WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.074
Volume 8, Issue 3, 1-11. Research Article ISSN 2277– 7105

ERUCISM IN FEMALE ADULT BOXER CAUSED BY *Cocytius antaeus* Drury, 1773 (Lepidoptera, Sphingidae): A CASE IN MEXICO CITY

Héctor Gabriel Ramos Rodríguez[1] and José D. Méndez[2]*

[1]Gerontology Module. Tlalpan Family Medicine Clinic. Institute of Security and Social Services of State Workers. Mexico City, Mexico.

[2]Medical Research Unit in Metabolic Diseases. Cardiology Hospital. Mexican Institute of Social Security. Mexico City, Mexico.

Article Received on
22 Dec. 2018,

Revised on 12 Jan. 2019,
Accepted on 04 Feb. 2019

DOI: 10.20959/wjpr20193-14251

***Corresponding Author**
Dr. José D. Méndez
Medical Research Unit in Metabolic Diseases. Cardiology Hospital. Mexican Institute of Social Security. Mexico City, Mexico.

ABSTRACT

In this article we present the case of an adult Bóxer bitch that developed ulcerative glosso-palatitis due to exposure to caterpillar of *Cocytius antaeus*. The insect was recovered. Accidents with caterpillars were described since 1658 in Brazil. In 95% of cases, insects are destroyed or discarded, which makes it impossible to know the epidemiology of lepidopterism and erucism. Cases are known by *Malacosoma* in sows and mares in which reproduction is affected, causing abortions. In dogs and cats, *Thaumetopoea pityocampa* can cause ulcerative glossitis and even death. Since this kind of accidents can occur not only in animals but also in humans, particularly in children, we decided to alert on the clinical and medical relevance of *Cocytius antaeus* and related species.

KEYWORDS: Lepidopterism, Erucism, *Cocytius antaeus*, caterpillar poisoning, ulcerative glossitis.

INTRODUCTION

The toxicological events that impact public and veterinary health in our country are becoming more important today. Poisoning by poisonous animals, due to the high morbidity and mortality that they cause, has aroused the interest of toxicologists because of the difficulties they present for their diagnosis and treatment. In fact, this type of intoxication (zootoxicosis) is resolved from the consideration of the corresponding Toxsyndrome, since in 95% of the cases the specimens involved are destroyed or discarded. Therefore, it is important to know

the biogeography of toxic species, as well as their biology, the chemical components of the venom and the target organs that affect them to apply the necessary life support measures.[1,2]

In short, the way in which poisonous animals adversely affect the health of an individual or a pet, or even of a group or a population, is very different. Some only cause discomfort by their appearance or by their bite or sting; others provoke local reactions (by contact) or general reactions (by inhaling their remains or inoculating their poisons). Table 1 shows epidemiological data worldwide.[3]

Some, due to their characteristics along with their biological cycle (complete metamorphosis: egg, larva, pupa, winged adult), have led the human being to incorporate them into their myths, beliefs and fears; they have been associated with the soul, reincarnation, death, etc.[4]

Table. 1: Epidemiology of poisonings worldwide (Modified from Sandoval, Ramírez and Vara, 2016).[3]

Index Species	Incidence	Severe Poisonings	Mortality
Snakes	5, 000, 000 (0.2 %)	2, 500, 000 (54 %)	150, 000 (87 %)
Scorpions	30, 000, 000 (1 %)	2, 000, 000 (43 %)	20, 000 (12 %)
Spiders	500, 000, 000 (20 %)	100,000 (2 %)	1, 000 (0.8 %)
Insects	2, 000, 000, 000 (75 %)	10, 000 (0.3 %)	200 (0.2 %)
Marine invertebrates	100, 000, 000 (4 %)	20, 000 (0.7 %)	200 (0.2 %)
Total	2, 635, 000, 000 (100 %)	4, 630, 000 (100 %)	171, 400 (100 %)

Since ancient Greece, dermatological lesions have been documented by contact with stinging caterpillars. In the Roman Empire, Plinio wrote about property irritant of lepidoptera. In America, the first reports are due to the priest José de Anchieta, who in 1569 recorded in his travel diary, among other practices of the Brazilian Indians, that of rubbing the penis with caterpillars to cause edema and facilitate the sexual act. In 1658 Marcgrave registered accidents by caterpillars in the northeast of Brazil. In 1918, in French Guiana, Leger and Mouzels described the first cases of dermatitis caused by scales of the genus *Hylesia* Hübner (1820).[4]

