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Toothpaste Ingredients Make a Difference:

PATIENT-SPECIFIC RECOMMENDATIONS

2 CONTINUING EDUCATION CREDITS

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COURSE OBJECTIVES

At the completion of this program the participant will be able to:

- List and describe ingredients in toothpastes
- List the different broad categories of toothpastes
- Compare abrasives in toothpastes
- List the therapeutic agents in toothpastes
- Understand recommendations for toothpastes need to be patient specific

COURSE SPONSOR

Benco Dental is the course sponsor. Benco's ADA/CERP recognition runs from November 2009 through December 2013. Please direct all course questions to the director: Dr. Rick Adelstein, 3401 Richmond Rd., Suite 210, Beachwood, OH 44122. Fax: (216) 595-9300. Phone: (216) 591-1161. email: toothdoc@core.com

SCORING & CREDITS

Upon completion of the course, each participant scoring 80% or better (correctly answering 16 of the 20 questions) will receive a certificate of completion verifying two Continuing Dental Education Units. The formal continuing education program of this sponsor is accepted by the AGD for FAGD/MAGD credit. Term of acceptance: November 2009 through December 2013. Continuing education credits issued for participation in this CE activity may not apply toward license renewal in all states. It is the responsibility of participants to verify the requirements of their licensing boards.

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The fee for this course is \$54.00. If you are not completely satisfied with this course, you may obtain a full refund by contacting Benco Dental in writing:

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PARTICIPANT COMMENTS

Any participant wishing to contact the author with feedback regarding this course may do so through the course director: Dr. Rick Adelstein, 3401 Richmond Rd., Suite 210, Beachwood, OH 44122. Fax: (216) 595-9300. Phone: (216) 591-1161. email: toothdoc@core.com

RECORD KEEPING

To obtain a report detailing your continuing education credits, mail your written request to: Dr. Rick Adelstein, 3401 Richmond Rd., Suite 210, Beachwood, OH 44122. Fax: (216) 595-9300. Phone: (216) 591-1161. email: toothdoc@core.com

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COURSE ASSESSMENT

Your feedback is important to us. Please complete the brief Course Evaluation survey at the end of your booklet. Your response will help us to better understand your needs so we can tailor future courses accordingly.

WHY TAKE THIS COURSE?

Abrasives in toothpastes can have an efficacious role in the treatment of gingivitis and caries prevention. It is the responsibility of the oral care professional to understand the ingredients in toothpastes and direct patients to different products based upon their individual needs.

PATIENT CARE—Understand recommendations for toothpastes need to be patient specific.

CONVENIENCE—Continue your education without traveling, taking time away from work and family, or paying high tuition, registration, and material costs.

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WHO SHOULD TAKE THIS COURSE?

Dentists, Dental Assistants, and Dental Hygienists.

ABSTRACT

Toothpastes contain active ingredients or additives that perform specific functions. These additives are abrasives, fluorides, desensitizing agents, antiplaque agents, and antitartar ingredients. Toothpastes also contain detergents, humectants, thickeners, preservatives, flavoring agents, sweeteners, and coloring agents. This article will review the common ingredients in toothpastes and the role abrasives play in plaque and stain removal. Also, abrasives in toothpastes can have an efficacious role in the treatment of gingivitis and caries prevention. It is the responsibility of the oral care professional to understand the ingredients in toothpastes and direct patients to different products based upon their individual needs.

TOOTHPASTE INGREDIENTS MAKE A DIFFERENCE- THE ROLE OF ABRASIVES IN TOOTHPASTES

Among the many oral care products that are available to patients, the most often used are toothbrushes and toothpastes. In a 2003 Lemelson-Massachusetts Institute of Technology study of what products can you not live without, the toothbrush beat out the personal computer, automobile, microwave oven and cell phone. In fact, 34% of teenagers and 42% of adults cited the toothbrush. The corollary to this survey is that toothpastes are used with toothbrushes. Most people brush their teeth at least once a day.

