Beware of stinging hairs from processionary caterpillars!

Pine and oak processionary caterpillars have stinging hairs that can cause sometimes severe clinical symptoms in exposed individuals. You can develop symptoms even without any direct contact with the caterpillar as it can shed these stinging hairs, which are then carried very easily by the wind.

Pine processionary caterpillars

Pine (*Thaumetopoea pityocampa*) and oak (*Thaumetopoea processionea*) processionary caterpillars are poisonous urticating insects in the Lepidoptera (butterfly and moth) order that live in colonies and move in single file.

These two species have many stinging hairs on the body that they use as a defence mechanism. These hairs are located on dorsal plates that the caterpillars open when they feel threatened. When released, these tiny "spears" can reach the skin, eyes and respiratory tract and cause reactions in the form of stinging due to the chemical substances they contain, in particular a toxic protein (thaumetopoein), and also from embedded hairs. Since the venom remains active in the shed hairs, people can be exposed through the air in infested areas, by handling nests, or by secondary contact with clothes or with domestic animals that have themselves been exposed.

Cutaneous (hives, erythema, pruritus, etc.), ocular (conjunctivitis, corneal lesion/keratitis, eyelid oedema, etc.), respiratory (cough, bronchospasm, etc.) or digestive (digestive pain, vomiting, oral-facial oedema) signs may occur depending on the route of exposure. They can be associated with general signs (malaise, hyperthermia, etc.) or even with a state of anaphylactic shock (the most serious form of allergy, which can be life-threatening) in case of repeated exposure and/or a history of allergy. There are no specific treatments.

The habitats, areas of colonisation and biological cycles of these two species are different.

The pine processionary caterpillar is found in conifer forests in Atlantic and Mediterranean regions. The species' area of establishment has been spreading to the north-east since the 1960s; it has been shifting north, especially to the Île-de-France region, since 2010 as a result of global warming [1].

Towards September, after hatching of the eggs laid a month earlier by the adult moths on the tree branches, pine processionary caterpillars build a winter nest where they pass through various larval stages. They march out at night to feed on the pine needles. Between January and March, they descend from the tree in single file to burrow underground, pupate and then emerge between June and August, transformed into adult moths.

The cycle of the pine processionary caterpillar is generally annual; however, depending on the weather conditions (if the temperatures are too cold or too hot [2]), the caterpillar may remain underground for several years consecutively.

The oak processionary caterpillar is found in oak stands. The eggs laid by the adult moths at the ends of the branches hatch around April. The caterpillars form several nests depending on the larval stage and go out at night to feed, leaving a silk trail behind them. They stay on the trunk or a main limb of the tree to pupate around July-August, before becoming moths a month later.

In France, periodic outbreaks of oak processionary caterpillars are experienced in several regions, primarily the north-west, Île-de-France and east [3].

In addition to causing significant defoliation, processionary caterpillars are considered as a public health problem due to the effects of their hairs on humans. Action No. 12 of the Third National Environmental Health Action Plan (PNSE 3, 2015-2019) included "strengthening and coordinating the management of plant and animal species such as processionary caterpillars whose proliferation can be harmful to public health".

To determine the extent of the health problem, ANSES, together with the network of Poison Control Centres (PCCs), analysed cases of poisoning by processionary caterpillars.

In total, 1274 cases of symptomatic exposure to processionary caterpillars were recorded by the PCCs between 1 January 2012 and 31 July 2019: 753 people (59.1 %) had been exposed to pine processionary caterpillars and 345 (27.1%) to oak processionary caterpillars; for the remaining 176 cases (13.8%), the species of processionary caterpillar in question could not be determined.

Cases of exposure to processionary caterpillars could involve several people from the same family or the same group. The 1274 symptomatic cases were thus divided up into 888 dossiers, each including one to 50 people.

Pronounced seasonality

The number of dossiers showed pronounced seasonality, consistent with the biological cycle of the caterpillars.

On average, the PCCs recorded 30 dossiers of symptomatic exposure to **pine** processionary caterpillars in the month of March (Figure 1), with exposure being most frequent from January to April (85% of dossiers).

Symptomatic exposure to **oak** processionary caterpillars was most frequent in June (8.5 dossiers on average); 90.7% of cases were observed from April to July.

Peaks of symptomatic exposure to **pine** processionary caterpillars varied in intensity depending on the year (Figure 2); the highest occurred in 2014 (47 dossiers) and 2017 (50 dossiers).

Seasonal peaks of poisoning by **oak** processionary caterpillars seemed to increase from 2012 (seven dossiers in July) to 2019 (15 dossiers in June), with a higher poisoning peak in June 2018 (29 dossiers).

