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Commentary

The Future of Caries Prevention: Innovations in Dentistry

Shimoda Mahdi*

Department of Odontology, University of British Columbia, Nova Scotia, Canada

ABOUT TO STUDY

Dental caries, or tooth decay, remains one of the most common chronic diseases globally, affecting individuals across all age groups. Despite significant progress in dental care, the prevention of caries continues to pose challenges. However, advances in caries prevention have seen remarkable strides in recent years, driven by technological innovation, improved understanding of oral health, and novel treatments. These advances are not only making prevention more effective but also more accessible, offering the potential to significantly reduce the prevalence of tooth decay worldwide.

The evolution of caries prevention

Traditionally, caries prevention relied on basic methods such as brushing with fluoride toothpaste, using dental sealants, and regular visits to the dentist for professional cleanings and checkups. While these practices remain foundational, new technologies and approaches have significantly enhanced the ways in which we can prevent tooth decay, shifting from reactive treatments to more proactive, personalized care.

Fluoride innovations: Fluoride has long been a cornerstone in caries prevention due to its ability to strengthen tooth enamel and prevent demineralization. In recent years, however, new forms of fluoride delivery have emerged. One notable development is the use of fluoride varnishes that can be applied directly to the teeth in higher concentrations during routine dental visits. These varnishes provide long-lasting protection against decay and are particularly effective for patients at higher risk of caries.

Additionally, fluoride-releasing dental materials, such as fluoride-based sealants and fillings, have become more common. These materials continuously release small amounts of fluoride over time, offering sustained protection from tooth decay, especially in deep fissures and areas that are harder to clean.

Dental sealants: Enhanced protection: Dental sealants have long been an essential tool in caries prevention, particularly for children and adolescents. These thin, plastic coatings are applied to the chewing surfaces of back teeth (molars) to protect them from the bacteria and acids that cause decay. Recent advances in dental sealants have led to more durable and longer-lasting materials that offer even better protection against caries. Some sealants now contain fluoride, which enhances their ability to remineralize the enamel and prevent cavities from forming.

Furthermore, the advent of resin-based sealants that bond more securely to enamel has improved the effectiveness of this preventive measure. These sealants can now be applied with greater precision and require less frequent replacement, making them a cost-effective solution for long-term dental health.

The role of Xylitol and antimicrobial agents: Xylitol, a natural sugar alcohol found in many sugar-free gum and oral care products, has gained attention for its role in caries prevention. Studies have shown that Xylitol can inhibit the growth of harmful bacteria in the mouth, such as *Streptococcus mutans*, which are directly responsible for the development of cavities. Regular use of Xylitol-based products can help reduce the incidence of dental caries, particularly in individuals who are at higher risk.

In addition to Xylitol, antimicrobial agents are being incorporated into oral care products to combat bacteria that contribute to tooth decay. Products containing chlorhexidine, for instance, can reduce the growth of cariogenic bacteria and decrease plaque formation, further aiding in the prevention of caries.

Advances in saliva testing and personalized prevention: One of the most exciting developments in caries prevention is the growing focus on personalized oral health care. Innovations in saliva testing now allow dental professionals to assess an individual's risk for developing caries by analyzing their saliva for

Correspondence to: Shimoda Mahdi, Department of Odontology, University of British Columbia, Nova Scotia, Canada; E-mail: mahdis@gmail.com

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the presence of cariogenic bacteria, pH levels, and other biomarkers. This testing enables the identification of individuals at higher risk of tooth decay, allowing for targeted preventive measures tailored to each patient's unique needs.

For example, saliva testing can identify people with low salivary flow (a condition known as dry mouth), which increases the risk of caries. These individuals may benefit from tailored interventions such as increased fluoride treatments, prescription-strength toothpaste, or saliva-stimulating therapies like gum or lozenges containing xylitol.

Technological innovations: Artificial intelligence and teledentistry: Emerging technologies such as Artificial Intelligence (AI) and teledentistry are also playing an increasingly important role in caries prevention. AI-powered software can now analyze dental images to detect early signs of caries that may not be visible to the naked eye, allowing for earlier intervention and more precise treatment planning. These technologies can even predict an individual's risk for developing caries based on their dental history and other factors.

In addition, teledentistry providing consultations and guidance remotely—has made it easier for individuals to receive professional advice on maintaining oral health, even in underserved areas or for those with limited access to dental care. Remote consultations can help monitor oral hygiene routines, provide recommendations on diet and products, and ensure that at-risk patients receive the preventive care they need.

Diet and nutrition: The power of preventive diet: Diet plays a vital role in the prevention of dental caries, and recent research has highlighted the importance of nutrition-based interventions in oral health. Reducing the intake of sugar-rich foods and beverages, which feed the bacteria responsible for tooth decay, remains a primary strategy. Additionally, calcium and phosphate-rich foods help to remineralize teeth, potentially reversing early stages of tooth decay before they develop into cavities.

The rise of oral probiotics is another promising development, as certain strains of beneficial bacteria may help balance the oral microbiome and prevent the harmful bacteria that cause caries from thriving.

CONCLUSION

The advances in caries prevention over the past few years are nothing short of transformative. From fluoride innovations and improved dental sealants to personalized care and technological breakthroughs, dental professionals now have a broader toolkit than ever before to prevent tooth decay and promote oral health. As these innovations continue to evolve, they will play a vital role in reducing the global burden of dental caries, offering individuals more effective, accessible, and personalized prevention strategies. With continued progress, we can expect to see even fewer cavities and a healthier population, making caries prevention a reality for all.