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Journal of Dental Health Oral Disorders & Therapy

Editorial

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Can we eradicate dental caries?

Abstract

The primary, secondary and tertiary prevention include all the measures taken to reduce or eradicate the carious decay. Dental caries is a transmissible bacterial disease process caused by acids from bacterial metabolism, diffusing into enamel and dentine and dissolving the mineral. Cariogenic bacteria induce a number of demineralization and remineralization cycles. A high numbers of bacteria are contributing to the formation and accumulation of dental plaque (composed essentially by mutans *streptococci* and *lactobacilli*), inadequate salivary flow, insufficient fluoride exposure, poor oral hygiene, and inappropriate methods of feeding infants. Altogether these factors contribute to increase the number and severity of carious decay. Fluoride, antimicrobial agents (e.g. chlorhexidine), sugar substitutes and stimulation of saliva flow contribute to diminish or minimize dental carious lesions.

Keywords: cariogenic bacteria, dental plaque, de-and re-mineralization cycles, sugar substitutes

Volume 10 Issue 5 - 2019

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Received: September 12, 2019 | **Published:** September 16, 2019

Editorial

Microorganisms

Primary prevention includes all actions aiming to reduce the risk of new carious lesions. It uses individual prevention (food, hygiene, and vaccinations) and collective (drinking water distribution, waste disposal, food safety). This conception of prevention leads to a broad program improving the quality of life and reforming institutions, to assesses the dangers to humans of harmful work environments (toxic risk, lighting conditions, load handling, occupational stress and health) as well as physical or occupational constraints.

Secondary prevention includes all actions reducing the prevalence of caries in a population, and the progression of the decay. It takes into account the early detection of the first attacks. It **is** carried out by the medical surveillance of the workers: hiring medical and periodic visits. Workers benefit from enhanced medical surveillance in case of exposure to particular risks.

Tertiary prevention consists in preventing the risk of job loss for employees with a health problem related or not to their work. It reduces the prevalence or minimizes the functional disabilities resulting from the decay. This concept extends prevention to the field of rehabilitation, promoting professional and social reintegration.

The pH values of 4.0 are observed at the tooth surface within a few minutes following exposure to sugar. Lactic, acetic, and formic are the most commonly detected acids. The early colonizers of the tooth surface include members of the genera Streptococcus, Actinomyces, Haemophilus, Neisseria, and Veillonella. Consistent with the prevention of disease under the ecological plaque hypothesis, such acid challenges implies a reduced frequency to acid exposure. This could be achieved by

1. Inhibitors of food or drinks containing fermentable sugars.
2. The consumption of items that contain alternative sweeteners that are only weakly metabolized by oral bacteria.
3. Stimulation of saliva flow after the main meals.

Dietary factors

Significant changes in the environment lead to overgrowth of previously minor species. Such changes trigger changes from a "healthy," to a more "pathogenic" plaque. Dental plaque bacteria create their own hydrated exopolysaccharide matrix. They largely include glucans, which acts as a "glue". Sugar, especially sucrose, promotes this matrix formation.

A group of enzymes, known as the glucosyltransferases (GTFs), are produced on the tooth surface by specific species of oral bacteria, especially by the cariogenic mutans *streptococci* (SM). The acid-producing bacteria metabolize this sugar-producing acid at the tooth surface. Therefore, the cariogenic bacteria and sugars play an important role in plaque pathogenicity. When acid is formed in sufficient amounts that favor mineral dissolution from the tooth enamel, demineralization occurs and the tooth mineral is lost. The presence in pellicle of glucosyltransferases and fructosyltransferases in an active form, and other unidentified bacterial products is known for more than a decade. sM and other oral micro-organisms adhere effectively to glucan surfaces formed when pellicle is exposed to sucrose. Furthermore, there is a considerable degree of selectivity in the surfaces to which the various glucosyltransferases bind. Glucosyltransferase B sticks preferentially to oral bacteria. The reaction involves opening the proline ring and the acceptance of two protons from lactic acid, giving rise to delta amino valeric acid. As soon as the teeth erupt, the enamel surfaces are coated with a conditioning film containing molecules derived from both the host (primarily saliva) and bacteria. The early colonizers then grow and modify local environmental conditions, making the site suitable for colonization by more species. The later colonizers bind to the already attached species via similar adhesin-receptor mechanisms (a process termed co-aggregation or co-adhesion) (Table 1).

Table 1 Comparison of sweetness of various sweeteners to that of sucrose (sweetness of succrose)

1	Xylitol 1.0x
2	Sorbitol 0.6x
3	Malitol 0.9x
4	Mannitol 0.5x
5	Glycerol 0.6x
6	Monellin 3000x
7	Stevia 250x
8	Thaumatin 2000x

Sugars replacers or bulk sweeteners include the sugar alcohols, (also called polyols), sorbitol, mannitol, xylitol, isomalt, erythriol, lactitol, mantitol, hydrogenated starch hydrolysates, and hydrogenated glucose syrups. Polyols and other bulk sweeteners have potential advantages over sugar as food ingredients. Mutans streptococcal invertase splits sucrose into glucose and fructose, which are metabolised to produce mainly lactic but also other acids including acetic and formic acids. The resulting low pH alters the plaque ecology. A low pH in plaque is ideal for aciduric bacteria such as *streptococci*, *lactobacilli* and bifidobacteria as these microorganisms are more competitive at low pH than bacteria not associated with dental caries. The evidence shows that sugars are undoubtedly the most important dietary factor in the development of dental caries. The term 'sugars' refers to all mono and disaccharides while the term 'sugar' only refers to sucrose. The term 'free sugars' refers to all mono and disaccharides added to foods. The term 'fermentable carbohydrate' refers to free sugars, glucose polymers, fermentable oligosaccharides and highly refined starches.

Conclusion

Prevention program is based on plaque control and topical application of fluorides, and conventional caries therapy. After a 6 years follow-up and during the next 9 years period patients were recalled to see the efficiency of preventive sessions. Prevention actually contributes to the reduction or eradication of dental caries.[1–4]

Funding details

None.

Acknowledgement

None.

Conflicts of interest

The authors declare that there is no conflict of interest.

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