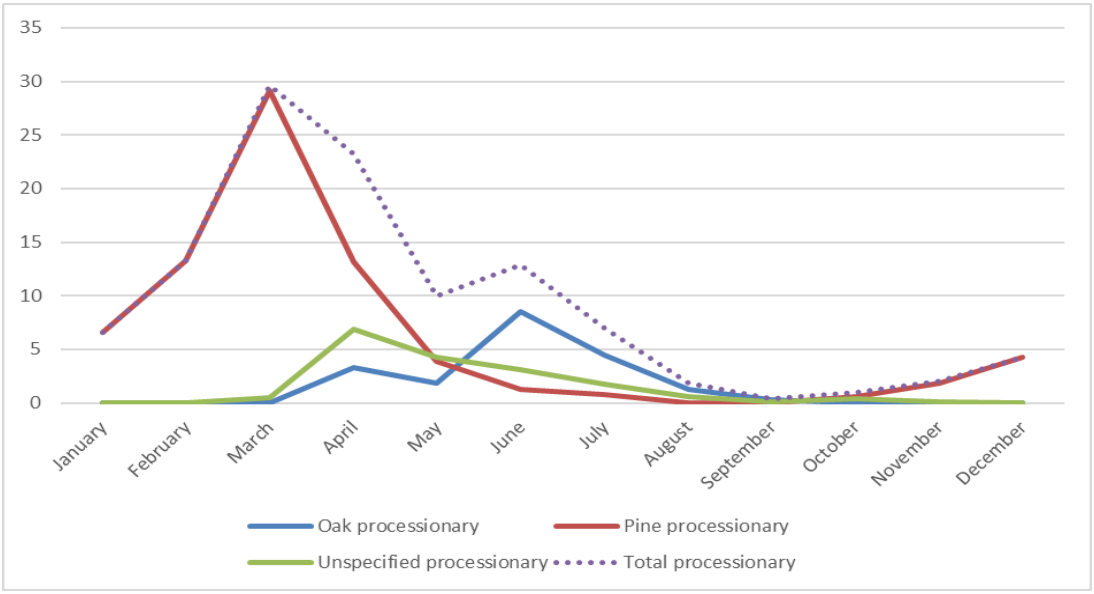

Figure 1 : Average number of dossiers of symptomatic exposure to processionary caterpillars recorded by the PCCs from January 2012 to July 2019. Source: SICAP.

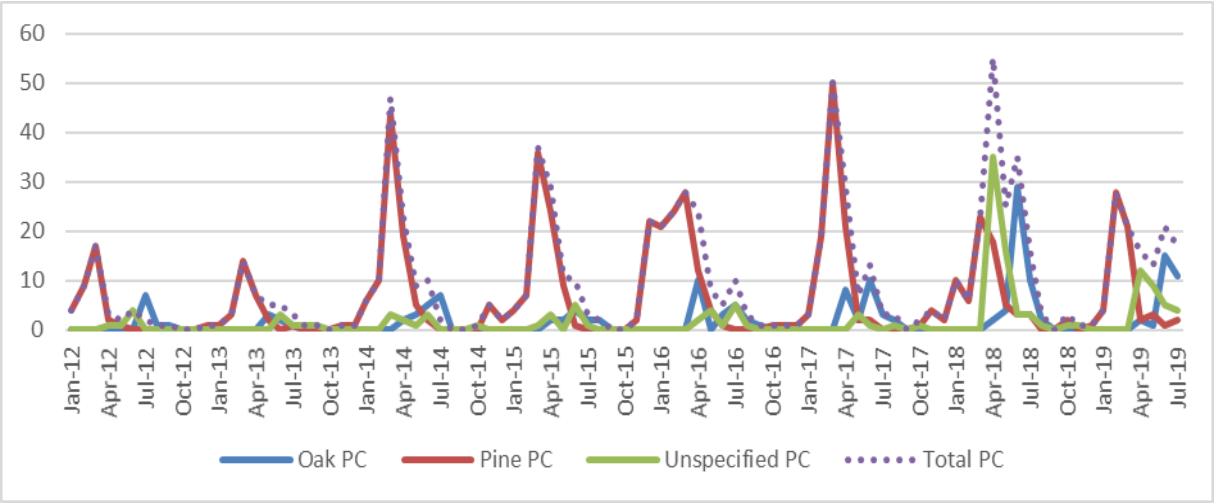

Figure 2 : Monthly breakdown of the number of symptomatic dossiers for processionary caterpillars from January 2012 to July 2019. Source: SICAP

A geographic distribution of cases consistent with the caterpillars' habitats

For **pine** processionary caterpillars, the highest incidence rates (number of cases of poisoning by processionary caterpillars per 100,000 inhabitants during the study period) were observed in *départements* in southern and western France. The particularly high incidence rate in Gironde was due to a dossier of 50 clustered cases in this *département* in 2018.

