

The natural toothbrush

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The sources, properties and uses in dental and oral health of chewing sticks are outlined in the present article.

Chewing sticks were used by the Babylonians some 7000 years ago; they were later used throughout the Greek and Roman empires, and have been used by Jews, Egyptians and many other peoples. Today they are used in Africa, Asia, the Eastern Mediterranean Region and South America.

The commonest source of chewing sticks is *Salvadora persica*, a small tree or shrub with a crooked trunk. Its stems and roots are spongy and can easily be crushed between the teeth. Pieces of the root usually swell and become soft when soaked in water. In West Africa the lime tree (*Citrus aurantifolia*) and the orange tree (*Citrus sinensis*) sometimes provide chewing sticks. The roots of senna (*Cassia vinnea*) were used by American Blacks, and those of African laburnum (*Cassia sieberianba*) were used in Sierra Leone. Neem (*Azadirachta indica*) is widely used to provide chewing sticks in the Indian subcontinent.

Chemical composition, pharmacological properties and dental and oral hygiene

Chewing sticks contain trimethylamine, salvadorine, chlorides, fluoride in large amounts, silica, sulfur, vitamin C, and small quantities of tannins, saponins, flavenoids and sterols. The fluoride content is well known to be beneficial, and the silica present in many chewing sticks helps to clean the teeth, acting

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as an abrasive. Chewing sticks derived from the Rutaceae contain alkaloids that have a bactericidal effect. Those obtained from *Aegles marmelos*, *S. persica*, *A. indica*, *Fagara zantholoxoids* and some other plants contain essential oils and exert carminative, antiseptic and analgesic action. The tannins and resins in many chewing sticks have an astringent effect on the mucous membrane and form a layer over the enamel, thus giving protection against caries.

Certain chewing sticks, including those derived from *S. persica*, *A. indica* and *Accacia arabica* are active against several types of cariogenic bacteria frequently found in the oral cavity (1, 2), and many, among them those obtained from *Alnus glutinosa*, *Antidesma venosum* and *Azadirachta indica*, contain substances with a strong anti-inflammatory action on the gums. Extracts from some plants relieve toothache, local analgesic and anaesthetic properties having been demonstrated in *Fagara*, *Alchornea*, *Accacia* and other genera.

The effectiveness of topical fluoride preparations depends on their ability to wet the

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enamel and reach sites susceptible to caries, such as pits, fissures and interproximal areas. When chewing sticks are used the fresh sap that is released seems to meet these criteria. The chewing stick plants *Accacia arabica*, *Azadirachta indica*, *Juglan regia* and *Paku ijebu* contain 2.8, 1.0, 0.5 and 0.2 ppm fluoride respectively (3).

Plaque reduction

A study in Ghana indicated that there was more plaque and gingival bleeding in chewing stick users than in toothbrush users (4). However, no such difference was found among children aged 7–15 years in Tanzania (5). In trials with children in Ethiopia and adolescents in Nigeria, the chewing stick appeared to be as effective as the toothbrush in removing plaque (6, 7). Other studies have indicated that chewing sticks reduced plaque to varying degrees. Chlorhexidine was reported to be more effective than chewing sticks in plaque reduction; streptococci were eliminated in users of chewing sticks and were reduced in people using chlorhexidine (8). Chewing sticks are also apparently of value in reducing gingival inflammation occurring as a consequence of plaque reduction.

Gingival recession and occlusal wear

It seems doubtful that the high prevalence of gingival recession among adults in Tanzania is caused by the use of chewing sticks (9). However, it has been suggested that the frequent occurrence of this condition in Saudi children aged 10–15 years is attributable to the common use of chewing sticks (10). It was found that the daily use of chewing sticks on the same area of the mouth could produce gingival lesions, and that chewing stick users had deeper pockets on midfacial surfaces than toothbrush users. In another study, gingival inflammation occurred to a smaller degree in

people using chewing stick powder than in those using toothpaste.

Occlusal tooth wear in a young Saudi population has been reported as significantly correlated with the use of chewing sticks (11).

