What's Eating You? *Megalopyge opercularis*

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Caterpillars are the larvae of both moths and butterflies and are commonly perceived as gentle harmless creatures. However, some caterpillars are endowed with protective spines or hairs, which serve as a defense mechanism allowing them to sting potential predators. Of the stinging caterpillars, the larval stage of the flannel moth (*Megalopyge opercularis*) is perhaps the most significant.[1] It is commonly referred to as the *puss caterpillar, asp, tree asp, Italian asp, woolly worm, woolly slug, opossum bug, el perrito (little dog)*, and *bicho peludo negro (black hairy bug)*.[2,3] M *opercularis* is of the phylum Arthropoda, class Insecta, order Lepidoptera, and family Megalopygidae.[2,4] It has a rather wide distribution in the southeastern and south-central United States ranging from Maryland to Mexico, with Texas apparently having the largest population.[2]

The toxic effects caused by M *opercularis* larvae are related to specialized poisonous hairs or spines, which make up only a small part of the total number of the caterpillar's hairs. These poisonous hairs or spines (also referred to as toxic, urticating, or nettling hairs; setae; nettles; spicules; flechettes; and arrows) become more dangerous as the larva matures[4] and are designed to provide the puss caterpillar with a biologic defense mechanism against its natural predators, such as flies and wasps. The larva has 6 rows of spines underneath its long hairs. It is believed that the toxin is contained within these spines and is made by specialized basal cells. The toxin is theorized to be passively secreted into the victim upon touch.[5] Studies of specific toxins are few, but they have shown that the toxins contained within M *opercularis* larvae are thermolabile proteins, some possessing enzymatic and proteolytic activities. Histamine, histamine-releasing substances, kinin activators, plasminogen activators, and those with trypsin and chymotrypsinlike properties have been reported.[6]

Butterflies and moths demonstrate an extremely complex life cycle. The caterpillar typically goes through a series of 5 or 6 molts and transformations called *instars*. The most mature developed instar pupates into a cocoon.[4] Size, color, and hair vary as M *opercularis* larvae undergo 5 or 6 instars and reach maturity in 30 to 60 days.[2,3] The puss caterpillar's first instar measures approximately 1.5 mm in length and is usually yellowish with a reddish tinge. The caterpillar's poisonous spines are only slightly developed in this stage. With each molt, the number and size of these spines increases. The mature asp is about 2.0 to 3.5 cm in length and 1.0 to 2.0 cm in width and height.[4,5] It has 7 pairs of prolegs, which are suction-cup–like claspers on the rear of the body.[7] The spines are yellowish with black tips, and hair color is variable, ranging from pale yellow and gray to various shades of brown and some mixtures. As the caterpillar matures, successive instars appear darker because of accumulated ingested plant pigments. M *opercularis* hairs are about two thirds the length of the body and taper at the posterior end to form a tuft (Figures 1 and 2). The cocoon and caterpillar are similar in appearance because the larva sheds hairs and uses them, as well as the silk they produce, to make the cocoon. The adult flannel moths that eventually exit the cocoon are yellowish brown with wings that have long, wavy, white-streaked hairs.[5] The female flannel moth is larger than the male, with a wingspan of 4 cm.[3,5]

The abundance of M *opercularis* in a given year is related to the effectiveness of natural controls.

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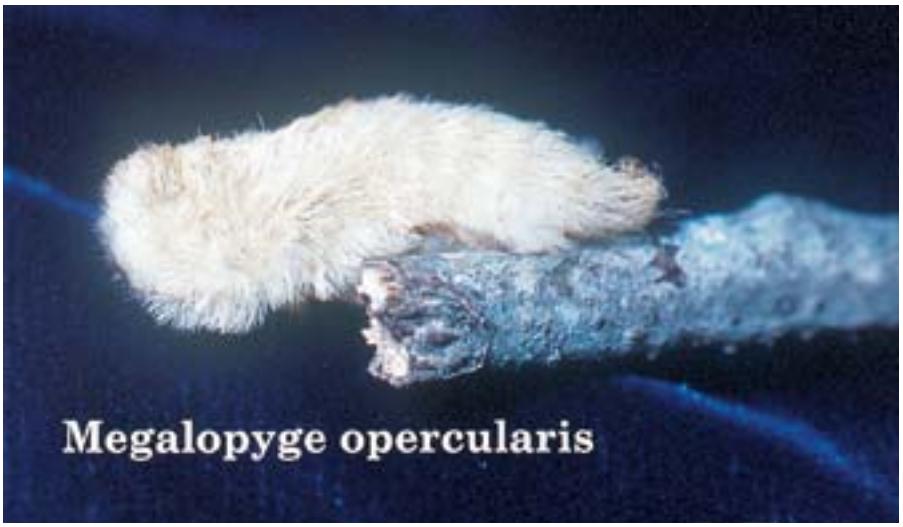

Figure 1. *Megalopyge opercularis* varies in color from light tan to brick red and dark brown. Younger caterpillars typically are lighter in color.

