EXTRUDABLE DENTIFRICE

The present invention relates to an extrudable dentifrice. In particular, it relates to a dentifrice having desirable rheological properties such as being a readily extrudable dentifrice when packaged in a mechanically operated or pressure differential dentifrice dispenser.

A dentifrice is generally recognizable by its creamy or gel consistency and may commonly be called a dental cream, a toothpaste or, in some cases, a clear gel or opacified gel toothpaste. Indeed, it can be characterised as a semi-solid, for instance, being essentially solid when standing on the bristles of a toothbrush and essentially liquid such as during manufacture with agitation or when subject to pressure to extrude the dentifrice from its container. Such liquification is greatest when a pressure differential dispenser is employed due to its typically narrow orifice.

The creamy or gel consistency of dentifrices is imparted by a gelling or binding agent, sometimes supplemented with a non-gelling thickener. In the past, gelling agents have been selected primarily to provide ease of dispersion of the dentifrice in the oral cavity. Many gelling agents such as cellulosic materials, seaweed derivatives, gums and clays meet this criteria. However, some gelling agents while generally desirable for dentifrices packaged in flexible tubes, do cause rheological disadvantages

when the dentifrices are packaged in a mechanically operated or a pressure differential dispenser.

Dentifrices containing conventional polishing agents such as dicalcium phosphate including each of the anydrous and dihydrate forms and mixtures thereof and conventional gelling agents such as sodium carboxymethyl cellulose or hydroxyethyl cellulose, although often recommended for and used with such dentifrices, have tended to thicken with the passage of time. A similar problem occurs when a siliceous polishing agent such as silica xerogel, hydrous silica, precipitated silica or amorphous silica containing combined alumina, that is essentially an alumino-silicate such as sodium aluminosilicate, is employed. Kappa carrageenan gelling agent, which has also been recommended, tends to cause such dentifrices to become thin upon being sheared when passing through a container orifice.

Dentifrices which thicken may become increasingly difficult for a consumer to extrude from a dentifrice tube over a period of time. In other words, the consumer may have to increase pressure on a dentifrice tube containing such a dentifrice during the period of use in order to soften or liquify the semi-solid dentifrice mass to extrude it. This has not been a major problem in the past since formulations can be adjusted to use less gelling agent to strike a balance between not being too soft at the start of use and too thick at the end and in any event consumers have readily adjusted to applying the amount of pressure

necessary to extrude the desired amount of dentifrice onto bristles of a toothbrush.

Dentifrices which are thin upon extrusion from a tube have also been tolerated during use if they set to more solid form on toothbrush bristles within a few seconds. Thus, the type of gelling agent could be widely varied for dentifrices packaged in tubes. Indeed, the Copenhagen Pectin Factory Ltd., of Little Skensved, Denmark, a subsidiary of Hercules Inc., of Wilmington, Delaware, U.S.A., has proposed its product Genuvisco Type 0819, an iota-carrageenan (i-carrageenan), as a possible thickener for toothpaste. I-carrageenan available from Marine Colloids Division of FMC Corp., of Springfield, New Jersey, as Viscarin TP-5 has also been proposed for possible toothpaste use with toothpaste containing dicalcium phosphate or silica. Indeed, i-carrageenan has been disclosed as a thickener component together with k-carrageenan and alkali metal alginate for a dentifrice containing galactan galactose in Japanese Patent Publication 56 115711, published September 11, 1981, of Lion Dentifrice Ltd. Xanthan is another type of gelling agent which can be used to make a dicalcium phosphate or siliceous polishing agent less prone to thicken.

When a dentifrice dispenser which operates mechanically or by pressure differential is employed, conventional techniques of reducing thickening of dentifrice containing dicalcium phosphate or siliceous

polishing agent are not fully satisfactory. Likewise, since the tendency to liquify is increased during shearing and extrusion, particularly from pressure differential dispensers, gelling agents which produce thin dentifrices are also not fully satisfactory as they tend to be too slow to reset to solid form after extrusion. When conventional gelling agents such as sodium carboxymethyl cellulose or hydroxyethyl cellulose are employed, the dentifrice becomes too thick to extrude through the orifice of the dispenser or extrudes only with substantial difficulty. In fact, if dentifrice containing such gelling agent can be extruded, it then becomes unduly thin upon shearing. With k-carrageenan the dentifrice is too thin upon shearing. Reduced levels of such gelling agents tend to make the product too soft or liquid such that it does not stand up well upon the bristles of a toothbrush when extruded but rather becomes flat and sags. Alternative types of gelling agents such as xanthan tend to make the dentifrice soft and stringy.

