other less calorific alternatives. Examples include fructose, inulin, erythritol and cellobiose.

[0005] Cellobiose belongs to a group of compounds called cellooligosaccharides or cellodextrins. Cellodextrins/cellooligosaccharides are intermediate products created upon the breakdown, and in particular the enzymatic breakdown or acid mediated breakdown, of cellulose to glucose. Cellodextrins exist in various forms and are often classified in accordance with their degree of polymerisation (DP), the DP indicating the number of glucose monomers present in the cellodextrin. Common names for some of these cellodextrins include: cellobiose (DP=2), cellotriose (DP=3), cellotetraose (DP=4), cellopentaose (DP=5), cellohexaose (DP=6). Depending upon their method of manufacture, they may be in the form of mixtures. Cellodextrin materials can include one or more of these cellodextrin forms. The average DP of a cellodextrin material depends on the types and amounts of the cellodextrin forms in the cellodextrin material.
Such compounds can be made in various ways such as biosynthesis from monomers, enzymatic hydrolysis of cellulose as well as chemical synthesis.

Cellobiose has been suggested as a prebiotic compound because although mostly non-digestable by humans due to the B-1,4 linkage present, it is thought to be readily fermented by bacteria in our digestive system. Prebiotics are suggested to have health benefits by encouraging growth of desirable bacteria in our gut. Given its non-digestibility, cellobiose has also been suggested as a low calorie sugar replacer, partly due to its sweetness, but also because of its ability to act as a bulking agent. There remains a need for alternative low-calorie sugar alternatives, particularly for use in confectionery products such as chocolate.

Prebiotics such as cellobiose encourage gut bacteria to grow and ferment. This is generally regarded as being beneficial since many of the gut bacteria are ‘friendly bacteria’ providing positive health effects.

Since cellobiose is virtually non-digestible to humans, it is also suggested as a low-calorie sugar alternative.

Some food compositions containing celloextrins and including some higher (greater than 3) DP values have been described in the art, for example in EP-345199 or JP2009125064. Typically, however, the higher DP celloextrin within a single composition represents a minor amount (less than 50% w/w and typically less than 20% w/w) of the total celloextrin content, and cellobiose will generally be present as a preferred component.

Contrary to the general understanding in the art, the applicants have found that cellobiose has undesirable side effects when used in food compositions and in particular solid or semi-solid foodstuffs. Specifically, the undesirable side effects include stomach cramps, nausea, diarrhea and loss of appetite. Such unpleasant side effects were not observed to such a great degree when the cellobiose was administered to humans as a drink (Nakamura, Nutrition 20 (2004) 979-983).

SUMMARY OF THE INVENTION
The applicants have developed novel cellodextrin compositions for food use.

In the first aspect of the invention, there is provided a food composition comprising a cellodextrin material, wherein the cellodextrin material comprises a principal cellodextrin with a degree of polymerisation (DP) value of at least 4.

As used herein, “principal cellodextrin” is defined as a single cellodextrin form which is present in the cellodextrin material comprising it in an amount of more than 50% weight by weight of the total weight of cellodextrins. By selecting a DP value of at least 4, the cellodextrin material of the invention comprises a principal cellodextrin that is not cellobiose or cellotriose.

By incorporating cellodextrin material where at least a substantial proportion of the cellodextrin material has a DP of 4 or more, unpleasant side effects are reduced. Without being bound by theory, this may be due to the fact that gut bacteria are less able to ferment the higher DP cellodextrins and therefore, the probiotic effect is reduced or eliminated. In a particular embodiment, the cellodextrin material does not contain cellobiose, and in particular does not contain cellobiose or cellotriose.

In one embodiment of the first aspect of the invention, the principal cellodextrin of the cellulose material has a DP value of between 4 to 8 inclusive. For example, in some embodiments, the principal cellodextrin may be selected from cellotetraose, celpentaose, cellohexaose.

In a second embodiment of the first aspect of the invention, the food composition comprises a celodextrin material wherein the principal cellodextrin has a DP value of at least 8.