All toothpastes (dentifrices) contain an abrasive in the paste or gel to keep teeth clean. A toothpaste needs only an abrasive and a foaming agent to keep teeth clean of bacterial plaque and a fluoride to help prevent dental caries. However, there are many other ingredients that can be added to a toothpaste that are specific to tasks that toothpastes can accomplish. Depending on how you define toothpastes, there are currently as many as 9 to 12 separate categories from which a patient can select. Many of the categories overlap—desensitizing toothpastes with whitening or gingivitis toothpastes with caries protection or baking soda toothpastes with peroxide for gum care.

Advertising and packaging claims made by toothpastes are based upon their ingredients. When a therapeutic claim is made by a toothpaste, e.g., reducing caries, desensitizing teeth or for the treatment of gingivitis, it must be substantiated using controlled research studies that are submitted to the FDA to make this claim. There is an FDA monograph that specifies the types and percentage of fluoride that must be present in a toothpaste

to make the therapeutic claim of anticaries. In recent years there has been an increased interest by patients and dental professionals on tooth whitening and tooth stain removal with different chemical additives and abrasives being mixed into toothpaste formulas. The therapeutic claim by toothpastes that have fluoride to help prevent dental caries is well proven and accepted.

In many cases, toothpastes that contain fluorides will have the American Dental Association seal of acceptance. “Accepted” is the designation for toothpastes by the ADA that the product fulfills the claims that are being made on the product packaging based upon evidence that has been presented. Usually the seal is awarded for preventing tooth decay, having antitartar effects preventing gingivitis, desensitizing teeth or tooth whitening. The “Accepted” seal is for oral care products while for oral care devices the ADA seal would be “Acceptable.”

TOOTHPASTE INGREDIENTS

Toothpastes contain active ingredients or additives that perform specific functions. These additives are abrasives, fluorides, desensitizing agents, antiplaque agents, and antitartar ingredients.⁽¹⁾ Toothpastes also contain detergents, humectants, thickeners, preservatives, flavoring agents, sweeteners, and coloring agents.⁽²⁻⁵⁾

- Abrasives perform the primary functions of removing plaque and stain from teeth.^(3,4)
- Common fluorides in toothpastes include stannous fluoride, sodium monophosphate fluoride and sodium fluoride. Fluoride’s primary action is to be incorporated into the tooth substrate (enamel and dentin) making the tooth more resistant to acid attack by cariogenic bacteria. Fluoride is also bactericidal and has additional antiplaque effects.⁽⁶⁻⁸⁾
- Desensitizing agents are active ingredients, usually potassium nitrate, in toothpaste that reduce dentin hypersensitivity through a depolarizing effect on the odontoblastic processes in the dentinal tubules. The nerve endings of the odontoblastic processes then repolarize and have a reduced pain sensing ability.⁽⁹⁻¹¹⁾ Also, desensitizing effects of arginine bicarbonate/calcium carbonate complex and stabilized stannous fluoride have been demonstrated to provide a dentin desensitizing effect.^(12,13)
- Antiplaque agents reduce plaque growth. This can have a positive effect in reducing plaque growth on teeth, reducing gingivitis, and potentially reducing caries.⁽¹⁴⁾ Some antiplaque agents include triclosan,

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Fig. 1



Fig. 2



Fig. 3



papain, and sanguinaria extract. Triclosan has been accepted by the FDA as an antiplaque-antigingivitis therapeutic additive to toothpastes.^(13,15)

