

# Beware of the caterpillar: Anaphylaxis to the spotted tussock moth caterpillar, *Lophocampa maculata*

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## ABSTRACT

We present a case report of a 5-year-old boy with presumed anaphylaxis to the caterpillar, *Lophocampa maculata*, manifesting as the acute development of diffuse urticaria and progressive dyspnea. This reaction required prompt treatment with antihistamines and a bronchodilator. Allergen scratch testing with a homogenized caterpillar extract suggests that immunoglobulin E-mediated type I hypersensitivity as the pathophysiological mechanism responsible for the boy's anaphylaxis. This case report represents the first documented occurrence of an anaphylactic reaction to *Lophocampa maculata* and adds to the rare incidence of documented hypersensitivity to the order Lepidoptera.

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Caterpillars are primarily known to cause dermatitis and urticaria in humans, with cases of systemic reactions rarely reported.<sup>1–5</sup> Topical reactions are mediated *via* direct contact with caterpillar setae or airborne spread of mirror spines, which are shed by the caterpillar.<sup>6,7</sup> Thaumetopoein, a protein located in caterpillar setae, may also mediate these responses by activating mast cell degranulation.<sup>7</sup> Sensitization with prior exposure to caterpillar setae is the greatest risk factor for manifesting urticarial or contact dermatitis from caterpillars.<sup>1</sup> Existing literature on caterpillar dermatitis, urticaria, and anaphylaxis is based primarily on the caterpillar/moth genus *Thaumetopoea*. This genus is common to Mediterranean Europe and Africa.<sup>1,2,5</sup> Adverse reactions to caterpillar species within the same order, *Lepidoptera*, is also documented in North America. However, these documented reactions are primarily limited to locally induced dermatologic responses.<sup>3,8–10</sup> To our knowledge, this is the first reported case of anaphylaxis to a new family and species of *Lepidoptera* caterpillars, *Lophocampa maculata*, the spotted tussock moth (Fig. 1).

## CASE REPORT

A 5-year-old boy was exposed to a caterpillar while playing in an area of northeast Ohio in August 2012. The child had been playing with the caterpillar for 20

minutes before sensing a piercing pain from under the caterpillar and reporting to his mother, who identified a small erythematous lesion at that location. Within 3 minutes, the boy experienced urticaria starting at the lesion and advancing up his arm, quickly covering his entire body. These lesions were associated with severe itching. Within 5 minutes, he became dyspneic. The boy received 37.5 mg of diphenhydramine within 7 minutes of the piercing sensation. At 30 minutes after the exposure, he received albuterol treatment given by his mother (available because of the family's history of allergic rhinoconjunctivitis and asthma). The inhaled albuterol appeared to decrease the boy's dyspnea, achieving full resolution within 1 hour after caterpillar exposure. The associated urticaria and pruritus required scheduled dosing of oral diphenhydramine and use of diphenhydramine/allantoin cream for 7 days before symptoms completely resolved (pruritus persisting longer than urticaria). At the time of his caterpillar exposure, the boy was in the sun and had not experienced any other stings or other insect exposures that day. He was not recently ill, and he did not have any new exposures to animals, chemical products, clothing, food, or other potential allergen sources. The caterpillar was thus identified as the only potential causative agent for the boy's reaction.

The child's medical history revealed only allergic rhinoconjunctivitis. He had no previous episodes of anaphylaxis, respiratory symptoms, or diffuse urticaria as documented here. His family medical history is notable only for paternal allergic rhinoconjunctivitis, asthma, and epidermolysis bullosa in his sister. The boy's frequent environmental exposure to woodland areas where these caterpillars/moths reside increases his potential to develop sensitivity to these insects. Allergen scratch testing after this anaphylactic event revealed a strong (>2-mm wheal) type I hypersensitiv-

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Figure 1. Spotted tussock moth, *Lophocampa maculata*. Photograph by Jerry McCormick, Minnesota.

ity response to commercially available moth/*Lepidoptera* extract (GREER Allergy and Immunology, item B11; GREER, Lenoir, NC). Both scratch test results and exposure history support that an immunoglobulin E (IgE)-mediated type 1 hypersensitivity was responsible for the symptoms experienced by the boy so quickly after his caterpillar exposure.

