ANTIBACTERIAL ANTIPLAQUE, ANTICALCULUS ORAL COMPOSITIONS COMPRISING POLYPHOSPHATE SALT AND POLY(VINYL PHOSPHONIC ACID)

This invention relates to an antibacterial antiplaque anticalculus oral composition. More particularly, it relates to an oral composition containing a polyphosphate anticalculus (that is, antitartar) agent and a compatible antibacterial agent effective to inhibit plaque, wherein antiplaque effectiveness is optimized by the presence of an antibacterial-enhancing agent which enhances the delivery of said antibacterial agent to, and retention thereof on, oral surfaces.

In U.S. Patents 4,627,977 to Gaffar et al; 4,515,772 to Parran et al; and 4,323,551 to Parran, oral compositions are described which include various polyphosphate compounds. In the patent to Gaffar et al, a linear molecularly dehydrated polyphosphate salt is employed in conjunction with a fluoride ion-providing source and a synthetic linear polymeric polycarboxylate to inhibit calculus formation. In copending European Patent Application 89 200 710.5 (Serial No. 0333301), anticalculus effectiveness is optimized with a reduced amount of the linear molecularly dehydrated polyphosphate salt in conjunction with the fluoride ion-providing source and increased amount of the synthetic linear polymeric polycarboxylate.

In the patents to Parran et al and to Parran, water

soluble dialkali metal pyrophosphate alone or mixed with tetraalkali metal pyrophosphate is employed.

Oral compositions which inhibit calculus formation on dental surfaces are highly desirable since calculus is one of the causative factors in periodontal conditions. Thus, its reduction promotes oral hygiene.

Dental plaque is a precursor of calculus. Unlike calculus, however, plaque may form on any part of the tooth surface, particularly including at the gingival margin. Hence, besides being unsightly, it is implicated in the occurrence of gingivitis.

Accordingly, it would be highly desirable to include antimicrobial agents which have been known to reduce plaque in oral compositions containing anticalculus agents. Indeed, this has been described in U.S. Patent 4,022,550 to Vinson et al, wherein a compound providing zinc ions as an anticalculus agent is admixed with an antibacterial agent effective to retard the growth of plaque bacteria. A wide variety of antibacterial agents are described with the zinc compounds including cationic materials such as guanides and quaternary ammonium compounds as well as non-cationic compounds such as halogenated salicylanilides and halogenated hydroxydiphenyl ethers.

Hitherto, the cationic antibacterial materials such as chlorhexidine, benzethonium chloride and cetyl pyridinium

chloride have been the subject of greatest investigation as antibacterial antiplaque agents. However, in spite of their being used in conjunction with zinc anticalculus agent, they are not effective when used with anionic materials such as polyphosphate anticalculus agent. This ineffectiveness is considered to be quite surprising as polyphosphates are chelating agents and the chelating effect has previously been known to increase the efficacy of cationic antibacterial agents. (see e.g. Disinfection, sterilization and Preservation,, 2nd Ed., Black, 1977, Page 915 and Inhibition and Destruction of the Microbial Cell, Hugo, 1971, Page 215). Indeed, quaternary ammonium compound is present in the plaque control mouthwash containing pyrophosphate of U.S. Patent 4,323,551 to Parran and bis-biguanide antiplaque agent is suggested in the anticalculus pyrophosphate oral composition of U.S. Patent 4,515,772-Parran et al.

In view of the surprising incompatibility of cationic antibacterial agents with polyphosphates present as anticalculus agents, it was quite unexpected that other antibacterial agents would be effective.

It is an advantage of this invention that certain antibacterial agents are effective in anticalculus oral compositions containing a linear molecularly dehydrated polyphosphate salt, a fluoride-ion-providing source and the

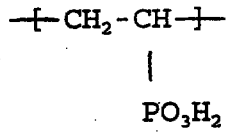
aforementioned antibacterial-enhancing agent to inhibit plaque formation.

It is a further advantage of this invention that a composition is provided which is effective to reduce calculus formation and optimize plaque reduction.

It is a further advantage of this invention that an antiplaque, anticalculus oral composition is provided which is effective to reduce the occurrence of gingivitis.

Additional advantages of this invention will be apparent from consideration of the following specification.

In accordance with certain of its aspects this invention relates to an oral composition comprising in an orally acceptable vehicle, an effective anticalculus amount, preferably 0.1-3% by weight, of polyphosphate salt as anticalculus agent, an effective antiplaque amount of a substantially water insoluble noncationic antibacterial agent and, desirably up to preferably about 4% by weight of, an antibacterial-enhancing agent which enhances the delivery of said antibacterial to oral surfaces, the said antibacterial-enhancing agent being a poly(vinyl phosphonic acid) containing units of the formula



the composition having a pH of 4.5-9. Preferably the weight ratio of antibacterial-enhancing agent to polyphosphate ion ranges from in excess of 0.72:1 to less than 4:1, e.g. from about 1:1 to about 3.5:1, especially from about 1.6:1 to about 2.7:1, preferably about 1.7:1 to about 2.3:1 and most preferably about 1.9:1 to about 2:1. For instance, when 2%

tetrasodium pyrophosphate (TSPP) is employed (providing about 1.3% of

pyrophosphate ion) with 2.5% of the antibacterial-enhancing agent, a highly desirable weight ratio of about 1.9:1 is provided.

