Caterpillars are primarily known to cause dermatitis and urticaria in humans, with cases of systemic reactions rarely reported.\textsuperscript{1-5} Topical reactions are mediated via direct contact with caterpillar setae or airborne spread of mirror spines, which are shed by the caterpillar.\textsuperscript{6,7} Thaumotopoein, a protein located in caterpillar setae, may also mediate these responses by activating mast cell degranulation.\textsuperscript{7} Sensitization with prior exposure to caterpillar setae is the greatest risk factor for manifesting urticarial or contact dermatitis from caterpillars.\textsuperscript{1} Existing literature on caterpillar dermatitis, urticaria, and anaphylaxis is based primarily on the caterpillar/moth genus \textit{Thaumetopoea}. This genus is common to Mediterranean Europe and Africa.\textsuperscript{1,2,5} Adverse reactions to caterpillar species within the same order, \textit{Lepidoptera}, is also documented in North America. However, these documented reactions are primarily limited to locally induced dermatologic responses.\textsuperscript{3,8-10} To our knowledge, this is the first reported case of anaphylaxis to a new family and species of \textit{Lepidoptera} caterpillars, \textit{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-
The setae can potentially contain other venoms or toxins secreted from the caterpillar’s hemolymph to its outer surface, like other Lepidoptera.

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 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 allergic 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. 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.

ACKNOWLEDGMENTS

The authors thank Roger A. Downer, Ph.D., from the Ohio State University, Department of Horticulture and Crop Science, Wooster, OH, for assistance identifying caterpillar species, and Jerry McCormick for the use of his photograph.

REFERENCES

1. Gottschling S, Meyer S, Dill-Mueller D, et al. Outbreak report of airborne caterpillar dermatitis in a kindergarten. Dermatology. 215:5–9, 2007.
2. Ramesh Bhat Y, Vinayaka G, and Sushma S. Systemic allergic reaction to a caterpillar in a 3-month-old infant. Ann Trop Paediatr 30:83–86, 2010.
3. Santos-Maçadân S, González de Olano D, Bartolomé-Zavala B, et al. Adverse reactions to the processional caterpillar: Irritant or allergic mechanism? Contact Dermatitis 60:109–110, 2009.
4. Redd JT, Voorhees RE, and Török TJ. Outbreak of lepidopterism at a Boy Scout camp. J Am Acad Dermatol 56:952–955, 2007.
5. Shkalim V, Herscovici Z, Amir J, and Levy Y. Systemic allergic reaction to tree processional caterpillar in children. Pediatr Emerg Care 24:233–235, 2008.
6. Vega JM, Moneo I, Armentia A, et al. Anaphylaxis to a pine caterpillar. Allergy 52:1244–1245, 1997.
7. Rodriguez-Mahillo AI, Gonzalez-Muñoz M, Vega JM, et al. Setae from the pine processory moth (*Thaumetopoea pityocampa*) contain several relevant allergens. Contact Dermatitis 67:367–374, 2012.
8. Tripi PA, Lee R, Keiper JB, et al. An unusual case of ingestion of a moth cocoon in a 14-month-old girl. Am J Otolaryngol 31:123–126, 2010.
9. Kuspis DA, Rawlins JE, and Krenzelok EP. Human exposures to stinging caterpillar: *Lophocampa caryae* exposures. Am J Emerg Med 19:396–398, 2001.
10. Vega JM, Moneo I, Armentia A, et al. Pine processory caterpillar as a new cause of immunologic contact urticaria. Contact Dermatitis 43:129–132, 2000.