Unexpectedly from amongst alternative types of gelling agents, i-carrageenan provides excellent rheology for a dentifrice containing dicalcim phosphate or siliceous polishing agent which is to be extruded from a mechanical or pressure differential dispenser. This is the case when i-carrageenan is used as the sole gelling agent. Moreover, when i-carrageenan is used in admixture with cellulosic gelling agent additional desirable rheology characteristics of such gelling agents are obtained

without undue thickening. It is noteworthy that xanthan has not been compatible with cellulosic gelling agents since it may contain cellulase.

It is an advantage of the present invention that a dentifrice is provided which is readily extrudable from a mechanically operated or pressure differential dentifrice dispenser with desirable rheological properties.

It is an advantage of this invention that desirable dentifrice rheological properties associated with cellulosic gelling agent are retained while undue dentifrice thickening is avoided.

In accordance with the present invention there is provided a dispenser containing a dentifrice, the dispenser being a mechanically operated dispenser, or a pressure differential dispenser, the said dentifrice comprising an aqueous humectant vehicle, 0.1-5% by weight of gelling agent and 10-75% by weight of polishing agent, the dentifrice containing either

a) at least 20% by weight of dicalcium phosphate polishing agent based upon the weight of the dentifrice in which case the aqueous humectant vehicle is provided by 10-55% by weight of water and 20-50% by weight of humectant based on the weight of the dentifrice, or

b) at least 10% e.g. 10-30% by weight of a siliceous polishing agent based upon the weight of the dentifrice, in which case the aqueous humectant vehicle is provided by 3-50% by weight of water and 20-70% by weight of humectant based on the weight of the dentifrice, the said gelling agent being

c) i-carrageenan or

d) a mixture of an amount of 0.1-2.5% by weight of the dentifrice of i-carrageenan with a cellulosic gelling agent, the weight ratio of i-carrageenan to cellulosic gelling agent in the said mixture being 99:1 to 1:3.

In the dentifrice formulation the dental vehicle comprises a liquid phase proportioned with the gelling agent to form an extrudable creamy mass of desirable consistency. The liquid phase in the dentifrice will comprise chiefly water and humectant such as polyols including glycerine, sorbitol, maltitol, xylitol, low molecular weight polyethylene glycol (e.g. 400 or 600), and propylene glycol including suitable mixtures thereof.

The dentifrice contains polishing agent in amounts of ~~about~~ 10-75% by weight. Dicalcium phosphate may be used in its dihydrated or anhydrous forms or as mixtures thereof in any desired ratio. Most typically dicalcium phosphate is employed, generally as the dihydrate. Dicalcium phosphate is typically the sole polishing agent, but if desired minor amounts (e.g. up to 20% by weight of the dental cream and less than the amount of dicalcium phosphate) of other dentally acceptable water-insoluble polishing agents which do not substantially interfere with the ability of the composition of the invention to promote oral hygiene may be present. Siliceous polishing agents, besides being a main polishing agent, may also be an additional polishing agent to dicalcium phosphate. Other typical additional polishing agents include hydrated alumina, anhydrous alumina and calcium carbonate. A minor

amount of hydrated alumina (e.g. about 1%) also inhibits or even eliminates the tendency of some dental creams to separate or "bleed" in their tubes.

Siliceous polishing agent includes an amorphous silica containing combined alumina which can be considered to be an alkali metal aluminosilicate having a refractive index of from 1.44 to 1.47 and containing at least 70% by weight silica, up to 10% by weight alumina, such as 0.1-10%, e.g. 0.1-3%, preferably up to 20% by weight of moisture, such as 0.5-10%; and up to 10% by weight of alkali metal oxde. Typically, this material has a particle size in the range from 1 to 35 microns, preferably from 2 to 20 microns, e.g. 2 to 4 microns. The preferred moisture content is from 10% to 20% measured by ignition at 1000°C and the typical content of alkali metal oxide is from 5% to 10%. Generally, the polishing agent has a loose bulk density of up to 0.2 g/cc, such as from 0.07 to 0.12 g/cc.