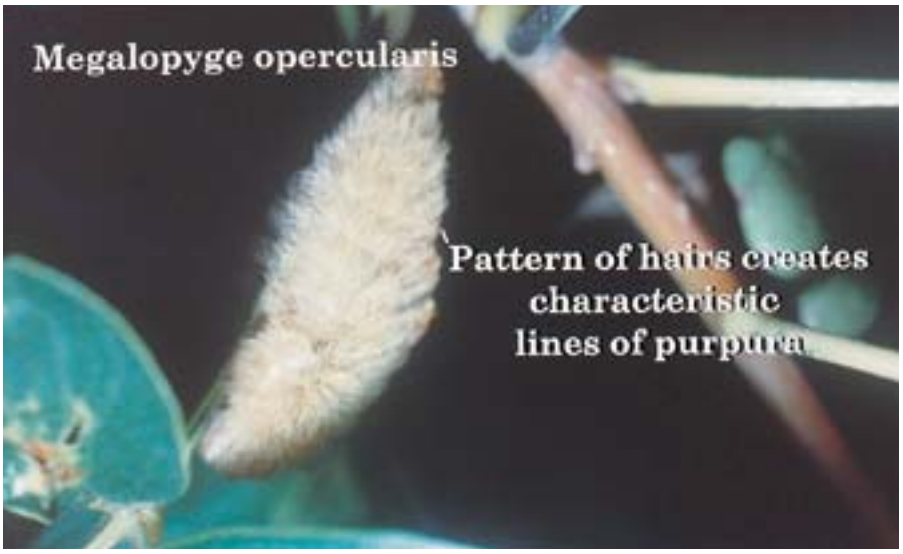

Figure 2. The parallel pattern of caterpillar hairs of *Megalopyge opercularis* produces a similar pattern of purpura.

Bacterial disease caused by *Micrococcus* species is thought to be partially responsible for the mortality of the larvae. In addition to bacteria, parasitic flies such as *Carcelia lagoae* and *Phorocera claripennis* may have a prominent role in keeping the puss caterpillar population under control.[2,5] Although these natural enemies of M *opercularis* larvae usually are able to control the population, it seems that approximately every 4 to 5 years the prevalence of these caterpillars increases markedly.[2]

M *opercularis* is an herbivore and feeds on leaves from a variety of trees and shrubs. Puss caterpillars are found predominantly in citrus, hackberry, elm, plum, sycamore, willow, sugarberry, mulberry, and oak trees, as well as frequently on rose bushes, corn, geraniums, and a variety of household plants.[3-5] In Texas, puss caterpillars typically are found in live oak trees. Many envenomations are related to tree pruning when the caterpillars fall from the tree as the branches are disturbed. Often, the individual who has been stung never sees the caterpillar but reports immediate pain after observing something falling from a tree. The characteristic train-track pattern of purpura associated with M *opercularis* envenomation is diagnostic when present (Figure 3).

M *opercularis* stings also occur when a person brushes against the caterpillar or during attempts to remove it from exposed skin or clothing. The caterpillar can only sting from the spines on its dorsal surface and cannot sting from its underside.[2] A puss caterpillar that has died recently and molted skin also can sting. However, the adult

Figure 3. *Megalopyge* purpura.

Figure 4. Purpura and papulopustules resulting from *Megalopyge* envenomation.

moths of this species are essentially harmless (ie, not a significant cause of lepidoptrism). The most common sites of M *opercularis* envenomation in order of frequency are: the hand or arm, the foot or leg, and the neck or face.[3] When the caterpillar's poisonous spines penetrate the skin, the toxin passes through the hollow spines from the underlying glands and enters the dermis at points of contact. Some spines break off and remain in the skin, and others are pulled out as the caterpillar is removed.[2] The sting produces an intense radiating pain, with a halo of erythema around the site of envenomation.[6] This pain frequently radiates up an entire extremity toward the inguinal and axillary regions. The individual puncture sites may develop into serous or hemorrhagic papulovesicles or bullae, often in a characteristic gridlike pattern (Figure 4). This hemorrhagic pattern is the only diagnostic pattern of M *opercularis* envenomation. Localized swelling usually develops, as well as radiating lymphangitis from the site of the sting and enlargement of lymph nodes in draining areas. Within minutes, some patients complain of severe headache, which may persist for 24 hours. Nausea, vomiting, malaise, fever, restlessness, tachycardia, hypotension, and urticaria may occur. Shocklike symptoms or convulsions may manifest within 2 hours of the sting. To our knowledge, no anaphylactic reactions or deaths have been reported from M *opercularis* envenomation.[2,3,5,6]

Given the lack of antidote, supportive and symptomatic care is the mainstay of treatment. Adhesive can be helpful for removing any spines that have broken off and remain embedded in the skin. Intermittent ice application may reduce pain, but strong analgesics such as morphine or meperidine may be needed. Calcium gluconate 10% (10 mL intravenously) has been reported to provide some pain relief, and triamcinolone acetonide (40 mg intramuscularly) with concomitant topical application of desoximetasone cream 0.1% also has been used with some success. Diphenhydramine and cimetidine may relieve pruritus and urticaria, and epinephrine has helped to control symptoms in several patients with shocklike symptoms. Antibiotic prophylaxis is not necessary. Laboratory tests are not required after the diagnosis of M *opercularis* envenomation has been made. No deposition of complement or immunoglobulins has been detected by direct immunofluorescent examination of

involved cutaneous lesions.[8] Despite the severity of pain and prolonged duration, an effective treatment protocol has not yet been established.[2,5]

The best way to prevent caterpillar stings is to avoid them. Human contact may be reduced by education regarding appearance and habitat. When puss caterpillars are found in abundance, chemical controls such as lead arsenate and DDT have proven beneficial.[3] Weak phosphodiesterase inhibitors such as carbaryl are safer for domestic use and are reported anecdotally as effective.

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