- Antitartar ingredients that reduce calculus build-up on teeth include tetrapotassium pyrophosphate, tetrasodium pyrophosphate, disodium pyrophosphate, papain and citroxaine.⁽²⁾
- Remineralizing agents have recently been added to toothpastes. These remineralizing agents are based upon amorphous calcium phosphate. This soluble calcium and phosphate are described as enhancing remineralization, preventing dental caries, reducing enamel and/or dentin erosion, and reducing dentin hypersensitivity. The mode of action that has been hypothesized for these agents is the calcium and phosphate in soluble form which allows it to bind to enamel and dentin and to dental plaque. While there are laboratory studies demonstrating these effects, there is little clinical evidence to support these claims.⁽¹³⁾
- Detergents are responsible for the foaming action of toothpastes. Sodium lauryl sulfate (SLS), the most widely used detergent in toothpastes, has been reported to cause adverse effects on oral soft tissues. SLS in toothpastes significantly increased the incidence of desquamation of the oral mucosa compared with toothpastes containing the detergent cocoamidopropyl-betaine (CAPB). Patients with a history of recurrent aphthous ulcers should use toothpastes that are SLS-free (Tom's of Maine has an SLS-free toothpaste that can be purchased online).^(16,17)
- Humectants provide for toothpaste texture and help the toothpaste maintain its moisture. Some common humectants in toothpastes are glycerine, sorbitol and water. Xylitol is also a humectant.
- Thickeners are added to a toothpaste to provide

body to the toothpaste. Some thickeners are carrageenan and xanthan gum.

- Preservatives prevent growth of microbes in the toothpaste. Some common preservatives used in toothpastes are methyl paraben and sodium benzoate.
- Flavoring agents are added to improve the taste of toothpastes. They can range from minty flavors to fruity flavors.
- Herbal agents such as aloe vera, sodium carrageenan, Echinacea, goldenseal and bee propolis have been added to toothpastes. Currently there are no controlled, long-term studies that demonstrate the efficacy of these agents.⁽¹³⁾
- Sweeteners also improve the taste of toothpaste. Most toothpaste sweeteners are artificial and are not able to be used by cariogenic bacteria.
- Coloring agents are added to provide toothpastes with a pleasing appearance.

CLASSIFICATION OF TOOTHPASTES

While many toothpastes have multiple ingredients and additives that differentiate the dental professional's recommendations for use, one can categorize toothpastes into seven major categories based upon patient needs and desires.⁽¹³⁾ These broad categories of toothpastes are

- Caries prevention—cavity protection (Fig. 1)
- Antitartar activity (reduction of calculus formation) (Fig. 2)
- Gingivitis reduction
- Plaque formation reduction
- Remineralizing—calcium-phosphate-fluoride-containing (Fig. 3)
- Cosmetic effect—tooth whitening, stain removal (note: typical whitening toothpastes are significantly less abrasive than smoker's toothpastes, e.g., Topol or Pearl Drops.) (Fig. 4)
- Reduction in tooth sensitivity (Fig. 5)



Fig. 4



Fig. 5



Fig. 6

- Multicare toothpastes (Fig. 6)
- Natural toothpaste—natural ingredients (Fig. 7)
- Toothpastes for patients with dry mouth—xerostomia (Fig. 8)

While these categories broadly classify toothpastes, unless a toothpaste makes a therapeutic claim, e.g., reduction in caries, reduction in tooth sensitivity, or gingivitis reduction, there is no regulatory agency that controls how a toothpaste is advertised. When a toothpaste is advertised for tooth whitening and natural ingredients, these are marketing descriptions and are not therapeutic claims.

While in some cases, manufacturers may have evidence to support advertising claims, (e.g., the cosmetic claim of tooth whitening) it is not required. Keep in mind there are whitening toothpastes that achieve a whitening effect by stain removal with abrasives and there are whitening toothpastes that provide a bleaching effect usually with hydrogen or carbamide peroxide. The ADA does have an ac-

ceptance seal for whitening toothpastes that is awarded when a manufacturer submits for the seal and can provide controlled clinical trials that demonstrate, by clinical research, changes in tooth shade.

While there are broad categories of toothpastes, it is important that dental professionals and patients read the labels and ingredients of toothpastes to be certain they are selecting a toothpaste with the ingredients that will provide them with the effects they require and desire.^(1, 2) In some cases, manufacturers have made toothpastes multicare with the addition of therapeutic agents for caries reduction, desensitizing, antigingivitis, antitartar and whitening.