Typical examples of antibacterial agents which are particularly desirable from considerations of antiplaque effectiveness, safety and formulation are:

Halogenated Diphenyl Ethers

2',4,4'-trichloro-2-hydroxy-diphenyl ether (Triclosan)

2,2'-dihydroxy-5,5'-dibromo-diphenyl ether.

Halogenated Salicylanilides

4',5-dibromosalicylanilide

3,4',5-trichlorosalcylanilide

3,4',5-tribromosalicylanilide

2,3,3',5-tetrachlorosalicylanilide

3,3,3',5-tetrachlorosalicylanilide

3,5-dibromo-3'-trifluoromethyl salicylanilide

5-n-octanoyl-3'-trifluoromethyl salicylanilide

3,5-dibromo-4'-trifluoromethyl salicylanilide

3,5-dibromo-3'-trifluoro methyl salicylanilide (Flurophene)

Benzoic Esters

Methyl - p-Hydroxybenzoic Ester

Ethyl - p-Hydroxybenzoic Ester

Propyl - p-Hydroxybenzoic Ester

Butyl - p-Hydroxybenzoic Ester

Halogenated Carbanilides

3,4,4'-trichlorocarbanilide

3-trifluoromethyl-4,4'-dichlorocarbanilide

3,3,4'-trichlorocarbanilide

Phenolic Compounds (including phenol and its homologs, mono- and poly-alkyl and aromatic halo (e.g. F, Cl, Br, I.)-phenols, resorcinol and catechol and their derivatives and bisphenolic compounds). Such phenolic compounds include, inter alia:

Phenol and its Homologs

Phenol

2 Methyl - Phenol

3 Methyl - Phenol

4 Methyl - Phenol

4 Ethyl - Phenol

2,4-Dimethyl - Phenol

2,5-Dimethyl - Phenol

3,4-Dimethyl - Phenol

2,6-Dimethyl - Phenol

4-n Propyl - Phenol

4-n-Butyl - Phenol

4-n-Amyl - Phenol

4-tert-Amyl - Phenol

4-n-Hexyl - Phenol

4-n-Heptyl - Phenol

2-Methoxy-4-(2-Propenyl)-Phenol (Eugenol)

2-Isopropyl-5-Methyl - Phenol (Thymol)

