FIG. 4 shows indentations in tooth enamel of a tooth exposed to 0.25% NaF (750× mag.).

FIG. 5 shows indentations in tooth enamel of a tooth exposed to 5 mg/L theobromine (750× mag.).

FIG. 6 shows indentations in tooth enamel of a tooth exposed to 10 mg/L theobromine (250× mag.).

FIG. 7 shows indentations in tooth enamel of a tooth exposed to 200 mg/L theobromine (750× mag.).

FIG. 8 shows indentations in tooth enamel of a tooth exposed to 500 mg/L theobromine (250× mag.). The dashed box within FIG. 8 indicates the area shown in FIG. 9 at 750× magnification.

FIG. 9 shows the area bounded by the dashed square in FIG. 8, and shows indentations in tooth enamel of a tooth exposed to 500 mg/L theobromine (750× mag.).

FIG. 10 is a bar graph showing the effects of different concentrations of NaF and theobromine on microhardness.

FIG. 11 is a semi-log scatterplot showing the effects of different concentrations of NaF and theobromine on microhardness.

FIG. 12 shows three scanning electron micrograph of three different tooth samples scratched with a diamond scribe. FIG. 12A shows such a tooth incubated in control solution (artificial saliva); FIG. 12B shows such a tooth incubated in a solution containing 0.25% NaF; and FIG. 12C shows such a tooth incubated in a solution containing 200 mg/L theobromine.

FIG. 13 is a bar graph showing the change in Vickers microhardness of tooth samples subjected to a caries model, then incubated for 14 days to artificial saliva, 0.25% NaF toothpaste, or 200 mg/L theobromine.

FIG. 14 is a bar graph showing the change in Vickers microhardness of tooth samples subjected to an erosion model, then incubated for 14 days to artificial saliva, 0.25% NaF toothpaste, or 200 mg/L theobromine.

DETAILED DESCRIPTION

Before the subject of the instant application is further described, it is to be understood that ~~the instant application is not limited to the particular embodiments described below, as~~ variations of the particular embodiments may be made and still fall within the scope of the appended claims. It is also to be understood that the terminology employed is for the purpose of describing

Following this, all surfaces of each block were painted with two coats of acid-resistant nail varnish, except buccal surface. Using acid-resistant nail varnish the 90 tooth blocks were attached to 9 glass slides (10 blocks/slide). Each block-bearing glass slide was immersed in a 50 mL beaker containing freshly prepared 1% citric acid (1.0 g of powdered citric acid anhydrous dissolved in 100 mL of deionized distilled water under constant agitation with magnetic stirrer) for 10 minutes with continuous agitation with magnetic stirrer. After immersion for the designated time, specimens were removed from the solution and rinsed thoroughly with distilled water for 10 seconds. Specimens were then dried carefully with paper towels and removed from the glass slide, providing a total of 3 lesion-bearing blocks from each tooth for the remineralization tests.

The Treatment Procedure was performed as described above for EXAMPLE 6. As in EXAMPLE 6, ten blocks from each of three treatment groups (control, NaF toothpaste, and theobromine toothpaste) were removed after immersion for 14 days and subjected to Vickers microhardness testing as described above in EXAMPLE 6.

The remaining 20 blocks from each of the three groups (n = 60) will continue to be treated according to the treatment schedule of TABLE 4 for a total of 28 days, and will be evaluated as described under "Baseline Transverse Microradiographic (TMR) Data Analysis" and "Post Treatment Processing" in EXAMPLE 6 above; for these 20 blocks, the Baseline Transverse Microradiographic (TMR) Data Analysis, the Post-Treatment Processing, the Data Handling and Interpretation, and the Statistical Power Analysis will all be performed as described above for EXAMPLE 6.

As shown in FIG. 14, blocks subjected to the erosion model and then treated for 14 days with theobromine toothpaste demonstrated dramatically improved HV (surface hardness gain of 43.9%) compared to blocks treated for 14 days with either artificial saliva (control) or NaF toothpaste (surface hardness gains of 4.6% and 4.9%, respectively).

~~All references cited in this specification are herein incorporated by reference as though each reference was specifically and individually indicated to be incorporated by reference. The citation of any reference is for its disclosure prior to the filing date and should not be construed as an admission that the present application is not entitled to antedate such reference by virtue of prior invention.~~

It will be understood that each of the elements described above, or two or more together may also find a useful application in other types of methods differing from the type described above. Without further analysis, the foregoing will so fully reveal the gist of the present application that others can, by applying current knowledge, readily adapt it for various applications without

CLAIMS

We claim:

1. A composition, said composition comprising:
   a) an isolated theobromine compound, or a salt or double salt thereof;
   b) at least one source of calcium;
   c) at least one source of phosphate; and
   d) a pH of about 6.0 to about 8.5.
2. The composition of claim 1, wherein said at least one source of calcium is selected from the group consisting of calcium chloride, calcium carbonate, calcium gluconate, calcium phosphate, and combinations thereof.
3. The composition of claim 1, wherein said at least one source of phosphate is selected from the group consisting of potassium dihydrogen phosphate, dipotassium hydrogen phosphate, tripotassium phosphate, sodium dihydrogen phosphate, disodium hydrogen phosphate, trisodium phosphate, and combinations thereof.
4. The composition of claim 1, further comprising at least one isotonic agent.
5. The composition of claim 4, wherein said isotonic agent is a polyhydric alcohol.
6. The composition of claim 5, wherein said polyhydric alcohol is selected from the group consisting of xylitol, sorbitol, mannitol, maltitol, lactitol, isomalt, erythritol, arabitol, glycerol, and combinations thereof.
7. The composition of claim 1, further comprising at least one thickener.
8. The composition of claim 7, wherein said thickener is selected from the group consisting of methyl cellulose, carboxymethyl cellulose, ethyl cellulose, hydroxypropyl cellulose, and combinations thereof.
9. The composition of claim 1, further comprising an antibacterial agent, an antimicrobial agent, or combinations thereof.
10. The composition of claim 9, wherein said antibacterial agent is selected from the group consisting of triclosan, hydrogen peroxide, methyl-4-hydroxybenzoate, clove oil, and combinations thereof.
11. The composition of claim 1, for enhancing the hardness of at least one tooth, wherein said composition enhances said hardness more than a dentifrice containing 0% to about 1.1% of sodium fluoride or 0% to about 0.76% sodium monofluorophosphate.

12. The composition of claim 11, wherein said composition enhances said hardness more than a dentifrice containing 0% to about 0.5% of sodium fluoride or 0% to about 0.76% sodium monofluorophosphate.

13. The composition of claim 11, wherein said composition enhances said hardness more than a dentifrice containing 0% to about 0.25% of sodium fluoride or 0% to about 0.76% sodium monofluorophosphate.

14. The composition of claim 11, wherein said composition enhances said hardness more than a dentifrice containing 0% to about 0.15% of sodium fluoride or 0% to about 0.76% sodium monofluorophosphate.

15. Use of a composition comprising an isolated theobromine compound, theobromine salt, polymorphs, or theobromine double salt, at least one source of calcium, and at least one source of phosphate, wherein the pH of said composition is about 6.0 to about 8.5 in the manufacture of a medicament for treating dental decay in a mammal in need thereof.

16. The use of claim 15, wherein said at least one source of calcium is selected from the group consisting of calcium chloride, calcium carbonate, calcium gluconate, calcium phosphate, and combinations thereof.

17. The use of claim 15, wherein said at least one source of phosphate is selected from the group consisting of potassium dihydrogen phosphate, dipotassium hydrogen phosphate, tripotassium phosphate, sodium dihydrogen phosphate, disodium hydrogen phosphate, trisodium phosphate, and combinations thereof.

18. The use of claim 15, further comprising at least one isotonic agent.

19. The use of claim 18, wherein said isotonic agent is a polyhydric alcohol.

20. The use of claim 19, wherein said polyhydric alcohol is selected from the group consisting of xylitol, sorbitol, mannitol, maltitol, lactitol, isomalt, erythritol, arabitol, glycerol, and combinations thereof.

21. The use of claim 15, wherein said composition further comprises at least one thickener.

22. The use of claim 21, wherein said thickener is selected from the group consisting of methyl cellulose, carboxymethyl cellulose, ethyl cellulose, hydroxypropyl cellulose, and combinations thereof.

23. The use of claim 15, wherein said composition further comprises an antibacterial agent, an antimicrobial agent, or combinations thereof.

24. The use of claim 23, wherein said antibacterial agent is selected from the group consisting of triclosan, hydrogen peroxide, methyl-4-hydroxybenzoate, clove oil, and combinations thereof.

25. The use of claim 15, for enhancing the hardness of at least one tooth, wherein said composition enhances said hardness more than a dentifrice containing 0% to about 1.1% of sodium fluoride or 0% to about 0.76% sodium monofluorophosphate.

26. The use of claim 25, wherein said composition enhances said hardness more than a dentifrice containing 0% to about 0.5% of sodium fluoride or 0% to about 0.76% sodium monofluorophosphate.

27. The use of claim 25, wherein said composition enhances said hardness more than a dentifrice containing 0% to about 0.25% of sodium fluoride or 0% to about 0.76% sodium monofluorophosphate.

28. The use of claim 25, wherein said composition enhances said hardness more than a dentifrice containing 0% to about 0.15% of sodium fluoride or 0% to about 0.76% sodium monofluorophosphate.

29. Use of a composition comprising an isolated theobromine compound, theobromine salt, or theobromine double salt, at least one source of calcium, and at least one source of phosphate, wherein the pH of said composition is about 6.0 to about 8.5 in the manufacture of a medicament for enhancing the indentation hardness of at least one tooth to said mammal.

30. The use of claim 29, wherein said at least one source of calcium is selected from