ABRASIVES—THEIR ROLE IN TOOTHPASTES

In recent years, many toothpaste brands have added abrasives that are specific for removing the broad base of stains that are deposited on the tooth. The category of “whitening toothpastes” are indicative of this trend. It is not unusual to see a toothpaste on the shelf of the stores at which we shop that has a primary effect, e.g., desensitizing, with “whitening” also on the label. In most cases the whitening effect is due to the abrasive in the toothpaste.

In order for a dental paste or gel to be referred to as a toothpaste, it must contain an abrasive. The primary purposes of the abrasive particle is to remove plaque from the teeth⁽¹⁸⁾ and to remove stains from the tooth surfaces.⁽¹⁹⁻²³⁾ The ability of a dentifrice to clean teeth with an abrasive is based upon the toothpaste formulation, which usually consists of the abrasive agent, a thickening agent to hold the abrasive in a uniform suspension while in the tube and while the teeth are being brushed, and a surface-active agent to facilitate the removal of oral debris.⁽²⁴⁾ There are four major categories of abrasives used in toothpastes. These are carbonates,



Fig. 7



Fig. 8

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phosphates, silicas and other agents including alumina, clays, and oxides (Table 1). When choosing a toothpaste, the dental professional needs to understand how the hardness of the abrasive can have a direct effect on the tooth surfaces. Abrasive particles have been evaluated based upon their hardness relative to dentin. Table 2 lists the Moh's hardness of some common abrasives used in toothpastes.⁽²⁵⁾ Also, it is not uncommon for manufacturers to combine one or more abrasives in toothpastes to have them act in a complementary fashion. Toothpastes with abrasives that are in the carbonate group have an alkaline pH and can act as a natural buffer in the oral cavity while other abrasives have a neutral pH. Sodium bicarbonate (baking soda), unlike other calcium carbonates, is naturally occurring in the body. The alkaline pH of baking soda is beneficial in that it has been demonstrated to have a beneficial role in neutralizing pH changes in acid forming plaque after exposure to sucrose⁽²⁶⁾ and caries inhibition.⁽²⁷⁾ Manufacturers can adjust pH of toothpastes depending on how they formulate them. The primary goal of a toothpaste is to clean the accessible tooth surfaces with minimal damage to enamel, dentin, root surfaces and gingival tissues due to mechanical abrasion of those surfaces. Relative abrasivity comparison of toothpastes is typically done using the American Dental Association's method. This method is a radioactive dentin abrasivity test and is referred to as an RDA for a toothpaste.^(28, 29) The lower the RDA number the less abrasive the toothpaste, the higher the RDA number, the higher the abrasivity of the toothpaste. One can not assume that whitening toothpastes have high RDA numbers. Many whitening toothpastes are less abrasive than antitartar and smokers toothpastes. Table 3 lists RDA numbers for some different toothpastes.⁽³⁰⁾

**TABLE 2:
MOH'S HARDNESS NUMBER OF DENTIFRICE ABRASIVES**

Compound (Formula)	Moh's Hardness
Dentin	2.0- 2.5
Baking soda	2.5
Dicalcium phosphate dehydrate	2.5
Calcium carbonate	3.0
Anhydrous dicalcium phosphate	3.5
Hydrated silica dioxide	2.5-5.0
Calcium pyrophosphate	5.0
Alumina	9.25

TABLE 1: TOOTHPASTE ABRASIVES

CARBONATE

Chalks Mined and synthetic calcium carbonates
Baking soda Sodium bicarbonate

PHOSPHATE

DiCal Dicalcium phosphate and or anhydrous dehydrate
CalPyro Calcium pyrophosphate
IMP Insoluble sodium metaphosphate
TriCal Tricalcium phosphate

SILICA

Abrasive or thickening agent
Combined abrasive and thickening properties

OTHER TYPES

Alumina- aluminum oxide
Clays
Oxides

From Hefferren JJ. Historical view of dentifrice functionality methods. J Clin Dent 1998 9(3):53-56.