Mono- and Poly-Alkyl and Aralkyl Halophenols

Methyl - p-Chlorophenol

Ethyl - p-Chlorphenol

n-Propyl - p-Chlorophenol

n-Butyl - p-Chlorophenol

n-Amyl - p-Chlorophenol

sec-Amyl - p-Chlorophenol

n-Hexyl - p-Chlorophenol

cyclohexyl - p-Chlorophenol

n-Heptyl - p-Chlorophenol

n-Octyl - p-Chlorophenol

O-Chlorophenol

Methyl - o-Chlorophenol

Ethyl - o-Chlorophenol

n-Propyl - o-Chlorophenol

n-Butyl - o-Chlorophenol

n-Amyl - o-Chlorophenol

tert-Amyl - o-Chlorophenol

n-Hexyl - o-chlorophenol

n-Heptyl - o-Chloropenol

p-Chlorophenol

o-Benzyl - p-Chlorophenol

o-Benzyl-m-methyl - p-Chlorophenol

o-Benzyl-m, m-dimethyl - p-Chlorophenol

o-Phenylethyl - p-Chlorophenol

o-Phenylethyl-m-methyl - p-Chlorophenol

3-Methyl - p-Chlorophenol

3,5-Dimethyl - p-Chlorophenol

6-Ethyl-3-methyl - p-Chlorophenol

6-n-Propyl-3-methyl - p-Chlorophenol

6-iso-propyl-3-methyl - p-Chlorophenol

2-Ethyl-3,5-dimethyl - p-Chlorophenol

6-sec Butyl-3-methyl - p-Chlorophenol

2-iso-Propyl-3,5-dimethyl - p-Chlorophenol

6-Diethylmethyl-3-methyl - p-Chlorophenol

6-iso-Propyl-2-ethyl-3-methyl - p-Chlorophenol

2-sec Amyl-3,5-dimethyl - p-Chlorophenol

2-Diethylmethyl-3,5-dimethyl - p-Chlorophenol

6-sec Octyl-3-methyl - p-Chlorophenol

p-Bromophenol

Methyl - p-Bromophenol

Ethyl - p-Bromophenol

n-Propyl - p-Bromophenol

n-Butyl - p-Bromophenol

n-Amyl - p-Bromophenol

sec-Amyl - p-Bromophenol

n-Hexyl - p-Bromophenol

cyclohexyl - p-Bromophenol

o-Bromophenol

tert-Amyl - o-Bromophenol

n-Hexyl - o-Bromophenol

n-Propyl-m,m-Dimethyl - o-Bromophenol

2-Phenyl Phenol

4-Chloro-2-methyl phenol

4-chloro-3-methyl phenol

4-chloro-3,5-dimethyl phenol

2,4-dichloro-3,5-dimethyl phenol

3,4,5,6-tetrabromo-2-methylphenol

5-methyl-2-pentylphenol

4-isopropyl-3-methylphenol

5-chloro-2-hydroxydiphenyl methane

<u>Resorcinol and Its Derivatives</u>

Resorcinol

Methyl - Resorcinol

Ethyl - Resorcinol

n-Propyl - Resorcinol

n-Butyl - Resorcinol

n-Amyl - Resorcinol

n-Hexyl - Resorcinol

n-Heptyl - Resorcinol

n-Octyl - Resorcinol

n-Nonyl - Resorcinol

Phenyl - Resorcinol

Benzyl - Resorcinol

Phenylethyl - Resorcinol

Phenylpropyl - Resorcinol

p-Chlorobenzyl - Resorcinol

5-Chloro -2,4-Dihydroxydiphenyl Methane

4'-Chloro -2,4-Dihydroxydiphenyl Methane

5-Bromo -2,4-Dihydroxydiphenyl Methane

4'-Bromo -2,4-Dihydroxydiphenyl Methane

Bisphenolic Compounds

Bisphenol A

2,2'-methylene bis (4-chlorophenol)

2,2'-methylene bis (3,4,6-trichlorophenol) (hexachlorophene)

2,2'-methylene bis (4-chloro-6-bromophenol)

bis (2-hydroxy-3,5-dichlorophenyl) sulfide

bis (2-hydroxy-5-chlorobenzyl) sulfide

The antibacterial agent is present in the oral

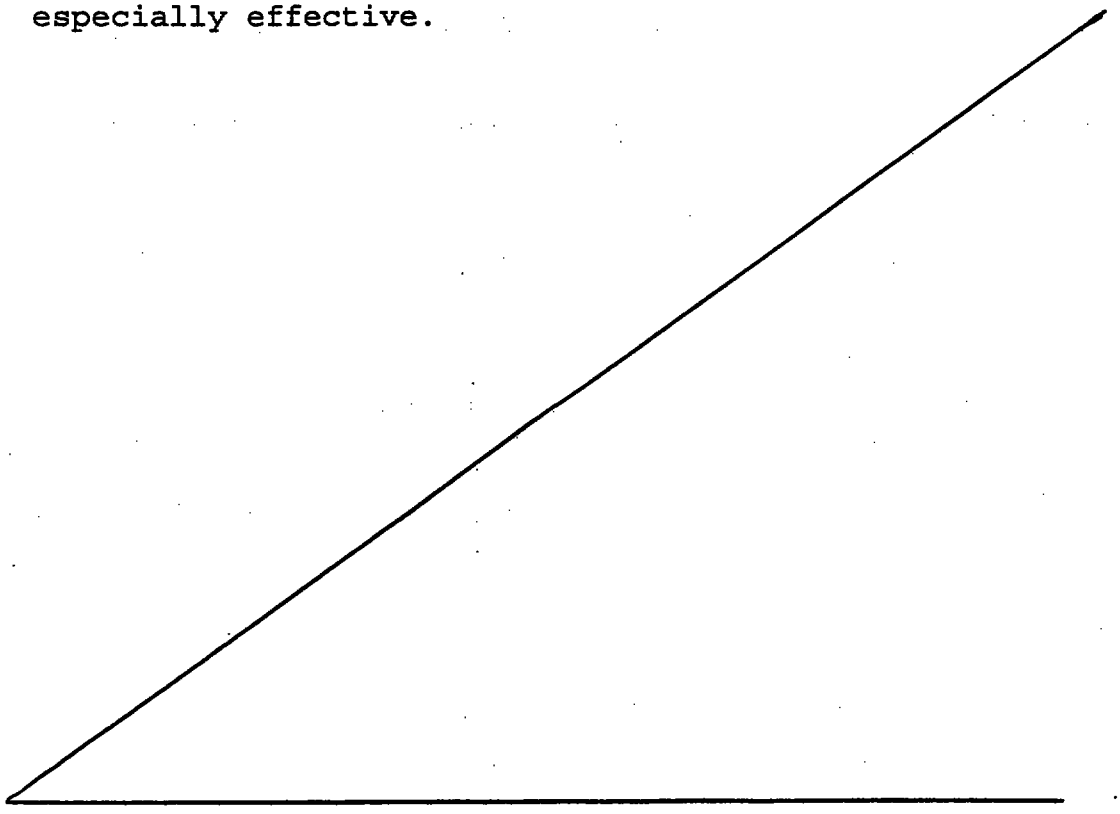
composition in an effective antiplaque amount, preferably about 0.01-5% by weight, more preferably about 0.03-1% and very preferably about 0.25-0.5% and most preferably about 0.25-0.35%. The antibacterial agent is substantially water-insoluble, meaning that its solubility is less than about 1% by weight in water at 25°C and may be even less than about 0.1%. If an ionizable group is present solubility is determined at a pH at which ionization does not occur.