Another suitable type of polishing agent is porous amorphous silicic anhydride having an average particle size preferably below 20 microns and above 1 micron, a surface area of at least 200 m^2/g, preferably at least 300 m^2/g, and a bulk density of at least 0.15 g/cm^3, preferably at least 0.30 g/cm^3, such as a dehydrated silica hydrogel (i.e. a xerogel), preferably of the well known regular density or intermediate density type. Examples of such amorphous silicic anhydride polishing agents are "Syloid 63", "Syloid 72" and "Syloid 74" (SYLOID is a Registered Trade Mark) which are described in "The Davison Family of Syloid Silicas" published by their manufacturer, Grace, Davison Chemical Company. "Santocel 100" of Monsanto (SANTOCEL is a Registered Trade Mark), is also a suitable dental abrasive. "Syloid 72" has an average particle size of about 4 microns, a surface area of about 340 m^2/g, and a bulk density of about 1.77 g/cm^3. For "Syloid 63" the corresponding figures are about 9 microns, about 675 m^2/g and about 0.4 g/cm^3. A grade of "Santocel 100" has a surface area of about 239 m^2/g and a bulk density of about 0.24 g/cm^3. These amorphous silicic anhydrides may be used singly or in mixtures.

Hydrous silica which may be used as polishing agent is particularly described in British Published Patent Applcation 2 038 303A of Grace G.m.b.H. The hydrous gel is generally described as having an average particle size of 1 to 30 microns and:

a) a surface area of 1 to 600 m^2/g,

b) a pore volume of 0.05 to 0.5 cm^3/g,

c) a product of surface area (in m^2/g) x pore volume (in cm^3/g) less than or equal to 240,

d) a calculated pore diameter of 1.5 to 2.5 nm, and

e) a water content of less than 25% by weight.

Polishing agent in the form of synthetic hydrated precipitated silica is not a silica gel, xerogel or aerogel but is obtained as a finely divided precipitate, such as from a solution of alkali metal silicate and acid. The variables of concentration, pH and temperature are chosen to prevent the formation of a continuous gelatinous mass and to promote the precipitation of silicas in a finely divided form which can be readily filtered and washed.

The gelling agent of the present invention is present in the dentifrice in an amount of 0.1-5% by weight. It may be entirely i-carrageenan in amount of 0.1-2.5% by weight or a mixture in amount of 0.1-2.5% by weight of i-carrageenan mixed with a cellulosic gelling agent, wherein the weight ratio of the said i-carrageenan to the said cellulosic gelling agent is 99:1 to 1:3, preferably from 2:1 to 1:3 and particulary 2:1 to 3:2 or 3:2 to 1:2, and the total gelling agent mixture is present in an amount up to 5% by weight, preferably 0.2-3%. The yield point viscosity of the dentifrice is desirably in the range of 2000-5000 dynes/cm^2, preferably 2000-4000 dynes/cm^2, from the time the dentifrice sets after preparation for at least three months when

maintained at room temperature (measured on Haake Rotovisco Viscometer using a profiled SV IIP cup).

As mentioned above, iota carrageenan is commercially available as Genuvisco type 0819 and Viscarin TP-5 and has been recommended for use in a toothpaste. Such use in a toothpaste was described in Japanese Patent Publication 56 115711 of Lion Dentifrice Ltd., wherein i-carrageenan is mentioned as a possible component of a gelling system together with k-carrageenan and alkali metal alginate. In U.S. Patent 4,353,890 to Scott, i-carrageenan is disclosed as an alternative to k-carrageenan as a toothpaste gelling agent wherein the toothpaste is subjected to microwave radiation to reduce the tendency of carrageenan in general to become thin during manufacture. The carrageenan may be the sole gelling agent or mixed with other gelling agents. In the present invention, dentifrice containing i-carrageenan to be packaged in a mechanically operated or pressure differential dispenser does not require microwave radiation.

The prior art generally discussed above does not indicate that gelling systems based on i-carrageenan can provide dentifrices containing dicalcium phosphate or siliceous polishing agent with the rheology necessary for long-term extrusion from a mechanically operated
or pressure differential dispenser.

It is noteworthy that U.S. Patent 4,029,760 to de Roeck et al discloses an oral composition in which i-carrageenin is set forth as an antigingivitis agent

alternative to other carrageenins. Carrageenins are highly depolymerized derivatives of carrageenans. Carrageenans do not appear to provide an antigingivitis effect.

