

## An Epidemic Airborne Disease Caused by the Oak Processionary Caterpillar

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**Abstract:** The oak processionary caterpillar (*Thaumetopoea processionea* Lepidoptera) is found in several European countries. It usually lives in oak forests or on single-standing oak trees. The larva of from the 3rd to 6th developmental stage (instar) develops poisonous hair (setae), filled with an urticating toxin that may lead to serious dermatitis, conjunctivitis, and pulmonary affection (summarized as lepidopterism) on contact with the setae. In June 2004 more than 40 people including young children developed symptoms of lepidopterism after resting within 20 m of an infested oak tree. Only a few people had touched the caterpillars. All those with clinical symptoms of lepidopterism could be treated as outpatients, but several needed systemic steroids because of the severity of their complaints. Lepidopterism, an airborne disease caused by the setae of the processionary caterpillar, is a growing public health problem because of the increasing numbers of outbreaks.

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*Thaumetopoea processionea* is a species of Lepidoptera. These insects, known as the oak processionary caterpillar and moth, tend to infest trees at the edge of oak forests as well as solitary oak trees close to cities (1–3). That increases the risk of a contact between human beings and the poisonous hairs (setae) of the larvae. Those setae contain the urticating toxin, thaumetopoein, which can produce the clinical symptoms summarized as lepidopterism. Direct or airborne contact with the poisonous setae leads to reactions in the skin or mucous membranes. Cutaneous reactions of lepidopterism are of three different types: weal and flare reaction, toxic irritant dermatitis, and persistent itchy papules. Other signs are conjunctivitis, pharyngitis, malaise, and upper respiratory tract symptoms including respiratory distress (1–10). Few instances of life-threatening anaphylactic reactions have

been reported (4). *Thaumetopoea processionea* infests oak trees of various species especially in south and central Europe. Outbreaks in other geographic regions of Europe are also being reported more frequently (2,4,5).

### OUTBREAK REPORT

On June 27, 2004 a group of about 90 persons including 28 children of all ages visited a recreational area in the region of Saarland in the southwest of Germany near the French border. They stayed there for several hours and the children played in the area. An oak infested with oak processionary caterpillars nearby was soon of special interest to the children, who played with the caterpillars. Somewhat later, several people in the group developed severe pruritus. Most of the affected people were not in

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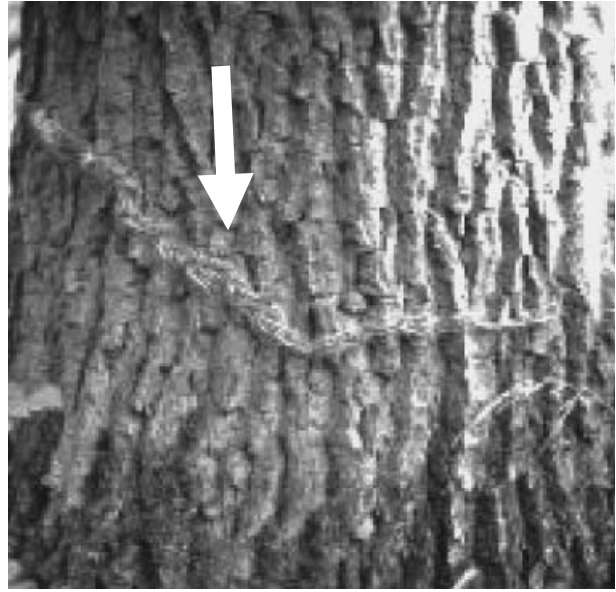


**Figure 1.** Larva of *Thaumetopoea processionea* on an oak leaf.

direct contact with the caterpillars. At the end of the day, 42 people out of the group were seen by physicians. Their complaints included itching, visible weal and flare lesions, pin-sized red papules, Quincke edema in one patient and upper airway affects with respiratory distress (bronchoconstriction, cough, and wheeze) in five patients. Some of the pediatric patients visited the outpatient clinic of the University Children's Hospital in Homburg. They brought some of the caterpillars, which were identified as *T. processionea*, leading to the diagnosis of lepidopterism (Fig. 1). All patients were treated successfully with antihistamines, with or without additional topical or systemic steroids depending on the severity of the symptoms. Only six patients received systemic steroids. Two of them were children aged 4 and 6 years. They had direct caterpillar contact and presented with dyspnea and bronchoconstriction. Three adults with similar complaints and another with Quincke edema also received systemic steroids. None of these adults had direct contact with the caterpillars. All patients could be treated as outpatients because the symptoms resolved in all within 1 hour after steroid administration.