Lepidoptera are almost always flying insects, which are identified as butterflies (diurnal species, usually bright colors) or, moths or peacocks (nocturnal species, with more muted colors and in general "hairier"). Their larvae are known as caterpillars or "hairy cats". Some are harmful to agricultural production, both in its caterpillar stages and in its stage of adults. The larval stages can generate lesions of variable intensity in humans and animals; few adults

can be of medical importance (*Lonomia, Hylesia*). Contact with the caterpillars can trigger an inflammatory reaction urticant, which can lead to tissue necrosis; the mere presence of his hairs it can provoke injuries. *Lonomia* can cause severe hemorrhagic symptoms that lead to death.[5]

Frequent in dogs and occasional in cats, contact with the caterpillar "Processionary of the pine " (*Thaumetopoea pityocampa*), a pest that is harmful to pines, cedars and firs; can provoke severe poisoning caused by a protein (haloprotein called Thaumetopoein) that induces the massive release of histamine with intense inflammatory process, tissue necrosis, partial loss of the tongue and even death.[6,7,8] Erucism, accident with the immature stages of the butterflies, can be direct (contact with the caterpillar mushrooms), indirect (detached bristles) or meta Erucism (persistence of larval setae in pupae and adults).[9,10] In general, poisonings by butterflies are classified as "phanerotoxic". The increase in this type of poisoning is most likely related to the population increase, to the invasion of areas wild and the lack of maintenance in parks and gardens.[9] In general terms, the poison contains thermolabile proteins, proteolytic enzymes, hydrocyanic acid, formic acid and histamine (Table 2).[11,12]

Table. 2: Content of the toxins of some lepidoptera species, their mechanism of action and effects.[8,10,16,18,22-24]

Lepidoptera	Substance	Mechanism of Action & Effects
Thaumetopoea pityocampa Thaumatopoea wilkinsoni	Thaumetopoein	Mast cells; hypersensitivity due to IgE (5 allergens), urticaria; angioedema, bronchial asthma; Ophthalmia nodosa
Doratifera oxleyi	Histamine	Dermatitis, erythema
Latoia consocia, Arctiidae, Chelepterix collesi, Anthela sp	Histamine, Polypeptide (low molecular weight) and Protein (High molecular weight)	Pain, erythema, hives, itching, mechanical damage; Ophthalmia nodosa (*Anthela*)
Lophocampa caryae	Histamine	Salivation, dermatitis, pain, difficulty swallowing, difficulty breathing. It exists in Mexico
Euproctis edwardsi, E, chysorrhea, E. subflava, E. pseudoconspersa	Histamine; trypsin and chymotrypsin-like enzyme activity; Serin proteases (kallikrein), Phospholipase A and stearase	Dermatitis, irritant potential; Fibrinolytic, proteolytic, hemolytic and anti-complement activity; plasmin from plasminogen; spherocytosis; Type 1 hypersensitivity, edema; Ophthalmia nodosa
Dirphia	Histamine, toxin	Induces histamine; proinflammatories of cyclooxygenase and nitric oxide
Lymantria dispar	Histamine	Dermatitis, erythema
Uraba lugens	Histamina	Dermatitis, erythema
Spilosoma lutea,	Histamine-like substance	Ophthalmia nodosa

Spilosoma virginica		
Hylesia	Histamine, trypsin-like protein activity	Type 1 hypersensitivity, vesicles
Arctia caja	Acetylcholine	Ophthalmia nodosa
Lochmaeus manteo	Formic acid	Itching, pain, erythema, blisters
Megalopyge urens	Proteins	Hemolysis, proteolytic activity
Lonomia obliqua, L. achelous	Losac y Lopap; Lonomines	Factor X activator and prothrombin activating protease; consumption coagulopathy with secondary fibrinolysis, hemorrhagic diathesis, factor XIII degradation and factor Xa-like activity
Cerodirphia speciosa	Proteins-like the poison of *Lonomia*	No hemorrhage reported
Dendrolimus (Dendrolimiasis) and Premolis semirufa (Pararamosa)	Mechanical action, allergen (allergic reaction)	Prominent arthritis in association with pruritic dermatitis; Ophthalmia nodosa (*Dendrolimus punctatus*)
Orgyia pseudotsugata	Histamine	Primary irritant reaction and subsequent vesiculation, papules
Hemileuca oliviae, Ochrogaster lunifer	Mechanical action	Eye irritation, Ophthalmia nodosa
Automeris io	Proteolytic enzyme	Urticant, tissue destruction

