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Accidents with Lepidoptera (Insecta): Biology, Poisonous, Clinical Manifestations, Treatment, Prevention, and Therapeutic Possibilities

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Abstract

Accidents triggered by contact with winged adult forms of moths and accidents caused by contact with larvae. These accidents are caused by contact with the bristles on the abdomen of females of certain species, belonging to the genus *Hylesia* Hübner, 1820 (Family: Hemileucidae). Therefore, the simple fact of penetration of the bristles seems to be capable of causing intense inflammatory, popular, and pruritic reactions. Pararama (pararamose) is the common name for a stinging caterpillar found in the artificial rubber plantations of Pará, Brazil, the larval stage of the moth *Premolis semirufa* (Walker, 1856) (Famíly: Erebidae). Therefore, accidental contact with the small bristles of the caterpillars or with those of the cocoons causes a chronic inflammatory reaction in the interphalangeal joints that leads to ankylosis. The morbid condition mainly affects rubber tappers and is classified as an occupational disease. Eruca=larva; erucism is poisoning caused by a moth larva. The main families of Lepidoptera fireworms that cause erucism accidents are Megalopygidae, Saturniidae, and Arctiidae. The caterpillars of the Megalopygidae family have a body covered with long, harmless bristles that cover the smaller, sharp spines that carry poison glands this manuscript aims to report the biological characteristics of venomous Lepidoptera (Insecta) and their biological, clinical manifestations, treatment, prevention, and therapeutic possibilities. That paper is a narrative review of the literature, which is designed to explain and discuss a certain subject from a theoretical or contextual perspective, to allow the reader to acquire or update knowledge on a specific topic. The scientific articles that made up this review were searched on Google Scholar, Biological Abstract, HAL, Qeios, ResearchGate, Scielo, and SSRN. The following descriptors in Health Sciences (DeCS) were used: biological therapy, larva, wound, debridement, and healing. The following inclusion criteria were considered: original articles and reviews, published nationally and internationally in full, available electronically, and published in Portuguese, English, and Spanish. The exclusion criteria were dissertations, theses, monographs, and conclusion work, duplicates, and those that required payment to access the content in full.

Keywords: Butterfly, Caterpillar, Families, Moth, Poison.

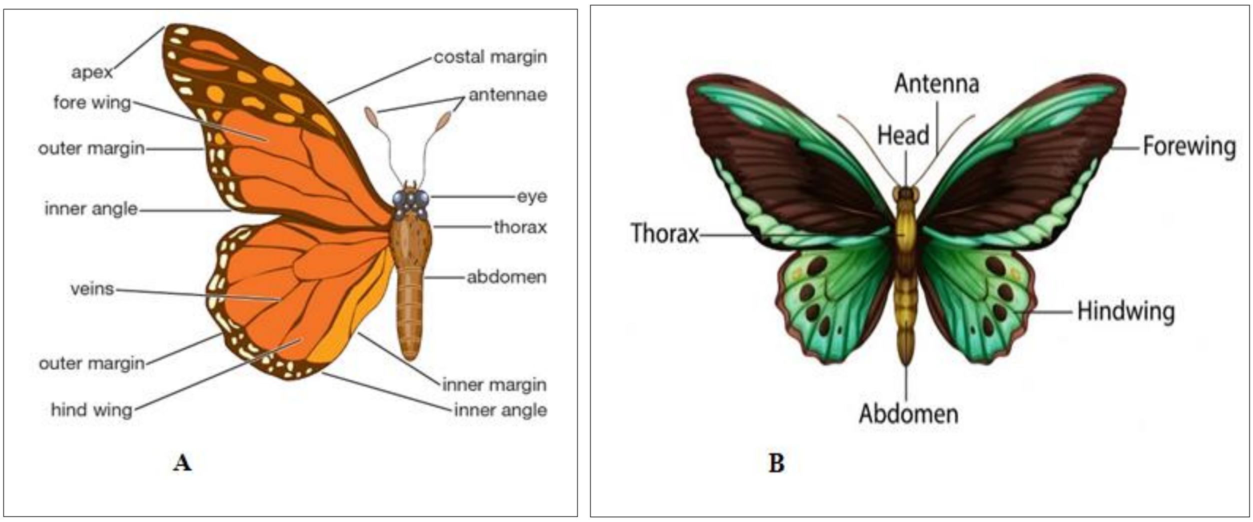
1. INTRODUCTION

Lepidoptera is one of the major insect orders, both in size and numbers, with around 160,000 species described in more than 120 families, and popularity, with many amateur and professional entomologists studying the order, particularly butterflies. Three of the four suborders contain few species and do not have the proboscidae characteristic of the larger suborder, Glossata, which includes the Ditrysia series, with many species, defined by unique abdominal characteristics, especially in the genitalia (Heppner, 1991).

1.1. Morfology

The wings are covered in scales and the sucking mouthpiece is modified into a beak, which is a tube wrapped in a spiral that works similar to the mother-in-law's tongue toy. This type of mouthpart is exclusive to this order of insects, with the function of extracting nectar from flowers and aspirating liquid substances to feed. Adults who do not eat have atrophied mouthparts. The head is rounded and narrower than the thorax, with one pair of compound eyes, with a large number of ommatidia; two eyespots that may be barely visible due to the scales that cover the body; one pair of antennae of various types and positioned on the inner edge of the eyes; one sucking-type mouthpiece (Figures 1A-2)

(Gaston, 1991; Heppner, 1991; Kristensen, 2003; Dias, 2006; Heikkilä *et al*., 2014).



Figures: 1AB: A butterfly is an insect with two pairs of colorful wings that are covered with scales. Here is a brief description of the labeled parts of a butterfly:

Antenna: The sensory appendage on the head used for smelling and feeling.

Head: The front part of the body that contains the brain, eyes, and mouthparts.

Eye: The large, compound eye that is made up of many small lenses.

Thorax: The middle part of the body that contains the wings and legs.

Forewing: The upper wing that is attached to the thorax and is used for flight.

Hindwing: The lower wing that is attached to the thorax and is used for flight.

Abdomen: The rear part of the body that contains the digestive and reproductive organs.

Wing Vein: The network of narrow, transparent tubes that support the wings and help to channel fluids through the wings.

Scales: The tiny, overlapping structures that cover the wings and give them their color.

Proboscis: The long, tube-like mouthpart that is used for feeding on nectar from flowers

Legs: The six jointed appendages that are used for walking and clinging to surfaces.