In a third embodiment of the first aspect of the invention, the principal celldextrin defined above is present in the quantities of more than 51%, more than 55%, more than 60%, more than 70%, more than 75%, more than 80%, more than 90% or 100% w/w of the total cellodextrin material found in the food composition.
[0019] In a further embodiment of the first aspect of the invention, the cellodextrin material is soluble in water. The use of soluble materials in food production is advantageous due to the fact that water soluble materials are readily handled. The cellodextrin materials may be readily substituted in place of some or all of any high calorie sweetener used in food production, such as sugars, e.g., sucrose or lactose.

[0020] In general, the food compositions will contain one or more additional ingredients used in food production, such as fats, proteins, carbohydrates such as non-sugar type carbohydrates etc.

[0021] Thus, food compositions in accordance with the invention may be similar in all respects to the compositions used in the production of conventional food products, with the exception that some or all of the sugar (such as sucrose or lactose) present in that product is replaced with a cellodextrin material as defined above.

[0022] Thus, in a second aspect of the invention, there is provided a food product, said product comprising a food composition as defined above. The product is generally a processed food product where the food composition has been processed, for example shaped or mixed with other components, to form a final product ready for sale to the public. In one embodiment of the second aspect of the invention, the food product does not contain sugar. In this case, the cellodextrin material replaces all of the sugar that would conventionally be present in the product, meaning that the product has a lower calorific value.

[0023] In another embodiment, the cellodextrin material replaces only some of the sugar found in the conventional product, for example from 10-90%w/w of the sugar found in the conventional product. The relative amount of cellodextrin material that may be used to replace the sugar will depend upon various factors including the nature of the product, the levels of sweetness required and the precise composition of the cellodextrin material utilized.

[0024] In some embodiments, additional sweeteners may be added to the products to compensate for any loss of sweetness or flavour provided by the use of the cellodextrin material in the product. Thus, the food product may comprise an added sugar, but in particular it comprises a sweetener that is not sucrose, so as to maintain a low calorific value.
In one embodiment, the food product comprising the food composition as described above is a confectionery product. Examples of confectionery products include but are not limited to chocolate, non-standardized chocolate, and chocolate products comprising one or more fillings, such as cream fillings, caramel, honeycomb and nougat.

In the third aspect of the invention, there is provided the use of the cellodextrin material as described above in the preparation of a food composition. In one embodiment of the third aspect of the invention, the food composition further comprises a sweetener that is not sucrose. In one embodiment of the third aspect of the invention, the food composition is one that is used to prepare a confectionery product.

Certain cellodextrin materials used in the food compositions are novel and these form a further aspect of the invention.

Thus in a fourth aspect of the invention, there is provided a cellodextrin material comprising a principal cellodextrin with a degree of polymerisation (DP) value of at least 4 and at least one further cellodextrin. Suitably the further cellodextrin is not cellobiose, and in particular also has a DP value of at least 4.

In a fifth aspect of the invention, there is provided a method of manufacturing the cellodextrin material used in the food composition of the first aspect of the invention or the food product of the second aspect of the invention, or the cellodextrin material of the fourth aspect. The cellodextrin material is suitably prepared by mixing the required cellodextrin components in pure form, in the required amounts. This method has the advantage of allowing maximal control and flexibility in the preparation. Thus, a principal cellodextrin, having a DP value of at least 4, is chosen and is optionally mixed with one or more other cellodextrins such that it is present in the resulting material in an amount in excess of 50%w/w.

Alternatively, the cellodextrin material may be prepared by hydrolysis, for example enzymatic or acid hydrolysis of cellulose under conditions which result in the production of a cellodextrin material as defined herein. The conditions used will vary depending upon various factors such as the nature of any enzymes or chemicals used in the hydrolysis, the temperatures used and the time that the hydrolysis reaction is continued. These may be determined by routine methods.
The resulting cellodextrin material may be used to prepare a food composition according to a first aspect of the invention and/or a food product of the second aspect of the invention.

Thus, in a sixth aspect of the invention, there is provided a method for preparing a food composition or a food product such as a confectionary product as described above, the method comprising the steps of:

a. making the food composition and/or food product in accordance with known methods but without adding all or some of the sugar normally found in the food composition;

b. adding the cellodextrin material as described herein to the food composition.

In one example, the principal cellodextrin of the cellodextrin material mentioned in step (b) has a DP value of at least 4.