The preferred halogenated diphenyl ether is Triclosan. The preferred phenolic compounds are phenol, 2,2'methylene bis (4-chloro-6-bromophenol), thymol and eugenol. The most preferred antibacterial antiplaque compound is Triclosan. Triclosan is disclosed in aforementioned U.S. Patent 4,022,880 as an antibacterial agent in combination with an anticalculus agent which provides zinc ions and in German Patent Disclosure 35 32 860 in combination with a copper compound. It is also disclosed as an antiplaque agent in a dentifrice formulated to contain a lamellar liquid crystal surfactant phase having a lamellar spacing of less than 6.0 nm and which may optionally contain a zinc salt in published European Patent Application 0161898 of Lane et al and in a dentifrice containing zinc citrate trihydrate in published European Patent Application 0161899 to Saxton.

The, preferably linear molecularly dehydrated, polyphosphate salts operative herein as anticalculus agents are well known,

being generally employed in the form of their wholly or partially neutralized water soluble alkali metal (e.g. potassium and preferable sodium) or ammonium salts, and any mixtures thereof. Representative examples include sodium hexametaphosphate, sodium tripolyphosphate, disodium diacid, trisodium monoacid and tetrasodium pyrophosphates, the corresponding potassium salts and the like. Linear polyphosphates are preferably employed in the oral compositions in approximate weight amounts of 0.1 to 3% typically 1 to 2.5% more typically 1.5 to 2%.

Particularly desirable anticalculus agents are tetraalkali metal pyrophosphates, including mixtures thereof, such as tetrasodium pyrophosphate, tetrapotassium pyrophosphate and mixtures thereof. An anticalculus agent comprising about 2% by weight of the oral compositions of tetrasodium pyrophosphate is especially effective.



The antibacterial-enhancing agent (AEA) which enhances delivery of said antibacterial agent to oral surfaces, is employed in amounts effective to achieve such enhancement, preferably within the range in the oral composition of about 0.05% to about 4%, preferably about 0.1% to about 3%, more preferably about 0.5% to about 2.5% by weight.

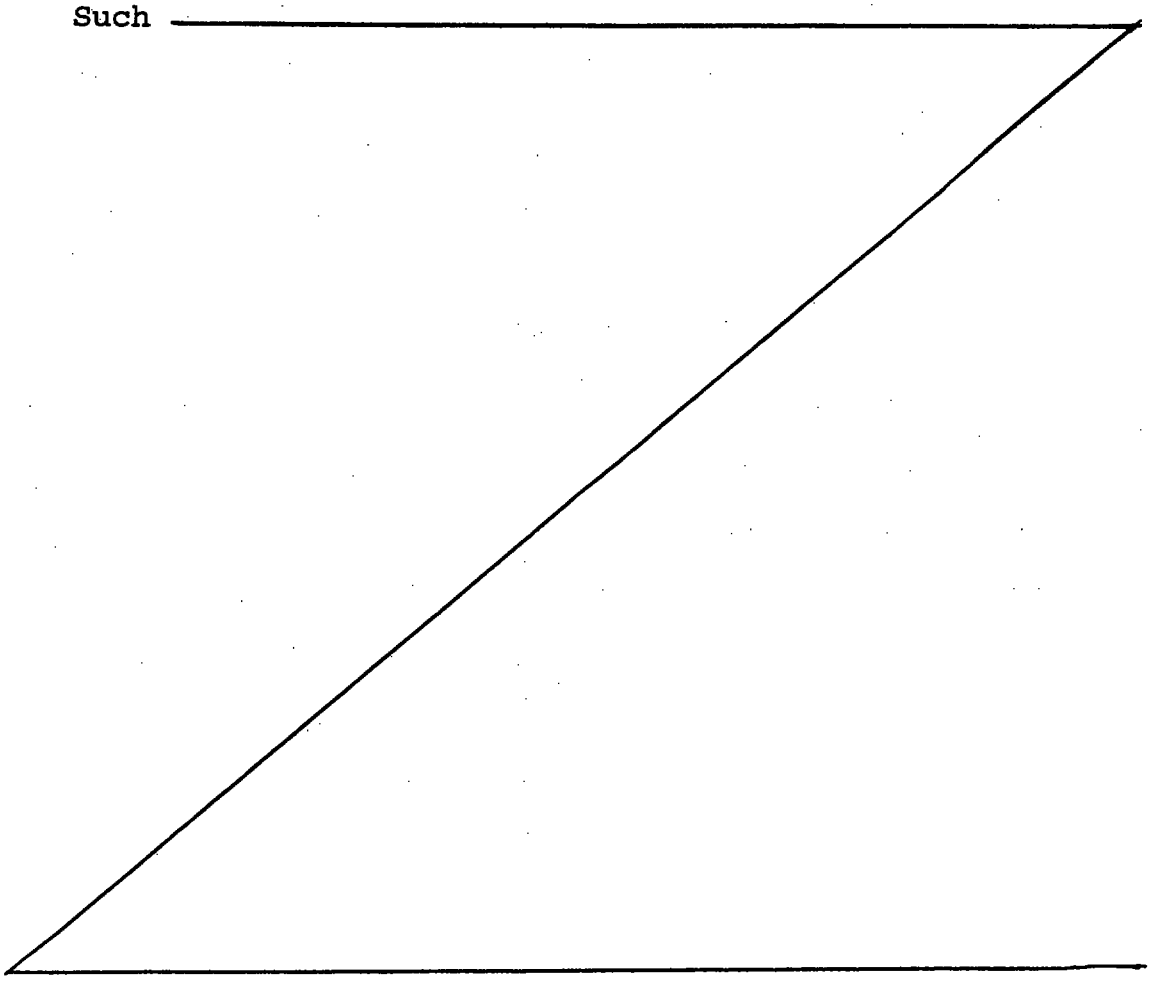
It preferably has an (weight) average molecular weight of about 100 to 1,000,000, preferably about 1,000 to about 1,000,000, more preferably about 2,000 or 2,500 to about 250,000 or 500,000.

