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## Allergic contact dermatitis caused by triphenyl phosphite in poly(vinyl chloride) gloves

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**Key words:** gloves; hand dermatitis; poly(vinyl chloride) gloves; triphenyl phosphate; triphenyl phosphite.

Contact dermatitis caused by vinyl gloves is considered to be very rare, and identification of the allergen can be difficult.

Bisphenol A, adipic polyester, mono(2-ethylhexyl) maleate in di-(n-octyl)tin-bis(2-ethylhexylmaleate), benzisothiazolinone and formaldehyde are identified allergens in poly(vinyl chloride) (PVC) gloves.

Here, a patient with contact dermatitis caused by triphenyl phosphite (TPP) in PVC gloves is presented.

### Case Report

A 26-year-old woman, suffering from chronic dermatitis mainly of the backs of both hands, consulted for a second opinion.

Her dermatitis had been considered to be caused by her atopic constitution in combination with her wet work in a sandwich bar, complicated by protein contact dermatitis caused by carrots, and contact allergies to linalool and limonene in handcreams that she had been using, and to carbamates in reusable latex and nitrile gloves.

Despite avoidance of these allergens, treatment with topical steroids, psoralen + ultraviolet A treatment of the hands, and adequate hand protection, which included wearing of gloves, the hand dermatitis did not improve.

Given her contact allergy to carbamates, the patient had been advised to use vinyl gloves (Peha-soft power-free vinyl gloves from Hartmann, Heidenheim, Germany).

A test with a piece of this PVC glove showed a 2+ reaction. Patch testing with two other brands of vinyl

glove [stretch vinyl-powered ambidextrous non-sterile (WM Supplies, PM gloves, Taipei, Taiwan), and TT clear vinyl gloves (Medica Europe, Oss, The Netherlands)] provoked similar reactions.

Patch tests with an extended plastic glue series, including triphenyl phosphate, and with the common ingredients, di-isononyl phthalate (DINP) and bis(2-ethylhexyl adipate), of the different brands of gloves, as declared by the manufacturers, did not provoke an allergic reaction.

Further identification of the allergen was carried out by patch tests with extracts of the gloves in acetone, ethanol, and water. To rule out irritant reactions, the tests were also performed with 1:10 dilutions of these extracts.

The patient reacted to the extracts in ethanol and acetone.

Further analysis of the acetone fraction revealed TPP as a potential allergen; this was also recently identified as the allergen in 2 Finnish patients (5). This hypothesis was confirmed by positive patch test reactions to TPP 0.1% (+) and 1% (++) in pet.

Five other patients tested with this allergen (TPP 0.1% and 1% pet.) remained negative.

### Discussion

Contact dermatitis caused by vinyl gloves is considered to be rare, but its frequency may be underestimated, owing to its 'hypoallergenic' status and the fact that allergens in vinyl gloves are difficult to identify (1).

Allergens eliciting allergic contact dermatitis caused by vinyl gloves that have been described before include bisphenol A, adipic polyester, mono(2-ethylhexyl) maleate in di-(n-octyl)tin-bis(2-ethylhexylmaleate), benzisothiazolinone, and formaldehyde (2–6).

This case report confirms TPP as an allergen to this list of allergens in PVC gloves.

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TPP (PO3C18H15) (CAS:101-02-0) is the ester of phosphorous acid and phenol. It is a colourless viscous liquid that is insoluble in water but soluble in aromatic organic solvents (acetone), which explains the positive reactions to the acetone extract.

It is mostly used in an industrial setting as a stabilizer in many types of polymer, such as polyesters, polyethylene, PVC, polyurethane, and epoxy compounds, and is used in adhesives and coatings. It also provides increased heat resistance to the finished products, in which it is used as a flame retardant.

Contact dermatitis caused by TPP as a result of occupational exposure has been previously described. One case concerned a man who worked in a plastic pipe factory and who was sensitized when working with Doverphos-10® (100% TPP). Patch testing gave a positive result for TPP 2.5%, but negative results for TPP 1.25% and triphenyl phosphate (7). Another case concerned a laboratory worker who developed allergic contact dermatitis on several occasions after contact with Lancromark™ LE (99% TPP). This patient also did not react to triphenyl phosphate (8).

TPP allergy in a non-occupational setting is also reported. Holden et al. described a case of allergic dermatitis caused by an oxygen face mask, with a positive test reaction to triphenyl phosphate. Because the manufacturer mentioned only TPP as being present in the face mask, these authors suggested a possible cross-reaction between the phosphate and phosphite (9).

However, cross-reactions between TPP and triphenyl phosphate did not occur in the described cases of occupational contact dermatitis, or in our patient who was tested with triphenylphosphate.

Apart from allergic contact dermatitis, one case of allergic contact urticaria caused by TPP has also been published (10).

This case report supports TPP as a new potential allergen to the list of allergens in vinyl gloves as recently described by Suuronen et al (11). It is important to state that TPP did not cross-react with triphenyl phosphate in the plastic and glue series.

Our case also proves the importance of testing all types of gloves used by patients with hand dermatitis, even though vinyl gloves are considered to be rare sensitizers.

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