In a seventh aspect of the invention, there is provided a method for reducing calorie intake of a human or animal, by substituting either (i) a sugar-containing food composition with the food composition of the first aspect of the invention, or (ii) a food product according to the second aspect of the invention for a similar conventional food product, supplied to said human or animal. Suitably what is supplied to the human or animal is a confectionery product comprising a food composition of the first aspect of the invention.

For ease of use in food production, the cellodextrin material may be formulated as a ‘bulking agent’. Convenient bulking agents will contain an additional ingredient required in the production of a particular food product in the required ratio. Suitable ratios of cellodextrin material:additional ingredient will vary depending upon the nature of the additional ingredient and the desired result, but may typically be in the range of from 2:8 to 9:1. In particular the additional ingredient would be a carbohydrate sweetener.

Thus, in an eighth aspect of the invention, there is provided a bulking agent comprising a cellodextrin material and a carbohydrate sweetener wherein the cellodextrin material comprises a principal cellodextrin as defined herein with a DP of at least 4. In one embodiment of the eighth aspect of the invention, the carbohydrate sweetener is selected from
the group consisting of sucrose, dextrose, maltose, fructose, galactose, corn syrup solids, lactose, glucose syrup solids, invert sugar, hydrolyzed lactose, honey, maple sugar, brown sugar, molasses, sorbitol, hydrogenated isomaltulose, mannitol, xylitol, lactitol, erythritol, hydrogenated starch hydrolysate, maltitol, polydextrose, maltodextrin, and combinations thereof. Preferably, the carbohydrate sweetener is a high intensity sweetener. More preferably, the high intensity sweetener is selected from the group consisting of aspartame, cyclamates, saccharin, acesulfame-K, neohesperidin dihydrochalcone, sucralose, alitame, stevia sweeteners, steviosides, rebaudiosides, glycyrrhizin, thaumatin, and combinations thereof.

[0037] In a particular embodiment, the bulking agent comprises a cellodextrin material comprising a cellodextrin selected from the group consisting of cellotetraose, cellopentaose, cellohexaose, and mixtures thereof, and a carbohydrate sweetener. In another embodiment, the carbohydrate sweetener is selected from the group consisting of sucrose, dextrose, maltose, fructose, galactose, corn syrup solids, lactose, glucose syrup solids, invert sugar, hydrolyzed lactose, honey, maple sugar, brown sugar, molasses, sorbitol, hydrogenated isomaltulose, mannitol, xylitol, lactitol, erythritol, hydrogenated starch hydrolysate, maltitol, polydextrose, maltodextrin, and combinations thereof. Preferably, the carbohydrate sweetener is a high intensity sweetener. More preferably, the high intensity sweetener is selected from the group consisting of aspartame, cyclamates, saccharin, acesulfame-K, neohesperidin dihydrochalcone, sucralose, alitame, stevia sweeteners, steviosides, rebaudiosides, glycyrrhizin, thaumatin, and combinations thereof.

[0038] In a ninth aspect of the invention, there is provided a bulking agent comprising a cellodextrin having a DP of at least 4, and a carbohydrate sweetener. In one embodiment of the eighth aspect of the invention, more than 50% of the cellodextrins have a DP of at least 4. In one example, 50% of the cellodextrins have a DP of between 4 to 8 inclusive. In one embodiment of the ninth aspect of the invention, the carbohydrate sweetener is selected from the group consisting of sucrose, dextrose, maltose, fructose, galactose, corn syrup solids, lactose, glucose syrup solids, invert sugar, hydrolyzed lactose, honey, maple sugar, brown sugar, molasses, sorbitol, hydrogenated isomaltulose, mannitol, xylitol, lactitol, erythritol, hydrogenated starch hydrolysate, maltitol, polydextrose, maltodextrin, and combinations thereof. Preferably, the carbohydrate sweetener is a high intensity sweetener. More preferably, the high intensity sweetener is selected from the group consisting of aspartame,
cyclamates, saccharin, acesulfame-K, neohesperidin dihydrochalcone, sucralose, alitame, stevia sweeteners, steviosides, rebaudiosides, glycyrrhizin, thaumatin, and combinations thereof.

DETAILED DESCRIPTION

[0039] As used herein, the expression “food composition” does not include drinks or beverages, but rather, a food composition is typically something more solid or semi-solid in character. Examples of food compositions are mixtures of ingredients for use in the production of food products such as confectionery products and cakes and biscuits. The food composition is intended to be suitable for human or mammalian consumption.

