Electrochemical Screening Spot Test Method for Detection of Nickel and Cobalt Ion Release From Metal Surfaces

**Background**

Present screening methods to rapidly detect release of nickel and cobalt ions from metallic surfaces involve colorimetric dimethylglyoxime (DMG)- and disodium-1-nitroso-2-naphtol-3,6-disulfonate-based spot tests with a cotton bud. There is a risk of false-negative test reactions because test outcomes are dependent on the pressure, area, and duration of surface wiping.

**Objective**

The aim of the study was to develop a miniaturized electrochemical device that uses a voltage to accelerate nickel and cobalt release from the tested item and perform an initial validation.

**Methods and Results**

A device was built in plastic, and its performance was investigated using 0.5 mL of test solutions of, respectively, DMG and disodium-1-nitroso-2-naphtol-3,6-disulfonate. Cotton buds that had been wetted in test solution were pressed against different metal surfaces at various voltages (0-9 V) and a range of test durations (0-120 seconds). Duplicate testing for nickel and cobalt release was also performed on a sample of 163 jewelry items.

**Conclusions**

This novel electrochemical device makes it possible to perform nickel and cobalt ion release testing without rubbing, thereby reducing interindividual differences in testing technique. The nickel testing with the device seemed to be superior to conventional DMG spot testing.