

CONTACT POINT

A case of immediate-type allergy from polypropylene in a particle filter mask in a nurse

Mara Goller¹  | Heinrich Dickel² | Jan Peter Nicolay¹

¹Department of Dermatology, Venereology and Allergology, University Medical Center Mannheim, Mannheim, Germany

²Department of Dermatology, Venereology and Allergology, St. Josef-Hospital, University Medical Center, Ruhr University Bochum, Bochum, Germany

Correspondence

Jan Peter Nicolay, Department of Dermatology, Venereology and Allergology, University Medical Center Mannheim, Theodor-Kutzer-Ufer 1-3, 68167 Mannheim, Germany.

Email: jan.nicolay@umm.de

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Since the Covid-19 pandemic, the wearing of particle filter masks (FFP2 in Europe, N95 in US and KN95 in China) has become indispensable in many (medical) professions. While allergic contact dermatitis has occasionally been reported,^{1,2} immediate-type reactions have only rarely been documented.³⁻⁵

CASE REPORT

A 28-year-old non-atopic female nurse presented with suspected immediate-type hypersensitivity to FFP2 masks. She had started to develop erythematous, itchy macules and wheals of the face, décolleté and back, together with an occasional globus sensation and shortness of breath, within 30 min of wearing the masks. These reactions would last up to 24 h after their removal. Surgical masks provoked similar yet less pronounced reactions, whereas the wearing of commercialized textile masks caused no reactions. As antihistamines proved unsuccessful, the patient became incapable of continuing her work. Initially, patch tests with additional immediate readings were performed using the baseline series of the German Contact Allergy Group (DKG) (SmartPractice, Finn Chambers on Scanpor, 8 mm) and the used FFP2 masks ('as is'). Already after a few minutes wheals, erythema and pruritus appeared on the entire back and upper body (Figure 1A), requiring removal of all tests and treatment with oral antihistamines. Repeated isolated testing of one single FFP2 mask

resulted in the same reaction. Further patch tests with pieces of an FFP2 mask disassembled into its individual components (inner surface, outer surface, nose bridge, ear bands), 'as is' applied to the back, again triggered an urticarial skin reaction within 30 min, accompanied by shortness of breath and globus sensation, again necessitating removal of all tests. It is worth noting that the skin lesions always initiated at, but were never restricted to the site of application of the mask (materials). The manufacturer only revealed that the mask mainly contained polypropylene in the filter, next to polyamide and spandex in the ear bands and plastic with wire reinforcement in the nose bridge. As polypropylene was considered a possible culprit, and to further substantiate our findings, a prick test was additionally performed using a commercially available polypropylene mesh (Polypropylen-Vorfilter, hydrophob, 5.0 µm, 47 mm, AN5004700, Millipore [Merck]): contrary to conventional prick-to-prick tests, or instead of using predefined (dilutions of) aqueous extracts, we performed a prick test with aqua (aq.), in which the mesh had been submerged, and we placed a piece of the moisturized mesh at the surrounding prick-test site. Histamine was used as a positive control (wheal 10 mm), and saline solution and white petrolatum as negative controls. A strongly positive reaction to the polypropylene mesh occurred after 15 min (wheal 12 mm; Figure 1B). In addition, there was also a reoccurrence of hives and diffuse erythematous macules on the upper body (Figure 1C), together with shortness of breath; serum tryptase did not show any abnormal values. Prick

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FIGURE 1 (A) Wheals and diffuse elongated erythematous macules a few minutes after removal of the test material. (B) Skin prick testing for polypropylene with a wheal of 12 mm and a diffuse erythema. (C) Wheals and diffuse erythematous macules a few minutes after skin prick testing for polypropylene

tests to formaldehyde (1:1000 and 1:100 aq.), a potential by-product of polypropylene,^{6,7} remained negative. The patient was subsequently reported to the responsible statutory accident insurance company due to the strong suspicion of an occupational skin disease.

DISCUSSION

Several cases of irritant rhinitis, irritant and allergic contact dermatitis, exacerbation of acne or rosacea and contact urticaria have been attributed to the wearing of medical masks.^{3–5,8} Identification of culprit allergens in masks is often difficult and hampered by the unwillingness of manufacturers to disclose information on their composition.^{1,9,10} Polypropylene, a declared ingredient of the culprit FFP2 masks in our case, has been described as a cause of contact dermatitis from surgical materials.^{9,11} Furthermore, polypropylene and medical masks have been described as triggers of contact urticaria, although in many cases the exact causative substance(s) remained unidentified.^{3,5,12} Polypropylene is a polymeric hydrocarbon and generally considered to be inert.¹² In most cases, additives are suspected to be the potentially triggering substances. Regarding our case, we could not further pin-point if the strong reaction was indeed provoked by the polypropylene itself, or by residues of mono- or oligomeric propylene, catalysts or other reagents from the production process, or additives. In conclusion, we present an occupational case of severe immediate-type hypersensitivity likely caused by the polypropylene component of an FFP2 mask worn during the Covid-19 pandemic. Our case underlines that all components present in medical devices, including masks, should be disclosed.

AUTHOR CONTRIBUTIONS

Mara Goller: Conceptualization; investigation; writing – original draft; writing – review and editing. **Heinrich Dickel:** Conceptualization; methodology; writing – review and editing. **Jan Peter Nicolay:** Conceptualization; methodology; supervision; validation; writing – review and editing.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICS STATEMENT

Informed consent to publish the pictures was given by the patient.

ORCID

Mara Goller  <https://orcid.org/0000-0001-5858-2670>

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