[0040] Cellodextrin and celloooligosaccharides are used interchangeably in the art to describe reaction intermediates produced during the hydrolysis of cellulose to glucose. Hence, they have the same basic chemical structure as cellulose but with shorter chain lengths. Such molecules can be produced in a variety of ways, including but not limited to (bio)synthesis from monomers, chemical lysis of cellulose or enzymatic hydrolysis of cellulose. Most anaerobic bacteria can produce cellodextrins by means of its “cellulosome” (an amalgamation of cellulolytic enzymes on the outside of a cell) wherein an endoglucanase first cuts the crystalline cellulose in an amorphous zone and exoglucanases subsequently cleave these large insoluble chunks of cellulose into smaller, soluble cellodextrins which can be used by the cell.

[0041] The terms “cellodextrin” and “celloooligosaccharide”, as used herein, are used interchangeably and include any products that can be created during the breakdown of cellulose to glucose, regardless of the manner in which these breakdown products are produced.

[0042] Suitable cellodextrins for the performance of this invention include but are not limited to cellotetraose, cellopentaose, cellohexaose and mixtures thereof. Such compounds can be purchased from suppliers such as Carbosynth Limited (UK). Methods of making such cellodextrins are well known in the art, for example, methods of making cellodextrins are described in US2004/0217063.
As used herein, references to the cellodextrin ‘replacing’ all the sugar or some of the sugar found in a food composition or food product means that some or all of the sugar typically found in such a food composition or product is substituted with a cellodextrin material as described herein. For example, a particular chocolate bar recipe will have a certain amount of sugar listed. If the amount of sugar is decreased or eliminated and cellodextrin is used in the recipe instead, then this is a situation where replacement has occurred. Since the perceived sweetness of 1g of sugar and 1g of a particular cellodextrin is not the same, then this phrase is not intended to be limited to a 1:1 replacement of sugar with cellodextrin. Instead, if the percentage of sugar used is decreased and some cellodextrin is used to increase the sweetness of the food product, then this would fall within the definition. This definition also includes scenarios where cellodextrin is added to the food composition in combination with a sweetener.

The definition of “confectionery product” is well-understood by a skilled person. Included in “confectionery product” as used herein are candies, chocolate, non-standardized chocolate, filled chocolate products (e.g. Snickers™), caramels, and honeycomb such as is found in e.g. Crunchie™ and nougat.

The term "chocolate" is intended to refer to all chocolate or chocolate-like compositions with a fat phase or fat-like composition whether used in isolation, as a coating or chocolate couverture etc. The term is intended, for example, to include standardized and non-standardized chocolates, i.e., including chocolates with compositions conforming to the U.S. Standards Of Identity (SOI) and compositions not conforming to the U.S. Standards Of Identity, respectively, including dark chocolate, baking chocolate, milk chocolate, sweet chocolate, semi-sweet chocolate, buttermilk chocolate, skim-milk chocolate, mixed dairy product chocolate, low fat chocolate, white chocolate, aerated chocolates, compound coatings, non-standardized chocolates and chocolate-like compositions, unless specifically identified otherwise. Chocolate herein also includes those containing crumb solids or solids fully or partially made by a crumb process.

Non-standardized chocolates are those chocolates which have compositions which fall outside the specified ranges of the standardized chocolates. Non-standardized chocolates result when, for example, the nutritive carbohydrate sweetener is replaced partially or completely; or when the cocoa butter or milkfat are replaced partially or completely; or when
components that have flavors that imitate milk, butter or chocolate are added or other
ditions or deletions in formula are made outside the FDA standards of identity of chocolate
or combinations thereof.

[0047] As used herein, “sweetener” is defined as anything that is present in a food
composition that imparts a quality of sweetness to the food composition. Such sweetness can
be detected by the consumer of the food composition. Examples of such sweeteners include
sucrose, sugar alcohols and high intensity sweeteners such as sucralose. In one embodiment,
the sweetener is not sucrose.

[0048] The invention will now be particularly described by way of example.

[0049] EXAMPLES

[0050] Comparative Example 1 – chocolate containing cellobiose - testing

[0051] A panel of 10 assessors were used to evaluate sensory differences between cellobiose
containing (2 levels; 75% and 100% sucrose substitution) and standard chocolate.