Toothpaste from chewing stick plants

Some chewing stick plants, most notably *S. persica*, have recently been used in the commercial manufacture of toothpastes in Egypt, India, Pakistan, Switzerland and the United Kingdom. The root and/or bark of *S. persica* contains 27% ash, alkaloids, resin and large amounts of chlorine and trimethylamine; silica, vitamin C and negligible quantities of tannins and saponins are also present (12). The high chloride content helps to remove tartar and stains from the teeth; the silica helps to whiten them; the resin may form a coating over the enamel, thus giving protection against decay; trimethylamine has a stimulatory effect on the gums; vitamin C contributes to the healing and repair of tissues; and the presence of sulfur compounds and possibly the alkaloid content lend antibacterial activity to the products.

Other uses

Chewing sticks clean not only the teeth but also the tongue. The juice extracted by the chewing process is reputed to have antibacterial effects (13). Chewing sticks are of value

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as jaw exercisers, notably following injuries to the jaw and temporomandibular joint, and in the reflex induction of copious saliva secretion, which is beneficial to both oral

hygiene and general health. Chewing sticks are often used to combat undesirable oral habits, such as smoking and thumb-sucking. They can also be used during the teething

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process. In Africa, children are usually introduced to the use of chewing sticks when 7–10 years of age. Chewing sticks are used by Muslims in religious rituals as well as for cleaning the teeth.

Preparation of chewing sticks

The chewing stick is a piece of wood averaging 1 cm in diameter and 15 cm in length. It is usually derived from the stems or roots of certain very fibrous plants having an agreeable taste. In *S. persica* there is a large amount of phloem and the widely spaced, thick-walled fibres in the pericycle of the root allow the spongy wood to be crushed easily by the teeth and softened. The xylem contains numerous thick-walled vessels and fibres.

Chewing sticks are sold in various diameters and lengths and can be further cut into suitable lengths by the user. A length of 20 cm for adults and 15 cm for children is recommended for convenience of grip and ease of manipulation. A diameter of 1 cm makes for suppleness and sufficient firmness.

Chewing sticks should be freshly cut so that they are supple, easily chewed, and still possessed of their active constituents. A very dry chewing stick can be expected to damage the gums and other oral tissues. If a stick is dry the end for chewing should initially be soaked

in fresh water for 24 hours. It should be noted that soaking for unduly long periods causes losses of active constituents and diminishes the therapeutic properties, although the mechanical effects on the teeth can still be expected to occur.

Before a chewing stick is used the end should be washed with water. It is then chewed repeatedly until the fibres stand out like the bristles of a toothbrush. These fibres can be cut off after each use of the stick or according to individual preferences. If possible the stick should be kept in a moist place when not in use.

How to use the chewing stick

The chewing stick is very similar to the toothbrush in that both have bristles and are used to remove plaque from the tooth surfaces mechanically. However, the chewing stick may also have a chemical action and may be chewed or sucked for several hours daily by some people.

The techniques employed for removing plaque mechanically are similar with the toothbrush and the chewing stick, e.g., vertical and horizontal brushing. However, these techniques are less important than people's attitudes, knowledge and manual dexterity.

Two basic holds have been described in order to ensure that a firm, controlled movement of the brush end of the chewing stick in the mouth is achieved and that every part of the oral cavity is reached with relative ease. They are indicated below.

- Five-finger grip
 - The four fingers of one hand are curled lightly round the stick, with the index finger nearest the end to be chewed.
 - The pulp of the thumb rests firmly on the opposite side of the stick to the index

finger; the thumb is thus in a higher position than the index finger. The thumb controls the movement of the stick and retains it in a firm grip. All tooth surfaces are accessible if the wrist or arm is moved as needed.

■ Three-finger grip

- The chewing stick is placed between the index and third fingers. The operative end of the stick is pointed upwards when the hand is in the supine position.
- The fourth and fifth fingers are kept clenched on the palm.
- The thumb rests on the side opposite the index and third fingers, where it assumes the dominant role and position.

The cleaning movement should always be directed away from the gingival margin of the teeth on both the buccal and lingual surfaces. An anterior-to-posterior scrubbing movement is used on the occlusal surfaces. Care should be taken to avoid damaging the soft tissues of the mouth. Satisfactory cleaning can be achieved if this procedure is followed for five minutes.

The tongue is commonly cleaned by users of chewing sticks, the object being to control bad breath and remove the white coating that develops on the dorsum of the tongue. This surface is usually cleaned by means of the brush end of the chewing stick, but better results are obtained by breaking the stick into a V-shape and scraping the resulting blade several times across the tongue.

