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# Effect of adsorption time on the adhesion strength between salivary pellicle and human tooth enamel

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## Abstract

Salivary pellicle is a biofilm that is formed by the selective adsorption of salivary proteins. Almost all the functions of the salivary pellicle (lubricating properties, anti-caries properties, etc) are closely associated with its adhesion strength to tooth surface. The objective of this study was to investigate the effect of adsorption time on the adhesion strength between salivary pellicle and human tooth enamel, aiming to understand what act as the determinant of the interfacial adhesion. In this study, human tooth enamel samples were immersed in human whole saliva in vitro to obtain a salivary pellicle on the surface of enamel. Immersion treatments lasting up to 1, 3, 10 and 60 min were conducted, respectively. Nano-scratch tests were conducted on the surface of enamel after different adsorption times. The wettability of enamel surface was measured through water contact angle. Results showed that the shear energy between salivary pellicle and enamel surface increased exponentially with the adsorption time. The adhesion force between salivary pellicle and bare enamel surface was more than twice that between salivary pellicle and salivary pellicle. It was found that both the wettability and zeta potential of enamel increased obviously after 1 min saliva-adsorption treatment, and then they almost kept stable as the adsorption time further increased. In summary, the adhesion strength between initial salivary pellicle and enamel surface was much higher than that between initial salivary pellicle and outer salivary pellicle. It seemed that electrostatic interaction contributed to the adhesion between the initial salivary pellicle and enamel surface, but not to the adhesion between the initial and outer salivary pellicle. The results would be helpful to extend the understanding of the adhesion mechanism of salivary pellicle and then to develop new artificial saliva and dental restorative materials.

**Keywords:** Human tooth enamel, Salivary pellicle, Adhesion strength, Adsorption time

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