[0052] Test Design

[0053] The maximum amount of cellobiose consumed during one 3 hour sensory session was
set at 20g and 8g respectively (100% cellobiose sample contained 49.5g cellobiose/100g, 75%
cellobiose sample contained 34.7g/100g and 60% inulin sample contained 29.7g inulin/100g).

[0054] All testing was carried out at room temperature in an air conditioned room and in
individual booths. Data was collected using Fizz Network software (Biosystemes, France).

[0055] For each attribute, panelists were presented with all samples (~3.5g sample size)
allowing comparative assessment. Panelists first determined rank order and then assigned
ratings using separate line scales for each sample/attribute.

[0056] All samples were presented in 2oz plastic pots labelled with random 3 digit codes.
Panelists were provided with unsalted cracker (Rakusen, U.K.), green apple slices and mineral
water (Evian, France) for palate cleansing. Attributes were assessed in blocks of 2 followed by 15mins rest breaks.

[0057] Data Analysis

[0058] Data was examined at an individual panelist level initially to assess panel performance. The ability of the panelists to discriminate between the samples was examined using coefficient of variance(CV) ANOVA data (indicating reproducibility of panelists replicate intensity scores) plotted against probability (level of discrimination between products). Final panel results were analyzed using Friedman Test for rank data and 2 way ANOVA (factors; sample and judge) for rating data, using Fizz software (Biosystemes, France). Significant differences between samples (p<0.05) were evaluated post hoc using Tukey’s HSD.

[0059] Results and Discussion

[0060] Gastro-intestinal symptoms

[0061] A number of gastro-intestinal symptoms were reported by the panelists in the 24 hours following the sensory sessions, the most common being flatulence (10/10 on at least 1 occasion) and bowel sounds (8/10 on at least 1 occasion). Some degree of abominable discomfort was reported by 7/10 panelists on 1 or more occasions and 5 out of the 10 panelists suffered diarrhea following 1 or more sessions. A summary of reported GI symptoms, together with severity ranges, is shown in Table 1. A previous tolerability study carried out using cellobiose (H-09-2011) examined GI effects when cellobiose was delivered in a water based solution and used only male subjects aged between 18-35yrs. The number and severity of symptoms seen in this study was not expected given the previous tolerability results where cellobiose was consumed as a drink (10, 20, 30 or 50g of cellobiose was dissolved in 200 ml of hot water and allowed to cool to room temperature overnight). In that study (data not shown), mild or no abdominal symptoms were reported by the volunteers after receiving 10g and 20g of cellobiose. With the consumption of 30g, 4 people (31%) experienced short duration abdominal pain (ranging in severity from 1 to 3 out of 5), 2 people (15%) reported mild flatulence (severity 1 out of 5) and one person reported this at a severity of 3 out of 5. After the 50g dose, 1 person had a single episode of diarrhea 2 h after consuming the
cellobiose and 1 reported diarrhea in the first 24h. Six subjects (46%) reported flatulence (range 1-4 out of 5), and 4 experienced abdominal pain (severity between 1-2 out of 5). Three quarters of subjects were happy to take part in future studies involving the ingestion of cellobiose, even at the highest dose.

[0062] Example 2 Recipe examples

[0063] Below are examples of recipes comprising the celldextrin materials of invention that could be carried out by a skilled person. Methods of making the chocolate or caramel etc. (without celldextrins) are well known to skilled artisans and can also be found in textbooks such as Chocolate, Cocoa and Confectionery, Bernard W. Minifie third edition, which is incorporated herein by reference. The substitution of sucrose in such methods with celldextrin could be readily accomplished by a skilled artisan when furnished with the information described herein.

[0064] Total substitution of sucrose with celldextrins

[0065] Dry mix:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Milk chocolate</th>
<th>White chocolate</th>
<th>Dark chocolate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Celledextrin</td>
<td>44%</td>
<td>45%</td>
<td>30%</td>
</tr>
<tr>
<td>Skimmed Milk powder</td>
<td>21.57%</td>
<td>23.57%</td>
<td>0%</td>
</tr>
<tr>
<td>Anhydrous milk fat</td>
<td>4%</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>Cocoa butter</td>
<td>22%</td>
<td>27%</td>
<td>20%</td>
</tr>
<tr>
<td>Cocoa liquor</td>
<td>14%</td>
<td>0%</td>
<td>46.47%</td>
</tr>
<tr>
<td>Emulsifier and flavouring</td>
<td>0.4%</td>
<td>0.4%</td>
<td>0.4%</td>
</tr>
<tr>
<td>High potency sweetener:</td>
<td>0.03%</td>
<td>0.03%</td>
<td>0.03%</td>
</tr>
<tr>
<td>sucralose</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[0066] Crumb powder: example recipes

