Cisplatin-chemotherapeutic Drug Interactions with the Surface of Some Metal Bioimplants in Physiological Serum

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The effect of cisplatin-chemotherapeutic drug (CisP), IUPAC name: azanide; dichloroplatinum(2+), on materials used as bioimplants, namely 304L stainless steel (SS) and titanium was investigated in physiological serum (PS) using the cyclic voltammetry, the potentiodynamic polarization and the electrochemical impedance spectroscopy (EIS) associated with UV-Vis spectrophotometry. The experimental data were reported to those obtained for platinum electrode, as the comparison and discussion standard. It has been established that the cisplatin-bioimplants interactions are dependent on the substrate, highlighting weakly CisP-SS links, moderate CisP-Ti bonds, the strongest being CisP-Pt interaction. The electrochemical measurements showed that, the presence of CisP in the physiological serum leads to degradation of the bioimplant surface, affecting the material/electrolyte interface layer, but the platinum surface does not have susceptibility to the drug. UV-Vis spectrophotometry showed that, after successive electrochemical measurements CisP was degraded, the highest electrochemical instability being recorded on 304L stainless steel. Corroborating the results of electrochemical and spectrophotometric measurements revealed the following types of interactions: hydrogen/chlorine bridges are established between CisP and SS; the CisP-Ti_xO_y links are most likely to occur in the titanium case; metal-metal bonds in the case of platinum electrode.

Keywords: cisplatin; bioimplant; interaction; electrochemical measurements; UV-Vis spectrophotometry.

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