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Letter to the editor

Recycled products are not always skin-friendly: Occupational dermatitis due to recycled plastic

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The plastics industry often uses a process called extrusion to obtain finished products such as bags, covers and cling film. Three men working in a European factory producing rubbish bags developed skin lesions. The plastic bags were made from recycled polyethylene (PE), an organic PE derived from sugar cane and potato starch. During the process, workers were exposed to several components of thermoplastics (copolymers, degradation products, recycled polymers) as well as basic additives. The men were in charge of loading and maintenance of the extruders. All three presented facial eczema with eyelid oedema. Worker 2 had eczema lesions on his hands and periungual erythema, as well as urticarial papules on his arms. These urticarial papules appeared within minutes of starting work at his workstation in the morning. Worker 3 also had eczema lesions on his hands. None of the three workers had atopic dermatitis as children and none had reported any allergies. Cutaneous reactions were affected by working times, with notable improvement being seen during holidays. No personal protective equipment was provided in the factory. The three workers felt that the skin lesions occurred more frequently during production of recycled plastics than during production of other plastics. Patch tests (European baseline patch test series, additives series, methacrylate and synthetic materials series) and semi-open tests were performed for plastic samples from the company. Chemical analysis by engineers of the Caisse d'Assurance Retraite et de la Santé au Travail (the body governing pension funds and healthcare in the workplace) detected glutaraldehyde, 1,4butanediol, tetrahydrofuran and formaldehyde in the recycled bags. These substances were also tested using patch tests. All the patch tests were negative except for cobalt in workers 1 (doubtful) and 2. However, no cobalt was found in the environment after a study of the workplace. Worker 2 also had an irritative reaction to glutaraldehyde. Semi-open tests were performed on samples (3 × 3 cm) of recycled PE plastics, organic PE derived from sugar cane, and plastics derived from potato starch. The immediate readings for all the semi-open tests were negative. During delayed readings of tests, only semi-open tests performed on a sample of recycled PE were positive (++) reaction for workers 1, 2 and 3). These eczematous reactions were observed during re-evaluation 72 hours after the test. In addition, prick-prick tests performed with potatoes for workers 2

and 3 were negative. These skin reactions had major professional consequences for all three patients. Worker 1 presented repeated lesions on returning to work and was subsequently dismissed due to his incapacity. The two others required professional reassignment within the company. We thus concluded that these workers presented contact dermatitis lesions due to a component in the recycled bags.

Contact dermatitis (allergic, irritant or protein contact dermatitis [PCD]) is the most frequent work-related cutaneous disorder [1,2]. Prevention of contact dermatitis involves exclusion of the offending allergen after its identification by means of several allergy tests. Plastic materials are a frequent cause of occupational dermatitis [3]. In the plastics industry, the main allergens are monomers (epoxy, phenolic and acrylic), hardeners and rubber additives [1,4]. Plastic products are often to blame during the manufacturing process but rarely after completion thereof. In our industry, the recycled PE came from recycling of agricultural tarpaulin from several European farms. In our study we were unable to establish precise traceability for these recycled plastics, and it was thus difficult to identify the causative allergen. However, chemical analysis enabled us to identify several components that were all negative after testing. There are very few published articles on contact dermatitis caused by recycled plastics. Though occupational contact dermatitis is generally caused by haptens, it can in some rare cases be induced by proteins. Protein contact dermatitis (PCD) may either involve type I and type IV hypersensitivity reactions or it may be the final phase of type I hypersensitivity [5]. The clinical presentation combines eczematous lesions and urticaria. Periungual oedema and erythema could be an important sign for PCD according to Kanerva [6]. It is for this reason that we initially suspected PCD to either potatoes or sugar cane for worker 2 [7]. This diagnostic hypothesis could not be retained, however, in the face of the negative potato prick test. The originality of our case is that the recycling process made precise identification of the allergen difficult. Nevertheless, the positive reactions to the semi-open tests suggest the workers' skin lesions were caused by components of the recycled plastic bags. Worldwide plastic production has been increasing since 1950 and France accounts for 10% of all demand in Europe. Plastic recycling is therefore essential [8]. Although testing of workplace products seems necessary, carrying out allergy testing in the world of plastics processing is difficult [3,4,9]. Patch tests do not in fact reproduce real working conditions near the extruder, which blows hot plastic. Occupational dermatitis caused by recycled plastics is likely to become an emerging issue. Although environmentally friendly, recycled plastic production could prevent the identification of offending allergens.

Disclosure of interest

The authors declare that they have no competing interest.

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