Dentifrices are commonly manufactured by cold process, e.g. at about 25°C, or by a hot process, e.g. at about 60°C. I-carrageenan can be used in either cold process or hot process techniques. K-carrageenan can only be used with hot processing.

Physical properties of Genuvisco type 0819 i-carrageenan are indicated below:

1. Viscosity of 0.30% solution of GENUVISCO type 0819 in lean solvent (high glycerine, low water) prepared using a hot process (60°C):
   Viscosity = 690 ± 80 cP measured on Brookfield Viscometer LVT at 25°C.
   Viscosity = 110 ± 17 cP at 32 rpm.
   Viscosity = 70 ± 11 cP at 64 rpm.
   Viscosity = 45 ± 7 cP at 128 rpm.
   Measured on HAAKE Rotovisco RV3 at 25°C.
2. Viscosity of 0.30% solution of GENUVISCO type 0819 in lean solvent prepared using a cold process (25°C):
   Viscosity = 450 ± 60 cP measured on Brookfield Viscometer.
   LVT at 25°C.
   Viscosity = 85 ± 13 cP at 32 rpm.
   Viscosity = 55 ± 8 cP at 64 rpm.
   Viscosity = 37 ± 6 cP at 128 rpm.
   Measured on HAAKE Rotovisco RV3 at 25°C.

3.	Particle size:	Less than 1% by weight gum on 0.075 mm test sieve (DIN 80, 200 U.S. mesh).
4.	Moisture content:	Less than 12% by weight.
5.	pH:	8.5 ± 1.5 in 0.5% by weight solution in distilled water at 25°C.
6.	Colour:	White to cream.

Viscarin TP-5 i-carrageenan has the following physical properties:

Colour:	light tan to tan.
Particle size:	more than 95.0% by weight through a U.S. Standard Sieve, 250 nm (Series #60).
Moisture:	maximum 12.0% by weight (Cenco Moisture Balance).
pH:	7.0 to 9.5, 1.5% by weight solution, 30°C (86°F).

When i-carrageenan is mixed with a cellulosic gelling agent in a dentifrice containing dicalcium phosphate or siliceous polishing agent, thickening does not occur to interfere with extrusion from a mechanically operated or pressure differential dispenser and other rheological properties such as consistency and stand-up to touch are improved. Typical desirable cellulosic gelling agents include alkali metal carboxymethyl cellulose, methyl cellulose, hydroxyethyl cellulose and hydroxypropyl cellulose. Sodium carboxymethyl cellulose is preferred. When the mixed gel system is present in amount up to 5% by weight of the

dentifrice, 0.1-2.5% of the dentifrice is i-carrageenan and the weight ratio of i-carrageenan to cellulosic gelling agent is from 99:1 to 1:3, preferably 2:1 to 1:3, such as 3:2 to 2:1 or 1:1. Thus, a typical dentifrice can contain 0.9-1.2% total gelling agent including 0.3 to 0.9% of each of i-carrageenan and cellulosic gelling agent, the weight ratio between the two being from 3:2 to 2:1 or 3.2 to 1:2.

It is noteworthy that grades of sodium carboxymethyl cellulose which may be used include the following:

TABLE 1

SUPPLIER	CMC GRADE	VISCOSITY
Hercules	7MXF	300-500
Hercules	7MFD	300-500
Hercules	9M31F	900-1200
Hercules	9M31XF	900-1200
Hercules	12M31XF	900-1200
Hercules	8MF	300-500
Hercules	12M32PD	900-1200
Hercules	7M3SXF	200-800
Wolff Walsrode	Walocel CRT 1000 PA 07	700-1200
Nyma	Nymcel (Registered Trade Mark) ZMF.33*	50-80
Enka	Akucell AC 1642*	80-120
Enka	Akucell AC 1632*	60-120
Cros	Cellogen (Registered Trade Mark) HP-SA	700-900
Uddeholm	Cekol MVEP	500-800
Hoechst	Tylose (Registered Trade Mark) CB 200**	120-260

measured as 1.5% solutions except:

* 1% solution (Brookfield; 25°C)

** Hoeppler Viscometer (2%; 20°C)

Further, grades of hydroxyethyl cellulose which may be used include the following:

TABLE 2

SUPPLIER	HEC GRADE	VISCOSITY
Hercules	Natrosol (Registered Trade Mark) 250M and MR	4500-6500
Hercules	Natrosol 250 HR* and 250 H*	1500-2500
Hercules	Natrosol 250 HHR* and 250 HH	3400-5000
B.P. Chemicals	Cellobond (Registered Trade Mark) 5000 A	4200-5600
B.P. Chemicals	Cellobond 7000 A	6000-7000
Hoechst	Tylose H 4000 P**	3000-5000
Hoechst	Tylose H 10000 P**	7000-12000

* 1% solution (Brookfield; 25°C)

** Hoeppler Viscometer (2%; 20°C)

The i-carrageenan and cellulosic gelling agent may be mechanically mixed together prior to mixing with the liquid phase of the dental cream vehicle or may be mixed separately with the liquid phase, with hot processing (typically about 60°C) or cold processing (typically about 25°C) techniques.

Synthetic finely divided silicas such as those sold as the "Cab-O-Sil (Registered Trade Mark) M-5", "Syloid 244", "Syloid 266" and "Aerosil (Registered Trade Mark) D200" and mixtures thereof, may also be employed, e.g. in amounts of from 0.5% to 20%, to promote thickening of the dentifrice, particularly when the dentifrice contains siliceous polishing agent.

Amounts in the range of 5-10% by weight are preferred.

The dentifrice is packaged in a container from which it can be readily extruded such as a pressure differential or mechanically operated dental cream dispenser. The invention also extends to a process for preparing a dispenser containing a dentifrice in accordance with the present invention which comprises extruding the said dentifrice into the mechanically operated or pressure differential dispenser which is open at its bottom and sealing the said despenser. These dental cream dispensers are differentiated from ordinary toothpaste tubes in that the dispenser has an outer rigid wall and the force required to dispense the product is generated within the container. This may be by mechanical pump action in a mechanically operated dental cream dispenser or by gas pressure or atmospheric pressure in a pressure differential dispensing container of the aerosol or vacuum type respectively. The rheological properties are highly desirable when a mechanically operated dispensing container of the type described in British Patent Application 2 070 695A, published September 9, 1981, is employed. This dispensing container comprises a dispensing mouthpiece, a tension member, a central rod, a piston and operating hand control. Pressure differential dispensing container may be of the aerosol or vacuum type.

The advantages of the present invention are particularly evident when a pressure differential dispenser is employed since such dispensers have quite narrow orifices, typically 50 mm^2 or less, which do not permit extrusion of thick compositions and which produce high shear effects on extruded products.

Suitable pressure differential dispensers include those comprising a collapsible product-containing bag being disposed within a rigid container which contains a propellant fluid. In such dispensing containers, operation of the valve permits release of the product only, the propellant fluid being separated from the product by the fluid impermeable bag. Dispensers of this type are described in U.S. Patents 3,828,977 and 3,838,796. These are the so-called Sepro dispensers. So-called Exxel containers also utilize pressure.

Still another type dispenser is the barrier piston container described in U.S. 4,171,757. Such container includes a valve, a product-containing compartment and an essentially fluid-tight barrier piston which separates the propellant fluid from the contained product (The so-called Diamond container).

Filling is effected by conventional techniques, e.g. by extruding the said dentifrice into the mechanically operated or pressure differential dispenser which is open at its bottom and then sealing the said dispenser. For instance, when a mechanically operated dispenser of the type described in published British Patent Application 2 070 695A is used a predetermined amount of the dentifrice is extruded through a nozzle to fill the dispenser which is open at its bottom and which contains a central rod. A piston having a diameter corresponding to the inner diameter of the dispenser and a central hole to permit insertion of the central rod therein is slid into place. The dispenser is then sealed with a bottom disc.

The dentifrice may contain a compound which provides at least 100 ppm by weight, of fluoride, typically 100-10000 ppm by weight, typically 750-2000 ppm by weight. Compounds which provide fluorine

include sodium fluoride, stannous fluoride, potassium fluoride, potassium stannous fluoride, sodium hexafluorostannate, stannous chlorofluoride, sodium monofluorophosphate and amine fluorides including mixtures thereof. Most typically in accordance with the present invention sodium fluoride, sodium monofluorophosphate or a mixture of sodium monofluorophosphate and sodium fluoride may be employed.

The dentifrice may preferably contain sodium monofluorophosphate or a mixture of sodium monofluorophosphate and sodium fluoride in amount to provide 100-10000 ppm by weight of fluorine, e.g. 750-2000 ppm by weight, and particularly 1400-2000 ppm by weight, such as 1400-1670 ppm by weight. A binary fluoride system of sodium monofluorophosphate and sodium fluoride is desirably used in which 30-40% by weight of the fluorine (e.g. 30-35%) is provided by sodium fluoride.

