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# IMPACT OF ANTISENSITIVITY TOOTHPASTE ON ORAL HEALTH

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## ABSTRACT

The purpose of this review is to educate practitioners about dentine hypersensitivity (DH). We provide a brief overview of the anti-sensitivity role of ingredients and the clinical management of dentine hypersensitivity, and discuss technical approaches to mitigate susceptibility. This clinical information is explained in the context of the underlying biology. The author used his PUBMED to find relevant English literature published between 1999 and 2010. The authors used a combination of search terms 'dentin*', 'tooth', 'teeth', 'hypersensitivity' and 'desensitize. Abstracts and full-text articles were used to identify studies describing etiology, prevalence, clinical features, controlled clinical trials of treatments, and relevant laboratory studies on mechanism of action.

**KEYWORDS**: Dentin Sensitivity, Pain, Sensitivity relief.

## INTRODUCTION[1,2]

Dentin hypersensitivity is a common condition associated with hot and cold foods and drinks, physical and osmotic pain, and is associated with porosity of dentinal tubules. Dentin adhesives and desensitizing agents have been added to toothpastes to ease the pain of dentine hypersensitivity. It can lead to dentin exposure. Globally, the prevalence of dentine hypersensitivity ranges from 1.3% to 92.1%, with an average prevalence of 33.5%. Dentin hypersensitivity is common in women between the ages of 20 and 40 and is most common in premolars and canines. Symptoms such as aches and pains associated with dentine influence dietary hypersensitivity often choices and can affect quality of life. The etiology of dentine hypersensitivity remains unknown. Representative theories include hydrodynamics, nerve terminal conduction, and odontoblast conduction. The theory of nerve endings postulates that

nerve endings extend through the dental pulp and dentin to the enamel-dentin junction. The odontoblast conduction theory postulated that odontoblasts are receptors for external stimuli and transmit signals to nerve endings. The hydrodynamic theory proposed by Brännström is the most widely accepted theory to explain dentin hypersensitivity. The theory is that when dentin is exposed for a variety of reasons, external stimuli can cause excessive fluid flow in the dentinal tubules, causing relaxation or compression of odontoblastic processes, affecting peripheral nerve endings and causing pain and discomfort. It is proposed that other sensations arise. Sensitive teeth are short- lived, sharp pains that occur when hot or cold foods or drinks are consumed. The outermost layer of our teeth is the enamel that covers the crown, cementum covers the root of the tooth, and dentin is the inner layer. Hyperesthesia occurs when the enamel wears away and the dentin is exposed. There are several reasons why enamel wears away, dentin becomes exposed, and teeth become sensitive. Many hypersensitivity products contain an ingredient called potassium nitrate. Without getting too scientific, these compounds are involved in the desensitization of nerve fibers. less likely to cause This is considered medication and may take up to two weeks to reach effective therapeutic levels and toothpaste he should use twice daily. That means "regular" toothpaste needs to be relegated to the back of the medicine cabinet. It is very effective in relieving discomfort in people who suffer from texture sensitivity.

**History**[32,33,34,36,37,38]

**1. Early TOOTHPASTE**

Since 5000 BC, the Egyptians have made a toothpaste consisting of cow hoof ash, myrrh, powdered and baked egg shells, and pumice stone. The Greeks, and then the Romans improved the recipe by adding abrasives such as crushed bones and oyster shells. In the 9th century, Iraqi musician and fashion designer Ziryab invented a type of toothpaste, popularized it throughout Muslim Spain. The exact ingredients of this toothpaste are unknown, but it is reported to be "functional and pleasant tasting. Whether these early toothpastes were used alone or rubbed onto the teeth with a cloth. It is unknown if it was used with neem tree twigs or early toothbrushes such as miswak. During Japan's Edo period, inventor Genna Hiraga's Tobiko Rakuyo (1769) contained an advertisement for soseki powder, a "boxed toothpaste." Toothpaste and powder came into common use in the 19th century.

