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Unexpected cross-reactivity in a cat-allergy patient. An allergic reaction at the circus

To the Editor,

Sensitisation to cats is one of the most frequent aeroallergens in atopic children, causing respiratory and anaphylactic reactions. The current guidelines addressing allergic symptoms in patients with a cat allergy discuss all aspects of environmental allergen prevention techniques including the major cat allergen, Fel d1 avoidance.¹ We would like to draw attention to the fact that people allergic to domestic cats may also express adverse reactions to big cats, such as when visiting wild parks or zoos.

We present a unique case of a cross-reaction in a cat-allergic patient in response to contact with another species, particularly big cats (felidae). An 8-year-old boy presented to our paediatric Emergency Department with a generalised urticarial rash, conjunctivitis and rhinorrhoea. He came along with his parents, directly from a circus show.

According to his parents, he was in good health prior to the start of the performance and had not had any meal within the previous two hours. About 30–45 min after the beginning of show, he started complaining of itching skin and a burning sensation in his eyes, followed by rhinorrhoea. The symptoms occurred a few minutes after the first animals appeared on stage.

At the time of evaluation, his vital signs were normal and he appeared to be in no apparent distress. He presented with increased nasal discharge, conjunctivitis, and generalised urticarial eczema. The remainder of his examination

was unremarkable. His past medical history was positive for allergic conjunctivitis to cat dander.

Suspecting an allergic reaction in response to an unknown factor no specific laboratory examinations were ordered. Skin testing was also not performed because of the temporal relation to the episode and the subsequent use of medications.

After the administration of a second generation antihistamine preparation – cetirizine® (10 mg orally) his condition improved over the next 20 min and he was discharged after short observation. The parents were instructed to schedule a follow-up visit to our clinic for a detailed evaluation.

The patient returned a few weeks later for the follow-up, and his history was analysed further to look for possible triggers for his urticaria. It was then revealed that our patient was at first symptom-free and truly relishing in the many performances, until the symptoms suddenly arose when the lion-taming begun. This unusual circumstance prompted a detailed evaluation, and subsequently, a set of skin-prick tests. The panel included both food- and inhalant-allergenic extracts (peanut, strawberry, apple, tomato, egg yolk and white, wheat and rye flour, cocoa, hazelnut, meat, cow's milk, grass and tree pollens, *D. farinae*, *D. pteronyssinus*, danders: hamster, dog, cat, guinea pig, moulds: *Alternaria*, *Cladosporium*, *Aspergillus*, *Penicillium*; all from Allergopharma®, Reinbeck, Germany). The results of the SPT revealed a sole sensitisation to cat dander, which was then confirmed through measuring specific IgE (80 kU/L, class V CAP for Fel d1).

Airborne allergens such as aerosolised food particles, pollen, or animal dander can trigger skin allergic symptoms; this likely involves systemic absorption of the allergen through the airways and/or skin.²

The case of our patient was unusual, because of a positive medical history for cat allergy and the development of an airborne anaphylaxis a few minutes after the lions appeared on the circus stage. The transient constellation of signs and symptoms was most likely secondary to the unexpected exposure to lions in the circus arena and the mild anaphylactic reaction most probably resulted from cross-reacting IgE antibodies from feline proteins in domestic cats to their close relatives – big cats. Therefore the possibility of a severe clinical presentation resulting from an unexpected exposure to big cats in domestic cat-allergic patients cannot be excluded.

Current recommendations to control allergic symptoms in cat allergic patients comprehensively list all aspects of environmental allergen prevention, including major cat allergen Fel d1.¹ These recommendations for avoiding Fel d1 allergens do not include any restrictions of contact with big cats in places like Wild Parks, Zoos or circus visits.^{1,3}

Sensitisation to cats is reported as the third most frequent among the aeroallergens in children with atopic disease.⁴ Patients sensitised to cats may display IgE cross-reactivity against allergenic proteins derived from different animals.⁵ Fel d 1 as the main cat allergen induces specific IgE production in even 95% of cat-sensitised patients.⁶ The Fel d 1 molecule has also been identified in big cats (*Felidae* species), such as: jaguar, leopard, puma, tiger and lion. Moreover, IgE and IgG4 antibodies derived from cat-allergic patients, reacted against Fel d 1-like structures in the other members of the *Felidae* family.^{5,7}

Allergens derived from feline animals such as the domestic cat (i.e. Fel d 1) are carried in the air both by particles with large (>10 µm) and small (<5 µm) diameter.⁸ Therefore, after a minimal air disturbance, these small particles readily become airborne and remain so for long periods in an indoor atmosphere. The dispersed allergens can trigger respiratory symptoms in sensitised patients within a few minutes.³

Current possible strategies and procedures to reduce exposure to cat allergens in these patients do not include any limitations of circus or zoo visits nor animal keepers working in confined/enclosed places where animals are kept.³ However unlikely, we highlight the possibility of generalised allergic reactions in cat-allergy patients in rather unexpected circumstances and indicate the need for further research in a larger group of cat-allergy patients.

Ethical disclosures

Patients' data protection. The authors declare that no patient personal data appear in this article.

Right to privacy and informed consent. The authors have obtained the informed consent of the parents of the patient mentioned in the article.

Protection of human subjects and animals in research. The authors declare that no experiments were performed on humans or animals for this investigation. The authors further declare that the procedures were in accordance with the regulations of the World Medical Association and the Helsinki Declaration. The authors have followed the institutional rules on the publication of this case report.

Conflict of interest

The authors have no conflict of interest to declare.

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