The test is performed by taking dentin samples and placing them in a radioactive neutron flux. The specimens are brushed with a prescribed brushing technique for 1500 strokes with a toothpaste. The toothpaste/dentin slurry is collected and the radioactivity measured to determine dentin abrasion of the toothpaste.

Among the abrasives in toothpastes, hydrated silica, alumina and calcium pyrophosphate are considered to be inactive. This compares to other abrasives that have some chemical activity in promoting dental health beyond the removal of plaque and stain. One abrasive, dicalcium phosphate dehydrate, (dical) when combined with sodium fluoride (NaF) in a toothpaste, was significantly superior to the silica dentifrice with NaF in preventing caries.⁽³¹⁾ In fact, dical provides the calcium necessary for remineralization.⁽³²⁾

Sodium bicarbonate is the most multifunctional of all abrasives used in dentifrices. While baking soda has the lowest Moh's hardness and is similar to the hardness of dentin,⁽²⁶⁾ proving it to be very low in abrasion to tooth structure, sodium bicarbonate has been demonstrated in clinical trials to have other effects. Sodium bicarbonate-containing dentifrices have been shown to be plaque-removing and antibacterial in clinical trials.^(33, 34) In trials comparing percentage of plaque removal of a hydrated silica, dical and a

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**TABLE 3:
RDA NUMBERS FOR SOME COMMON TOOTHPASTES**

Toothpaste	RDA index
Aquafresh Whitening	113
Arm and Hammer PeroxiCare	42
Arm and Hammer Dental Care	49
Colgate Platinum	106
Close-up	218
Crest Extra Whitening	117
Crest Multicare	139
Mentadent	118

sodium bicarbonate, abrasive toothpaste, the baking soda toothpaste removed a higher percentage of plaque.⁽¹⁹⁾

Enamel remineralization is a critical factor in reducing caries on smooth surfaces. Also, surface defects of enamel, scratching, acid erosion, and dimpling of the enamel surface affect the esthetic appearance of teeth. If the addition of other reagents combined with fluoride can make the enamel surface resistant to these defects, there would be a combined effect. When comparing three different toothpastes, the addition of soluble calcium (calcium phosphate) with a sodium bicarbonate and fluoride enhanced the microhardness of enamel when compared to a regular fluoride-containing toothpaste with no sodium bicarbonate or soluble calcium.⁽³⁵⁾ Charig and coworkers also investigated the enamel mineralization of a calcium-containing bicarbonate toothpaste.⁽³⁶⁾ They used four different techniques to assess surface changes to enamel. Their findings indicated that a calcium-containing bicarbonate toothpaste will deposit calcium into enamel deformities under a wide variety of conditions.

Tooth whitening has become an important aspect of clinical dental practice. Tooth whitening can be described as a range of dental treatments, from professional bleaching with active peroxides, to over-the-counter bleaching with active peroxides, to stain removal either by the dental hygienist at chairside, or to the use of a stain removing toothpaste at home. In making recommendations for specific types of toothpastes, the dental professional needs to understand the etiology of tooth staining. The abrasive in a toothpaste can play a major

role in tooth whitening. Toothpaste with the abrasive calcium carbonate and perlite has been shown to be effective at stain removal.^(37, 38) The addition of an alumina abrasive to a toothpaste has been shown to effectively remove extrinsic stain from teeth.^(39, 40) Alumina abrasive toothpastes and polishing pastes have been shown to be less abrasive to composite resin restoratives.⁽⁴¹⁻⁴³⁾ These results parallel abrasive research that has demonstrated that alumina is the abrasive of choice when polishing composite resins.⁽⁴⁴⁾

Patients using chlorhexidine have a chief complaint of extrinsic staining of their teeth. Clinical trials have evaluated toothpastes with different abrasives in their ability to control and remove extrinsic chlorhexidine stain. Toothpastes with a variety of abrasives including dical, baking soda, and alumina, have been shown to effectively reduce chlorhexidine staining of the natural dentition.^(40, 45, 46)

CONCLUSION

While there are broad categories of toothpastes, it is important that dental professionals and patients read the labels and ingredients of toothpastes to be certain they are selecting a toothpaste with the ingredients that will provide them with the effects they require and desire.⁽¹⁾ Multicare toothpastes have become available. These toothpastes contain all the ingredients that would make that toothpaste multicare to include anticaries, antigingivitis, antitartar, desensitizing, and whitening.