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Milk Chocolate crumb</th>
<th>White crumb</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
</tr>
</tbody>
</table>
Partial substitution of sucrose with cellodextrins

Dry mix: 75% of sucrose replaced by cellodextrins

Crumb chocolate made with the crumb powders:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Milk chocolate %</th>
<th>White chocolate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crumb powder</td>
<td>80</td>
<td>45</td>
</tr>
<tr>
<td>Cocoa butter</td>
<td>19.37</td>
<td>27</td>
</tr>
<tr>
<td>Emulsifier and flavouring</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>High potency sweetener: sucralose</td>
<td>0.03</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Crumb powder: 75% of sucrose replaced by cellodextrins
Crumb chocolate made with the crumb powders:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Milk Chocolate crumb</th>
<th>White crumb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sucrose</td>
<td>13</td>
<td>41.3</td>
</tr>
<tr>
<td>Celloextrin</td>
<td>39</td>
<td>33.7</td>
</tr>
<tr>
<td>Whole milk</td>
<td>28</td>
<td>34</td>
</tr>
<tr>
<td>Cocoa butter</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Cocoa liquor</td>
<td>20</td>
<td>0</td>
</tr>
</tbody>
</table>

This formulation is cooked so that 15% water remains in the cooked caramel.

Caramel

This formulation is cooked so that 15% water remains in the cooked caramel.
Table 1: Summary of gastro-intestinal symptoms following sensory sessions

<table>
<thead>
<tr>
<th>ID</th>
<th>symptoms (y/n)</th>
<th>abdom pain</th>
<th>bloating</th>
<th>flatulence</th>
<th>bowel sounds</th>
<th>other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1y</td>
<td>y</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>2y</td>
<td>y</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>1-4</td>
<td>2-4</td>
</tr>
<tr>
<td>3y</td>
<td>y</td>
<td>4</td>
<td>2-3</td>
<td>5</td>
<td>2-4</td>
<td>4</td>
</tr>
<tr>
<td>4y</td>
<td>y</td>
<td>2</td>
<td>3-4</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>5y</td>
<td>y</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2-3</td>
<td>3</td>
</tr>
<tr>
<td>6y</td>
<td>y</td>
<td>2</td>
<td>1-3</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>7y</td>
<td>y</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1-3</td>
</tr>
<tr>
<td>8y</td>
<td>y</td>
<td>3</td>
<td>3-5</td>
<td>2</td>
<td>2-5</td>
<td>4</td>
</tr>
<tr>
<td>9y</td>
<td>y</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10y</td>
<td>y</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1-5</td>
<td>0</td>
</tr>
</tbody>
</table>

- Abdominal pain: 0 sessions out of 7, severity range 0
- Bloating: 0 sessions out of 7, severity range 0
- Flatulence: 7 sessions out of 7, severity range 1
- Bowel sounds: 1 session out of 7, severity range 1

- Other symptoms noted:
  - Stomach cramps 1 occasion
  - Nausea, diarrhoea, 1 occasion each
  - Diarrhoea on 2 occasions
  - Nausea on 1 occasion
  - Diarrhoea on 2 occasions
  - Loss of appetite and diarrhoea on 3 occasions
  - Diarrhoea on 1 occasion
CLAIMS

1. A food composition comprising a cellodextrin material, wherein the cellodextrin material comprises a principal cellodextrin with a degree of polymerisation (DP) value of at least 4.

2. The food composition of claim 1 wherein the principal cellodextrin has a DP value of from 4 to 8 inclusive.

3. The food composition of claim 1 wherein the principal cellodextrin has a DP value of at least 8.

4. The food composition of any one of the preceding claims which does not contain celllobiose.

5. The food composition of any one of the preceding claims which does not contain cellotriose.

6. The food composition of any one of the previous claims wherein the principal cellodextrin is present in the quantities of more than 51%, more than 55%, more than 60%, more than 70%, more than 75%, more than 80%, more than 90% or 100% w/w of the total cellodextrin material found in the food composition.