These are the main labeled parts of a butterfly. Different species of butterflies may have variations in the shape, size, and coloration of these body parts

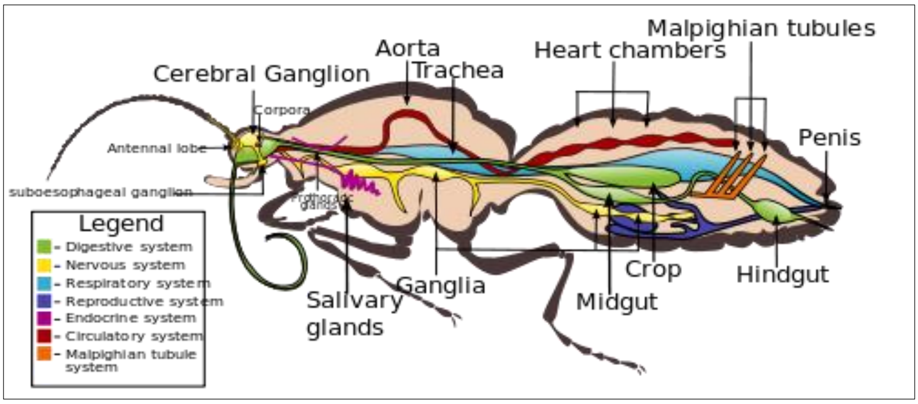


Figure 2: Internal anatomy of Lepidoptera viewing imago male (Family: Nymphalidae), showing most of the major organ systems, with characteristic reduced forelegs of that family and the corpora including the corpus allatum and the corpus cardiac

Source: Doi: 10.5772/intechopen.70452

On the head of the caterpillars are three pairs of simple eyes, one pair of antennae, and one chewing mouthpart. Both adults and caterpillars have three pairs of legs on their thorax, of variable size and very delicate. Only adults have two pairs of membranous wings covered in scales, with the front wings being more developed than the back ones. Caterpillars have false legs on their abdomen, with hooks at the base that hold food. The abdomen of adults is elongated and covered with scales, and the genitalia is the external sexual apparatus (Figure 3) (Gaston, 1991; Heppner, 1991; Becker, 2000; Kristensen, 2003; Dias, 2006; Farias, 2013; Heikkilä *et al.*, 2014).

Figure 3: Sexual dimorphism in antennae in *Caligula japonica* Moore, 1862, family Saturniidae: feathery antennae of male (left) and linear form in female (right)
Source: https://en.wikipedia.org/wiki/External_morphology_of_Lepidoptera

1.2. Biology

Regarding metamorphosis, it means that these animals change their bodies until they become adults. As their young and adult individuals are completely different, it is possible to say that the metamorphosis of butterflies is complete. This entire transformation is made up of four phases: egg, larva (caterpillar), pupa (or chrysalis), and adult (imago). The first three stages last between 30 and 120 days, depending on the species and environmental conditions (Daly, 1998; Davis, 1998; Dias, 2006; Montanha, 2024).

Egg:

The beginning of the cycle begins with eggs laid by butterflies, normally on plant leaves that are generally used as food when they are young. Furthermore, the mechanism in the insect's body causes the embryo to remain inactive in the egg until climate and plant growth conditions become favorable, as this is the phase most vulnerable to predators. Depending on the species, eggs vary in size and color (Figure 4) (Kristensen, 2003; Zagrobelny *et al.*, 2004; Bona *et al*., 2015; Brehm, 2017; Montanha, 2024).

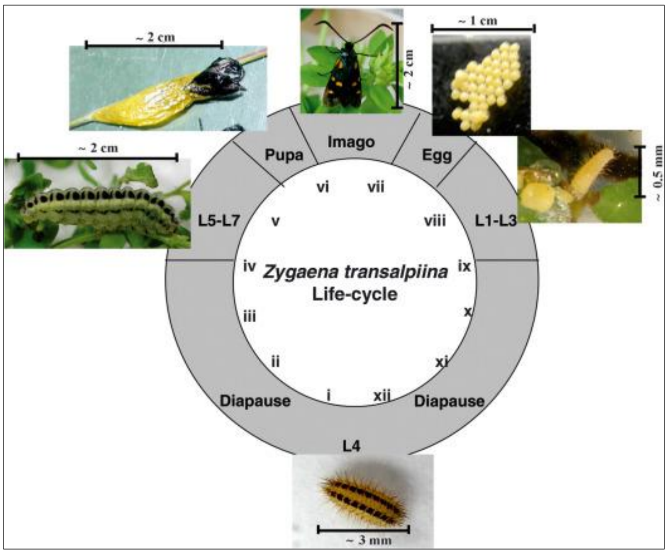


Figure 4: *Zygaena transalpina* (Esper, 1780) life-cycle Eggs are laid in July usually on the larval food plant. After 1–3 weeks they hatch and the first instar larvae emerge (L1). Molting occurs every 8–10 days and the larvae stop feeding and enter diapause usually in the third, fourth, or fifth instar (L3, L4, L5). During diapause, larvae reduce their metabolic turnover by about 70% compared to feeding instars and develop a considerably thicker cuticle. Larvae normally recommence feeding in spring when fresh food plants are available, but diapause may sometimes last two or more years. The larvae reach maturity in the sixth or seventh instar (L6, L7), and 4–6 weeks after emerging from diapause, they spin cocoons and pupate. The imago moths emerge from the cocoons 14–30 days later, mate, and the females lay eggs
Source: Zagrobelny *et al.*, 2004

Larva:

The second phase begins after 5 to 15 days, the estimated time for them to hatch, depending on the species, and release the larvae, popularly known as caterpillars. During this period, these animals feed intensely to save energy for the next phase, causing serious problems in places with plantations. From these leaves, the caterpillar takes its nutrients and water to survive. The butterfly stays in caterpillar form for approximately 1 to 8 months, depending on the species. After some time, the caterpillar attaches itself to a surface by the posterior portion of its body. Through silk threads produced, the formation of the chrysalis begins (Gaston, 1991; Davis, 1998; Kristensen, 2003; Duarte *et al.*, 2012; Camargo *et al.*, 2018; Montanha, 2024).

Pupa:

After several skin changes, the animal uses these threads to build the true cocoon. This is an immobile phase, in which the animal survives thanks to those reserves accumulated when it was still a caterpillar. It is in this third phase that the big changes happen. Butterflies develop adaptive strategies at this stage, so the chrysalises have particular shapes and colors that make them go almost unnoticed in the places where they are attached. This stage of absolute rest can last from one to three weeks, depending on the species (Heppner, 1991; Kristensen, 2003; Dias, 2006; Farias, 2013; Heikkilä *et al*., 2014).

