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**Microstructure of Subsurface Enamel Lesions Treated With Fluoride Varnish**

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**Objectives** We have previously reported that the application of fluoride varnish did not promote remineralization in subsurface lesions, but improved acid resistance in the deeper zone. To investigate in more detail, in this study, fluoride varnish was applied to bovine enamel subsurface lesions, and the microstructure was observed before and after demineralisation and compared with that of specimens with no fluoride treatment and with multiple treatments with fluoride mouth-rinse.

**Methods** Bovine enamel subsurface lesions were prepared by using a lactic acid gel system for 10 days. The specimens were subjected to single application of fluoride varnish (W: Clinpro White Varnish F, 3M Oral Care), immersion in a fluoride mouth-rinse (M: Miranol, Bee Brand Medico Dental) for 10 min twice a day for 3 days, or no fluoride treatment (Control), and were stored in a saliva reference mineral solution for 3 days, except when being treated. The specimens were then immersed in artificial decalcifying solution for 3 days. Cross-sections before and after the final demineralisation were observed using a scanning electron microscope.

**Results** Before demineralisation, an acid-etching pattern with preferentially removed prism peripheries was visible in the subsurface lesion in all groups. After demineralisation, in groups W and M, an acid-resistant zone was observed below the subsurface lesion, and a second lesion below it. In part of this second lesion, a pattern of hollowed prismatic cores and relatively intact prismatic peripheries was found. The acid-resistance zone and distinctive demineralization pattern were not found in the control group.

**Conclusions** It was found that a characteristic etching pattern with selective demineralisation of the prismatic core occurs below the deeper layer of the enamel subsurface lesion where acid resistance has been improved by fluoride varnish or fluoride mouth-rinse.