

Allergic contact dermatitis to black rubber in firefighters' masks: A case series

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N- isopropyl-N'-phenylenediamine (IPPD) is an antioxidant used in black rubber to prevent deterioration. Occupational allergic contact dermatitis (ACD) from IPPD has been reported in workers handling car tyres¹. Non-occupational sources include car brakes² and sports watches.³

We report a case series of occupational ACD caused by IPPD in 5 firefighters wearing protective face masks.

CASE SERIES

Five firefighters were referred for patch testing. All had developed an itchy, erythematous rash localized to the areas of skin in contact with black rubber in their newly introduced protective face masks. Symptoms would recur in 30 minutes to 2 hours with subsequent use and the rash would persist for up to a week. Treatment included mask avoidance, topical corticosteroids and moisturising creams. 4 patients were restricted to alternative duties and one patient used an alternative silicone mask.

Patients underwent patch testing with Australian Baseline Series, rubber series, their own products and components of the facemask supplied by the manufacturer. The patches were removed on day (D) 2 and readings were performed on D2 and D4. Information regarding the manufacturer and the type of facemask can be sought directly from the authors.

Table 1 summarizes the patient characteristics and patch test results. All patients were male, with a mean age of 45 years and dermatitis localized to the face. Three patients (60%) had a history of atopy. All patients reacted to black rubber mix (BRM), IPPD and mask samples and subsequently diagnosed with ACD to IPPD in their black rubber protective face masks. Information obtained from the manufacturer confirmed the presence of IPPD. An IPPD-free face mask was provided, with no patients reacting on patch testing or use testing, when they wore the mask for an hour.

DISCUSSION

We present 5 cases of occupational ACD caused by IPPD in black rubber used in firefighters' protective face masks in Australia.

ACD to IPPD in face masks has been previously reported in scuba divers.⁴ Contact urticaria to BRM in a face mask has also been described.⁵ BRM is tested in our baseline series and comprises IPPD along with N-cyclohexyl-N-phenyl-4-phenylenediamine and N, N-diphenyl-p-phenyldiamine. BRM accounts for 23% of positive tests in rubber allergy⁶. IPPD accounts for 90% of positive reactions to BRM.⁷ IPPD is chemically related to paraphenylenediamine, with cross reactivity being described.⁸

The use of respiratory protective equipment has been shown to impair the skin barrier as a result of increased temperature and humidity from expiration and the occlusive effect of masks.⁹

In conclusion we report a case series of ACD caused by IPPD in black rubber in parts of a protective face mask used by firefighters. Obtaining information from the manufacturer was vital in identifying IPPD as the culprit, finding an appropriate alternative mask and allowing the firefighters to return to full duties.

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Table 1: Summary of patient characteristics and patch test results

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5
Age (years)	33	58	44	34	53
Gender	Male	Male	Male	Male	Male
Past history/ skin rash	Atopic Eczema	-	Hay fever	Keratosis pilaris	Atopic Eczema
Site of dermatitis	Face	Face	Face	Face	Face
Patch test results (Day 4)	Black rubber mix (+) IPPD (+) Hydroperoxides of linalool (+/-)	Black rubber mix (+) IPPD (+) CPPD (+) Thiuram mix (++) Tetramethylthiuram monosulfide (++) Fragrance (+)	Black rubber mix (++) IPPD (+)	Black rubber mix (++) IPPD (++) CPPD (+)	Black rubber mix (+++) IPPD (++) CPPD (++) DPPD (+) Phenylene-diamine base (+) Textile dye mix (+++)
Outcomes	Dermatitis resolved on avoiding black rubber containing IPPD	Dermatitis resolved on avoiding black rubber containing IPPD	Dermatitis resolved on avoiding black rubber containing IPPD	Dermatitis resolved on avoiding black rubber containing IPPD	Dermatitis resolved on avoiding black rubber containing IPPD