Sodium monofluorophosphate, Na_2PO_3F, as commercially available, may vary considerably in purity. It may be used in any suitable purity provided that any impurities do not substantially adversely affect the desired properties. In general, the purity is desirably at least 80% by weight. For best results, it should be at least 85%, and preferably at least 90% by weight of sodium monofluorophosphate with the balance being primarily impurities or by-products of manufacture such as sodium fluoride and water-soluble sodium phosphate salt. Expressed in another way, the sodium monofluorophosphate employed should have a total

fluoride content of above 12% by weight, preferably above 12.7%, a content of not more than 1.5% by weight, preferably not more than 1.2% of free sodium fluoride; and a sodium monofluorophosphate content of at least 12% by weight; preferably at least 12.1% all calculated as fluoride.

As indicated above, sodium fluoride in the binary mixture is a separate fluorine-containing component from sodium monofluorophosphate. 225-800 ppm of fluorine is preferably provided to the dental cream by sodium fluoride.

Any suitable surface active or detersive material may be included in the dentifrice compositions. Such compatible materials are desirable to provide additional detersive, foaming and antibacterial properties depending upon the specific type of surface active material and are selected similarly. These detergents are water-soluble compounds usually, and may be anionic, nonionic or cationic in structure. It is usually preferred to use the water-soluble non-soap or synthetic organic detergents. Suitable detersive materials are known and include, for example, the water-soluble salts of higher fatty acid monoglyceride monosulphate detergent (e.g. sodium coconut fatty acid monoglyceride monosulphate), higher alkyl sulphate (e.g. sodium lauryl sulphate), alkyl aryl sulphonate (e.g.sodium dodecyl benzene sulphonate, and higher fatty acid esters of 1,2-dihydroxy propane sulphonate).

Further surface active agents include the substantially saturated higher aliphatic acyl amides of

lower aliphatic amino carboxylic acid compounds, such as those having 12 to 16 carbon atoms in the acyl radical. The amino acid portion is derived generally from the lower aliphatic saturated monoaminocarboxylic acid compounds. Suitable compounds are the fatty acid amides of glycine, sarcosine, alanine, 3-aminopropanoic acid and valine having 12 to 16 carbon atoms in the acyl group. It is preferred to use the N-lauroyl, myristoyl and palmitoyl sarcosinate compounds, however, for optimum effects.

The amide compounds may be employed in the form of the free acid or preferably as the water-soluble salts thereof, such as the alkali metal, ammonium, amine and alkylolamine salts. Specific examples thereof are the sodium and potassium N-lauroyl, myristoyl and palmitoyl sarcosides, ammonium and ethanolamine N-lauroyl glycide and alanine. For convenience herein, reference to "amino carboxylic acid compound", "sarcoside", and the like refers to such compounds having a free carboxylic group or the water-soluble carboxylate salts.

Such materials are utilized in pure or substantially pure form. They should be as free as practicable from soap or similar higher fatty acid material which tends to reduce the activity of these compounds. In usual practice, the amount of such higher fatty acids materials, is less than 15% by weight of the amide and insufficient to substantially adversely affect it, and preferably less than 10% of the said amide material.

Various other materials may be incorporated in the dentifrice of the present invention. Examples thereof are colouring or whitening agents, preservatives, such as methyl p-hydroxybenzoate or sodium benzoate, stabilisers, tetrasodium pyrophosphate, silicones, chlorophyll compounds and ammoniated materials such as urea, diammonium phosphate and mixtures thereof. These adjuvants are incorporated in the compositions of the present invention in amounts which do not substantially adversely affect the desired properties and characteristics and are suitably selected and used in conventional amounts.

For some purposes it may be desirable to include antibacterial agents in the compositions of the present invention. Typical antibacterial agents which may be used in amounts of 0.01% to 5%, preferably 0.05% to 1.0%, by weight of the dentifrice composition include:

N^1-4(chlorobenzyl-N^5-(2,4-dichlorobenzyl) biguanide;

p-chlorophenyl biguanide;

4-chlorobenzhydryl biguanide;

4-chlorobenzhydrylguanylurea;

N-3-lauroxypropyl-N^5-p-chlorobenzylbiguanide;

1,6-di-p-chlorophenylbiguanidehexane;

1-(lauryldimethylammonium)-8-(p-chlorobenzyldimethylammonium) octane dichloride;

5,6-dichloro-2-guanidinobenzimidazole;

N^1-p-chlorophenyl-N^5-laurylbiguanide;

5-amino-1,3-bis (2-ethylhexyl)-5-methylhexahydropyrimidine, and their non-toxic acid addition salts.