This is the last of the four butterfly stages and is also the final stage of the butterfly life cycle. At this stage, the butterfly emerges from the pupa fully developed and sexually mature so that it can reproduce. Adult butterflies feed differently than in the caterpillar stage and ingest nectar, pollen, and fermenting fruits, but they need nutrients rich in sugar to provide them with the energy necessary for their flights. Finally, the adult life of butterflies varies in length depending on their size and can last from 5 days to 1 year (Figure 5) (Gaston, 1991; Davis, 1998; Dugdale *et al.*, 1998; Kristensen, 2003; Dias, 2006).

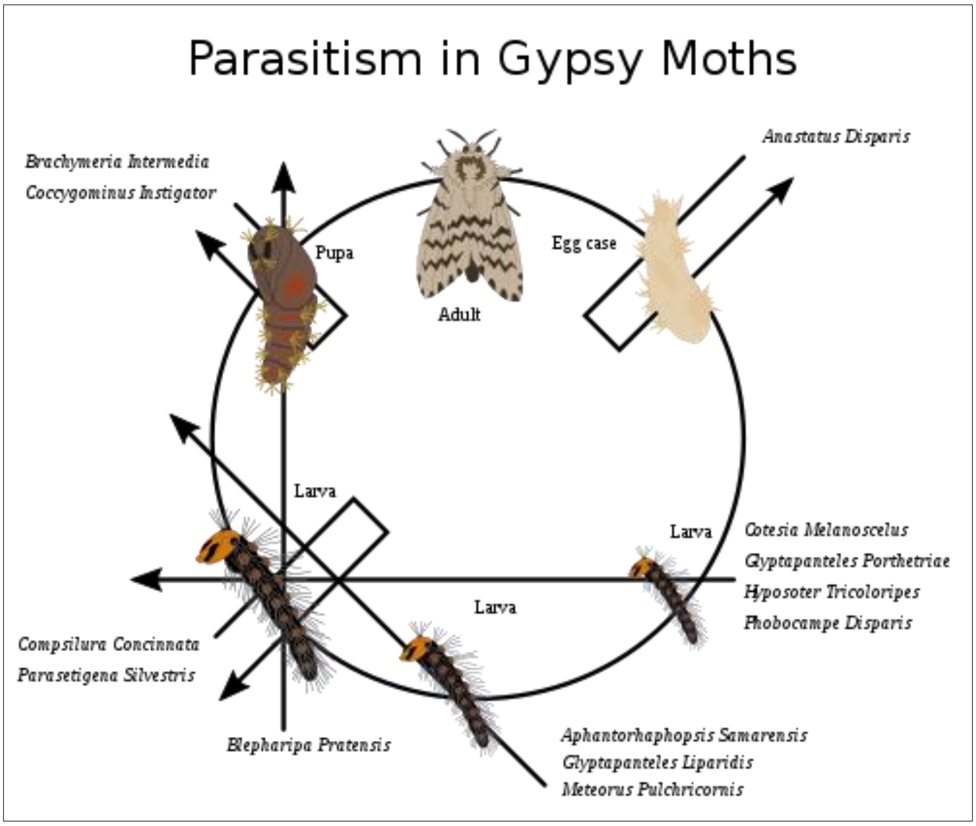


Figure 5: The different parasitoids affecting the spongy moth *Lymantria dispar* (Linnaeus, 1758): The stage they affect and eventually kill and their duration are denoted by arrows

Source: https://en.wikipedia.org/wiki/External_morphology_of_Lepidoptera

1.3. Ecology

Several factors related to the host plant can influence the richness of phytophagous insects, such as abundance and geographic distribution, morphological and structural characteristics, presence of secondary compounds, and availability and distribution of resources offered by host plants. It is found in different types of the division of Lepidoptera into butterflies and moths based on some observable characteristics, both about behavior and the shape of their bodies or morphology. Most butterflies, for example, are active during the day and have a daytime habit, while most moths prefer the night and have a nocturnal habit. Another difference between these two Lepidoptera is the position of the wings about the body butterflies leave their wings elevated, while moths keep their wings open at all times. The antennas are a good way to identify the Lepidoptera observed. Moths have feather-like antennae, they have sensory bristles that are used to capture pheromones from the opposite sex, while butterflies have thin antennae with a dilated tip (Gaston, 1991; Davis, 1998; Dugdale *et al.,* 1998; Dias, 2006; Duarte *et al.*, 2012; Camargo *et al.,* 2018; Montanha, 2024).

The larval forms feed almost exclusively on foliage and fruit structures, being the dominant herbivorous insect species in most habitats, which confers most of the group's economic importance. Each species of vascular plant is likely host to at least one species of Lepidoptera, which makes them important regulators of plant species, in addition to actively participating in nutrient cycling in different ecosystems. The adult forms feed predominantly on nectar and pollen, although some exceptions may feed on fermented fruits, animal excreta, vegetable resins, or even blood, in addition to groups that do not feed in adulthood, consuming only energy reserves acquired during growth. larval stage (Gilbert, 1984; Gaston, 1991; Tyler *et al*., 1994; Lamas *et al.*, 1995; Gullan and Cranston, 2017).

1.4. Habitat and Geography Distribution

Cultivated fields, flowery meadows, roadsides, open land, urban areas, and rubble piles. The caterpillar feeds on several species of Solanaceae, Brassicaceae, and Resedaceae. It has migratory behavior, which is why it is found in different environments. Geographic distribution: It is found in Mexico, Brazil, Bolivia, Ecuador, Colombia, and Peru (Montanha, 2024).

1.5. Importance

The diversity of species makes Lepidoptera one of the main groups of pollinators, with moths being the main nocturnal pollinators. As they are important pollinators, butterflies, and moths play a crucial role in maintaining the diversity of flowering plants in plant communities and, consequently, organisms that are related to these plants, in addition to serving as bioindicators. Considered harmful are those known as agricultural pests, which have larvae that feed on plant foliage (some species can also feed on the roots, stems, seeds, and fruits) (Tyler *et al.*, 1994; Lamas *et al.*, 1995; Rafael *et al*., 2012; Gullan and Cranston, 2017).

These species are capable of decimating plantations and directly interfering with cultivation. These potential biological control agents must undergo elaborate testing to ensure that they do not themselves become a pest. It has an ecological role with very relevant economic consequences, pollination. Adults of most Lepidoptera species contribute to insect-dependent plant pollination. Species possessing an exceptionally long proboscidae length are responsible for pollinating flowers with long corolla tubes (Tyler *et al*., 1994; Lamas *et al.*, 1995; Rafael *et al.*, 2012; Gullan and Cranston, 2017).

