Fluoride release from a glass ionomer cement

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ABSTRACT — The release of fluoride from a glass ionomer cement (ASPA®) was compared with that from a silicate cement. Test specimens were shaken in a solution with hydroxyapatite for 7 weeks. The solution was changed every week and the fluoride taken up by the hydroxyapatite measured. The specimens released considerably more fluoride during each of the first 2 weeks than during each of the subsequent 5 weeks. The continued release did not decrease very much with time. Slightly more fluoride was released from the glass ionomer cement than from the silicate.

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A glass ionomer cement which adheres chemically to enamel and dentin has been developed for filling gingival toothbrush abrasions and preventively opened “sticky” fissures. In these cases especially, a fluoride effect like that of silicate cement would be desirable. The glass ionomer cement contains fluoride but the solubility of the material in the oral fluids is less than that of silicate cement (KENT, LEWIS & WILSON 1973), which may have an influence on the release of fluoride. The purpose of the present study was to determine the release of fluoride in vitro from a glass ionomer cement compared with that from a silicate cement.

Material and methods

Test specimens (measuring 2 x 2 x 12 mm³) were made of the glass ionomer ASPA® (Amalgamed Dental, London, England) and of silicate cement (Biocap®, Gebr. De Trey A.G., Zürich, Switzerland) according to a method described earlier (FORSTEN & VALIAHO 1971). The materials were handled according to the manufacturer’s instructions and after hardening the specimens were covered with a layer of vaseline to prevent dehydration. The determination of the fluoride content of the powders and the release of fluoride from the specimens has been described earlier in detail (FORSTEN & PAUNIO 1972). To recapitulate, the specimens were shaken in a 10-ml 0.01 M phosphate buffer solution (pH 6.8) together with 100 mg synthetic hydroxyapatite. The solution with the hydroxyapatite was changed every week, and the apatite was analyzed for fluoride. No fluoride could be found in the supernatant (FORSTEN 1976). Six samples were made of each material and the results were compared using the Student’s t-test.

Results

The fluoride content of the silicate powder was 73.6 µg/mg and of the glass ionomer powder 132 µg/mg.
The release of fluoride from both materials as indicated by the increased fluoride content of the hydroxyapatite was much greater during the first 2 weeks than during each of the subsequent 5 weeks (Fig. 1). The continued release did not seem to decrease very much with time. The glass ionomer cement released more fluoride than the silicate, the differences being statistically highly significant \((P < 0.001)\) during the 3rd, 4th and 5th weeks.

**Discussion**

It may be assumed that the amount of released fluoride is dependent on the fluoride content and the possible dissolution of a filling. The relationship between these two factors is not quite clear. In an earlier study (FORSTEN & PAUNIO 1972) continued release of fluoride was shown from an almost insoluble composite resin to the same extent as from easily dissolving silicates. The present study shows more release from the less soluble glass ionomer cement than from the silicate. The composite and the glass ionomer powders contained more fluoride than the silicates, which may at least explain the greater release from the less soluble glass ionomer cement compared with that from the studied silicate.

If there is a fluoride release from test specimens an uptake of fluoride from the material into human enamel would be expected. Yet an earlier study failed to show such an uptake from the fluoride-containing composite (FORSTEN, RYTÖMAA, ANTTLA & KEINONEN 1976). Preliminary results have, however, shown a statistically significant increase of fluoride in enamel of extracted human teeth that had been in contact with the glass ionomer cement for 2 weeks (mean increase 2,258 parts/\(10^6\), \(0.005 > P > 0.001\)). Thus it may be justified to expect a cariostatic effect of the glass ionomer cement.

**References**


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