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CELLULOSE FOOD FILLER

The present invention relates to a process for the production of a low calorie cellulose food filler with an improved flavour or texture, more particularly a powdered cellulose food filler.

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In the preparation of low calorie foods the general method is to reduce the proportion of carbohydrate and fat in the food. However, if the carbohydrate and fat content were reduced without adding a substitute, there would be a reduction of bulk volume and change of texture of the food product. Therefore a bulking agent with a low calorie content is needed to provide the bulk volume and reduce the caloric density of the food. The bulking agents are known as low calorie fillers.

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Fat and oil may be replaced by recently developed fillers such as sucrose polyester and polyglycerol esters which have the characteristics of oil and fat but have a much lower calorie content.

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Carbohydrate may be replaced by two types of filler one being a soluble material for replacing sugar and the other being an insoluble material for replacing starch and flour. The most common materials used for replacing starch and flour are dietary fibres or the so-called "unavailable" carbohydrates, examples of which are pectic substances, gums, mucilages, hemicellulose, cellulose and lignins. Of these materials, purified cellulose is most effective because of its high fibre content, good shelf life and negligible levels of microbial contamination. There are two purified celluloses available commercially these being powdered cellulose and microcrystalline cellulose of which powdered cellulose is the most used in low calorie foods because of its lower cost. However, there are two major disadvantages of powdered cellulose when used in foods. One is that it

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possesses an undesirable cardboard taste and odour and the second is that it has a very gritty texture after rehydration. Because of the undesirable taste and odour, the palatability of foods containing powdered cellulose has always been a problem and this has meant that only a limited amount of powdered cellulose could be used not only in low calorie foods but also in high fibre foods such as breakfast cereals in which calorie reduction is not necessary but addition of fibre content is beneficial. This undesirable taste and odour is most significant when the powdered cellulose is used in instant foods which require minimum or no cooking.

It is common practice to add flavouring ingredients to powdered cellulose but this only masks or neutralises the cardboard taste and odour of the cellulose: it does not remove or alter it. For example, United States Patent 4,089,981 describes a process for making simulated foods by adding flavouring agent, gelling agent, oil and water to the cellulose with mild temperature pasteurisation at 74°C (165°F), but the flavour of the cellulose itself is not altered.

In accordance with the present invention we have found surprisingly that by mixing powdered cellulose with water and a flavouring ingredient and then heating the mixture to remove water, the undesirable taste and odour of the cellulose is substantially removed and a more pleasant flavour is obtained.

With regard to the gritty texture of powdered cellulose, efforts have been made to eliminate it by adding gelling agents such as cellulose gums, pectins, alginates and starches to the cellulose to provide a cohesive gel-like texture and smooth mouthfeel. However the addition of large amounts of gelling agents causes lumpiness when the mixture

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is rehydrated leading to poor dispersibility. In a preferred embodiment of the present invention we have found surprisingly that by incorporating a gelling agent into the mixture of powdered cellulose, water and flavouring agent before the mixture is heated to remove water, the
5 grittiness of the cellulose is substantially eliminated without any lumpiness thus providing the mixture with a good dispersibility.

Accordingly the present invention provides a process for the preparation of a powdered cellulose food filler which comprises
10 mixing powdered cellulose and a flavouring agent with water in an amount sufficient to wet substantially all the cellulose powder, and afterwards heating the mixture to remove most of the water.

15 The amount of water mixed with the powdered cellulose depends on the type of cellulose and the water absorption of the cellulose. Less water is required to wet fine cellulose than coarse cellulose. The principle is to wet all or
20 substantially all the powdered cellulose. This can conveniently be achieved by mixing from 25 to 75 parts by weight and preferably from 40 to 60 parts by weight of water with 100 parts by weight of powdered cellulose.

25 The amount of flavouring agent mixed with the powdered cellulose depends on the amount of the treated powdered cellulose used, on the type of food product into which it is incorporated and on the type of flavouring agent itself. The amount may vary from 0.05 to 10 parts by weight per
30 100 parts by weight of cellulose. The amount of flavouring agent that is preferred is the amount which gives an optimum use level in the treated cellulose. For example if the

flavour is too strong it is not desirable to add too much of the treated cellulose powder to foods. Generally the amount of flavouring agents such as cysteine and thiamine are from 0.1 to 1.0 parts by weight and preferably from 0.2 to 0.5 parts by weight per 100 parts by weight of powdered cellulose. Other types of flavouring agent such as beef extract, yeast extract, cheese powder, egg yolk powder and cocoa powder are generally used in amounts of from 0.5 to 10 parts by weight and preferably from 1 to 5 parts by weight per 100 parts by weight of powdered cellulose.

