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Inhibitory effects of nanocurcumin and curcumin on early oral biofilm formation

Geethanjali Ajith

Dental plaques or biofilm formations start with the acquired pellicle formation, a coating made of salivary glycoproteins, which immediately form after tooth-brushing. This coating helps in the adherence of bacteria to the tooth through receptors called adhesins. These bacteria are called primary colonisers. Streptococcus mutans, a facultative Gram-positive anaerobe is one of the major primary colonisers that lead to plaque formation. Dental plaques build-up can cause serious consequences, such as gingivitis and periodontitis that result in the formation of inflammatory lesions and bone destructions around the teeth. Therefore, there is a growing interest in tackling the root cause of the biofilm formation, i.e. inhibition of the adhesive properties of primary colonisers like S. mutans to enhance oral health and hygiene. Curcumin, a hydrophobic polyphenol compound has been showing great potential in several therapeutic applications in dentistry, such as relief from dental problems, anti-cariogenic property, prevention of plaque formation and gingivitis, etc. Recent studies have shown that, curcumin could inhibit the adhesiveness of S. mutans. However, curcumin is insoluble in water and it has limited bioavailability and instability, thereby restricting its clinical applicability. Hence, an effective alternative to improve the properties of curcumin is to encapsulate it in drug delivery systems, such as nanoparticles. Nanocurcumin can inhibit bacterial growth by attaching and damaging the bacterial cellular membrane, destroying the bacterial organelles, resulting in progressive lysis of the cells. Thereupon, extensive research in the usage of nanocurcumin and its therapeutic advantages can give promising results in the future of dentistry and medicine.

Keywords: Curcumin, Nanocurcumin, Streptococcus mutans, Oral biofilm, Adhesins, Glycoproteins

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