Tooth whitening is an important criteria for many of our patients when they choose toothpastes. From the evidence, the abrasive within a toothpaste makes a difference. An important role for the dental health professional is the recommendation of oral care products based upon the patient’s oral conditions. For patients needing a toothpaste to remove plaque, stain and for whitening, the abrasive particle in the toothpaste plays an important role. When recommending a toothpaste, one should recommend toothpastes that are kinder to enamel, dentin and restorative materials. Research has shown that low hardness, less abrasive toothpastes can accomplish these goals. The dental professional must customize his or her recommendations for toothpastes and not a one-size-fits-all philosophy. Currently, the advances in the ingredients and additives to toothpastes offer the patient some good clinical choices. It is the responsibility of the oral care professional to understand the ingredients in toothpastes and direct patients to different products based upon their individual needs.■

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1. **In a 2003 Lemelson-Massachusetts Institute of Technology study of what products can you live without, of the products listed below in the answers, what was the highest rated with 34% of teenagers and 42% of adults?**
 - a. Microwave oven
 - b. Cell phone
 - c. Toothbrush
 - d. Automobile

2. **Claims made by toothpastes are based upon their ingredients. When a therapeutic claim is made by a toothpaste, e.g., desensitizing teeth or caries reduction, it must be substantiated by research to the FDA.**
 - a. Both statements are true.
 - b. The first statement is true, the second statement is false
 - c. Both statements are false
 - d. The first statement is false, the second statement is true

3. **The American Dental Association seal of acceptance program is based upon research proving a claim. All the following have an ADA seal of acceptance program EXCEPT:**
 - a. Tooth whitening
 - b. Desensitizing teeth
 - c. Preventing tooth decay
 - d. Best tasting toothpaste

4. **The additive of abrasives to toothpastes performs what primary functions?**
 - a. Desensitizing teeth
 - b. Removing plaque and stain from teeth
 - c. Remineralizing teeth
 - d. Sealing margins of restorations that are in teeth

5. **The addition of fluoride to a toothpaste provides the therapeutic effect of**
 - a. desensitizing teeth
 - b. removing plaque and stain from teeth
 - c. anticaries
 - d. whitening teeth

6. **All the following are common fluorides in toothpastes EXCEPT:**
 - a. Stannous fluoride
 - b. Sodium monophosphate fluoride
 - c. Sodium fluoride
 - d. Flouridated peroxide.

7. **A desensitizing agent in toothpaste to reduce dentin hypersensitivity is**
 - a. sodium laurel sulfate
 - b. fumed silica
 - c. potassium nitrate
 - d. calcium carbonate

8. **The desensitizing effect of potassium nitrate in toothpastes is by creating a depolarizing effect on the odontoblastic processes in the dentinal tubules. The nerve endings of the odontoblastic processes then repolarize and have a reduced pain sensing ability.**
 - a. Both statements are true
 - b. The first statement is true, the second statement is false
 - c. Both statements are false
 - d. The first statement is false, the second statement is true

9. **Antiplaque agents added to toothpastes provide for a reduction in plaque growth. All the following are antiplaque additives to toothpastes EXCEPT:**
 - a. triclosan
 - b. papain
 - c. sanguinaria extract
 - d. sodium monocarbonate crystals

10. **In recent years, remineralizing agents have been added to toothpastes. These remineralizing agents are based upon soluble calcium and are chemically**
 - a. interfacial calcium carbonate
 - b. amorphous calcium phosphate
 - c. stannous calcium peroxide
 - d. calcium carbonate