**2. Tooth Powder**

Toothpaste for use with toothbrushes became popular in England in the 19th century. Most were homemade and used chalk, brick dust, or salt as ingredients. The 1866 Home Encyclopedia recommended powdered charcoal and warned that many patented toothpastes sold commercially did more harm than good.

Arm & Hammer sold baking soda-based toothpaste in the US until around 2000, and Colgate now sells toothpaste in countries such as India.

**3. Modern TOOTHPASTE**

18th-century American and British toothpaste recipes called for burnt bread. Another concoction around this time called for dragon's blood (resin), cinnamon, and burnt alum. In 1873, Colgate began mass-producing bottles of aromatic toothpaste. 1940s Kolynos toothpaste advertising poster By the 1900s, a paste made from hydrogen peroxide and baking soda was recommended for use on toothbrushes. Premixed toothpaste was first marketed in his 19th century, but it was not until World War I that toothpaste It was never over popular. Newell Sill Jenkins developed a toothpaste with Willoughby D. Miller and named it Kolynos, the first toothpaste containing an antiseptic. The name is derived from the Greek he Kolyo nosos and means "prevention of disease". European pharmacists tried many times to manufacture toothpaste, but it was not economical. After returning to the United States, he continued his experiments under Harry Ward Foote (1875-1942), Professor of Chemistry at the Sheffield Institute of Chemistry, Yale University. After 17 years of Kolynos development and clinical trials, Jenkins retired and transferred manufacturing and distribution to his son, Leonard A. Jenkins. He launched his first tube of toothpaste on April 13, 1908. Within a few years the company expanded to North America, Latin America, Europe and the Far East. In 1909 a branch was opened in London. In 1937 Korinos was manufactured in his 22 countries and sold in 88 countries. Kolynos was primarily sold in South America and Hungary. Colgate-Palmolive bought the manufacturing division of American Home Products for his $1 billion in 1995.

**4. Toothpaste Tubes**

In 1880 Dr. Washington, Sheffield, New London, Connecticut, supplies toothpaste in collapsible tubes. Sheffield's Cream Toothpaste His son traveled to Paris, where a painter took paint from the tube. After seeing it in use, he got the idea. Colgate & Company dental cream was packaged in a collapsible tube modeled after Sheffield, York in 1896. The original

collapsible toothpaste tube was made of lead.

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**DIFFERENT TYPES OF TOOTHPASTE**

**1. HERBAL TOOTHPASTE**

Companies such as Tom's of Maine make natural and herbal toothpastes and sell them to consumers who want to avoid the artificial ingredients commonly found in regular toothpastes. Many herbal toothpastes are free of fluoride and sodium lauryl sulfate. The ingredients in natural toothpastes vary, but often include baking soda, aloe, eucalyptus oil, myrrh, chamomile, and calendula. neem, toothbrush tree, botanical extracts (strawberry extract) and essential oils.

Randomized trials were found to be flawed and at high risk of bias to determine whether herbal dentifrices containing aloe vera can reduce plaque and improve gum health.


A study by the Delhi Institute of Pharmaceutical Sciences found that many of the herbal toothpastes sold in India were laced with nicotine.

Charcoal is also incorporated into toothpaste formulas. However, there is no evidence to determine its safety and efficacy. A 2020 systematic meta-review of 24 controlled randomized controlled trials involving 1,597 adults aged 18 to 65 years found that herbal toothpaste was superior to non-vegetable toothpaste, whereas fluoridated toothpaste was superior to non-vegetable toothpaste. It has been shown to be no better than brushing your teeth. Some examples of herbal toothpaste.

**2. SENSITIVE TEETH TOOTHPASTE**

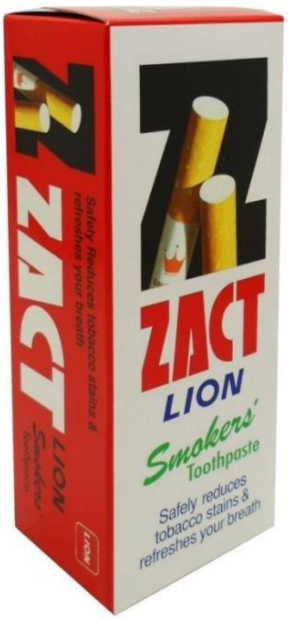
Sensitive teeth are short, sharp pains that occur when you drink hot or cold food or drink. The outermost layer of our teeth is the enamel that covers the crown, cementum covers the root of the tooth, and dentin is the inner layer. Hyperesthesia occurs when the enamel wears away

and the dentin is exposed. There are several reasons why enamel wears away, dentin becomes exposed, and teeth become sensitive.