The boy's mother and sister were outside with the boy at the time of exposure; thus, all had vivid images of the animal's appearance and markings. These family members were asked to describe the caterpillar's appearance and identify the animal by picture lineup. An entomologist practicing in northeast Ohio was consulted to verify that the correct species was identified. According to the entomologist, the only native caterpillars fitting the distribution, habitat, and appearance are *Pyrrharctia isabella* and *L. maculata*. Although similar in coloration, *L. maculata* possesses unique white lashes at its anterior and posterior segments, which clearly differentiates the two species. The boy's family confidently identified the caterpillar as *L. maculata*, the spotted tussock moth, from images, ensuring that the correct species was determined.

## DISCUSSION

Spotted tussock moth caterpillars are classically described as densely hairy with black anterior and posterior segments separated by a yellow to orange mid-section. Although this caterpillar may be confused with *P. isabella* from the same *Erebidae* family, *L. maculata* is clearly distinguished by white lashes on its anterior and posterior as well as black dorsal tufts. The barbed setae of *Lophocampa* are known to cause physical irritation or stings and may also contain allergenic proteins such as thaumotopoein.<sup>1,6-8</sup> The setae can potentially contain other venoms or toxins secreted from the caterpillar's hemolymph to its outer surface, like other *Lepidoptera*.<sup>5</sup> In the case presented, we speculate that

the sting the boy experienced was a puncture injury from caterpillar setae with subcutaneous delivery of allergens, initiating the boy's systemic reaction of urticaria, pruritus, and dyspnea. Subsequent allergen scratch testing of the boy revealed a strong response to *Lepidoptera* moth extract, which includes a homogenized mixture of several species of the order *Lepidoptera*, including *Lophocampa* caterpillars/moths according to GREER Allergy and Immunology.

We suspect this to be an IgE-mediated type I hypersensitivity reaction based on clinical history and positive scratch testing. Most likely, the patient was sensitized with previous exposure to caterpillar habitats. Further allergenic testing of the child revealed strong responses to other insect species as well as *Lepidoptera*. This increases the boy's risk for developing hypersensitivities, thus favoring a diagnosis of IgE-mediated anaphylaxis instead of a direct mast cell response without prior sensitization.

Although the administration of epinephrine would have been the preferred therapy, the prompt antihistamine and albuterol treatment provided by the patient's mother was effective in this case. Use of intramuscular injection of epinephrine was not used because this was the patient's first presentation of anaphylaxis and epinephrine treatment was not available at time of symptom onset. Medical management of the patient by his allergist/immunologist now includes avoidance measures, routine prescription of intramuscular injectable epinephrine, and bronchodilators to ensure patient safety. Desensitization therapies and immunologic agents were also considered in treatment of this patient but are currently not being used because of the patient's age and good response/compliance to treatments currently in place. Symptomatic and expectant management of his hypersensitivity is most prudent at this time considering that the boy may become increasingly intolerant to caterpillar and other insect allergens as he ages.

## CONCLUSION

Previously documented evidence that other caterpillar species have caused similar anaphylactic reactions in humans further supports our proposed physiological mechanism. However, the incidence is rare and has not been documented until now in this family of *Lepidoptera*.<sup>2,5,10</sup> Additional *in vitro* testing with species-specific allergen extracts and associated IgE serum studies would definitively clarify the reaction type involved in this case but were not commercially available. Repeat patient exposures and more case reports of anaphylactic reactions to caterpillars in this species, genus, family, or order would help delineate the allergen involved. Analyzing allergen similarities between species of *Lepidoptera* and investigating cross-reactivity

to related caterpillar/most species or allergens of biting insects may also provide some insight on the allergen and potential desensitization protocols. To our knowledge, this case is the first reported instance of anaphylaxis to *L. maculata*. Thus, we suggest adding the spotted tussock moth, *L. maculata*, and its family *Erebidae* to the list of insects with the potential to induce life-threatening allergic responses.

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