7. The food composition of claim 1 or claim 2 wherein the cellodextrin material is selected from the group consisting of cellotetraose, cellopentaose, cellohexaose, and mixtures thereof.

8. The food composition of any one of the preceding claims wherein the cellodextrin material is soluble in water.

9. The food composition of any one of the preceding claims which further comprises a fat, protein or other carbohydrate.

10. A food product comprising a food composition according to any one of the preceding claims.
11. The food product of claim 10 which additionally comprises a sweetener that is not sucrose.

12. The food product of claim 10 or claim 11 which is a confectionery product.

13. The food product of claim 12 wherein the confectionery product is selected from the group of chocolate, non-standardized chocolate, filled chocolate product such as cream fillings, caramel, honeycomb and nougat.

14. A cellodextrin material comprising a principal cellodextrin with a degree of polymerisation (DP) value of at least 4 and at least one further cellodextrin.

15. A cellodextrin material according to claim 14 wherein the further cellodextrin is not cellobiose.

16. A cellodextrin material according to claim 14 or claim 15 wherein the said further cellodextrin also has a DP value of at least 4.

17. The use of a cellodextrin material as defined in any one of claims 1 to 8 or as claimed in any one of claims 14 to 16, in the preparation of a food composition.

18. The use of claim 17, wherein the food composition further comprises a sweetener that is not sucrose.

19. The use of any one of claims 17 or 18, wherein the food composition used to prepare a confectionery product.

20. A method of manufacturing a cellodextrin material according to any one of claims 14 to 16, which comprises mixing together a principal cellodextrin with a degree of polymerisation (DP) value of at least 4 and at least one further cellodextrin; or hydrolysis of cellulose under conditions in which a cellodextrin composition comprising a principal cellodextrin have a degree of polymerisation (DP) value of at least 4 and at least one further cellodextrin is formed.
21. A method for preparing a food composition according to any one of claims 1 to 9 or a food product according to any one of claims 10 to 13, the method comprising the steps of:

(a) making the food composition and/or confectionery product in accordance with known methods but without adding all or some of the sugar normally found in the food composition;

(b) adding the cellodextrin material as defined in any one of claims 1 to 9, or the cellodextrin material of claims 14 to 16, to the food composition.

22. A method of reducing calorie intake of a human or animal, supplying to said human or animal a food composition according to any one of claims 1 to 9 or a food product according to any one of claims 10 to 13 instead of a similar sugar-containing food composition or food product.

23. A bulking agent comprising a cellodextrin material and a carbohydrate sweetener wherein the cellodextrin material comprises a principal cellodextrin with a DP of at least 4.

24. The bulking agent of claim 23 wherein the carbohydrate sweetener is selected from the group consisting of sucrose, dextrose, maltose, fructose, galactose, corn syrup solids, lactose, glucose syrup solids, invert sugar, hydrolyzed lactose, honey, maple sugar, brown sugar, molasses, sorbitol, hydrogenated isomaltulose, mannitol, xylitol, lactitol, erythritol, hydrogenated starch hydrolysate, maltitol, polydextrose, maltodextrin, and combinations thereof.

25. The bulking agent of claim 23 or claim 24 further comprising a high intensity sweetener.

26. The bulking agent of claim 25 wherein the high intensity sweetener is selected from the group consisting of aspartame, cyclamates, saccharin, acesulfame-K, neohesperidin dihydrochalcone, sucralose, alitame, stevia sweeteners, steviosides, rebaudiosides, glycyrrhizin, thaumatin, and combinations thereof.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. A23G1/00 A23L33/24

ADD.

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)

A23G A23L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data, BIOSIS, EMBASE, FSTA

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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<th>Relevant to claim No.</th>
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<td>JP 2009 125064 A (ASAHI KASEI CHEMICALS CORP) 11 June 2009 (2009-06-11) cited in the application on paragraphs [0008] - [0013], [0044]; claims 1-5</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:
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Date of the actual completion of the international search

17 August 2016

Name and mailing address of the ISA:

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NL - 2280 HV Rijswijk

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Date of mailing of the international search report

30/08/2016

Authorized officer

de La Tour, Camille

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