Examples of toothpaste for sensitive teeth


### 3. Smoker's Toothpaste

This toothpaste was specially developed for smokers. Smokers often find their teeth discolored from inhaling tobacco smoke. Over time, tar stains teeth a tan color. Toothpastes made for smokers usually contain cleaning agents designed to make your teeth look whiter.




### 4. WHITENING TOOTHPASTE[25]

1) Tooth whitening or tooth bleaching is the process of lightening the color of human teeth. Whitening is often desirable when teeth yellow over time for a number of reasons,

including the intrinsic or extrinsic effects of tooth enamel through the chemical breakdown of chromogens in or on the teeth known as bleaching. This can be achieved by changing the color of the hydrogen peroxide.


2) It is the most commonly used active ingredient in skin lightening products and is supplied as hydrogen peroxide or carbamide peroxide. Hydrogen peroxide is similar to carbamide peroxide in that the stable complex is released when it comes into contact with water. When diffused into teeth, hydrogen peroxide acts as an oxidizing agent and breaks down to create unstable free radicals. In the spaces between the inorganic salts of tooth enamel, these labile free radicals bind to organic pigment molecules, leaving less of the smaller, darker components. These small molecules reflect less light and create a "brightening" effect. Various products are available on the market for this purpose. Exposure time and bleach concentration determine the end point of tooth whitening.

## 5. CHILDREN TOOTHPASTE

This type of toothpaste usually has less fluoride than adult toothpaste. This is because of the health risks for children who may accidentally overdose on fluoride. Because children's teeth are much more sensitive than adult teeth, children's toothpaste contains no abrasives. Not included. In addition, the children's toothpaste is flavored with the taste of young people who like sweets in mind.


### 6. TARTER CONTROL TOOTHPASTE

Plaque is one of the main causes of periodontal disease. It builds up along the tooth-gums border and eventually inflames and irritates the gums. If you don't remove plaque with thorough brushing and flossing, it will eventually harden into tartar, increasing your risk of developing gum disease and tooth decay. According to India's National Health Portal, your teeth Periodontal disease is widespread, affecting up to 90% of the population worldwide and is the leading cause of tooth loss in adults. Therefore, all family members, especially children, should practice good oral hygiene.


## MAJOR INGREDIENT AND THEIR ROLE

Some key ingredients found in most products include:

**Fluoride**

- Tooth decay (cavities) is a widespread disease that affects billions of people worldwide. Fluoride has long been used to prevent tooth decay in a variety of ways, including toothpaste, water, milk, mouthwash, dental gel, and varnish.
- Strengthens tooth enamel and acts as a protective layer.
- **Strontium chloride**. It blocks the openings of the dentinal tubules, making it so that stimuli such as hot and cold sensations aren’t able to reach the nerve.

**POTASSIUM NITRATE**

Sensitivity toothpastes containing potassium nitrate depolarize the nerves in your teeth, preventing them from sending pain signals when they come into contact with sensitivity triggers such as cold air or hot coffee. • Potassium nitrate is a mineral. It contains potassium ions that desensitize the nerves in your teeth and help relieve sensitive toothaches.

- • Sensodyne Toothpaste with Potassium Nitrate contains the following ingredients.
- • Deep Clean – Deep clean your delicate teeth by brushing twice a day. • True White – Helps prevent and remove stains. • Essential Care - Soothe the nerves of your teeth.

- **SODIUM FLUORIDE**[16,17,22]
- Like stannous fluoride, sodium fluoride strengthens teeth and prevents tooth decay. It also helps remineralize tooth enamel in the early stages of tooth decay.3
- Many Sensodyne toothpastes contain sodium fluoride.
- Deep Cleaning - Refreshing, minty taste and deep cleaning of teeth.
- Comprehensive Protection – Reduces sensitivity and prevents cavities.