11. **Detergents are responsible for the foaming action of toothpastes. Some research has shown that patients with recurrent aphthous ulcers would benefit from using toothpastes without these detergents. The recommendation from dental professionals should be for a _____-free toothpaste for patients with a history of aphthous ulcers.**
 - a. hydrogen peroxide (HP)
 - b. sodium peroxide (SP)
 - c. sodium laurel sulphate (SLS)
 - d. sodium monophosphate fluoride (SMF)

12. Antitartar ingredients have been added to some toothpastes. The active antitartar additives include all the following EXCEPT:

- a. tetrapotassium pyrophosphate
- b. tetrasodium pyrophosphate
- c. disodium pyrophosphate
- d. hydrogen peroxide

13. Toothpastes must have an extended shelf life because they are over-the-counter products being sold in stores. In order to extend the shelf life of toothpastes, preservatives are added to prevent the growth of microbes in toothpaste. Common preservatives added to toothpastes are

- a. benzoyl peroxide
- b. methylated arginine
- c. methyl paraben and sodium benzoate
- d. potassium dioxide

14. Listed in this article are broad categories of toothpastes. These categories include:

1. Caries prevention
2. Antitartar activity
3. Gingivitis reduction
4. Plaque formation reduction
5. Cosmetic effect (whitening)
6. Reduction in tooth sensitivity
7. Natural toothpaste

- a. 1, 2, 3, 5, and 6 only
- b. 1, 2, 3, and 6 only
- c. 1, 2, 5, and 6 only
- d. All the above categories are listed in the article to describe toothpastes

15. In order for a dental paste or gel to be referred to as a toothpaste it must contain _____.

- a. fluoride
- b. calcium peroxide
- c. abrasive
- d. triclosan

16. The ability of a toothpaste to clean teeth is based upon its formulation with an abrasive agent mixed with a thickening agent to keep the abrasive particles in a uniform suspension while in the tube. The addition of foaming ingredients creates a foaming effect that facilitates the loosening of calculus from the teeth.

- a. Both statements are true

- b. The first statement is true the second statement is false
- c. Both statements are false
- d. The first statement is false, the second statement is true

17. The categories of abrasives used in toothpastes include all the following EXCEPT:

- a. carbonates
- b. phosphates
- c. laurel sulfates
- d. silicas

18. Sodium bicarbonate (baking soda) is an abrasive in toothpastes. The _____ pH of baking soda has been shown to be beneficial because it neutralizes the pH changes in acid forming plaque after exposure to sucrose.

- a. high-acid
- b. low-acid
- c. alkaline
- d. neutral

19. RDA values for toothpastes refer to a toothpaste's

- a. abrasivity
- b. anticaries potential
- c. antitartar potential
- d. whitening effects

20. Patients using chlorhexidine have a chief complaint of extrinsic staining of their teeth. Reduction of chlorhexidine staining can be accomplished by using toothpastes that contain the abrasives dical, baking soda, and alumina.

- a. Both statements are true.
- b. The first statement is true, the second statement is false.
- c. Both statements are false.
- d. The first statement is false, the second statement is true.

ANSWER KEY

- 1. (A) (B) (C) (D)
- 2. (A) (B) (C) (D)
- 3. (A) (B) (C) (D)
- 4. (A) (B) (C) (D)
- 5. (A) (B) (C) (D)
- 6. (A) (B) (C) (D)
- 7. (A) (B) (C) (D)
- 8. (A) (B) (C) (D)
- 9. (A) (B) (C) (D)
- 10. (A) (B) (C) (D)
- 11. (A) (B) (C) (D)
- 12. (A) (B) (C) (D)
- 13. (A) (B) (C) (D)
- 14. (A) (B) (C) (D)
- 15. (A) (B) (C) (D)
- 16. (A) (B) (C) (D)
- 17. (A) (B) (C) (D)
- 18. (A) (B) (C) (D)
- 19. (A) (B) (C) (D)
- 20. (A) (B) (C) (D)

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