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The electronic cigarette: the new source of nickel contact allergy of the 21st century?

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Nickel exposure may occur from various objects in the individual's environment. We report the first case of allergic contact dermatitis caused by nickel resulting from the use of an electronic cigarette.

Case Report

A 52-year-old woman presented with itchy erythematous dermatitis on the right hand that had started 8 months previously. The patient's past medical history included a transient ischaemic attack (TIA) 10 months earlier and a history of contact allergy to costume jewellery, with a positive patch test reaction to nickel.

Clinical examination revealed erythematous, scaly dermatitis, slightly lichenified and limited to the right thumb and index finger, compatible with contact dermatitis (Fig. 1). Further questioning showed that the patient had stopped smoking tobacco after her TIA, and had started to use electronic cigarettes (Fig. 2). We asked her to come back with her electronic device for a dimethylglyoxime (DMG) nickel spot test. This gave a strongly positive result (Fig. 3). We also noticed that the front part of the electronic cigarette was corroded, probably by the sweat of the hands of the patient, which may have increased nickel release and thus elicitation by this allergen (Fig. 4).

We report, to our knowledge, the first case of nickel contact dermatitis associated with the use of an electronic cigarette. We advised the patient to use a nickel-free device in the future. Two months later, the dermatitis had cleared.

Exposure Study

To obtain an impression of the amount of nickel exposure from these devices, we visited four shops selling electronic



Fig. 1. Contact dermatitis limited to the thumb and index finger of the patient's right hand.



Fig. 2. How the patient holds her electronic cigarette.

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Fig. 3. Dimethylglyoxime spot test with a positive result.



Fig. 4. Electronic cigarette corroded by the sweat of the hands of the patient.

cigarettes, explaining that we wanted to determine the release of nickel from electronic cigarettes with the DMG test. In total, we tested 11 different models, including 13 electronic cigarettes, on site. Two drops were deposited on a cotton-wool-tipped applicator, which was then rubbed for 20 seconds on the electronic cigarette. The test was conducted at three different locations of each device, and especially on the portion held by the consumer. A positive reaction was defined as red or pink discolouration of

Table 1. Results of the dimethylglyoxime (DMG) test for 11 different models of electronic cigarette

Brand of electronic cigarette	Electronic cigarettes tested (no.)	DMG-positive (no.)
A	1	1
B	1	0
C	1	0
D	2	2
E	2	0
F	1	0
G	1	0
H	1	0
I	1	0
J	1	0
K	1	1
Totals: 11 brands	13	4

the applicator. Of 11 models tested, three were positive. Model D was tested twice, and was positive in both cases (Table 1).

Discussion

Exposure to nickel was regulated by the EU Nickel Directive in 1994, which was revised in 2004, requiring that nickel released by objects (other than piercing posts) in contact with the skin of consumers should not exceed $0.5 \mu\text{g}/\text{cm}^2/\text{week}$ (1, 2). Following the reports of contact dermatitis caused by nickel related to the use of mobile phones, the European Directive included, in 2009, mobile phones in the nickel regulation (3).

The electronic cigarette was developed by a Chinese pharmacist, Hon Lik, and patented in 2003. Now, >2500 brands are sold worldwide (4). According to our study, a number of these probably release nickel. Contact dermatitis caused by nickel due to the use of electronic cigarettes could become increasingly common. Therefore, it is necessary to correctly diagnose these cases, and also to raise the awareness of European institutions, so that this new source of nickel release is added to the list of objects to be regulated.

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