Nickel-plated steel coins: the risk to the nickel-allergic public needs wider consideration

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Handling nickel has been known for some time to pose the risk of hand dermatitis to those who are allergic to the metal (1) and suspicion has grown that coins may contribute to this (2–4). Improvements in techniques have better quantified the skin levels of nickel required to elicit an allergic reaction (5, 6). On a European level, attempts have been made to minimize the risks through the Nickel Directive and REACH, its successor from 2009 (7, 8).

The UK’s Royal Mint introduced into circulation nickel-plated steel 5 and 10 pence coins in early 2012. In a press release the Royal Mint state that they have conducted a standard test for the release of nickel that is defined by European Commission Regulation 1907/2006 (9). This is the EN 1811 reference test for the release of nickel over a 7 day period which basically is designed for the assessment of items that would be in constant and prolonged skin contact, e.g. jewellery, watches and buttons (10). The Royal Mint does not state its actual results but concluded that ‘there is no increased risk to people from handling the new nickel-plated steel 5 and 10 pence’. The EN 1811 test though does not reproduce the effects of the repeated short exposures that occur with the handling of coins and cannot be regarded as an assessment of the in-use situation for coins.

One of the well-recognized features of coin handling is that there is a rapid increase in the skin levels of nickel on handling the coins seen over a short time of seconds to minutes (6). Thus a true test for risk assessment in this area is one that reproduces as near as possible the situation found in day-to-day handling of coins by professions such as cashiers or bank workers (and consumers), supported by the measurement of nickel levels on the skin surface over time points.

Julander and colleagues (pp. 323–330) sought to make a realistic assessment of nickel skin levels that may occur with the repeated handling of the newly-introduced nickel-plated 5 and 10 pence British coins (comparing them with the previous cupro-nickel coins). In the study, 6 volunteers handled the coins for periods of 1 hr and the quantities of nickel on the fingers were measured using acid wipe sampling of defined skin areas. The average amount of nickel on the skin after handling nickel-plated coins for 1 hr was 7.5 μg/cm² compared to 1.8 μg/cm² for fresh samples of the cupro-nickel coins. This level of nickel deposited onto the skin in 1 hr is well in excess of the 1 week upper limit (of 0.5 μg/cm²) of nickel release from items, as specified by REACH.

Coins are individually handled for seconds or minutes. It is therefore of interest to know the quantities of nickel that coins release over these time periods. Julander and colleagues compared the amounts of nickel released by coins using the EN 1811 test over 2 min, 1 hr, 24 hr and 1 week. As anticipated, the rate of release was highest over 2 min and lowest over 1 week, reaffirming the necessity to study short period activity in this situation. Nickel release was greater for the cupro-nickel coins than for the nickel-plated coins by this test. This confirms the appropriateness of the 1 hr coin-handling tests that tried to replicate the in-use situation. The explanation of the apparent paradox is that the surface of the nickel-plated coins is covered by a layer of nickel oxide/hydroxide whilst the cupro-nickel coins are covered by a mixed oxide of copper and nickel (which is the natural behaviour of metals and alloys): hence, less nickel is available to be deposited onto the skin when handling cupro-nickel coins.

The average values of nickel seen on the skin after handling nickel-plated coins for 1 hr (7.5 μg/cm²) are in excess of the 0.035 μg/cm² nickel needed as a twice daily open application during a week to induce dermatitis in 20% of nickel allergic subjects (11). The present study supports the notion that nickel-plated coins have an even greater potential than cupro-nickel coins to cause dermatitis in coin-handlers and in consumers who are nickel-allergic. General practitioners and public health regulators as well as dermatologists need to be aware of these risks.

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References