As employed herein, the delivery-enhancing group refers to one which attaches or substantively, adhesively, cohesively or otherwise bonds the AEA (carrying the antibacterial agent) to oral (e.g. tooth and gum) surfaces, thereby "delivering" the antibacterial agent to such surfaces. In some instances, attachment of the antibacterial agent occurs through physical entrapment thereof by the AEA, especially when the AEA is a cross-linked polymer, the structure of which inherently provides increased sites for such entrapment.

It is desirable, for maximizing substantivity and delivery of the antibacterial agent to oral surfaces, that the repeating units in the polymer chain or backbone of the AEA containing the acidic delivery enhancing groups constitute at least about 10%, preferably at least about 50%, more preferably at least about 80% up to 95% or 100% by weight of the polymer.

When the oral preparation is made by initially dissolving the polyphosphate and the antibacterial agent in humectant and surface active agent and adding thereto the AEA, incrementally, the solution becomes clear and may be characterized as a "microemulsion". As the amount of the AEA increases such that the complete oral preparation contains at least about 2.2% by weight thereof, the solution becomes cloudy and may be characterized as a "macroemulsion". In such "macroemulsion" type compositions, the antiplaque effect of the antibacterial agent appears to be optimized.

In order to optimize the anticalculus effectiveness of the oral composition, inhibitors against enzymatic hydrolysis of the polyphosphate are desirably present. Such



agents are an amount of a fluoride ion source sufficient to supply 25 ppm. to 5,000 ppm. of fluoride ions, and up to 3% or more of the synthetic anionic polymeric polycarboxylate having a molecular weight of about 1,000 to about 1,000,000, preferably about 30,000 to about 500,000.

The sources of fluoride ions, or fluorine-providing component, as acid phosphatase and pyrophosphatase enzyme inhibitor component, are well known in the art as anti-caries agents. These compounds may be slightly soluble in water or may be fully water-soluble. They are characterized by their ability to release fluoride ions in water and by freedom from undesired reaction with other compounds of the oral preparation. Among these materials are inorganic fluoride salts, such as soluble alkali metal, alkaline earth metal salts, for example, sodium fluoride, potassium fluoride, ammonium fluoride, calcium fluoride, a copper fluoride such as cuprous fluoride, zinc fluoride, barium fluoride, sodium fluorosilicate, ammonium fluorosilicate, sodium fluorozirconate, ammonium fluorozirconate, sodium monofluorophosphate, aluminum mono- and di-fluorophosphate, and fluorinated sodium calcium pyrophosphate. Alkali metal and tin fluorides, such as sodium and stannous fluorides, sodium monofluorophosphate (MFP) and mixtures thereof, are preferred.

