December 2002

Phys. Chem. News 8 (2002) 131-132 PCN

Comments on misleading statements concerning nickel release from 1- and 2-euro coins and the performance of the Swiss franc

P.-G. Fournier[1], J. Fournier[1], M. Monkade[2], M. Abani[2], K. Berrada[3], T.R. Govers[4]*

[1] *Laboratoire de Spectroscopie de Translation, Bât. 478, Université Paris-Sud, Orsay, France*

[2] *Département de Physique, Faculté des Sciences, Université Chouaib Doukkali, El Jadida, Morocco*

[3] *Département de Physique, Faculté des Sciences Semlalia, Université Cadi Ayyad, Marrakech, Morocco*

[4] *Aecono Consulting, 59, rue de Prony, Paris, France*

** Corresponding author. E-mail: thomas.govers@wanadoo.fr*

Received : 27 October 2002; revised version accepted : 29 November 2002

Abstract

Comments are made on a recent study entitled "High nickel release from 1- and 2-euro coins" [1], which gives the misleading impression that these coins do not comply with European regulations and pose an increased risk of nickel allergy. To the contrary, handling tests which simulate the common manipulation of coins show a decrease in nickel contamination both in comparison to pure-nickel pieces as to copper-nickel coins such as the Moroccan dirham and the Swiss franc.

Keywords : Allergy; Nickel; Manipulation; Euro; Dirham; Franc.

In a communication recently published in the British journal *Nature*, Nestle et al. [1] claim that "the actual release rate of nickel from the present 1- and 2-euro coins exceeds the value acceptable for prolonged contact with human skin (as defined by European Parliament and Council Directive 94/27/EEC [2]) by a factor of between 240 and 320".

This statement is misleading because of several reasons. Firstly, the quoted "nickel directive" does not apply to coins, but to objects intended to come into direct and prolonged contact with the human skin [2]. Secondly, Nestle et al. omitted to apply the correction factor of 10 which the normalised test EN 1811 [3] prescribes to compare nickel release data with the 0.5 µg per cm^2 and per week upper limit set by the nickel directive (see EN 1811 §7 and annex A of ref. [3]). Thus the "factor between 240 and 320", if the comparison had been relevant, should have read "between 24 and 32".

Thirdly, and more importantly in our opinion, the tests carried out by Nestle et al. do not answer the question how much nickel is transferred to the hands during the manipulation of coins. Given the short time-scale involved (typically less than 3 seconds) and the small liquid volumes available (a fraction of a ml, even for sweaty hands) contamination during handling is dominated by friction rather than by dissolution. Tests which ignore friction underestimate contamination by every-day handling and lead to erroneous conclusions. Rubbing under the shower is more effective than simple soaking, and, as pointed out in the 1974 study by the London police, "metal traces were best removed by mechanical action rather than by any solvation process" [4].

The importance of friction in evaluating nickel contamination was shown in a paper published in the June 2002 issue of this Journal [5] and further demonstrated in a publication that details the manipulation test used to simulate the common handling of coins [6]. In the latter paper we also suggested that the higher nickel release rates observed in long-term leaching tests with the 1- and 2-euro coins may be due to the enhancement of electrochemical corrosion by their bi-metallic structure, as claimed independently by Nestle et al. [1]. It should be noted that this effect may also lead to an overestimation in the corrosion measurements which Nestle et al. carried out on the separated white inner "pill" of the 1€ coin, as the physical separation from the yellow outer ring exposes the pure-nickel core in juxtaposition with the Cu75Ni25 outer cladding.

Contrary to long-term leaching tests, realistic coin-handling tests show that the 1- and 2€ coins transfer about 2 times *less* nickel during manipulation than the former pure-nickel French franc pieces, while their surface-averaged surface content is about 6 times lower. A complementary study submitted for publication compares a "basket" containing ten of each of the eight franc denominations with the analogous complete set of euro coins. We find that the euros transfer 4 times *less* nickel to the hands than francs [7].

It is legitimate to claim that the risk of nickel allergies due to the manipulation of coins could have been further reduced by using no nickel in any of the euro denominations. It is difficult to imagine however, that a lowering in nickel contamination resulting from the introduction of the euro could lead to an enhanced risk of nickel allergy, unless the simultaneous increase in copper contamination should be responsible for unexpected synergistic effects [8]. We are not aware of any confirmation of such behaviour and conclude that the introduction of the euro has *decreased* the risk of nickel allergies in countries that previously used nickel and nickel-alloy coins. We find it regrettable that conclusions based on tests that are not representative of contamination during the handling of coins are being given widespread publicity claiming an increased allergic risk.

We note in conclusion that the remark by Nestle et al. as to the better visual performance of the Swiss franc has no significance in regard to nickel contamination. The 1SFr coin is composed of a Cu75Ni25 nickel alloy, as are the Swedish 1Kr investigated nearly 30 years ago by Pedersen et al. [9], and several of the coins examined in the comprehensive study by Lidén and Carter [10]. These authors showed that such nickel-alloy coins release more nickel in prolonged water- or sweat-based leaching tests than do pure-nickel pieces. There is no reason for the Swiss 1SFr to behave any differently in that regard. Handling tests with different Swiss copper-nickel pieces yield nickel contamination values between 0.30 and 0.75 μg per manipulation, comparable to the 1987 Moroccan dirham (0.33 ± 0.08 μg) and the pure-nickel French 2F (0.40 ± 0.06 μg), and higher than the 2€ result, 0.23 ± 0.06 μg. From a nickel contamination point of view, the euro does better than the Swiss franc.

Acknowledgments

We thank the Comité Mixte Inter-Universitaire Franco-Marocain (Grant AI 99/186F/SM and grant MA 02/39-2002), Scientartphie Environnement, and the Marionnaud company for financial support.

References

[1] F.O.Nestle, H.Speidel, M.O.Speidel, Nature, 419 (2002) 132.
[2] European Parliament and Council Directive 94/27/EEC, JO CE L188 (1994) 1.
[3] JO CE C205 (1999) 5: EN 1810 (1998), EN 1811 (1998), EN 12472 (1998).
[4] G. D. Hudson, S. J. Butcher, J. Forens. Sci. Soc., 14 (1974) 9.
[5] P.-G. Fournier, T. R. Govers, M. Abani, H. Boughaleb, M. Monkade, Phys. Chem. News, 6 (2002) 82.
[6] P.-G. Fournier, T. R. Govers, J. Fournier, M. Abani., C. R. Physique, 3 (2002) 749.
[7] P.-G. Fournier, T. R. Govers, accepted for publication in Contact Dermatitis.
[8] B. Santucci, A. Cristaudo, M. Valenzano, E. Camera, M. Picardo, Contact Dermatitis, 40 (1999) 281.
[9] N. B. Pedersen, S. Fregert, P. Brodelius, B.Gruvberger, Acta Dermatovener, 54 (1974) 231.
[10] C. Lidén, S.Carter, Contact Dermatitis, 44 (2001) 160.