Cocytius sp, named in honor of Cocito one of the rivers of hell that surrounded the Tartarus with its bitter waters,[13] it belongs to the Sphingidae family whose outstanding feature is the size of its proboscis (spiritual spirit) which they use to suck nectar. They are of medium to very large sizes, with bodies robust, large subtriangular anterior wings and posterior wings comparatively small. In Colima (Mexico) they measure more than 20 cm long. The great majority of nocturnal habits, some crepuscular and others exclusively diurnal. They are among the fastest flying insects and several species are migratory. The eggs are flattened, ovoid or ellipsoidal, and without ornamentations. The larvae have a spine or cane (scolus) in the dorsal half of the eighth segment, from where they take the common name of "Hornworm" (Figure 1), they reach 14 cm long. Many have cryptic coloration (mimic the medium). They tend to erect the anterior part when they feel bothered, so they receive the name of "sphinxes". The fauna of sphinxes in Mexico is constituted by 195 species, in 50 genera, which represents 18% of the world total (Table 3).[14,15]

Table. 3: Geographic distribution of some *Cocytius* species in the New World.[15]

Species	Distribution
Cocytius antaeus	S United States to Uruguay; Antilles; Galapagos Islands
Cocytius beelzebuth	Guatemala to SE Brazil
Cocytius duponchel	S México to SE Brazil; Antilles
Cocytius lucifer	S México to SE Brazil
Cocytius mortuorum	SW Colombia to SW Brazil & Bolivia

An Australian study on children reports the case of a 10-year-old girl exposed to poison when kissing your pet, a sphincter caterpillar *Theretra oldenlandiae firmata* (Hawk moth); three hours later she starts with muscle spasms on the left side of the face and difficulty speaking, picture that was resolved in 4 minutes without sequels. Another 4-year-old boy developed severe pain in his hand for 30 minutes, recovering without incident.[16] During 2001, Kentucky mares exposed to moderate and high concentrations of *Malacosoma* (oriental moth), was one of several factors associated with the increased risk of fetal loss early. In pigs fed commercial feed combined with this same moth, 2 of 5 aborted their entire litter.[17] In Cozumel (Mexico), in 1989, an outbreak of dermatitis in humans was reported by *Hylesia alinda*.[18] In Nuevo Leon (Mexico), in 1970, was informed about the "sting" by a larva of *Megalopyge opercularis* with intense pain in the contact area. In 1980, another case by *Automeris io* with unspecified skin lesions on the forearm. In the same year, with the contact of a black "burner" larva there was pain and swelling that they disappeared in a few hours. The last case in adult woman, there was irritation, redness (erythema) and severe pain in the thigh, received no treatment specified and gave up the problem.[19] No reports were found on affectations by *Cocytius antaeus*.

Figure. 1: Larva of *Cocytius sp* (hawk moth) that presents the spine that distinguishes as "horn worm" (A and B).[20,21] Urticant hair of a caterpillar in which the acute silk associated with the venom gland is appreciated (C).[10,25]

Clinical case

December 15, 2018: "Nala", a two-year-old female Boxer, who is walked inside the dwelling unit (south of Mexico City, mayoralty of Tlalpan) and most of the occasions he runs and plays with the ball inside the fast soccer field, for 30 minutes in the morning. At the end of the activity started with salivation moderate and tongue movements trying to expel foreign body. Bilateral submandibular lymphadenomegaly with intense pain on palpation. At observation of oral cavity with presence of lingual hyperemia and deforming ulcerative lesions that involve papillary layer, stratified epithelium and part of connective tissue on its lateral edges, 5 cm long by 2 cm wide left side with irregular margins and another one on the right side of approximately 2 cm long by 1 cm wide, hemorrhagic. Likewise, on hard palate ulceration of approximately 3 cm in non-hemorrhagic diameter and small satellite ulcers (Figure 2). Lingual movements preserved. By later, she presented hyposthenia and stools of pasty, light brown stools, mucorrhea, not febrile. The consistency of the stool returned to normal on the third day. No difficulty for the consumption of food and water. Inside the court was located a moth (Figure 3), to which the dog did not pay attention, but, apparently, ingested a caterpillar that was inside a plastic cup. Photographs were taken of the insect and it was released.