This aspect gives the order great economic importance, helping in the reproduction of several species of commercialized plants. In terms of health, when in contact with humans, Lepidoptera can cause certain injuries. One example is the myth that butterflies can cause blindness. Because the wings of adult insects are very sensitive, during handling they can release fragments, which when in contact with the eyes, can cause an allergic response, but do not cause blindness. Almost all accidents related to Lepidoptera in Brazil result from contact with stinging caterpillars, which cause burns (Gaston, 1991; Tyler *et al*., 1994; Lamas *et al.*, 1995; Rafael *et al.*, 2012; Gullan and Cranston, 2017).

1.6. OBJECTIVE

This manuscript aims to report the biological characteristics of venomous Lepidoptera (Insecta) and their clinical manifestations, treatment, prevention, and therapeutic possibilities.

2. METHODS

This manuscript is a narrative review of the literature, which is designed to explain and discuss a certain subject from a theoretical or contextual perspective, to allow the reader to acquire or update knowledge on a specific topic. The scientific articles that made up this review were searched on Google Scholar, Biological Abstract, HAL, Qeios, ResearchGate, Scielo, and SSRN. The following descriptors in Health Sciences (DeCS) were used: biological therapy, larva, wound, debridement, and healing. The following inclusion criteria were considered: original articles and reviews, published nationally and internationally in full, available electronically, and published in Portuguese, English, and Spanish. The exclusion criteria were dissertations, theses, monographs, and conclusion work, duplicates, and those that required payment to access the content in full.

3. LEPIDOPTERAN ACCIDENTS

3.1. Clinical Manifestations: In addition to the harmful effect on some plants, these insects, when in contact with humans, can cause some damage.

3.1.2. Lepidopterism

Accidents triggered by contact with winged adult forms of moths and accidents caused by contact with larvae. These accidents are caused by contact with the bristles on the abdomen of females of certain species, belonging to the genus Hylesia Hübner, 1820 (Family: Hemileucidae). Therefore, the simple fact of penetration of the bristles seems to be capable of causing intense inflammatory, popular, and pruritic reactions (Figure 6A) (Korman and Kaffenberger, 2022; Perilo, 2023).

Figure 6A: Above Megalopygidae and Saturniidae caterpillars with respective lesions caused in humans. Below: *Lonomia* sp. and coagulation alterations in a patient who came into contact with a colony
Source: Photographs: Vidal Haddad Junior

3.1.3. Pararamosis

Pararama is the common name for a stinging caterpillar found in the artificial rubber plantations of Pará, (Brazil) the larval stage of the moth *Premolis semirufa* (Walker, 1856) (Famíly: Erebidae). Therefore, accidental contact with the small bristles of the caterpillars or with those of the cocoons causes a chronic inflammatory reaction in the interphalangeal joints that leads to ankylosis. The morbid condition mainly affects rubber tappers and is classified as an occupational disease (Korman and Kaffenberger, 2022; Perilo, 2023).

3.2. Families: Erucism

Eruca=larva; erucism is poisoning caused by a moth larva. The main families of Lepidoptera fireworms that cause erucism accidents are Megalopygidae, Saturniidae, and Arctiidae. The caterpillars of the Megalopygidae family have a body covered with long, harmless bristles that cover the smaller, sharp spines that carry poison glands (Figures 6B-D) (Haddad *et al.*, 2015; Kitching, 2018; Díez-Madueño *et at.*, 2022; Korman and Kaffenberger, 2022; Perilo, 2023; Petzel-Witt *et al.*, 2023).

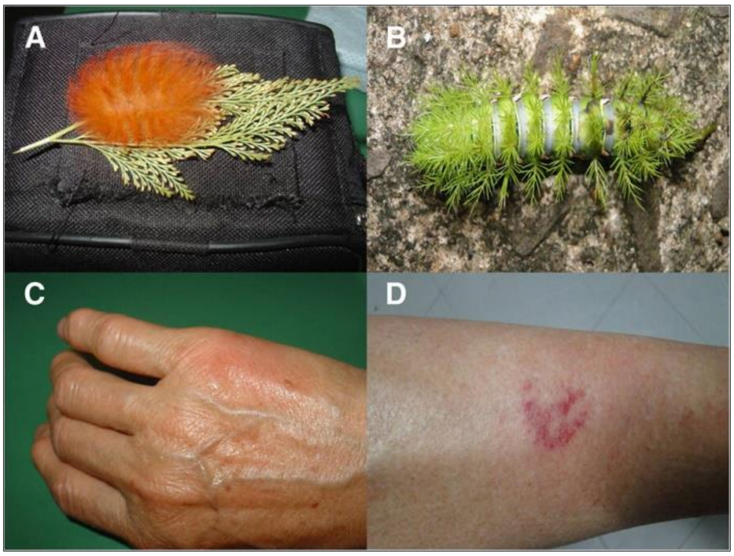


Figure 6B: Caterpillar of the Megalopygidae family (A), Saturniidae family (B), and caterpillar envenomations (C, D) showing mild local inflammation that caused intense pain
Source: Photos: Vidal Haddad Junior

Figure 6C: Disseminated erythematous-violet edematous plaques and necrotic nodules A 53-year-old man presented to the emergency department with a fever and painful skin lesions of 2 days' duration. He reported a medical history of an upper respiratory infection 4 weeks prior. Physical examination was notable for erythematous-violet edematous papules, necrotic lesions, and pseudo vesicles located on the face (top), head, neck, arms, and legs (bottom). Hemorrhagic splinters were evidenced in multiple nail sections. Urgent blood work revealed microcytic anemia (hemoglobin, 12.6 g/dL [reference range, 14.0–17.5 g/dL]) and elevated C-reactive protein (58 mg/L [reference range, 0.0–5.0 mg/L])
Source: Doi:10.12788/cutis.0457

Figure 6D: A 29-year-old pregnant woman at 18 weeks and 5 days of gestation presented with a diffuse, pruritic, blistering rash of 5 weeks' duration that started on the forearms and generalized to affect the trunk, legs, palms, and soles. Physical examination showed diffuse urticarial papules and plaques with small tense vesicles with an annular configuration on the abdomen and marked periumbilical involvement
Source: Doi:10.12788/cutis.0454

4. Classification of Lepidoptera of Medical Importance

Families: Arctiidae, Limacodidae, Megalopygidae, Notodontidae and Saturniidae. Genus *Automeris* Hübner, 1819, *Dirphia* Hübner, 1819, *Hylesia* Hübner 1820, *Lonomia* Walker, 1855, *Lymantriidae* Hübner (1819), *Megalopyge* Hübner, 1820, *Podalia* Walker, 1856, *Premolis* Hampson, 1901, and *Sibine* Herrich-Schäffer, 1855 (Amorim, 2002; Camargo *et al.*, 2015; Espeland *et al.*, 2015; Bazinet *et al.*, 2017; Espeland *et al*., 2018).