As noted above, in accordance with one embodiment of the invention a gelling agent is incorporated into the mixture before heating. The amount of gelling agent may be from 1 to 15 parts by weight, preferably from 3 to 10 parts by weight per 100 parts by weight of powdered cellulose. The gelling agent may be a cellulose gum, a pectin, an alginate or a starch.

Preferably the mixture is mixed thoroughly until uniform before being heated. This mixing may conveniently be carried out in a high shear mixer such as a Lodige or turbulent mixer.

The heating temperature and the time of the heat treatment are related to the amount of water added. Conveniently temperatures from 70°C to 160°C may be used, preferably from 90°C to 150°C. The heating time may vary, for example, from 15 minutes to 2 hours, shorter heating times being adequate at higher temperatures.

The heating can be carried out in any drying device that contacts and stirs the product. The water is removed until the moisture content of the treated cellulose powder is preferably less than 10%, more preferably less than 7%, most preferably less than 5%, by weight based on the treated cellulose powder. A vacuum evacuation system may be used to evaporate the added water.

In a preferred embodiment of the invention both the flavouring agent and the gelling agent are mixed with the powdered cellulose and water and the mixture afterwards heated to remove most of the water. The treated cellulose powder then has not only an improved flavour but also an improved texture.

The treated cellulose powder may be used in two types of applications:

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- a) As a substitute for carbohydrate in foods to reduce calories and provide bulk volume e.g. to replace dehydrated potato in mashed potato mix.
- 15 b) As a fibre source in foods in which calorie reduction is not necessary but addition of fibre content is beneficial e.g. addition of fibre to hot breakfast cereal.

The present invention also provides a foodstuff to which has been added a powdered cellulose filler treated as hereinbefore described. Examples of such foodstuffs are mashed potato mix, sauce mix and instant cream of wheat.

The process of the present invention has the following advantages:

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1. It enables a greater quantity of powdered cellulose to be added to foods as a high fibre, low calorie filler.
2. It imparts a better flavour to the powdered cellulose.
- 30 3. It allows usage of the powdered cellulose in a larger variety of foods.
4. It improves the texture of the powdered cellulose without

causing lumpiness on rehydration and thus provides a powdered cellulose with good dispersibility. Gums added to the cellulose after treatment with a gelling agent in accordance with this invention have a better dispersibility than gums added to the cellulose which has not been so treated.

5. The powdered cellulose has a better wetting quality.

The following Examples further illustrate the present invention in which parts are given by weight.

Example 1

To 98.5 parts of powdered cellulose, 1.5 parts of yeast extract powder and then 50 parts of water were added and the whole was mixed in a turbulent high shear mixer until uniform. The wet premix was fed into a Wyssmont Turbo K-10 unit dryer at a rate of 22.68 kg (50 pounds) per hour and heated for 30 minutes at 150°C until the moisture content was below 7 %.

To demonstrate the advantage of the present invention 40 parts of water were added to 10 parts of each of a) cellulose and b) cellulose/yeast extract, one sample of each of which was untreated and one sample of each of which had been mixed with water and heated to remove most of the water as in the process of the present invention. The results are given in the following Table I.

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TABLE I

	<u>CELLULOSE</u>		<u>CELLULOSE/YEAST EXTRACT</u>	
5	<u>without treatment</u>	<u>with treatment</u>	<u>without treatment</u>	<u>with treatment</u>
<u>Cellulose odour</u>	existing	none	existing	none
<u>flavour</u>	cardboard	slight cardboard	slight cardboard	pleasant roast note

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It is clear that treatment of the cellulose/yeast extract in accordance with the present invention produces a powdered cellulose with no odour and a pleasant flavour.

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Examples 2 to 8

A similar procedure to that described in Example 1 was followed but employing, instead of the yeast extract, the flavouring agents listed in the following Table II in the amounts designated. The amounts of cellulose used and the flavour characteristics produced are also specified in the Table.

TABLE II

25	<u>Example</u>	<u>Flavouring Agent (Parts)</u>	<u>Parts of Cellulose</u>	<u>Flavour characteristics</u>
	2	Beef extract (3.0)	97.0	Beefy
	3	Cysteine HCl (0.2)	99.8	Roast
30	4	Thiamine HCl (0.2)	99.8	Roast
	5	Egg Yolk Powder (3.0)	97.0	Chicken Type
	6	Romano Cheese Powder (2.0)	98.0	Dairy
	7	Cocoa Powder (3.0)	97.0	Cocoa
35	8	Hydrolysed Plant Protein (2.5)	97.5	Meaty

Example 9

97.5 parts of powdered cellulose, 2.5 parts of hydrolysed plant protein powder and 35 parts of water were mixed in a mixer with heating jacket and vacuum evacuation system. The mixture was heated at 90°C for 90 minutes and dried till the moisture content was 5 %.