For **oak** processionary caterpillars, there were higher incidence rates in the northern half of France and in the Southern Alps. The particularly high incidence rate in Essonne was due to a dossier of 45 clustered cases in this *département* in 2017.

For these two species, this geographic distribution corresponds to field observations.

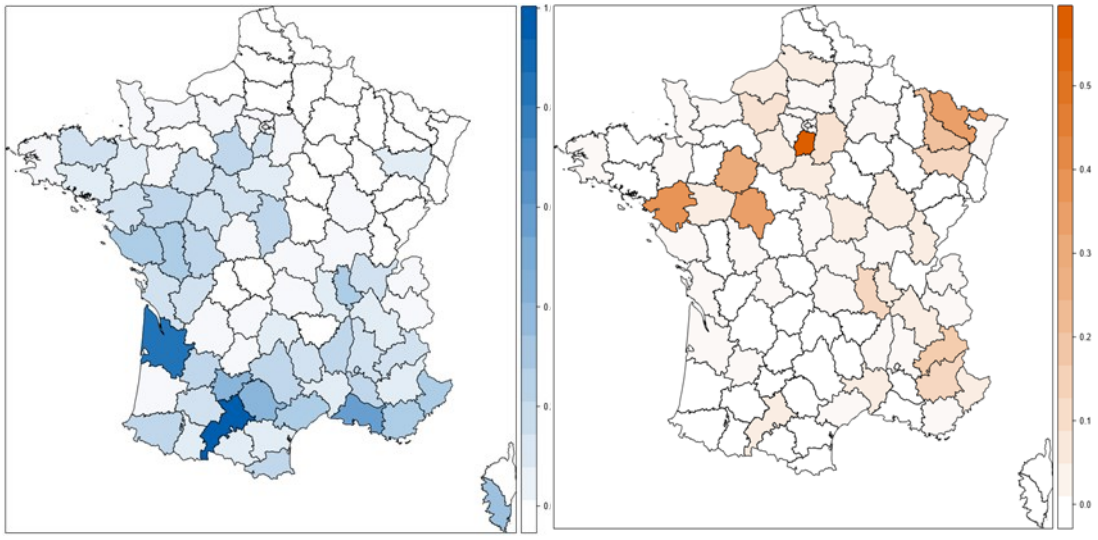

Figure 3 : Departmental incidence rates for cases of poisoning by pine (blue map) and oak (orange map) processionary caterpillars from January 2012 to December 2019. Source: SICAP.

Exposure mainly occurring in children

For the 1022 symptomatic cases[1] for which individual information was collected (out of 1274), the male-female ratio was 1.17 and the age of the subjects ranged from two months to 87 years with a median age of 11 years. A quarter of the subjects (25.8%) were under the age of five years; this proportion of young children is characteristic of the symptomatic accidental poisoning cases recorded by the PCCs, all agents combined (28.2%).

Exposure usually involving no direct contact with the caterpillars

When this was specified (in 78.5% of cases), the people exposed had not been in direct contact with the caterpillar (in 51.5% of cases); instead, they had come into contact with airborne hairs or with urticating hairs deposited on surfaces (terraces, lawns), objects (sticks, toys, fuel wood, etc.), clothes or domestic animals. There had been direct contact with a caterpillar in 37.5% of cases and both direct and indirect contact in the remaining 11%.

Nest of processionary caterpillars

Primarily cutaneous exposure and symptoms

Almost 90% of the subjects had been exposed by a single route (cutaneous, oral, ocular, respiratory) and 9.7% by a combination of several routes. The route of exposure was unknown for the remaining 0.6% of cases. The skin (92.7% of cases) was the main route of exposure, whether alone or combined with another route; it was followed by the eyes (6.9%), mouth (6.3%) and respiratory tract (3.8%).

Skin contact caused redness, itching, hives and, less often, small blisters. There were also general signs for 3% of the subjects (fever, asthenia, adenopathy, etc.).

Following eye contact, the subjects usually experienced conjunctivitis, watery eyes, ocular pain or, less often, keratitis (corneal lesion). In half of cases, eyelid oedema or itching was also reported.