**Stannous fluoride**[19,23,24]

- Since the 1960s, stannous fluoride (0.4%) has been incorporated into oral hygiene products to reduce dentin sensitivity. This study was designed to evaluate the desensitizing effect of a stabilized 0.454% stannous fluoride/sodium hexametaphosphate toothpaste compared to a control sodium fluoride toothpaste. This was a double-blind, randomized, parallel- group clinical trial conducted in accordance with the American Dental Association guidelines for the acceptability of dentin hypersensitivity products. Her 77 subjects who met the eligibility criteria were stratified by age, sex, and air sensitivity score to receive either stabilized stannous fluoride/sodium hexametaphosphate dentifrice or sodium fluoride control dentifrice. assigned randomly. Subject instructed her to brush twice daily for eight weeks. Oral soft-tissue assessments including tactile sensitivity and efficacy assessments were performed at baseline, week 4 and week 8. Mean sensitivity ratings based on the Schiff air index in the experimental group were statistically significantly lower than those in the sodium fluoride control group at both weeks 4 and 8 ($P<0.0001$). Mean sensitivity scores based on the Yeaple Probe Index for the stannous fluoride/sodium hexametaphosphate group were statistically significantly higher, demonstrating decreased sensitivity over the sodium fluoride control group at both

weeks 4 and 8. shown ($p < 0.0001$). The results show that the stabilized stannous fluoride/sodium hexametaphosphate dentifrice provides a clinically and statistically significant reduction in dentine hypersensitivity compared to the sodium fluoride control dentifrice. I'm here.

## FORMULATION ASPECTS IN TOOTHPASTE

### Aeration

Aeration is a major problem in toothpaste manufacture.

All powders contain some air, and detergents can exacerbate the problem. To overcome this, mixing is usually done under vacuum. Other issues you may encounter are:

- Rheology modifiers tend to form clumps and are difficult to break up with agitation. Premixing with other liquid or powder ingredients increases process time and costs.
- Some rheology modifiers require high shear to maintain their function. • Some ingredients. Silica has a low density and is very difficult to incorporate and wet. • Conventional agitators are prone to entraining air, especially when mixing powders. Abrasives such as calcium carbonate can be supplied as slurry. These may require deagglomeration.

## REPORTED METHODOLIES FOR ANTISENSITIVITY TOOTHPASTE

### 1. Trituration method

Binders are pre-mixed with solid abrasives and abrasives, mixed with a liquid phase containing humectants, oils, preservatives and sweeteners added to the blender. After forming a homogenous paste, flavors and cleaning agents are added last, stirred slowly to minimize foaming, mixed, milled, degassed and packed into tubes.

### 2. Dry Gum Method[26]

In this process, all solid components of the formulation, such as abrasives, binders, etc., except surfactants, are mixed together in a dry mixer. The mixer can be an agitating mixer

consisting of slowly rotating blades.

Liquid ingredients such as moisturizers and water are gradually added to the dry mix.

Mixing is carried out until a smooth paste is formed.

The rest of the ingredients, such as surfactants and fragrances, are added to a uniform paste under vacuum.

### 3. Wet Gum Method

In this process all liquid ingredients are mixed to form a liquid phase. The binder is then mixed with the liquid phase with constant stirring to form a mucilage.

Then gradually add the solid ingredients to the slime except the surfactant and mix evenly with a powerful mixer to form a uniform paste.

remaining components, i.e H. Add surfactants, fragrances and colorants under vacuum to a homogenous paste.

Based on the principle involved in the above methods, some acceptable techniques have been proposed for the manufacture of toothpaste which is as follow

### A. Cold compression technique

The manufacture of toothpaste using this technique can be carried out as follows.

First, add a moisturizer such as sorbitol (70% w/v) or glycerin to the blender bowl.

The binder is then sprinkled over the wetting agent with agitation to achieve a uniform distribution.