The amount of fluorine-providing compound is dependent to some extent upon the type of compound, its solubility, and the type of oral preparation, but it must be a non-toxic amount, generally about 0.005 to about 3.0% in the preparation. In a dentifrice preparation, e.g. dental gel, toothpaste (including cream), toothpowder, or dental tablet, an amount of such compound which releases up to about 5,000 ppm of F ion by weight of the preparation is considered satisfactory. Any suitable minimum amount of such compound may be used, but it is preferable to employ sufficient compound to release about 300 to 2,000 ppm, more preferably about 800 to about 1,500 ppm of fluoride ion.

Typically, in the cases of alkali metal fluorides, this component is present in an amount up to about 2% by weight, based on the weight of the preparation, and preferably in the range of about 0.05% to 1%. In the case of sodium monofluorophosphate, the compound may be present in an amount of about 0.1-3%, more typically about 0.76%.

In oral preparations such as mouthwashes, lozenges and chewing gum, the fluorine-providing compound is typically present in an amount sufficient to release up to about 500 ppm, preferably about 25 to 300 ppm by weight of fluoride ion. Generally about 0.005 to about 1.0 wt. % of such compound is present.

In certain highly preferred forms of the invention the oral composition may be substantially liquid in character, such as a mouthwash or rinse. In such a preparation the vehicle is typically a water-alcohol mixture desirably including a humectant as described below. Generally, the weight ratio of water to alcohol is in the range of from about 1:1 to about 20:1, preferably about 3:1 to 10:1 and more preferably about 4:1 to about 6:1. The total amount of water-alcohol mixture in this type of preparation is typically in the range of from about 70 to about 99.9% by weight of the preparation. The alcohol is typically ethanol or isopropanol. Ethanol is preferred.

The pH of such liquid and other preparations of the invention is generally in the range of from about 4.5 to about 9 and typically from about 5.5 to 8. The pH is preferably in the range of from about 6 to about 8.0. It is noteworthy that the compositions of the invention may be applied orally at a pH below 5 without substantially decalcifying or otherwise damaging dental enamel. The pH can be controlled with acid (e.g. citric acid or benzoic acid) or base (e.g. sodium hydroxide) or buffered (as with sodium citrate, benzoate, carbonate, or bicarbonate, disodium hydrogen phosphate, sodium dihydrogen phosphate, etc.).

In certain other desirable form of this invention, the oral composition may be substantially solid or pasty in character, such as toothpowder, a dental tablet or a dentifrice, that is a toothpaste (dental cream) or gel dentifrice. The vehicle of such solid or pasty oral preparations generally contains dentally acceptable polishing material. Examples of polishing materials are water-insoluble sodium metaphosphate, potassium metaphosphate, tricalcium phosphate, dihydrated calcium phosphate, anhydrous dicalcium phosphate, calcium pyrophosphate, magnesium orthophosphate, trimagnesium phosphate, calcium carbonate, hydrated alumina, calcined alumina, aluminum silicate, zirconium silicate, silica, bentonite, and mixtures thereof. Other suitable polishing material include the particulate thermosetting resins described in U.S. Pat. No. 3,070,510, issued Dec. 15, 1962, such as melamine-, phenolic, and urea-formaldehydes, and cross-linked polyepoxides and polyesters. Preferred polishing materials include crystalline silica having particle sizes of up to about 5 microns, a mean particle size of up to about 1.1 microns, and a surface area of up to about 50,000 $cm.^2/gm.$, silica gel or colloidal silica, and complex amorphous alkali metal aluminosilicate.

When visually clear gels are employed, a polishing agent of colloidal silica, such as those sold under the

trademark SYLOID (Registered Trade Mark) as Syloid 72 and Syloid 74 or under the trademark SANTOCEL (Registered Trade Mark) as Santocel 100, alkali metal alumino-silicate complexes are particularly useful, since they have refractive indices close to the refractive indices of gelling agent-liquid (including water and/or humectant) systems commonly used in dentifrices.

Many of the so-called "water-insoluble" polishing materials are anionic in character and also include small amounts of soluble material. Thus, insoluble sodium metaphosphate may be formed in any suitable manner as illustrated by Thorpe's Dictionary of Applied Chemistry, Volume 9, 4th Edition, pp. 510-511. The forms of insoluble sodium metaphosphate known as Madrell's salt and Kurrol's salt are further examples of suitable materials. These metaphosphate salts exhibit only a minute solubility in water, and therefore are commonly referred to as insoluble metaphosphates (IMP). There is present therein a minor amount of soluble phosphate material as impurities, usually a few percent such as up to 4% by weight. The amount of soluble phosphate material, which is believed to include a soluble sodium trimetaphosphate in the case of insoluble metaphosphate, may be reduced or eliminated by washing with water if desired. The insoluble alkali metal metaphosphate is typically employed in powder form of a particle size such

that no more than 1% of the material is larger than 37 microns.

The polishing material is generally present in the solid or pasty compositions in weight concentrations of about 10% to about 99%. Preferably, it is present in amounts ranging from about 10% to about 75% in toothpaste, and from about 70% to about 99% in toothpowder. In toothpastes, when the polishing material is silicious in nature, it is generally present in amount of about 10-30% by weight. Other polishing materials are typically present in amount of about 30-75% by weight.

