

93.

Investigation of Ion Release from Ni-Cr Alloy in Various Acidity Conditions

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Cytotoxicity is in direct correlation to the level of ion release, with non-precious alloys having higher ion release than that of precious alloys. The most often used non-precious dental alloy is Ni-Cr alloy.

The aim of the investigation was to determine the type and quantity of ions released from Ni-Cr alloy (Wiron 99(r), Bego, Germany), in acid solutions with different pH values, and to determine the influence of the type of acid solution, its pH value, and duration of interaction on ion release. The overall sample consisted of 180 pieces of Ni-Cr alloy, 60 samples submerged in each of three different solutions (buffered phosphate solutions pH 3.5 and pH6, and lactic acid solution pH 3.5). Quantity of ion release was measured on solution samples taken at 10 different time intervals by means of the ICP-AES method.

Average release of Ni ions in lactic acid solution was 432.42 µg/L, while the highest average Ni⁺ ions release of 541.67µg/L was measured in buffered phosphate solution pH 6.0. MANOVA demonstrated significant influence of the type of solution on Ni ion release ($p < 0.01$), while the time of exposure was not a significant factor ($p = 0.23$). Zn ions demonstrated the lowest average ion release (88.95 µg/L, phosphate solution pH 3.5). Statistically significant influence of the type of solution and pH value on ion release was determined, except for chromium ions ($p < 0.05$). Dentobacterial plaque acidity is sufficient to start corrosion of Ni-Cr dental alloys.

94.

Quantity Evaluation of the Release of Heavy Metal Ions; Voltamperometric Study

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In recent years there has been an decrease in the use of non-precious casting alloys in dentistry. These materials offer many physical, chemical and financial advantages. In order to achieve the necessary mechanical and physical properties, the alloys often contain metals which are known to be biologically active. We have continued and expanded our research into the release of these heavy metal ions by concentrating on the processes that occur when two different alloys are together in the same environment.

The aim of this study was to evaluate and compare the influence of one, two or three different non-precious alloys on the degree of release of the selected ions, which are their components.

An analysis of the alloys Remanium G-Weich, Remanium CS and Remanium GM 380 was made both individually or in combinations of two samples, which were prepared from these alloys. One of the metal samples was prepared in the laboratory in the shape of a cylinder from Cr-Ni, Cr-Co, Ag-Pd. The size of the samples, their shape, length and weight were matched. These elements were placed in an incubator of a definite time of permeability and 25 ml of the artificial saliva at a temperature of 37° C was poured. They were then transferred to an incubator at the same temperature and left for 1, 2, 4, 6, 7 and 30 days, after which the released ions Cr, Co, Ni were evaluated by means of inversion voltamperometry. The amount of nickel released into the artificial saliva from chrom-nickel alloys in combination with silver-palladium alloy was increased. The release of chromium and cobalt was detected and depended on the proportion of these ions in the alloy compositions. Exact results are given in tables and diagrams.