

Outbreak Report of Airborne Caterpillar Dermatitis in a Kindergarten

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Key Words

Oak processionary caterpillar · Lepidopterism · Contact dermatitis · Setae

Abstract

Background: The oak processionary caterpillar is found in several European countries. The larva of *Thaumetopoea processionea* Lepidoptera from the third to sixth larval instar develops poisonous hair (setae), filled with an urticating toxin that could lead to serious dermatitis, conjunctivitis and pulmonary problems (summarized as lepidopterism) on contact. **Objectives:** To determine the incidence of caterpillar dermatitis in a kindergarten population with three infested oak trees located in its enclosure. **Methods:** We made a survey by the use of a questionnaire that was handed out to all parents with children regularly visiting that kindergarten. **Results:** Twenty-four out of 47 (51%) questionnaires were returned and 10/24 (42%) children showing symptoms of lepidopterism were reported: 8/10 (80%) dermatitis, 5/10 (50%) pruritus, 5/10 (50%) respiratory distress, 4/10 (40%) malaise and/or fever and 1/10 (10%) conjunctivitis. Seven out of 10 visited a physician but the correct diagnosis was not posed in any case. Four out of 7 received medication (topical and/or systemic antihistaminics and/or steroids). **Conclusions:** 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, and it is still underestimated. Children seem to suffer more often from general symptoms and airway affection than adults.

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Introduction

Lepidopterism is the pathological condition caused by a poisonous larvae or moth of the Lepidoptera order. More than 150 species of this order are known worldwide. Direct or airborne contact with the poisonous setae leads to reactions of the skin or the mucous membranes [1]. In Europe, the different species of processionary caterpillars pose an increasing threat to humans [2–9].

Thaumetopoea processionea is a species of Lepidoptera. The insects, known as oak processionary caterpillars and moths are found in oak forests as well as on solitary oak trees even close to bigger cities (fig. 1). The insects tend to infest trees that are standing alone or at the edge of forests [1–3, 8], which increases the risk of contact between human beings and the poisonous hairs (setae) of the larvae. The larva develops its setae between the third and sixth larval instar (fig. 2). Those setae contain the urticating toxin thaumetopoein which causes the clinical symptoms summarized as lepidopterism. No direct con-

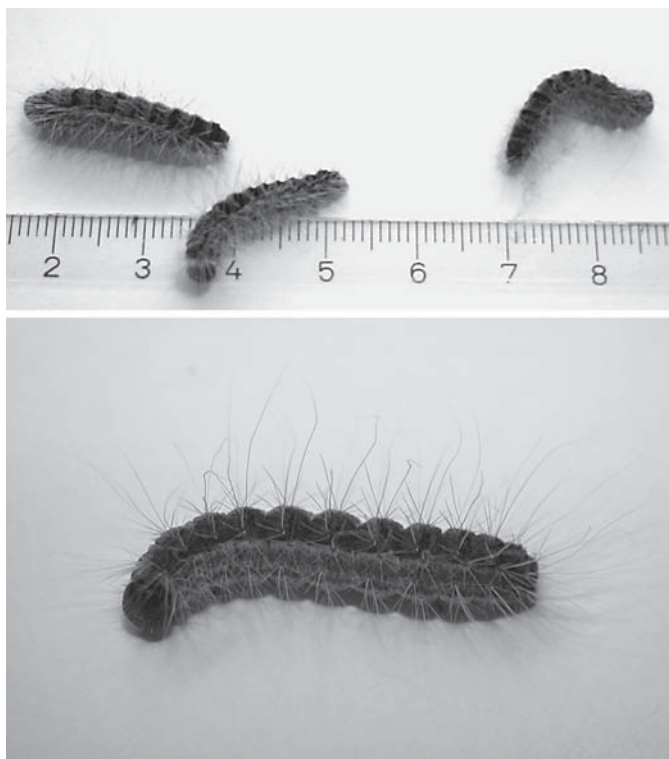


Fig. 1. Larvae of *T. processionea* (length between 2 and 2.5 cm).

tact with the larvae is necessary and the poisonous hair can be spread by the wind. Moreover, it is known that the setae can stay intact in the environment for more than a year and thaumetopoein has proved to be biologically stable [3]. 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 [2, 3]. (Developmental stages of *T. processionea* are depicted in table 1.)

