Allergic chromium dermatitis from wearing 'chromium-free' footwear

Jacob P. Thyssen[1], Morten S. Jellesen[2], Per Møller[2], Torkil Menné[1] and Jeanne D. Johansen[1]

[1]*Department of Dermatology and Allergology, Gentofte University Hospital, DK-2900 Hellerup, Denmark and* [2]*Department of Mechanical Engineering, Technical University of Denmark, Kemitorvet, DK-2800 Kgs. Lyngby, Denmark*

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Correspondence: Jacob P. Thyssen, Department of Dermato-Allergology, National Allergy Research Centre, Copenhagen University Hospital Gentofte, NielsAndersensvej 65, DK-2900 Hellerup, Denmark. Tel: +45 3977 7307; Fax: +45 3977 7118. E-mail: jacob.p.thyssen@regionh.dk

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Fig. 1. Allergic contact dermatitis caused by chromium exposure from allegedly 'chromium-free' footwear.

Chromium is used to tan most leather products available on the market, in an attempt to provide softness and durability (1). Recently, a significant increase in chromium allergy was observed in Danish dermatitis patients, owing to leather exposure (2). Furthermore, most shoes, boots and sandals for sale on the Danish market appear to have high chromium content and release (3). In the management of chromium-allergic patients with foot dermatitis, a recommendation to use chromium-free footwear is key. This can be achieved through the use of either non-leather footwear or chromium-free leather footwear. The latter is preferable during the winter in northern Europe, to keep the feet warm and dry. Chromium-free footwear is available from special vendors utilizing leather that has not been tanned with chromium. We describe a patient who had persistent allergic chromium dermatitis on the feet despite wearing such 'chromium-free' shoes.

Case Report

A 46-year-old atopic woman was referred with chronic dermatitis on the plantar aspects of both feet and with involvement of the lateral and medial borders towards the malleoli (Fig. 1). Prior to referral, she underwent unsuccessful therapy with ultraviolet B radiation, Grenz rays, and oral and topical corticosteroids. Patch testing by the referring dermatologist showed reactivity to chromium. Accordingly, the patient was informed about the association between foot dermatitis, chromium allergy and chromium in leather footwear. She then purchased three pairs of chromium-free shoes/boots. Moreover, she had a history of allergic nickel dermatitis following skin exposure to fashion jewellery, and had previously been found to be patch test-positive to nickel sulfate. Owing to the persistence of foot dermatitis upon referral, patch testing was performed in our clinic with the European baseline series and the Gentofte extended patch test series. Finn Chambers® (8 mm; SmartPractice®, Phoenix, AZ, USA) on Scanpor® tape (Norgesplaster A/S, Alpharma, As, Norway) were used. The patch tests were applied to the upper back and occluded for 2 days. Readings were performed on D2, D3, and D7, according to the recommendations of the International Contact Dermatitis Research Group. Positive test reactions were observed to potassium dichromate 0.5% (2+) and cobalt chloride 1% (2+), as well as to individual samples cut from the three pairs of 'chromium-free' shoes/boots (+1). The 'chromium-free' shoes were also analysed for their chromium content. In all three pairs, chromium but not cobalt was verified with X-ray fluorescence (XRF) spectroscopy. Spot tests to detect cobalt (based on disodium-1-nitroso-2-naphthol-3,6-disulfonate) and hexavalent chromium (based on diphenylcarbazide) release were also utilized on samples cut from the shoes, but gave negative results. On the basis of these analyses, we suspected that chromium, and perhaps mostly trivalent chromium, caused the patient's dermatitis. Chromium-free footwear was once again recommended, this time from a store collaborating with the municipality. This gradually led to complete resolution of the dermatitis.

Discussion

This case report illustrates that dermatologists sometimes need to question the validity of 'chromium-free' footwear in patients with foot dermatitis and chromium allergy. Having access to metallurgy expertise is beneficial for dermatologists, as seen in this patient. For fast and semi-quantitative analysis, we recommend testing with XRF spectroscopy as well as with spot tests. If precise amounts of metal in leather are to be obtained, full destruction of the leather and analysis with inductively coupled plasma mass spectrometry is optimal. The recently approved EU regulation on hexavalent chromium in leather is likely to reduce the morbidity caused by chromium substantially and protect the consumer.

References

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