Effect of various pH of lactic and citric acids on fluoride release from two different fluoride emitting restorative materials

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The increasing availability of adhesive materials and techniques has improved the capability of the restorative dentist to treat caries in a conservative manner. While amalgam continues to be used as a restorative material worldwide, its lack of innate bonding capability makes it generally unsuitable for the restoration of the minimal lesion because the achievement of adequate resistance and retention form for such an amalgam restoration may require removal of considerable amounts of sound tooth substance. The use of materials that may be bonded to tooth substance is therefore encouraged.

Since the observation that secondary caries formation was rarely associated with fluoride-containing silicate cement restorations, increasing attention has been focused on the development of various fluoride-releasing products, to be used as restorative materials, lining cements, sealants and orthodontic cements.

Fluoride is well documented as an anticariogenic agent. A variety of mechanisms are involved in the anticariogenic effects of fluoride, including the reduction of demineralization, the enhancement of remineralization, the interference of pellicle and plaque formation and the inhibition of microbial growth and metabolism [(1–4)]. Fluoride released from dental restorative materials is assumed to affect caries formation through all these mechanisms and may therefore reduce or prevent demineralization and promote remineralization of dental hard tissues.

Today, there are several fluoride-containing dental restoratives available in the market including glass-ionomers, resin modified glass-ionomer cements, polyacid-modified composites (compomers), composites

and amalgams. Due to their different matrices and setting mechanisms the products vary in their ability to release fluoride. However, it is assumed that the antibacterial and cariostatic properties of restoratives are often associated with the amount of fluoride released.

Glass-ionomer cements may have the benefit of fluoride release, although the effect of this on reduction of secondary caries is presently the subject of debate. These materials may have the benefit of less technique-sensitive placement as compared to resin composite [(5).]

The elution of fluoride is a complex process. It can be affected by several intrinsic variables, such as formulation and fillers of the different restoratives. It is also influenced by experimental factors, such as, storage media, frequency of change of the storage solution, composition and pH-value of the storage solutions [(6)].

The aqueous phase of glass ionomer cements enables fluoride ions to diffuse and to be released from the material. The matrix of resin composites is much less hydrophilic, and fluoride incorporated in the material is only released in small amounts [(7)].

The initial fluoride release from all types of glass-ionomer was maximum during the first 24 hours and then decreased [(8)].

The simultaneous release of fluoride and aluminum from dental materials in various acidic media must be taken into account when the anticariogenic potential is assessed [(9)].