The name processionary derives from the way in which the larvae moves head to tail from their nests at the bottom of the tree to the top of the tree (fig. 3), where they feed on foliage before returning to their nest in the same manner.

T. processionea infests oak trees of various species, especially in south and central Europe. Recently, outbreaks in other geographical regions have also been reported more frequently. Caterpillar dermatitis is probably far more common than previously thought. Patients often present with a rash of unknown origin, and the association with caterpillar exposure is often not recognized.

Clinical features of lepidopterism are three different types of cutaneous reactions (generally located in ex-

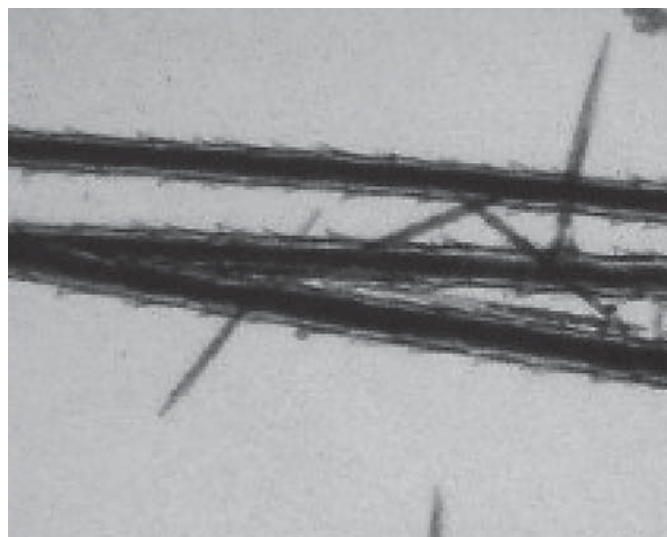


Fig. 2. Different types of hairs of sixth larval instar of the oak processionary caterpillar. Setae (small) 5 μm in diameter and 200 μm in length and silken nonpoisonous hair (large). Native, original magnification $\times 200$.

posed skin areas): weal and flare reaction, toxic irritant dermatitis and persistent itchy papules (fig. 4). Other signs are conjunctivitis, pharyngitis, malaise and upper respiratory tract symptoms including respiratory distress [1–3, 8–15]. Few cases of life-threatening anaphylactic reactions have been reported [4, 5].

The poisonous setae break on the slightest contact and release a protein cocktail. Thaumetopoein, a histamine-liberating toxin, seems to play a leading role in the clinical signs of lepidopterism. The symptoms caused by contact with the setae of the oak processionary caterpillar are due to the combined effects of a direct non-IgE-mediated mediator release by thaumetopoein and a mechanical irritation caused by the skin or mucous membrane penetration of the setae. IgE-mediated type I reactions have been reported but seem to be the exception [2, 3].

To the best of our knowledge, no epidemiological study on caterpillar dermatitis in children has been published so far.

Outbreak Report and Survey

The 2-year-old daughter of one of the authors visited a kindergarten in southwestern Germany close to the French border, where some children complained of recurrent dermatitis (urticaria, weal and flare reactions, persistent itchy papules) and/or respiratory distress (coughing, wheezing) in June 2005. An ex-



Fig. 3. 'Procession' and nest of larvae of *T. processionea* at the bottom of an oak tree.



Fig. 4. Cutaneous manifestation of lepidopterism in a 3-year-old boy.

Table 1. Development of *T. processionea*

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Egg stage (8–9 months)	█								█			
Larval stage (9–12 weeks)				█								
Pupal stage (3–6 weeks)						█						
Adult stage (3 days)								█				

The highest risk for outbreaks of lepidopterism is between May and July, when the larva is in its 3rd to 6th instar.