Any suitable flavouring or sweetening materials may be employed in formulating a flavour for the compositions of the present invention. Examples of suitable flavouring constituents include the flavouring oils, e.g. oils of spearmint, peppermint, wintergreen, sassafras, clove, sage, eucalyptus, marjoram, cinnamon, lemon and orange, as well as methylsalicylate. Suitable sweetening agents include sucrose, lactose, maltose, sorbitol, sodium cyclamate, sodium saccharine dipeptides of U.S. patent No. 3,939,261 and oxathiazin salts of U.S. patent No. 3,932,606. Suitable flavour and sweetening agent may together comprise from 0.01 to 5% by weight of the composition.

The dentifrices should have a pH practicable for use. A pH range of 5 to 9 is particularly desirable. The reference to the pH is meant to be the pH determination directly on the dentifrice. If desired, materials such as benzoic, or citric acid may be added to adjust the pH to, say 5.5. to 6.5.

The invention may be put into practice in various ways and a number of specific embodiments will be described by way of example to illustrate the invention with reference to the accompanying examples. All amounts of the various ingredients are by weight unless otherwise specified.

EXAMPLES 1A to 1H

The following dentifrices are prepared by conventional hot process at 60°C.

	PARTS		
	A	B	C
Glycerine	22.00	22.00	22.00
Sodium carboxymethyl cellulose (7 MF)	1.00	-	0.30
I-Carrageenan (Genuvisco 0819)	-	0.96	0.60
Sodium saccharin	0.20	0.20	0.20
Sodium benzoate	0.50	0.50	0.50
Sodium monofluorophosphate	0.76	0.76	0.76
Tetrasodium pyrophosphate	0.25	0.25	0.25
Dicalcium phosphate dihydrate	48.76	48.76	48.76
Sodium lauryl sulphate	1.20	1.20	1.20
Flavour	0.84	0.84	0.84
Deionized water	24.49	24.59	24.59

Each dentifrice is filled into the mechanically operated dispenser described in British Patent Publication No. 2 070 695A and the yield point viscosities determined in a Haake Rotovisco Viscometer using a profiled SV IIP cup initially (2 days following preparation), and after ageing for periods at room temperature. The results are as follows:

Example	Initial	2 weeks	1 month	3 months
1A	4380	5030	5760	7080
1B	3190	3370	3610	
1C	3190	2420	2610	2970

The dentifrice of Example 1A is initially somewhat thick and thickens considerably more during ageing so that it is difficult to satisfactorily extrude from the mechanically operated dispenser.

The dentifrices of Examples 1B and 1C (which are in accordance with the invention) have initially excellent rheology characteristics and extrude well from the mechanically operated dispenser after ageing. Indeed, the dentifrice of Example 1C does not even measurably thicken during the ageing period.

When each of the dentifrices of Examples 1A, 1B and 1C are filled into the pressure differential dispenser described in U.S. Patent 4,171,757, the dentifrice of Example 1A becomes too thick to extrude through the orifice of the dispenser, while the dentifrices of Examples 1B and 1C retain excellent rheology and extrude well.

Similar results occur when the dentifrices are made by conventional cold process at room temperature.

A modification (Example 1D) of the dentifrice 1C in which the flavour content is increased to 0.89 parts and the deionized water reduced to 24.54 also retains excellent rheology and extrusion characteristics from the mechanically operated and pressure differential dispensers.

Similar results are obtained when hydroxyethyl cellulose replaces sodium carboxymethyl cellulose (Examples 1E to 1H).

EXAMPLES 2A and 2B

The following dentifrices are prepared by conventional hot process at 60°C and by conventional cold process at room temperature and filled into each of the mechanically operated dispenser of British Patent Publication 2 070 695A and the pressure differential dispenser of U.S. Patent 4,171,757.