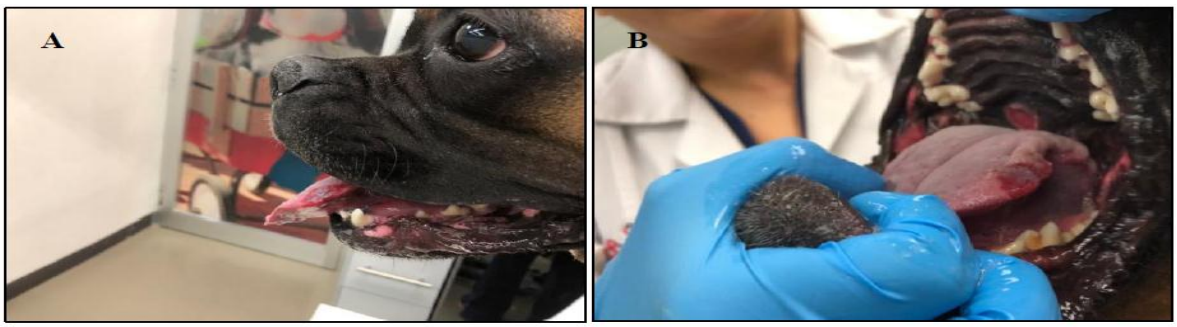

Figure 2. A. Ulcer in left lateral border of the tongue. B. Ulcerations in tongue and palate.

Figure. 3. A. Dorsal view of the moth *Cocytius antaeus* (giant sphinx moth). B. View ventral of the insect.

It is presented in a private veterinary clinic with the following antecedents: of a litter of 6 puppies, originally from Pachuca de Soto, Hidalgo; scheme of complete vaccination and periodic deworming, with mating in two occasions 9 days ago (December 11, 2018) with healthy male of the same race. It coexists with another 8-year-old female Boxer, which has no injuries. Consume Buffalo Blue food twice a day and water *ad libitum*. Active, reactive, cooperating to the physical examination, weighing 21 kg and presence of mucorrhea vulvar in small amount, so that sample was taken for imprint. It is prescribed treatment with Amoxicillin / Clavulanic acid 400/100 mg tabs. one every 12 hours for 7 days, Meloxicam tabs. 2.5 mg one every 24 hours for 4 days, Ranitidine tabs. 40 mg. one every 12 hours for 7 days and Chlorhexidine solution 15 ml mouthwash three times daily for 7 days. Revaluation in 7 days. The mouthwash application was replaced by daily washing with boiled and warm water, after removal of mushrooms with adhesive cloth. The evolution is presented in Figures 4 and 5 until the total recovery.