5. Lepidoptera Venom

5.2. Constitution

Histamine, phospholipase A2, proteolytic enzymes, complement activating substances acute local, inflammatory process, burning pain, edema, hyperemia, regional adenopathy vesicle, blister, and necrosis (Figure 7) (Korman and Kaffenberger, 2022; Perilo, 2023).

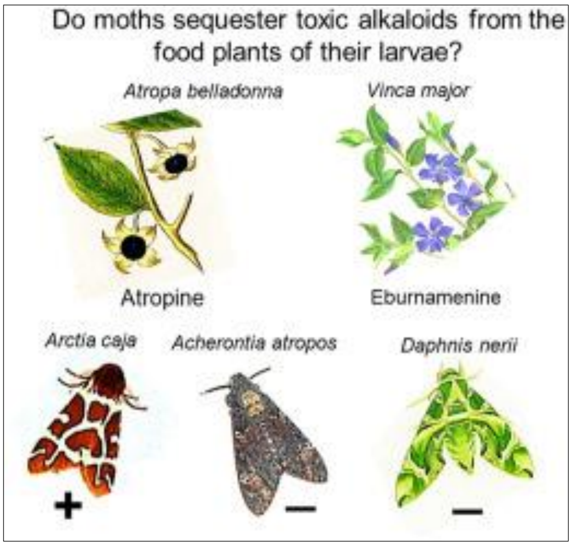


Figure 7: Some butterflies and moths sequester and retain harmful phytochemicals for defense against predators. In the present study, three moth species, *Arctia caja* (Linnaeus, 1758), *Acherontia atropos* (Linnaeus, 1758), and *Daphnis nerii* (Linnaeus, 1758), were tested whether they sequester alkaloids from their host plants. Whereas *A. caja* consistently sequestered atropine from *Atropa belladonna* L. (Solanaceae), also when atropine sulfate was added to the alkaloid-free diet of the larvae, *A. atropos* and *D. nerii* were unable to sequester alkaloids, neither atropine nor eburnamenine from *Vinca major* L. (Apocynaceae), respectively. Instead of acquiring toxicity as a chemical defense, their nocturnal lifestyle, and enigmatic attitudes may improve their chances of survival

Source: Doi.org/10.1016/j.toxicon.2023.107098

Family Arctiidae some species produce toxic substances or resemble species that produce them. Caterpillars are normally active during the day. If disturbed, 20 curl into a compact spiral (Kitching, 2018; Petzel-Witt *et al.,* 2023).

Family Megalopygidae "hairy" caterpillars. They are generally solitary and non-aggressive, 1 to 8 cm long. They have long, silky, harmless dorsal "hairs" of different colors brown, white, black and pink that camouflage the real, sharp, stinging bristles, which contain poison glands (Figures 8-9) (Krenn *et al.,* 2004; Fibiger and LaFontaine, 2005; Gielis, 2005).

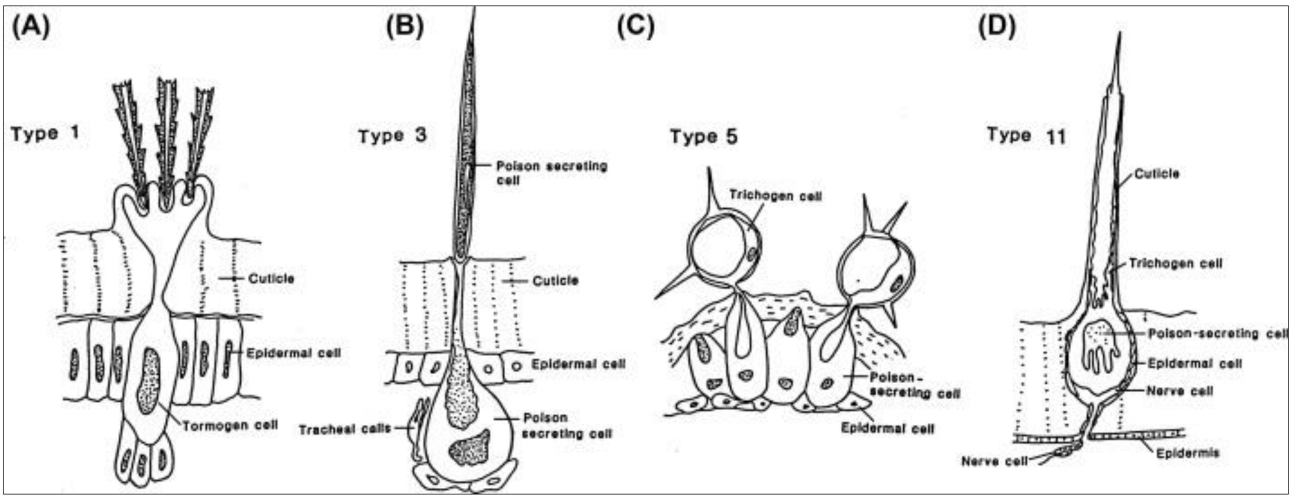


Figure 8: Representative types of spicule hairs and spine hairs in urticating caterpillars. (A) Type 1 spicule hair *Euproctis* sp. (Lymantriinae). (B) Type 3 spicule hair *Dendrolimus* sp. (Lasiocampidae). (C) Type 5 spicule hair starlike (Limacodidae). (D) Type 11 spine hair Latoia sp. (Megalopygidae).