	PARTS	
	2A	2B
Glycerin	22.00	22.00
Sodium carboxymethyl cellulose (7 MF)	0.36	0.45
I-Carrageenan (Genuvisco 0819)	0.54	0.45
Sodium saccharin	0.20	0.20
Sodium benzoate	0.50	0.50
Sodium monofluorophosphate	0.76	0.76
Tetrasodium pyrophosphate	0.25	0.25
Dicalcium phosphate dihydrate	48.76	48.76
Sodium lauryl sulphate	1.20	1.20
Flavour	0.84	0.84
Deionized water	24.59	24.59

The dentifrices have desirable rheology and extrusion characteristics initially and after storage.

EXAMPLES 3A and 3B

The following dentifrices are prepared by conventional cold process at room temperature and filled into each of are mechanically operated dispenser described in British Patent Publication 2 070 695A and the pressure differential dispenser described in U.S. Patent 4,171,757.

	PARTS	
	3A	3B
Glycerine	25.00	25.00
Sodium carboxymethyl cellulose (7 MF)	1.50	1.75
I-Carrageenan (Genuvisco 0819)	-	0.75
Sodium saccharin	0.20	0.20
Sodium benzoate	0.50	0.50
Titanium dioxide	0.40	0.40
Sodium fluoride	0.22	0.22
Amorphous silica containing about 1% combined alumina (Zeo 49-Huber)	22.00	22.00
Silica thickener (Syloid 244)	5.00	5.00
Sodium laurylsulphate	1.00	1.00
Deionized water	42.68	42.68

The dentifrice of Example 3A (which is a comparison example) thickens and extrudes poorly from the dispenser, whilst the dentifrice of Example 3B (which is in accordance with the invention) has desirable rheology and extrudes well initially and after storage.

It will be apparent to those skilled in the art that further modifications of the examples illustrative of the invention, may be made thereto.

CLAIMS

1. A dispenser containing a dentifrice, the dispenser being a mechanically operated dispenser, or a pressure differential dispenser comprising an aqueous humectant vehicle, 0.1-5% by weight of gelling agent and 10-75% by weight of polishing agent, the dentifrice containing either

a) at least 20% by weight of dicalcium phosphate polishing agent based upon the weight of the dentifrice in which case the aqueous humectant vehicle is provided by 10-55% by weight of water and 20-50% by weight of humectant based on the weight of the dentifrice, or

b) at least 10% by weight of a siliceous polishing agent based upon the weight of the dentifrice, in which case the aqueous humectant vehicle is provided by 3-50% by weight of water and 20-70% by weight of humectant based on the weight of the dentifrice, the said gelling agent being

c) i-carrageenan or

d) a mixture of an amount of 0.1-2.5% by weight of the dentifrice of i-carrageenan with a cellulosic gelling agent the weight ratio of i-carrageenan to cellulosic gelling agent in the said mixture being 99:1 to 1:3.

2. A dispenser containing a dentifrice as claimed in Claim 1, in which i-carrageenan is the only gelling agent present.

3. A dispenser containing a dentifrice as claimed in Claim 1, in which the said gelling agent is a mixture of i-carrageenan and cellulosic gelling agent in a weight ratio of i-carrageenan to cellulosic gelling agent of from 2:1 to 1:3.

* C L M S *

4. A dispenser containing a dentifrice as claimed in Claim 3, in which the said weight ratio is from 2:1 to 3:2.

5. A dispenser containing a dentifrice as claimed in Claim 3, in which the said weight ratio is from 3:2 to 1:2.

6. A dentifrice as claimed in anyone of Claims 3 to 5 containing 0.9 to 1.2% by weight total gelling agent.

7. A dispenser containing a dentifrice as claimed in Claim 3, 4, 5 or 6, in which the said cellulosic gelling agent is sodium carboxymethyl cellulose.

8. A dispenser containing a dentifrice as claimed in any one of Claims 1 to 7, in which the said polishing agent is dicalcium phosphate dihydrate.

9. Adispenser containing a dentifrice as claimed in any one of Claims 1 to 7, in which the said polishing agent is an amorphous silica containing combined alumina.

10. A dispenser containing a dentifrice as claimed in Claim 1, in which the dentifrice is substantially as specifically described herein with reference to any one of Examples 1B to 1H, 2A, 2B or 3B.

11. A process for preparing a dispenser containing a dentifrice as claimed in any one of Claims 1 to 10, comprising extruding the said dentifrice into the mechanically operated or pressure differential dispenser which is open at its bottom and sealing the said dispenser.