## DISCUSSION

*Thaumetopoea processionea* (the oak processionary caterpillar) is endemic in many European countries. The name processionary derives from the way in which the larvae move head to tail from their nests at the bottom of the tree to the top of the tree (Fig. 2) where they feed on



**Figure 2.** "Procession" of larvae of *Thaumetopoea processionea* (arrow) at the bottom of an oak tree.

foliage before returning to their nest in the same manner. Because of its specific behavior of infesting trees that are standing solitary or at the edge of forests, a contact between the larvae with its poisonous hairs and human beings is likely. Children are especially endangered because of their tendency to play with such animals.

Between the 3rd and 6th larval stage, the caterpillar develops poisonous hair (setae) that could be spread by the wind and could therefore cause an airborne disease without direct contact between human beings and the caterpillars. The setae have proved to be quite stable in the environment; intact setae have been detected more than a year later close to previously infested oak trees. Therefore, lepidopterism is not necessarily limited to the narrow time frame of a few weeks when the larva is in the 3rd to 6th larval instar (1,2). The developmental stages of *T. processionea* are depicted in Table 1. In years of favorable conditions for the species, lepidopterism may reach epidemic dimensions. More than 150 different poisonous species of this order are known worldwide. In Europe and the Middle East, four members of the Lepidoptera family (*Thaumetopoea processionea*; *Thaumetopoea pinivora*; *Thaumetopoea wilkinsoni*; *Thaumetopoea pityocampa*) pose an increasing threat to humans (1,2,4,5).

The poisonous setae break at the slightest contact and release a protein cocktail containing thaumetopoein, a histamine-liberating toxin that seems to play a leading role in producing the clinical signs of lepidopterism. The symptoms caused by contact with the setae of the caterpillar are the result of the combined effects of a direct non-IgE-mediated mediator release by thaumetopoein and

**TABLE 1.** Development of *Thaumetopoea processionea* in Central Europe. Whereas the 1st and 2nd Instar Larvae and Adult Moths are Nonpoisonous, the Caterpillars of the 3rd to 6th Larval Instar (May to July) are Armed with Poisonous Setae and the Risk is Then Highest for Outbreaks of Lepidopterism

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Egg stage 8–9 months	■								■			
Larval stage 9–12 weeks 1st to 6th larval instar				■								
Pupal stage 3–6 weeks							■					
Adult stage 3 days								■				

mechanical irritation caused by the skin or mucous membrane penetration of the setae. IgE-mediated type I reactions are described but seem to be the exception (1,2).

Cutaneous manifestations of lepidopterism are the leading symptoms; however, more severe symptoms up to anaphylactic reactions have been reported. Most symptoms of lepidopterism can be treated with topical steroids in combination with systemic antihistamines. In rare cases, systemic steroids +/- inhalative  $\beta$ -mimetics in patients with pulmonary affection are necessary.

### CONCLUSION

Lepidopterism is a condition of increasing incidence that is often not diagnosed because it is unfamiliar to physicians. Prevention is rather difficult, and therefore, lepidopterism should always be kept in mind as part of the differential diagnosis in epidemic outbreaks of dermatitis, especially when they occur during the time of year that *T. processionea* is in its larval period.

### ACKNOWLEDGMENTS

We thank Heiko Mueller for taking the photographs, Holger Nunold and Alexander Hoppe for technical assistance with the manuscript, and Karen Schneider for linguistic help.

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