Example 10

To 95.5 parts of powdered cellulose, 1.5 parts yeast extract powder and 3 parts cellulose gum were added 50 parts of water and the whole was mixed in a turbulent high shear mixer until uniform. The wet premix was fed into a Wyssmont Turbo K-10 unit dryer at a rate of 22.68 kg (50 pounds) per hour and heated for 30 minutes at 150°C until the moisture content was below 7 %.

The treated powdered cellulose had a pleasant roast flavour note and a smooth texture after it was rehydrated.

Example 11

To produce a reduced calorie mashed potato 15 g of 76 g potato flake was replaced by 15 g of the cellulose powder treated as in Example 10 and rehydrated with 300 ml hot water and 100 ml milk.

To demonstrate the advantages of a mashed potato produced in accordance with the present invention 76 g of a control potato was compared with 61 g of a potato to which was added 14.3 g of non-treated powdered cellulose and also 61 g of a potato to which was added 15 g of a powdered cellulose treated as in Example 10. The results are given in Table III below.

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TABLE III

RECONSTITUTED MASHED POTATO

	<u>Control potato</u>	<u>Potato + non-treated cellulose</u>	<u>Potato and treated cellulose</u>
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<u>Flavour characteristic</u>	potato	cardboard	cooked potato
<u>Texture</u>	smooth	grainy and dry	smooth
10			
<u>Energy Value</u> (Calorie content)	1448 Kilojoules (346 Cal)	1218 Kilojoules (291 Cal)	1222 Kilojoules (292 Cal)

This demonstrates that a mashed potato containing a powdered cellulose filler treated in accordance with the present invention contains fewer calories than an ordinary mashed potato and has a superior flavour and texture to a potato containing a non-treated powdered cellulose filler.

Example 12

20 To prepare a high fibre instant cream of wheat 98 parts of powdered cellulose were premixed with 2 parts Romano Cheese Powder. 50 parts of water were added and the whole was mixed in a turbulent high shear mixer until uniform. The wet premix was fed into a Wyssmont Turbo K-10 unit dryer at a rate of 50 pounds per hour and heated for 30 minutes at 150°C until the moisture content was below 7 %. The treated cellulose powder had a pleasant dairy note.

30 7 g of this treated powdered cellulose was premixed with 30 g instant cream of wheat mix and 12 g of sugar. The mixture was sprinkled into 200 ml of milk, brought to the boil and cooked for 30 seconds. The differences between regular cream of wheat, cream of wheat containing non-treated cellu-

lose and cream of wheat containing powdered cellulose treated in accordance with the present invention are given in Table IV below.

5 TABLE IV

RECONSTITUTED CREAM OF WHEAT

10	<u>Regular cream of wheat</u>	<u>Cream of wheat and non-treated cellulose</u>	<u>Cream of wheat and treated cellulose</u>
	good	slight cardboard	pleasant dairy note
15	<u>Flavour character- istic</u>		
	<u>Crude fibre</u>	0.5 g	6.1 g
		6.1 g	6.1 g

This demonstrates that cream of wheat containing powdered cellulose treated in accordance with the present invention not only has a higher fibre content than regular cream of wheat but also a much more pleasant flavour than wheat containing a non-treated powdered cellulose.

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CLAIMS

1. A process for the preparation of a powdered cellulose food-filler which comprises mixing powdered cellulose and a flavouring agent with water in an amount
5 sufficient to wet substantially all the cellulose powder, and afterwards heating the mixture to remove most of the water.
2. A process as claimed in claim 1 in which a gelling agent is incorporated into the mixture before
10 heating.
3. A process as claimed in claim 2 in which the amount of gelling agent mixed with the powdered cellulose is from 3 to 10 parts by weight per 100 parts by weight of powdered cellulose.
- 15 4. A process as claimed in any of claims 1 to 3 in which the amount of water mixed with the powdered cellulose is from 40 to 60 parts by weight per 100 parts by weight of powdered cellulose.
- 20 5. A process as claimed in any of claims 1 to 4 in which the amount of flavouring agent mixed with the powdered cellulose is from 0.2 to 5 parts by weight per 100 parts by weight powdered cellulose.
- 25 6. A process as claimed in any of claims 1 to 5 in which the mixture is mixed thoroughly until uniform before being heated.
7. A process as claimed in any of claims 1 to 6 in which the mixture is heated at a temperature from 90°C to 150°C until the moisture content is less than 7% by weight based on the treated cellulose powder.
- 30 8. A process for the preparation of a powdered cellulose food-filler substantially as described with particular reference to any of Examples 1 to 10 and 12.
- 35 9. A powdered cellulose food-filler when prepared by a process as claimed in any of claims 1 to 8.



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10. A foodstuff incorporating a powdered cellulose food-filler as claimed in claim 9.

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