THE PROTECTIVE EFFECTS OF FUJI VII ON ENAMEL-A PILOT STUDY

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ABSTRACT

Introduction

The quest was to investigate the claims made regarding the surface protective effect of Fuji VII on dental enamel, in particular on vulnerable erupting teeth. This was of clinical importance considering the demonstrated potential of glass ionomer cements to enhance remineralization and inhibit demineralization. It would be an advantage especially in developing countries to be able to use this material as part of the prevention program to reduce caries prevalence.

The aims of this study were:

1. To investigate whether a coat of Fuji VII on enamel can prevent formation of a carious lesion when challenged with acidic solution.
2. To evaluate the effect of a Fuji VII coat on an incipient carious lesion when exposed to remineralizing solution, and to answer the question, 'will it inhibit or enhance the remineralization process within the enamel lesion'?
3. To evaluate whether the presence of a Fuji VII coat over an incipient carious lesion can prevent the progression of the lesion when further challenged with an artificial caries acidic solution. Finally, assuming that some degree of remineralization of existing initial lesion under Fuji VII coat is achievable, to determine whether there would be any changes to the mineral profile when the same lesion is further exposed to demineralizing solution.

Materials and methods

Three sets of experiments were carried out *in vitro,* trying to simulate the condition under which Fuji VII would be used in the mouth as closely as possible. For the

first experiment, 15 molar teeth were sectioned mesio-distally then bucco-ligually to produce four sections of enamel. Only two buccal sections were selected and painted with varnish to leave exposed windows. One section of the tooth was painted with Fuji VII and the other section left uncoated. All sections were immersed individually in artificial caries demineralizing solution at 37°C and sets of five pairs removed after 14, 28 and 42 days of exposure. The depth of demineralization lesions was determined using Scanning Electron Microscopy (SEM).

The second experiment involved sectioning five molars. The crowns were sectioned longitudinally into four segments as described previously in which 14 day lesions had been generated to permit four categories of exposure to various treatments. Two of each four sections had Fuji VII coated. After 35 days in the remineralizing solution, the sections were prepared to permit examination using Electron Probe Micro-Analysis (EPMA) to determine whether there was evidence of increased uptake of selected mineral ions from the remineralizing solution into the demineralized lesion.

The third experiment again used similar sections of enamel in which 14 day lesions had been generated, though all coated with Fuji VII. One section was challenged with artificial caries acidic buffer alone and another one had been exposed to remineralization solution for 35 days, then subjected to a further acidic challenge. All sections were prepared for EPMA to permit determination of whether further acidic challenge increased the lesion depth or resulted in any changes in profiles of mineral distribution.

Results. The results revealed that no carious lesion is formed on intact enamel when a Fuji VII coat is used to seal it, even following 42 days of acidic challenge. In

unprotected enamel, lesion depth of 191.4μm, 393.2μm and 422.0μm were recorded after 14, 28 and 42 days exposure to acidic challenge respectively.

Furthermore, there is a potential for remineralization to take place even in the presence of a Fuji VII layer but to a limited extent. This is demonstrated by an increase in the level of calcium uptake in the section coated with Fuji VII though the increment noted is small.

Little or no further mineral loss was noted in those lesions protected by Fuji VII coatings exposed to further acidic challenge, though again with differing results between samples. Those samples that were first remineralized before subjected to further acidic challenge also showed a positive result of remineralization with little evidence of further demineralization.

Conclusions. A coating of Fuji VII was confirmed to prevent caries formation in this *in vitro* study even following 42 days of demineralization challenge. Within the limitation of the small number of samples providing the results for Experiments 2 and 3, there was evidence that Fuji VII could allow diffusion of calcium, phosphorus, and fluoride ions into underlying incipient caries lesions, which remained unaffected by further acidic challenge. However this was not consistent between teeth specimens. A number of aspects of the role and mechanism of action of Fuji VII need further investigation, though involving much larger sample numbers.