Biomaterials Journal
http://www.biomatj.com
Online ISSN: 2812-5045

Type of the Paper (Editorial)

Dental caries control using nanotechnology

Tamer M. Hamdy [1,*]

[1] Restorative and Dental Materials Department, Oral and Dental Research Institute, National Research Centre (NRC), Giza, Dokki, 12622, Egypt
* Corresponding author e-mail: dr_tamer_hamdy@yahoo.com

Citation: Tamer M. Hamdy. ***Dental caries control using nanotechnology***. *Biomat. J., 2 (6),1 – 2 (2023).*

https://doi.org/10.5281/znodo.5829408

Received: 25 June 2023
Accepted: 30 June 2023
Published: 31 June 2023

Abstract: In order to create new dental materials with cutting-edge qualities and anti-cariogenic potential, nanotechnology has been utilized in dentistry. Dentistry's current difficulties are with tooth decay prevention and cavity restoration. Due to their significant potential to limit biofilm accumulation, reduce the demineralization of the hard tooth tissues, and promote the remineralization process, recently discovered nanoparticles are now being used in preventative therapeutic agents and dental restorative materials. In this study, the advancement of nanomaterials for use in dental caries prevention and restoration is the main topic.

Keywords: Prevention dentistry; dental caries; nanotechnology.

The majority of adults and 60–90% of school-age children suffer from dental caries, which is the most common oral health condition impacting people globally throughout their lifetime. Small, chalky-white patches of demineralized, softened tissues on the enamel tooth surface are the first signs of dental caries and are typically difficult to discern because they are tucked away in fissures and grooves. The softer and more sensitive dentine layer is affected by untreated enamel caries, which causes more devastation. Periodontitis and gum recession may also be brought on by dental caries, which can similarly damage the root's cement [1].

Dental caries is caused by the action of cariogenic bacteria found in dental plaque on the tooth surface, which ferments carbohydrates found in foods and beverages and produces acids. The acids generated cause the calcium and phosphate in the tooth to become demineralized. In addition to buffering and neutralising the generated acids, normal saliva functions as a remineralizing agent, supplying a reservoir of minerals close to the enamel. Enamel undergoes numerous cycles of demineralization and remineralization every day. When this process is out of balance and demineralization occurs more frequently than remineralization, the enamel minerals are destroyed, which causes a cavity[2].

Dental caries prevention and minimally invasive treatment methods have taken centre stage in contemporary dentistry. Dental caries management entails both prevention and care for previously damaged and missing tooth tissue. Prevention is preferable to treatment. Fluoride and non-fluoride applications are just two examples of the many dental caries preventative treatments remineralizing chemicals that could be applied.

Enamel, dentin, or cementum of the tooth can be painted with fluoride varnish, which is normally a thick liquid that contains 5% sodium fluoride. Pit and fissure sealants, on the other hand, are a thin plastic coating applied to the teeth's occlusal surface to block plaque and acids from reaching the enamel. Fissure sealants and fluoride varnishes are regarded as successful occlusal surfaces caries prevention methods[3].

Unfortunately, dental caries is a condition that cannot be prevented, but it can be effectively minimised with dental and restorative care that closely adheres to approved caries prevention programmes. Removal of damaged tissue components and tooth replacement with suitable material are steps in the dental treatment of decaying teeth. Dental restorations are still required despite extensive efforts in oral health promotion and preventive measures. Due to the wide range of dental restorative materials currently on the market, several suitable materials, such as resin composite and glass ionomer and their variations [4], could be utilised to restore dental carious teeth. Lesions that develop caries at the borders of an existing restoration are referred to as recurrent caries. Recurrent caries is treated by replacing the compromised repair. It typically calls for prevention of both initial and recurrent caries. Therefore, great effort should be put into developing restorative materials that are highly effective and have anti-cariogenic qualities[5].

For the management of dental caries, nanotechnology, which deals with nanostructures at the nanometer scale (0.1–100 nm), offers novel methods. The biggest development in the therapeutic management of the missing enamel surface may come from remineralization. Nanotechnology was used to mimic the biomineralization process that naturally forms and repairs dental enamel. The main inorganic component of hard dental tissues is hydroxyapatite. The use of nano-hydroxyapatite as a preventive and therapeutic measure against tooth caries has significant potential. Dental materials' characteristics at the nanoscale are very different from those at the microscale. Newly developed nanoparticles can be employed to regulate the development of cariogenic biofilms and new tooth restorative materials [6].

Refernces

[1] R. H. Selwitz, A. I. Ismail, and N. B. Pitts, “Dental caries,” Lancet, vol. 369, pp. 51–59, 2007.

[2] C. Sicca, E. Bobbio, N. Quartuccio, G. Nicolò, and A. Cistaro, “Prevention of dental caries: A review of effective treatments,” Journal of Clinical and Experimental Dentistry, vol. 8. pp. e604–e610, 2016.

[3] S. M. Levy, “Pit-and-fissure sealants are more effective than fluoride varnish in caries prevention on occlusal surfaces,” Journal of Evidence-Based Dental Practice, vol. 12. pp. 74–76, 2012.

[4] W. Höland, V. Rheinberger, E. Apel, C. Ritzberger, F. Rothbrust, H. Kappert, F. Krumeich, and R. Nesper, “Future perspectives of biomaterials for dental restoration,” J. Eur. Ceram. Soc., vol. 29, pp. 1291–1297, 2009.

[5] L. L. Kirkevang, M. Væth, and A. Wenzel, “Incidence of caries lesions in approximal surfaces: A radiographic study of a general adult Danish population,” Caries Res., vol. 45, pp. 538–546, 2011.

[6] R. P. Allaker, “The Use of Nanoparticles to Control Oral Biofilm Formation,” J. Dent. Res., vol. 89, pp. 1175–1186, 2010.