In a toothpaste, the liquid vehicle may comprise water and humectant typically in an amount ranging from about 10% to about 80% by weight of the preparation. Glycerine, propylene glycol, sorbitol and polypropylene glycol exemplify suitable humectants/carriers. Also advantageous are liquid mixtures of water, glycerine and sorbitol. In clear gels where the refractive index is an important consideration, about 2.5-30 wt. % of water, 0 to about 70 wt.% of glycerine and about 20-80 wt. % of sorbitol are preferably employed.

Toothpastes, creams and gels typically contain a natural or synthetic thickener or gelling agent in proportions of about 0.1 to about 10, preferably about 0.5 to about 5 wt. %. A suitable thickener is synthetic hectorite, a synthetic colloidal magnesium alkali metal

silicate complex clay available for example as Laponite (Registered Trade Mark) (e.g. CP, SP 2002, D) marketed by Laporte Industries Limited. Laponite D analysis shows, approximately by weight, 58.00% SiO_2, 25.40% MgO, 3.05% Na_2O, 0.98% Li_2O, and some water and trace metals. Its true specific gravity is 2.53 and it has an apparent bulk density (g./ml. at 8% moisture) of 1.0.

Other suitable thickeners include Irish moss, iota carrageenan, gum tragacanth, starch, polyvinylpyrrolidone, hydroxyethylpropylcellulose, hydroxybutyl methyl cellulose, hydroxypropyl methyl cellulose, hydroxyethyl cellulose (e.g. available as Natrosol (Registered Trade Mark)), sodium carboxymethyl cellulose, and colloidal silica such as finely ground Syloid (e.g. 244). In some dentifrices prepared in accordance with the present invention particularly when more than about 0.35% by weight of the water insoluble antibacterial agent is employed and a siliceous polishing agent is present in amount of less than about 30% by weight, it may be desirable to include an agent which dissolves the antibacterial agent. Such solubilizing agents include humectant polyols such propylene glycol, dipropylene glycol and hexylene glycol, cellosolves such as methyl cellosolve and ethyl cellosolve, vegetable oils and waxes containing at least about 12 carbons in a straight chain such as olive oil, castor oil and petrolatum and esters such as amyl acetate, ethyl acetate and benzyl benzoate.

It will be understood that, as is conventional, the oral preparations are to be sold or otherwise distributed in suitable labelled packages. Thus, a jar of mouthrinse will have a label describing it, in substance, as a mouthrinse or mouthwash and having directions for its use; and a toothpaste, cream or gel will usually be in a collapsible tube, typically aluminum, lined lead or plastic, or other squeeze, pump or pressurized dispenser for metering out the contents, having a label describing it, in substance, as a toothpaste, gel or dental cream.

Organic surface-active agents are used in the compositions of the present invention to achieve increased prophylactic action, assist in achieving thorough and complete dispersion of the anticalculus agent and antiplaque agent throughout the oral cavity, and render the instant compositions more cosmetically acceptable. The organic surface-active material is preferably anionic, nonionic or ampholytic in nature, and it is preferred to employ as the surface-active agent a detersive material which imparts to the composition detersive and foaming properties. Suitable examples of anionic surfactants are water-soluble salts of higher fatty acid monoglyceride monosulfates, such as the sodium salt of the monosulfated monoglyceride of hydrogenated coconut oil fatty acids, higher alkyl sulfates such as sodium lauryl sulfate, alkyl aryl sulfonates such as

sodium dodecyl benzene sulfonate, higher alkylsulfo-acetates, higher fatty acid esters of 1,2-dihydroxy propane sulfonate, and the substantially saturated higher aliphatic acyl amides of lower aliphatic amino carboxylic acid compounds, such as those having 12 to 16 carbons in the fatty acid, alkyl or acyl radicals, and the like. Examples of the last mentioned amides are N-lauroyl sarcosine, and the sodium, potassium, and ethanolamine salts of N-lauroyl, N-myristoyl, or N-palmitoyl sarcosine which should be substantially free from soap or similar higher fatty acid material. The use of these sarcosinate compounds in the oral compositions of the present invention is particularly advantageous since these materials exhibit a prolonged and marked effect in the inhibition of acid formation in the oral cavity due to carbohydrates breakdown in addition to exerting some reduction in the solubility of tooth enamel in acid solutions. Examples of water-soluble nonionic surfactants are condensation products of ethylene oxide with various reactive hydrogen-containing compounds reactive therewith having long hydrophobic chains (e.g. aliphatic chains of about 12 to 20 carbon atoms), which condensation products ("ethoxamers") contain hydrophilic polyoxyethylene moieties, such as condensation products of poly(ethylene oxide) with fatty acids, fatty alcohols, fatty amides, polyhydric alcohols (e.g. sorbitan monostearate) and

polypropyleneoxide (e.g. Pluronic (Registered Trade Mark) materials).

