

Editorial

Allergenic Metals in Consumer Products and Food: Development of Quantification Methods and Cases of Sensitization

Allergic contact dermatitis (ACD) from metals is a continuing and increasing health problem. Allergenic metals occur in everyday objects that we touch and in our food. Metals are found in several consumer products like for example jewellery, piercing, cosmetics, personal adornments (clasps, belts, pins, buttons), coins, colors for tattoos, leather, dental/body implants and household appliances. Metals are also found in many foods, including legumes, chocolate, nuts, and soy.

Nickel (Ni), cobalt (Co) and chromium (Cr) are the most common allergens; in Europe, the Ni, Cr and Co ACD prevalence rates are of *ca.* 20%, 4% and 7%, respectively. Females are affected by Ni and Co ACD more than males due to ear piercing and fashion jewellery, while leather products as gloves and shoes are now responsible for the main Cr ACD. Cobalt and Cr based pigments used in colors for painting and tattooing provided new cases of skin sensitization.

Both the degree to which the user is exposed to the allergenic metal and its concentration are important factors in determining how the reaction will develop. In some cases (piercing, tattoos and dental implants) where the duration of exposure occur for the whole life, the chronic exposure to a low concentration of allergenic metal is sufficient to elicit an allergic response. An individual who became sensitized to the metal, when re-exposed to metal ions might have an allergic response within a matter of hours and at a much lower concentration of metal than that required for inducing sensitization. Last but not least, people with strong sensitization to a metal also react to other elements because of cross-reactivity, for this reason consumer products that do not leach Ni but which contains other elements (as palladium) cannot be a safe alternative.

The ACD from metals is characterized by a broad spectrum of skin symptoms ranging from dryness, chapping and inflammation to eczema and blisters. There are usually social stigmas present due to the discolouration and eruption of local areas of the skin that are visible to others. For this reason, the importance of the ACD is not only related to the high number of affected people, but also to worsening of the quality of life of patients. People that become allergic to metals should avoid every contact with the allergen, but because the range of allergens found in the daily life is increasingly diverse, it can be difficult for people with allergies to avoid exposure completely. For this reason, personal care is necessary (the use of cotton gloves, active and protective creams) and a careful selection of foods with a low concentration of the allergenic metal is required. The most serious medical complications related to allergy may also involve antibiotic therapy or laser surgery for removal.

At present, there is limited knowledge about the allergenic metals contained in alloys used for piercing, fashion jewellery and body implants, and colors used for tattooing are mostly uncharacterized. Moreover, there is little known about which kind of foods are rich in allergenic metals. Understanding the occurrence of allergenic metals in consumer products and in foods, developing multi-elemental chemical methods and new diagnostic tests and informing about prevention strategies can represent key points for the management of the risk to metal ACD.

In this context, the supplement covers the state of the art (sources, prevalence rates and prescriptions) on the ACD caused by the skin contact with metals contained in daily used products (Beatrice Bocca *et al.*) and in foods (Fransesco Petrucci *et al.*). The application fields, the advantages and the disadvantages of the tests used for the diagnosis of ACD are also reviewed (Antonio Cristaudo *et al.*). Moreover, a quantitative approach on market products such as piercings (Beatrice Bocca *et al.*) and colors for tattooing (Giovanni Forte *et al.*) have been applied to the determination of the total concentration and migration of

allergenic metals. Dental appliances containing palladium have been considered as another exposure scenario to allergenic metal ions (Stefano Caimi *et al.*). Quantification methods for the characterization of products based on multi-elemental techniques as the X-ray microanalysis and the Sector Field Inductively Coupled Plasma Mass Spectrometry have been developed and validated. The final purpose of the supplement is to give light about the health and safety of people exposed to allergenic food and metal containing products in the general environment.

I wish to thank all Authors for contributing to this issue.

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