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Inhibitory Effect of Common Plant Flavonoid Cyanidin on Dental Biofilm

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Objectives This study aimed to investigate the effect of a key pigment component present in red barriers and fruits, cyanidin, on oral streptococci including commensal species and the main cariogenic pathogens, *Streptococcus mutans and Streptococcus sobrinus*.
Methods Minimum inhibitory concentrations, viability test, and biofilm susceptibility assay were determined to assess the antimicrobial and antibiofilm effect of cyanidin on oral streptococci. The structural analysis of biofilm was made by scanning electron microscopy (SEM) and confocal laser scanning microscopy (CLSM). The proportion of water soluble (WSG) and water insoluble glucans (WIG) in biofilms was determined by anthrone method. Lactic acid assay was also performed to investigate the effect of cyanidin on acidogenicity of moo-species and mixed multispecies streptococcal biofilm.
Results Biofilm inhibitory assay combined with microscopic analysis revealed a strong antibiofilm activity of cyanidin against both *S. mutans and S. sobrinus,* while it remains non-toxic for their cell viability. Essentially, cyanidin does not kill commensal streptococcal species such as *Streptococcus sanguinis*, *Streptococcus oralis*, *Streptococcus gordonii*, and *Streptococcus mitis*, the first colonisers of the tooth surfaces and the main antagonists of cariogenic bacteria. At the same time, dual-species biofilm of *S. mutans* and *S. sanguinis,* as well as mixed multispecies streptococcal biofilm revealed to be more susceptible to cyanidin treatment and less acidogenic in comparison to monospecies *S. mutans* biofilm.
Conclusions These observations provide promising insights into the antibiofilm properties of common plant flavonoid cyanidin, while laying out a framework for future therapeutic strategies targeting virulence factors of complex dental biofilms.