Liquid ingredients such as water, sweeteners and preservatives are mixed to form a separate liquid phase, and any therapeutic additives are optionally added to the liquid phase.

This liquid phase is then added to the wetting agent and binder mixture in the bowl and mixed for 5 minutes to degas the thick gelatinous liquid phase. Stop vacuum and add abrasive with constant mixing until completely dissolved.

Vacuum is reapplied and mixing is continued for at least 30 minutes.

Surfactants and fragrances are dispersed separately in 5% moisturizer. Finally, the mixture is placed under vacuum and mixed for an additional 5 minutes.

Eventually, an air-free smooth paste is formed. Introduce a vacuum to the bowl to remove air from the liquid mixture. Release the vacuum, add the abrasive, and vacuum the mixture again for 30 minutes.

**B. Multiple Liquid Phase technique**

This method is suitable for formulations that use a combination of carboxymethyl cellulose (CMC) and a magnesium aluminum silicate barrier. Preparation can be done as follows.

First, pour hot water into a mixing bowl and add magnesium aluminum silicate.

Moisturizers, flavors, binders, and preservatives are mixed separately to form separate liquid phases.

Then add this solution to the blender and use moisturizer to make up the final volume.

Introduce a vacuum to the bowl to remove air from the liquid mixture. Release the vacuum, add the abrasive, and vacuum the mixture again for 30 minutes.

**C. Hot Liquid Phase Technique**

The preparation of the method using this technique is as follows.

In this process, abrasives, binders and preservatives are mixed separately in a dry mixer.

Moisturizer, sweetener and water are mixed separately and this liquid phase is heated.

The hot solution is then slowly added to the dry powder with constant mixing.

The resulting mass is then mixed under vacuum for 30 minutes. Finally, the flavor and surfactant solutions are added and mixed under vacuum for an additional 5 minutes. This process creates a clear, homogeneous paste.

**EVALUTION PARAMETER[28,29,30,31]**

**A. Evaluation**

**a. Colour**

Colour of the prepared toothpaste was evaluated for its colour. The colour was checked visually.

**b. Odour**

Odour was found by smelling the product.

**c. Taste**

Taste was checked manually by tasting the product.

**B Physical Parameter**

**1) Determination of hard and sharp edged abrasive particles**

The paste was extruded from a squeezable tube onto butter paper to a length of about 15-20 cm. The paste was then pressed with a finger along its entire length to test for the presence of hard, sharp abrasive particles.

**2) Determination of spreadability**

About 1 g of paste was weighed and held in the center of a glass plate (10 x 10 cm), on which another glass plate was carefully placed. A 2 kg weight was placed in the center of the plate (to prevent the plate from slipping). The diameter (cm) of the paste was measured after 30 minutes.

**3) Determination of fineness**

Accurately weigh approximately 10g of toothpaste into a 250ml beaker. Add 100ml of water and let stand for about 30 minutes, stirring occasionally, until the toothpaste is completely dispersed and the toothpaste/gel flakes trap any clumps. Transfer the beaker to an ultrasonic bath. Fill the ultrasonic bath (2 liter capacity) about three-quarters full with water. Secure the above beaker in the center of the bath approximately 1 cm away from the bottom of the bath and sonicate for 10 minutes to completely dissolve the components. This suspension is quantitatively transferred to a 150 micron IS sieve, washed with slow running tap water and finally with a fine stream of water from a wash bottle until all material that can pass through the sieve has passed through. Drain the water and dry the screen in the oven. If there is residue on the screen, carefully transfer it to a tarred watch glass and dry in an oven at 105 ± 2 °C until the mass remains constant.

**CALCULATION**

Material retained on 150-micron IS Sieve, percent by mass = M1 × 100 M

Where, M1 = massing of residue retained on the sieve, & test.

M = massing of the material taken for the 10g of toothpaste was weighed and dried in an oven at 105°C and then cooled.

Weight loss was recorded as percent water and

**4) Determination of pH[27]**

Pour 5g of toothpaste from the container into a 20ml beaker and add 5ml of freshly boiled cold water (27°C) to make a 50% aqueous suspension. Stir well to create a complete suspension. Determine the pH of the suspension within 5 min using a pH meter.