Source: Redrawn and modified from Kawamoto and Kumada (1984)

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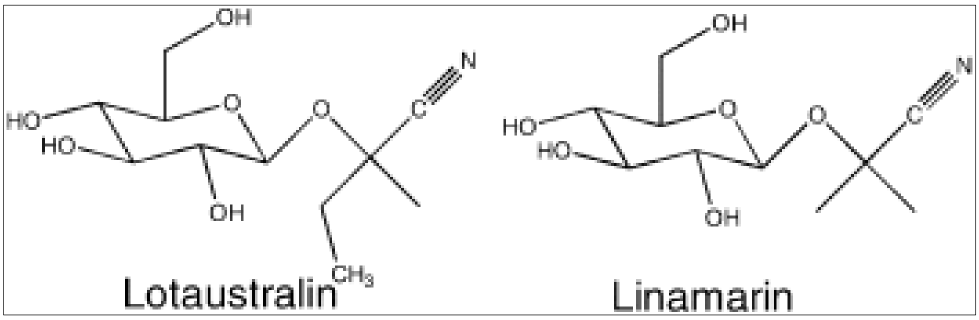

Figure 9: The cyanogenic glucosides linamarin and lotaustralin are derived from valine and isoleucine, respectively
Source: https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/megalopygidae

Family Saturniidae family is easily recognized by the bristles in the shape of small "pine trees" covering the body. The poison glands are inserted into these "thorns" which, penetrating the skin, release the toxin. They are popularly known as larvae, wrinkles, orugas, and kisses. They have stinging bristles in the form of thorns, similar to small green pine trees, distributed on the back of the caterpillar, without silky hairs. These "thorns" often mimic the plants that the caterpillars inhabit (Krenn *et al.,* 2004; Fibiger & LaFontaine, 2005; Gielis, 2005; Kitching *et al*., 2018).

In Brazil, the venomous species are *Lonomia achelous* (Cramer, 1777), which parasitizes the rubber plantations of Amapá and Ilha de Marajó, and *Lonomia obliqua* (Walker, 1855), found parasitizing fruit trees such as peach, avocado, and plum trees in the states of Rio Grande do Sul, Santa Catarina, and Paraná (Figure 10) (Cardoso, 2005; Azevedo, 2011).

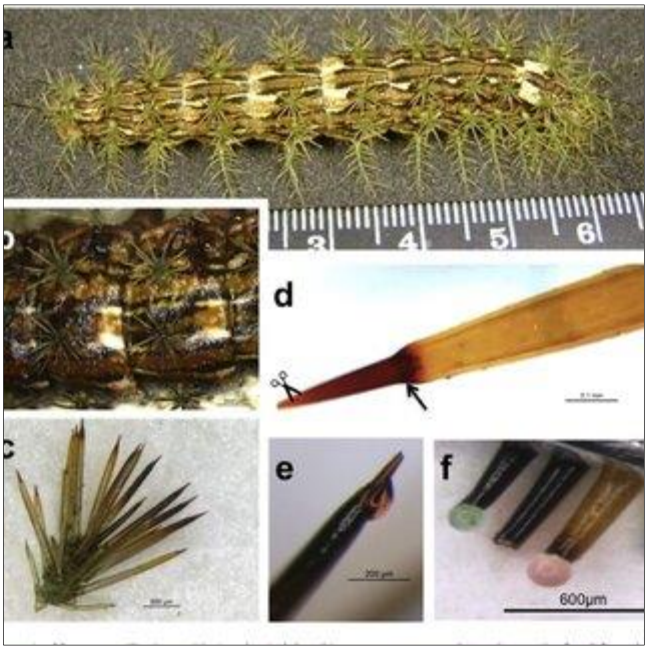

Figure 10: Clinical manifestations. (a) *Lonomia obliqua* (Walker, 1855), caterpillar. This photograph shows a caterpillar at the sixth stage or instar; and (b) Initial symptoms. This photograph shows some clinical manifestations that begin 12 to 24 hours after the accident involving contact with broken bristles. Edema (hands), erythema, heat, blisters (arm), and systemic symptoms have been reported. Ecchymosis, after 3 days of contact, of variable intensity, and hematuria (abdominal bruises, after 24 h), may occur
Sources: Photographs by Dra. Miryam P Alvarez-Flores, Dra. Marlene Zannin

6. Lepidoptera Venom - Clinical Manifestations, Treatment, Prevention, and Therapeutic Possibilities

Lonomia sp. in its larval stage has bristles that release toxins when it comes into contact, with the potential to cause injuries of varying intensities, which can be fatal. The larval forms are responsible for accidents called erucism and the adult forms for lepidopterism. Clinical manifestations of poisoning include urticaria, intense pain, phalangeal peri arthritis, and hemorrhagic syndrome, which is a serious and sometimes even irreversible condition (Figure 11) (Cardoso; 2005; Gielis, 2005; Chudzinski-Tavassi *et al*., 2009; Haddad, 2009).

Figure 11: *Lonomia obliqua* Walker, 1855, caterpillar. (a) Gregarious habit. (b) Larva (5th instar)
Source: Photographs: personal collection of Miryam P. Alvarez Flores

Its body is covered in bristles containing toxins, substances with pro-coagulant and fibrinolytic active ingredients, which quickly consume clotting factors through activating prothrombin, degrading fibrinogen, and fibrin. Its venom also contains several lipocalins, including the prothrombin-activating protein *L. obliqua* (Lopap, acronym - *Lonomia obliqua* prothrombin activator protease) which is involved in increasing the expression of adhesion molecules in cells of the surface (Figure 12) (Chudzinski-Tavassi *et al.*, 2009; Haddad, 2009; Azevedo, 2011; Chudzinski-Tavassi *et al.*, 2013; Silviane and Moreira; 2015; Franca *et al.*, 2018).

