Kinetics of early stages dissolution of human enamel in acid drinks

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Fruit juices and candies with high concentrations of citric acid and carbonated beverages are the usual extrinsic dietary agents of dental corrosion. Infrequently reported is the acid corrosion caused by wine. Wine derives its acidity mostly due to the fruit-acid content, especially tartaric, malic acid, and from smaller concentrations of citric and succinic acids. The dental erosion in wine is a long-term process appearing in the case studies of wine tasters, winemakers or judges. Reproducing intra-oral conditions is not possible *in vitro*. Several models and techniques have been proposed to acquire data for discussing mechanisms of dental corrosion or its influence on the mechanical properties (microhardness, wear). In this study dynamic test conditions are proposed to evaluate kinetics of enamel corrosion in white wine at simulated body temperatures. The initial dissolution rates are determined on the basis of the solution chemistry, and the influence of corrosion on morphology, and structural changes is discussed. Content of main (Ca, P, Mg, K, Na), and minor (Al, Cu, Fe, Mn, Zn) components in the corrosion solution of white wine, and chemical composition of enamel was determined by atomic emission spectrometry in inductively coupled plasma (ICP-AES). Comparison of the results from chemical analysis of enamel and the used corrosion solution (white wine) showed that the content of minor components, such as Al, Na, Mg, Zn, leached into the corrosive solutions from enamel, is overlapped by the matrix of white wine. The chemical resistance of enamel in wine was therefore monitored only through determination of major components of enamel, i.e. calcium and phosphorus. Time dependences of normalized leaching values of phosphorus and calcium NL(P) and NL(Ca) are comparable, which refers to congruent dissolution of hydroxyapatite as the main component of natural teeth. Significant influence of corrosion on chemical damage of tooth enamel, its decalcification and significant deterioration of micromechanical properties was detected.