Following ingestion or contact with the mouth, the subjects developed cutaneous signs (hives, oedema, itching), oropharyngeal irritation or digestive symptoms (tongue lesion or irritation, abdominal pain, hypersalivation, vomiting, etc.). More general signs were reported in some cases (oral and/or facial oedema, fever, malaise, etc.).

Lastly, people who had inhaled hairs mainly experienced coughing, respiratory discomfort or bronchospasm.

Potentially serious cases

Of the 1022 symptomatic cases, 96.3% were mild[2] (n=982), 3.5% were moderate (n=36) and 0.2% (n=2) were severe. The first severe case involved a three-year-old child who had swallowed a pine processionary caterpillar in the garden and developed oedema of the tongue and lips as well as hypersalivation, requiring two days of hospitalisation. The signs regressed after symptomatic treatment. The second case involved a 51-year-old man with a Hymenoptera allergy; cocoons of processionary caterpillars had fallen on his neck when he was standing by a swimming pool. He developed giant hives, dysphonia (voice disorder) and dysphagia (difficulty swallowing), requiring hospital treatment with corticosteroids, antihistamines and nebulised adrenaline. The clinical outcome was rapidly favourable.

1.PCCs can be contacted for "collective cases" where the agent of exposure (product, plant, animal, etc.) is clearly identified but where detailed case information is not available.

2. Severity assessed based on the Poisoning Severity Score (Persson HE, Sjöberg GK, Haines JA, Pronczuk de Garbino, J. J Clin Toxicol. 1998;36 (3):205-13).

Conclusion

Every year, pine and oak processionary caterpillars are responsible for sometimes serious cases of poisoning. While control methods are available (pheromone traps for moths, microbiological control with *Bacillus thuringiensis* [4], landscape and forest management, mechanical control via the collection and destruction of nests, nest boxes for tits, eco-trapping of caterpillars on tree trunks, etc.), it is necessary to reiterate some prevention messages to limit human exposure (see box below [5, 6]).

The public should be aware that the hairs of caterpillars, whether found in the air or deposited on surfaces, clothes or animals, cause the same symptoms as direct contact with a caterpillar.

A toxicovigilance study report has been published by ANSES in 2020.

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Recommendations

- Do not approach or touch the caterpillars or their nests: this applies especially to children
- Keep away from trees containing their nests
- Wear long clothing when walking in the forest or near infested trees
- Avoid rubbing your eyes during or after a walk
- Wash fruit and vegetables from your garden thoroughly if there is any infestation nearby
- Avoid drying laundry next to infested trees
- If you suspect you have been exposed to the caterpillars, take a shower and change your clothes.

- *In the event of any signs of a life-threatening emergency (respiratory distress, etc.), dial 15 (in France) or go to the hospital emergency department.*
- *If any symptoms of poisoning occur, seek advice from a doctor or call a poison control centre.*
- *If possible, take photos of the caterpillar for easier identification.*
- - *If pets are affected, seek advice from a veterinarian or call one of the veterinary poison control centres (the Western France Animal and Environmental Poison Control Centre [CAPAE-Ouest] or the National Information Centre for Veterinary Toxicology [CNITV]).*

References :

[1]. Le front d'expansion de la chenille processionnaire du pin progresse toujours. Département de la santé des forêts. July 2018. 4 p. Consulted on 1 October 2019. https://agriculture.gouv.fr/le-front-dexpansion-de-la-chenille-processionnaire-du-pin-progresse-toujours

[2]. Salman MHR, Bonsignore CP, El Alaoui EFA, et al. Winter temperature predicts prolonged diapause in pine processionary moth species across their geographic range. PeerJ. 2019 Feb 28;7:e6530.

[3]. Les défoliateurs de feuillus en 2018. Département de la santé des forêts. May 2019. 4p. Consulted on 1 October 2019. https://agriculture.gouv.fr/les-defoliateurs-en-2018

[4]. ANSES Opinion of 28 April 2017 on the advisability of enabling the use by derogation of the PHERO-BALL PIN biocidal product to control pine processionary caterpillars (https://www.anses.fr/fr/system/files/BIOC2017SA0068.pdf)

[5]. Ile-de-France Regional Health Agency. Chenilles processionnaires du chêne et du pin : attention aux poils. 2 April 2019. Consulted on 1 October 2019.

https://www.iledefrance.ars.sante.fr/system/files/2019-03/Chenilles-processionnaires-depliant.pdf

[6]. Grand-Est Regional Health Agency. Prévention des particuliers contre les chenilles urticantes. March 2019. 2p. Consulted on 1 January 2019.

https://www.grand-est.ars.sante.fr/system/files/2019-05/Fiche_prevention_chenilles2019.pdf