**5) Determination of foaming power**

Calculated according to the given formula.

$$\% \text{ moisture} = \frac{\text{Original sample wt} - \text{Dry sample wt}}{\text{Original sample wt}} 100$$

**7) Determination of heavy metals**

Accurately weigh about 5 g of toothpaste in a 100 ml beaker, add 10 ml of water, cover with a watch glass and leave for 30 minutes. This operation is done to disperse the toothpaste. Stir the contents of the beaker with a glass rod and pour the slurry into a 250 mL graduated cylinder. Be careful not to create bubbles (more than 2 mL) and avoid lumpy paste in the cylinder. Repeat the transfer of any remaining residue to the grinder with an additional 5-6 mL portion of water to ensure that all material in the beaker is transferred to the cylinder. Add enough water to adjust the contents of the cylinder to 50 mL and bring the contents of the cylinder to 30 °C. Stir the contents of the cylinder with a glass rod or thermometer to ensure a uniform suspension. When the temperature of the contents of the cylinder reaches 30°C, stop the cylinder and shake it completely 12 times. Each shaking includes movements in the vertical plane, upside down, and vice versa, as shown in Figure 2. After shaking 12 times, leave the cylinder for 5 minutes and read the volume of a) foam and water (V1 mL) and b) water only (V2 mL) as shown in Figure 3. calculation form power, ml=V1-V2

**6) Moisture content**

Accurately weigh 2 g of sample into a Kjeldahl flask. (4:1) was added to the flask and heated continuously until the solution became colorless. The sample was then transferred to a 25 mL volumetric flask and made up to volume with distilled water.

A reagent blank was prepared according to the procedure described above.

Lead standards were prepared according to the protocol and the samples were analyzed visually and compared with lead standard solutions.

**DISCUSSION**

This long-term study of people with DH examined the effect of twice-daily brushing with an anhydrous SnF2-based toothpaste on OHrQoL. This is the first study to evaluate long-term (24 weeks) benefits, although previously demonstrated in, the results are more valid. Overall, the psychosocial OHrQoL results were consistent with the biomedical results observed in this and other clinical studies. The pain assessment results confirmed the performance of his DH-directed toothpaste in agreement with his RCT reported in the literature, with statistically significant changes in DH baseline at 4 weeks and Schiff sensitivity across studies. Scores decreased continuously. Compared to previous studies of this toothpaste, the magnitude of change from baseline after 8 weeks of use was similar and below the '2' score required to classify teeth as sensitive. Baseline data for LMS reported by participants were similar to

those shown in the dental practice study, and the results here show that all LMS topics (description, duration, intensity, tolerability) were showed a significant decrease over 24 weeks. Pain assessment is the standard in clinical trials to demonstrate treatment efficacy, but DH is also described as a variety of sensations, such as 'itching' and 'shivering', 'pins and needles' and 'brain freeze'. I can do it. The impact of these sensations on the daily lives of study participants was specifically examined using the DHEQ. Responses to her DHEQ questions in section 1 examining the physical effects of DH showed a statistically significant improvement after 4 or 8 weeks of treatment.

## CONCLUSION[35]

This study is a non-systematic review of the literature on DH etiology, diagnosis, and therapeutic strategies. The purpose of this study was to expand the knowledge of dental students, dentists, and dental professionals regarding dentine hypersensitivity. The current review presents the latest trends in the etiology, diagnostic methods, and therapeutic strategies of this disease. However, we note that future studies on DH may involve some revisions, modifications, or changes to the content of the current study. Can DH be detected after removing all other factors that can cause pain? Treatment of dental hypersensitivity should be regular, beginning with home remedies, followed by complementary therapies. It is recommended that follow-up visits be scheduled for all patients after regular treatment.

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## COMPLIANCE WITH ETHICAL STANDARDS

The article does not contain clinical studies or patient’s data.

## AUTHOR CONTRIBUTION

All authors have agreed to be accountable for all the aspects of work.

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