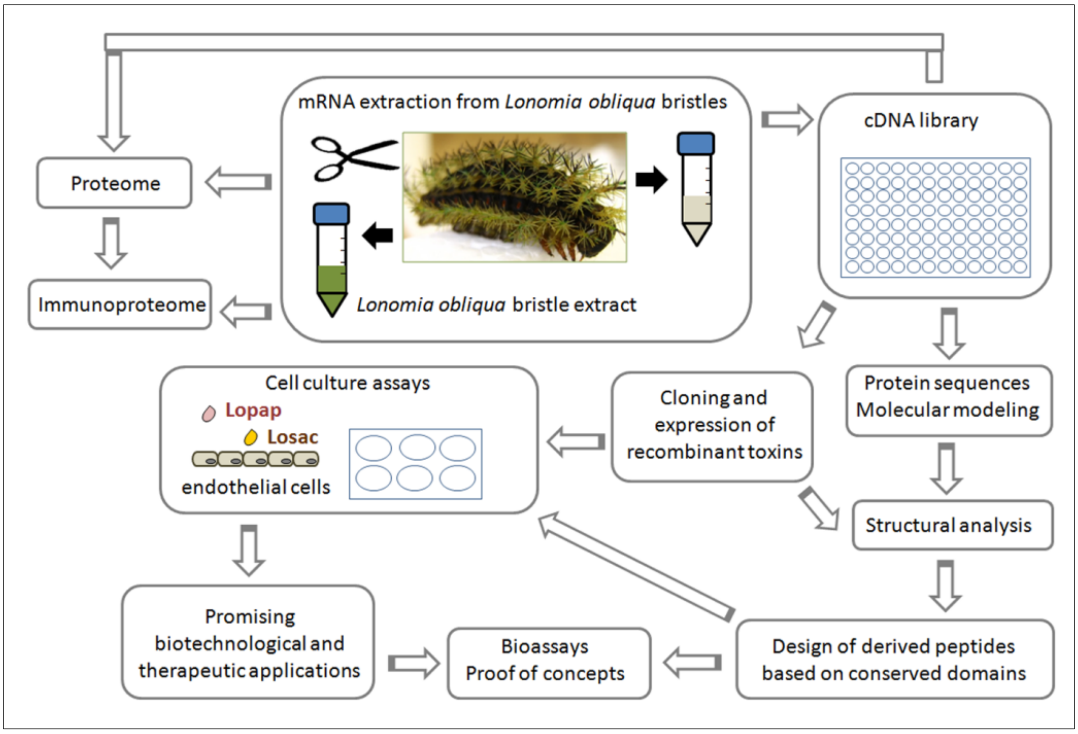

Figure 12: Schematic representation of the strategies to explore the *Lonomia obliqua* Walker, 1855, venom and toxins based on cellular and molecular approaches. Results obtained indicate promising applications for these proteins and derived peptides
Source: Doi: 10.5772/53697

Contact with the bristles causes pain, burning, erythema, heat, discomfort, headache, nausea and vomiting. Hemorrhagic manifestations may appear, such as body stains, epistaxis, gingival bleeding, hematuria, and hemorrhage in recent wounds, which may progress to hemorrhagic syndrome with serious clinical manifestations, cerebral and renal complications, and death (Figures 13-15) (Azevedo, 2011; Chudzinski-Tavassi *et al*., 2013; Silviane and Moreira; 2015; Franca and Lima, 2018).

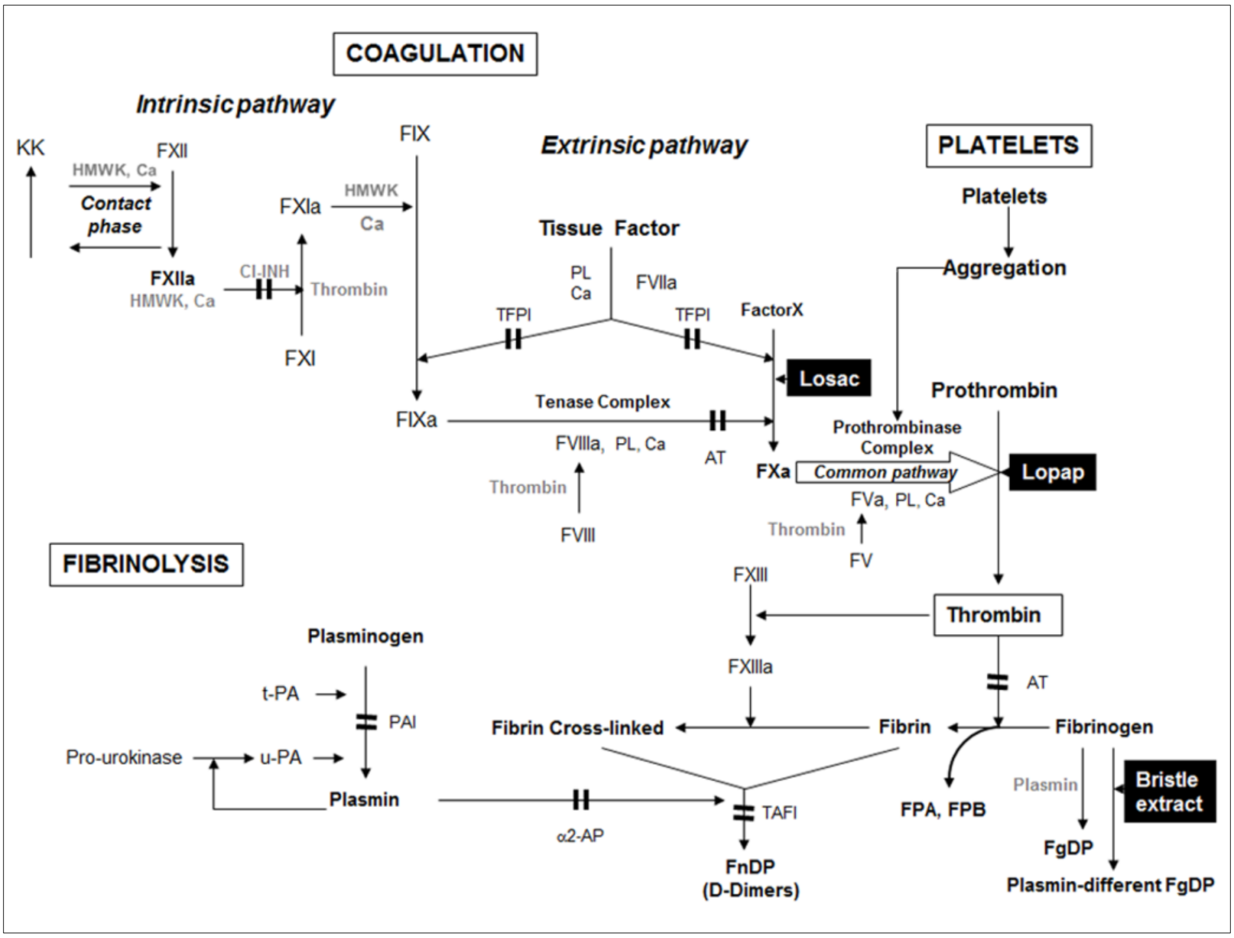

Figure 13: Schematic overview of hemostasis. Dark double bars indicate where inhibitors act. HMWK = high molecularweight-kininogen. PK = Prekallikrein. KK = Kallikrein. CI-INH = CI-inhibitor. TFPI = tissue factor pathway inhibitor. PL = phospholipids. Ca = calcium ions. AT = antithrombin. FDA = Fibrinopeptide A. FDB = Fibrinopeptide B. TAFI = Thrombinactivatable fibrinolysis inhibitor. FnDP = Fibrin degradation products. FgDP = Fibrinogen degradation products. α2-AP = α2- antiplasmin. Known interactions of the *L. obliqua* venom are indicated in the black boxes. Losac = *L. obliqua* factor activator. Lopap = *L. obliqua* prothrombin activator protease