Table 2. Questionnaire survey of children regularly visiting the kindergarten with three solitary oak trees infested with *T. processionea* Lepidoptera in its enclosure (outbreak of lepidopterism occurred in June 2005)

Children/parents questioned	47
Questionnaires returned	24 (51%)
Age, median (range), years	4.4 (1.5–6.0)
Gender, female/male	16/8
Children with symptoms of lepidopterism	10/24 (42%)
Dermatitis (urticaria, weal and flare reactions, persistent itchy papules in timely context with a kindergarten visit)	8 (80%)
Pruritus	5 (50%)
Respiratory distress, (coughing, wheezing)	5 (50%)
General symptoms (malaise, fever)	4 (40%)
Conjunctivitis	1 (10%)
Repeated occurrence of clinical symptoms	6 (60%)
Recurrence of symptoms after oak tree removal	0 (0%)
Duration of symptoms, median (range), h	60 (24–312)
Atopic disposition of all respondents	7/24 (29%)
Patients not affected with atopic disposition	3/14 (21%)
Patients affected with atopic disposition	4/10 (40%)
Patients seen by a physician (pediatrician, general practitioner, dermatologist)	7/10 (70%)
Medication received (topical and/or systemic antihistamines and/or steroids)	5/10 (50%)

amination of the surroundings showed three oak trees infested with the oak processionary caterpillar that were located in the enclosure of the kindergarten. The three oak trees were removed and a few days later, no recurrence of clinical signs of lepidopterism were reported in any of the previously affected children.

We conducted a questionnaire survey which covered the following information: number, age, gender of patients affected, signs of lepidopterism in temporal context to visits to the kindergarten before and after removal of the three infested oak trees, and atopic disposition. We evaluated whether the children had been seen by a physician and what medication had been prescribed. Results of the survey are depicted in table 2.

Discussion

T. processionea is endemic in many European countries and due to its specific behavior of infesting trees that are standing alone or at the edge of forests, contact between the larvae with its poisonous hairs and human beings is very likely [2, 3, 8]. Children are especially at risk because of the playful manner in which they tend to explore their surroundings [2, 8].

Certain local climatic factors (warm and dry weather in the previous year) and suitable nutritional conditions

may contribute to increased reproduction rates (mass gradation). In communities located close to infested trees, lepidopterism may reach epidemic dimensions [3].

Between the 3rd and 6th larval instar, the caterpillar develops poisonous hair (setae) that can be spread by the wind and could therefore cause the airborne disease known as lepidopterism. Moreover, the setae proved to be quite stable in the environment. Intact setae were detected close to previously infested oak trees more than a year later [3].

The setae contain thaumetopoein, a histamine-liberating toxin that can cause allergic reactions via direct contact with the larvae or airborne contact by wind-spread setae [1].

The setae have been shown to cause harmful effects in humans, especially on the skin and the eyes, although bronchial symptoms through penetration of the bronchial mucous membranes and anaphylactic reactions have also been occasionally reported [4, 5]. In our study population, bronchial symptoms were reported far more often than in previous studies, mainly with adult patients [2]. Maybe pediatric patients are more susceptible to bronchial affection caused by a combination of the mechanical irritation of the setae and the toxic effect of thaumetopoein. Once the source of exposure has been removed, treatment of caterpillar dermatitis is essentially symptomatic and supportive [2, 8, 9]. Most symptoms of lepidopterism could be treated with topical and/or systemic antihistamines. In rare cases, systemic steroids \pm inhalative β -mimetics in patients with severe pulmonary affection are necessary [8]. There was no significant correlation in our rather small study population between the atopic status of the patient and an increased risk for lepidopterism. There was also no correlation between the atopic disposition of the individual and the severity of the symptoms. This does not agree with other studies in adult patients, in which atopic patients were significantly more often affected, but that could be related to the small number of patients in this study. Age and gender were also not attributable risk factors in our study population.

Precautions and Recommendations

Precautions and recommendations for individual behavior in endangered regions are as follows [16]:

- 1 Avoid infested woods or parks from April to July. Local forestry bureaus can provide information on possible infestations.
- 2 Paths near woods should also be avoided on windy days, since the hairs can be transported over long distances through the air by the wind.

- 3 Do not touch caterpillars and nests – and in no case with bare hands.
- 4 While working in the garden or woods, especially between April and July, wear long clothing made of dense material. Change clothes if there is possible contamination, wash clothing, wash and rinse the skin intensively.
- 5 Have caterpillar nests in gardens near woods removed only by specialized companies.

Conclusion

Outbreaks of caterpillar dermatitis are not uncommon and may be difficult to diagnose. Prevention is rather difficult and therefore lepidopterism should always be kept in mind as a differential diagnosis in epidemic cases of dermatitis, especially when they occur during the larval period of *T. processionea*. Children seem to suffer more often from airway affection and general symptoms (fever, malaise) than adults.

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