An In-Vitro Study to Determine Anti-Caries Efficacy of Fluoride Varnishes

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Fundamental research on fluoride varnishes (FV) and how different formulations affect adherence to teeth, fluoride release into saliva and uptake by teeth is virtually non-existent. The objective of this in vitro study was to investigate the anti-caries efficacy of five commercially available FV: Enamel Pro® Varnish Clear, Flor-Opal® Varnish White, MI Varnish™, PreviDent® and Vanish™. Ninety bovine enamel specimens (4x4mm) were prepared and assigned to five groups (n=18). Early caries lesions were created in the specimens and characterized using Vickers microhardness (VHN). FV was applied to each group of specimens. Immediately afterwards, 7.5ml of artificial saliva (AS) were pipetted over each group, collected and renewed every 15min for 6h. AS samples were analyzed for fluoride using a ion-specific electrode and meter. FV was removed using chloroform and part of the specimens protected to determine enamel fluoride uptake (EFU) using the acid etch technique. Each group was then subjected to pH cycling consisting of a 4h/day acid challenge and two, one-minute treatments with Crest Cavity Protection. Post-pH cycling microhardness was measured and compared to baseline values to determine the ability of the FV to enhance remineralization/prevent demineralization. One-way ANOVA was used for data analysis ($p<0.05$). Specimens treated with Enamel Pro® revealed an increase in VHN that was significantly higher than all other groups. There was no significant difference in ΔVHN for Flor-Opal® compared to MI Varnish™, PreviDent® and Vanish™. Specimens treated with MI Varnish™ showed significantly higher ΔVHN than Vanish™ only. No significant difference in EFU was found among groups. Total fluoride release over 6h was MI Varnish™(303µg/ml) > Enamel Pro® (217µg/ml) > Flor-Opal® (153µg/ml) > PreviDent® (84µg/ml) > Vanish(28µg/ml). In conclusion, anti-caries efficacy (measured through EFU, fluoride release and VHN) differs among FV products and this difference may be attributed to different composition, fluoride source and other active ingredients.

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