Source: Doi: 10.5772/53697

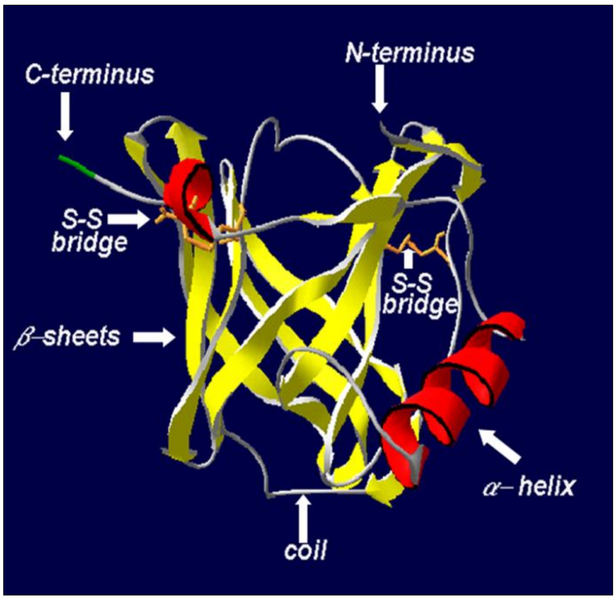

Figure 14: Model of the tridimensional structure of Lopap

Source: Doi: 10.5772/53697

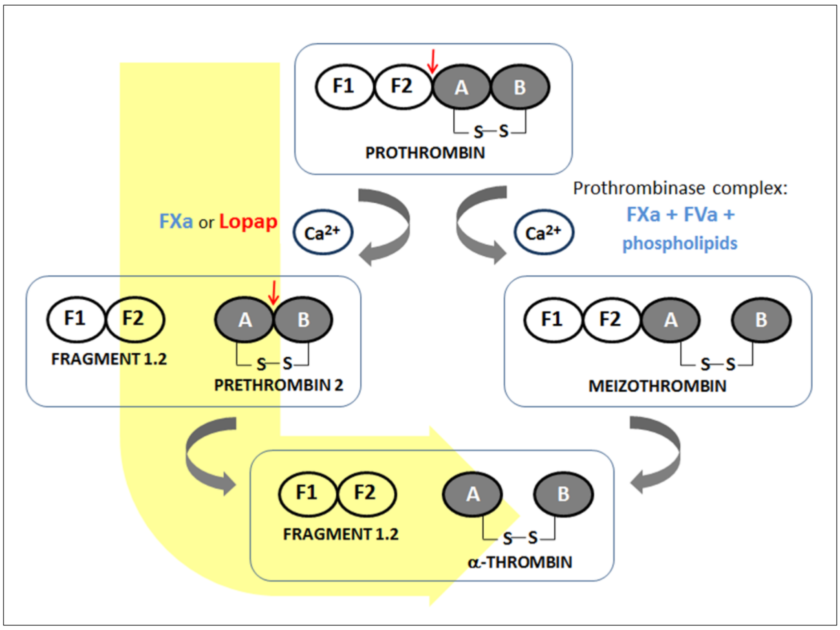

Figure 15: Prothrombin activation indicating mechanisms of the Lopap hydrolysis sites and its generated products
Source: Doi: 10.5772/53697

Caterpillar accidents, or erucism, is the clinical picture of poisoning resulting from contact with stinging caterpillar bristles, places where the venom is stored. The caterpillar is one of the phases of the biological cycle of moths and butterflies. Only the larval stage of moths is capable of producing effects on the organism; the rest egg, pupa, and adult and butterfly larvae are harmless. The only exception is the adult female moth of the genus *Hylesia* Hübner, 1820, which has stinging bristles on the abdomen. In contact with the skin, these bristles can cause papulopritic dermatitis. Accidents caused by caterpillars, popularly called "burns", have a benign evolution in most cases (Figure 16) (Zagrobelny *et al.*, 2004; Cardoso; 2005; Gielis, 2005; Chudzinski-Tavassi *et al.*, 2009; Haddad, 2009; Azevedo, 2011; Silviane and Moreira; 2015).

7. Prevention

In activities, or any other activity in wild environments, carefully observe the area, trunks, leaves, and wigs before handling them, always using gloves to avoid accidents. The higher incidence of accidents is due to deforestation, fires, the extermination of natural predators, unplanned subdivisions, and without assessment of the ecological impact that this entails, forcing these species to look for other environments to survive, where contact with humans occurs (Gielis, 2005; Azevedo, 2011; Silviane and Moreira; 2015; Franca *et al.*, 2018).

8. Treatment

It is eminently clinical-epidemiological, and laboratory tests are not used in routine hospitals to confirm the circulating poison. Clotting time (CT) is useful in aiding diagnosis and post-serotherapy monitoring. Depending on the caterpillar, symptoms can be treated with pain relief measures, such as cold or ice packs. In cases of a suspected accident with *Lonomia*, the patient must be taken to the nearest health service, so that the health professional can assess the need for administration of antinomian serum (SALon) (Gielis, 2005; Azevedo, 2011; Silviane and Moreira; 2015; Franca *et al.*, 2018).

It has been known for some time that other caterpillars, such as the lavas of the *Automeris* Hübner, (1819), have a poison gland in their hair. But there was doubt about what was happening with the fire caterpillars, which were once popularly described as killers because of their fatal accidents. Before the Butantan team, other researchers also investigated *Lonomia* bristles. As they did not find the gland, they inferred that the venom must be produced inside the body of the larva. For them, the bristles would only function as tubes transporting the secretion to the outside (Chudzinski-Tavassi, 2009; Haddad, 2009; Azevedo, 2011; Silviane and Moreira; 2015).

In addition to identifying the toxin-producing cell, the Butantan researchers found that the venom, once produced, is stored at the end of the hair. Interestingly, not all bristles produce venom, an orange-colored liquid. Some of the hairs release hemolymph, a greenish fluid responsible for transporting nutrients through the caterpillar's body (Researchers from the Butantan Institute, in São Paulo under the coordination of biologist Diva Denelle Spadacci-Morena, from the Pathophysiology Laboratory) (Cardoso; 2005; Gielis, 2005; Chudzinski-Tavassi, 2009; Franca *et al.*, 2018).

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