

Cobalt release from inexpensive earrings from Thailand and China

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Introduction

A recent study from Denmark showed that only 1.1% of 354 consumer items, of which 170 were earrings, released cobalt as assessed by a cobalt spot test (1–3). Cobalt allergy seems to be infrequent in the general population in Denmark, affecting only 0.2% of 3460 patch-tested subjects (4). However, in dermatitis patients undergoing routine patch testing, cobalt allergy remains

prevalent. It is interesting to study cobalt exposure from consumer products, as it has previously been debated whether cobalt could substitute for nickel as a component of consumer products following the European regulatory intervention on nickel exposure (5, 6). Using inexpensive earrings recently purchased in five large cities in Thailand and China, we set out to determine the proportion of earrings that gave a positive cobalt spot test reaction (7). This collection of earrings is expected to represent possible cobalt exposure in Chinese and Thai individuals; however, it should be underscored that most inexpensive earrings sold in Europe are produced in China and Thailand.

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Materials and Methods

Five hundred and fifty-seven earrings were randomly purchased from vendors in 11 markets located in Beijing, Chengdu, Bangkok, Patong Beach, and Hat Yai (7). One

drop of the cobalt spot test (based on nitroso R salt) (1), a clear yellow solution, was added to the tip of a white cotton stick, which was then rubbed for 20–30 seconds against the test item. If the cotton stick changed colour from yellow to red, it indicated that cobalt ions were released at a concentration that may elicit positive patch test reactions in cobalt-allergic patients (1). Earrings with a negative reaction that had visual evidence of surface discoloration from oxidation or other contamination were cleaned, and the cobalt spot test was repeated. Earrings with multiple metal parts were spot tested several times. A positive reaction to any part was recorded as positive. Earrings that gave positive cobalt spot test reactions were tested at least four times to confirm the result.

Results

Cobalt release was found in four (0.007%) of 557 earrings (Fig. 1). These four earrings were each tested four times, and yielded a positive test reaction each time. Even though the cobalt spot test was used after the dimethylglyoxime (DMG) test, we do not suspect false-positive cobalt spot test reactions, owing to the multiple cobalt testing of all positive earrings (false-positive cobalt spot test reactions may typically be observed after first cobalt spot testing following a positive DMG test outcome, owing to discoloration from left-over DMG). Seventeen of the 557 earrings had a dark metallic appearance, and 16% of these gave a positive cobalt spot test reaction. DMG test results from a previous study using the same set of earrings were utilized for the sake of a brief comparative analysis (7). Of the four positive cobalt earrings, only one also gave a positive

spot test reaction in the DMG test. Of the 17 dark metallic earrings, 59% tested positive with the DMG test.

Discussion

This study supported recent findings from Denmark showing that detection of cobalt in jewellery is uncommon (3). The specificity and sensitivity of the cobalt spot test have not yet been sufficiently established, but a recent study showed that the threshold of the test for detection of cobalt was 8 ppm, and that there was overall good concordance between the outcome of patch testing with cobalt alloys in cobalt-sensitive patients, cobalt release from the same alloys after 1 week in artificial sweat, and the outcome of cobalt spot testing. The results from the Danish cobalt exposure study and the current study are in line with epidemiological data from the general population in Denmark, which have shown that cobalt allergy is relatively infrequent, affecting less than 1% (4). There are no other recent general population patch test data from other countries, but the prevalence is expected to be similar elsewhere. The proportion of earrings that released nickel as assessed by the DMG test was slightly higher in the earring samples from China (31.5%) and Thailand (29.2%) than in jewellery and accessories purchased in Denmark (22%). As cobalt and nickel may occur together in alloys, the proportion of earrings that released cobalt in the Asian study could possibly have been higher than the proportion in the Danish study because of the higher prevalence of DMG test-positive items. However, this was not the case. We confirmed that earrings with a dark metallic appearance released cobalt more often than earrings with a silvery appearance. The Danish study showed that the four cobalt spot test-positive jewellery items had a tin–cobalt plating (3). However, it should be noted that the present sample was not collected for the purpose of cobalt spot testing. A study specifically aimed at investigating cobalt and nickel content in jewellery with a dark metallic appearance should be performed in the future. In conclusion, this study adds to the evidence that cobalt has not replaced nickel in the production of earrings in Thailand and China. Future studies will increase our knowledge about cobalt release from other consumer items and products used in an occupational setting.



Fig. 1. Four cobalt spot test positive earrings and one cobalt spot test negative earring.

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