Surface active agent is typically present in amount of about 0.1-5% by weight, preferably about 1-2.5%. It is noteworthy, that surface active agent may assist in the dissolving of the noncationic antibacterial agent and thereby diminish the amount of solubilizing humectant needed.

Various other materials may be incorporated in the oral preparations of this invention such as whitening agents, preservatives, silicones, chlorophyll compounds and/or ammoniated material such as urea, diammonium phosphate, and mixtures thereof. These adjuvants, where present, are incorporated in the preparations in amounts which do not substantially adversely affect the properties and characteristics desired. Significant amounts of zinc, magnesium and other metal salts and materials, generally soluble, which would complex with active components of the instant invention are to be avoided.

Any suitable flavoring or sweetening material may also be employed. Examples of suitable flavoring constituents are flavoring oils, e.g. oil of spearmint, peppermint, wintergreen, sassafras, clove, sage, eucalyptus, marjoram, cinnamon, lemon, and orange, and methyl salicylate. Suitable sweetening agents include sucrose, lactose, maltose, sorbitol, xylitol, sodium cyclamate, perillartine,

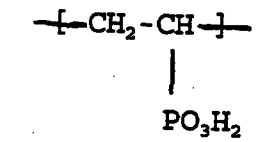
AMP (aspartyl phenyl alanine, methyl ester), saccharine and the like. Suitably, flavor and sweetening agents may each or together comprise from about 0.1% to 5% or more of the preparation. Moreover, flavor oil appears to aid the dissolving of the antibacterial agent.

In the preferred practice of this invention an oral composition according to this invention such as a mouthwash or dentifrice containing the composition of the present invention is preferably applied regularly to dental enamel, such as every day or every second or third day or preferably from 1 to 3 times daily, at a pH of about 4.5 to about 9, generally about 5.5 to about 8, preferably about 6 to 8, for at least 2 weeks up to 8 weeks or more up to lifetime.

The compositions of this invention can be incorporated in lozenges, or in chewing gum or other products, e.g. by stirring into a warm gum base or coating the outer surface of a gum base, illustrative of which may be mentioned jelutong, rubber latex, vinylite resins, etc., desirably with conventional plasticizers or softeners, sugar or other sweeteners or such as glucose, sorbitol and the like.

CLAIMS

1. An oral composition comprising in an orally acceptable vehicle, an effective anticalculus amount of polyphosphate salt as anticalculus agent, an effective antiplaque amount of a substantially water insoluble non-cationic antibacterial agent and an antibacterial-enhancing agent which enhances delivery of the said antibacterial to oral surfaces, the said antibacterial-enhancing agent being a poly(vinyl phosphonic acid) containing units of the formula



the composition having a pH of 4.5-9.

2. An oral composition as claimed in claim 1 in which the antibacterial-enhancing agent has a molecular weight of from 1000 to 1,000,000.

3. An oral composition as claimed in claim 1 or claim 2 in which the orally acceptable vehicle comprises a surface active agent or a flavouring oil to assist in the dissolving of the non-cationic antibacterial agent.

4. An oral composition as claimed in Claim 1, 2 or 3 in which the said oral composition is a dentifrice comprising 10-30% by weight of a siliceous polishing agent and the said antibacterial agent is present in an amount of 0.25-0.35% by weight.

5. An oral composition as claimed in Claim 1 or Claim 2 in which the said oral composition is a dentifrice comprising about 10-30% by weight of a siliceous polishing agent, the said antibacterial agent is present in amount of about 0.01-5% by weight and the said oral composition comprises a solubilizing material in amount to assist dissolving the said antibacterial agent in saliva.

6. An oral composition as claimed in any one of Claims 1 to 5 in which the said oral composition is a dentifrice comprising 30-75% by weight of a dentally acceptable water-insoluble polishing agent, including any siliceous polishing material which is present.

7. An oral composition as claimed in any one of Claims 1 to 5 in which the said oral composition is a mouthwash or liquid dentifrice and the said orally acceptable vehicle is an aqueous vehicle wherein there is present a non-toxic alcohol.

8. An oral composition as claimed in any one of Claims 1 to 5 in which the said antibacterial agent is selected from the group consisting of halogenated diphenyl ethers, halogenated salicylanilides, benzoic esters, halogenated carbanilides and phenolic compounds.

9. An oral composition as claimed in Claim 8 in which the said antibacterial agent is a halogenated diphenyl ether.

10. An oral composition as claimed in Claim 9 wherein the said halogenated diphenyl ether is 2',4,4'-trichloro-2-hydroxyphenyl ether.

11. An oral composition as claimed in any one of Claims 1 to 10 in which the said antibacterial enhancing agent is present in an amount of 0.5-2.5% by weight.