When to use the chewing stick

Ideally, the chewing stick should be used before meals so as to remove the bacteria that convert sugar into acid, or immediately after meals. However, the latter is impractical, since the fall in pH and the associated damage occur within a few minutes, and 20 minutes

later the saliva performs the buffering action itself. It does not seem that the use of chewing sticks occurs regularly after meals. Many people use them in public places, while speak-

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ing, in bed, before breakfast, before going to bed, before prayer, and so on. To the more orthodox Muslim the use of the chewing stick is an important part of the ablutions before worship which takes place five times daily.

The use of the chewing stick conforms with the notion of primary health care and has long-established associations with certain cultural and religious beliefs.

The chewing stick can be a good alternative to the toothbrush as a means of preventing oral and dental diseases. It is suitable for cleaning all the teeth, it costs little, possesses various medicinal properties, is available in most rural areas of developing countries, and requires no expertise or special resources for its production. ■

References

1. **Akpata ES, Akinrimisi EO.** Antibacterial activity of extract from some African chewing sticks. *Oral surgery, oral medicine and oral pathology*, 1977, **44**(5): 717–725.
2. **Buadu CY, Bokaye Yiodom AE.** The antibacterial activity of some Ghanaian chewing sticks. *Ghana pharmacological journal*, 1973, **1**: 150–153.
3. **Dzink JL, Socransky SS.** Comparative *in vitro* activity of sanguinarine against oral microbial isolates. *Antimicrobial agents and chemotherapy*, 1985, **27**: 663–665.

4. **Norton MR, Addy M.** Chewing sticks versus toothbrushes in West Africa. *Clinical and preventive dentistry*, 1989, **11**: 11–13.
 5. **Normark S, Mosha HJ.** Relationship between habits and dental health among rural Tanzanian children. *Community dentistry and oral epidemiology*, 1989, **17**: 317–321.
 6. **Olsson, B.** Efficiency of traditional chewing sticks in oral hygiene programmes among Ethiopian schoolchildren. *Community dentistry and oral epidemiology*, 1978, **6**: 1105–109.
 7. **Sote EO.** The relative effectiveness of chewing sticks and toothbrush on plaque removal. *African dental journal*, 1987, **1**: 48–53.
 8. **Gazi M.** Photographic plaque assessment of the antiplaque properties of sanguinarine and chlorhexidine. *Journal of clinical periodontology*, 1988, **15**: 106–109.
 9. **Van Palenstein Helderma WH et al.** Cleaning effectiveness of chewing sticks among Tanzanian schoolchildren. *Journal of clinical periodontology*, 1992, **19**: 460–463.
 10. **Younes SA, El Engebawi MF.** Gingival recession in mandibular central incisor region of Saudi schoolchildren aged 10–15 years. *Community dentistry and oral epidemiology*, 1983, **4**: 246–249.
 11. **Johansson A, Freed K, Omar R.** Analysis of possible factors influencing the occurrence of occlusal tooth wear in young Saudi population. *Acta odontologica scandinavica*, 1991, **49**: 139–145.
 12. **Farooqi MIH, Srivastava JG.** The toothbrush tree (*Salvadora persica*). *Journal of crude drug research*, 1968, **8**: 1297–1299.
 13. **Lewis ME.** Plants and dental health. *Journal of preventive dentistry*, 1980, **6**: 75–80.
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Nutritional equality between the sexes

While adequate nutritional intake is important for all human beings and closely linked to patterns of morbidity and mortality, it is particularly important for girls and women. This is because of intergenerational and cumulative effects which permeate different phases of a woman's life. ... Nutritional equality between boys and girls, men and women must be addressed at both economic and cultural levels in order to deal with the technical issues of providing more nutritious food to girls and women, in addition to the social issues which keep girls and women in a secondary place on the nutritional ladder of the family. Indeed, women (and children) are among the first victims of malnutrition when prevailing beliefs, customs and/or legislation keep them in a position of inferiority.

- *Women's health: towards a better world. Report of the first meeting of the Global Commission on Women's Health. Geneva, World Health Organization, 1994: pp. 15, 16 (document WHO/DGH/94.4).*