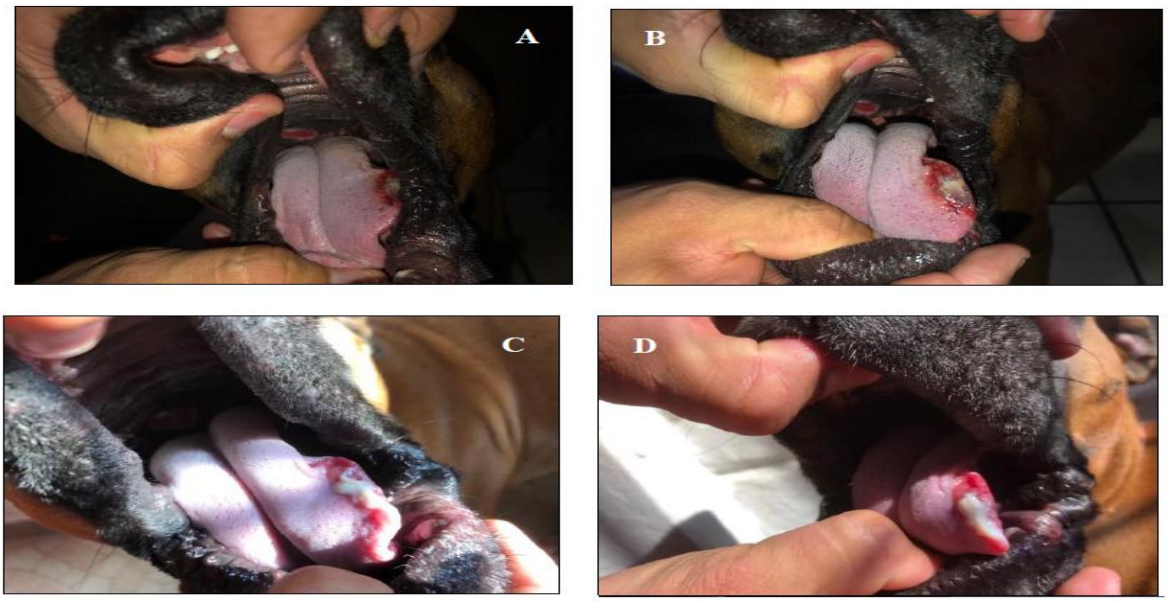

Figure. 4. A and B. At 24 hours, with presence of scarce purulent exudate and hyperemia; C and D) 48 hours later, with abundant purulent exudate and hyperemia.

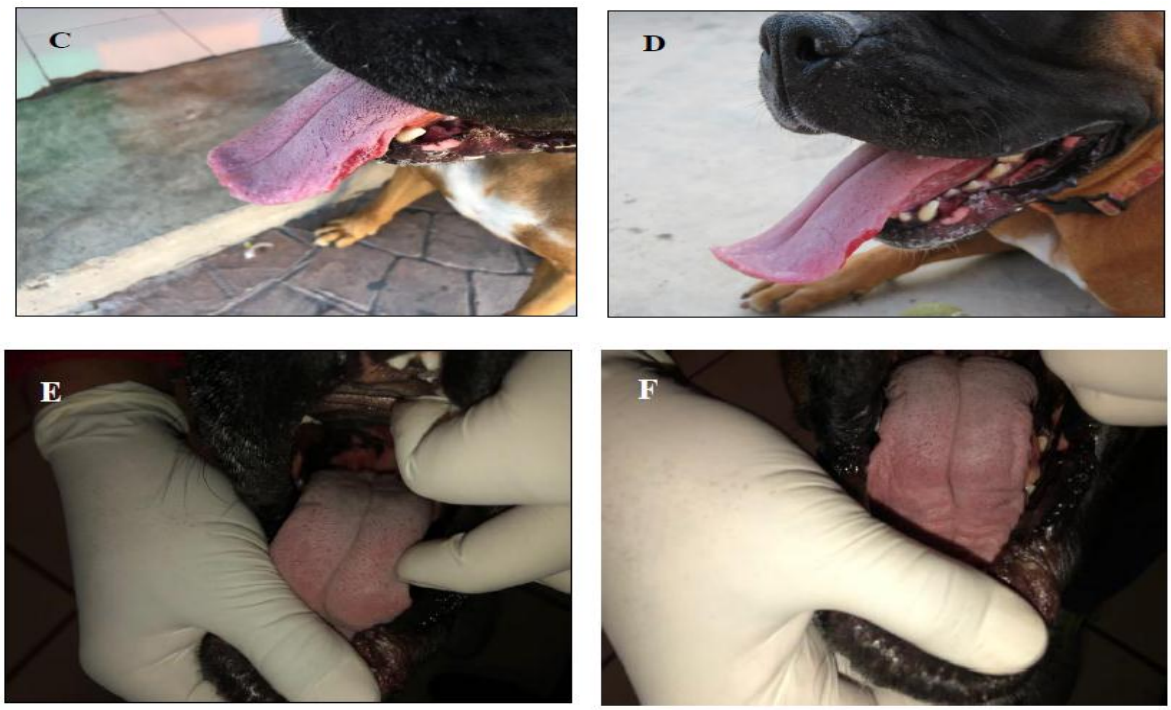

Figure 5. A and B, tongue with decrease in the dimensions of lateral ulcers, discrete hyperemia without purulent exudate, five days after the accident. C and D, ulcerative lesion in resolution process at 6 and 11 days of evolution, respectively. E and F, with complete resolution of ulcerative glosso-palatitis, after 31 days.

DISCUSSION AND CONCLUSIONS

Most cases of Lepidopterism and Erucism (from Latin Eruca = caterpillar) registered, mainly in South America, correspond to *Lonomia* (Taturana; Hypas; Churruscos), *Hylesia* (Hairy Cat, Burning Bug, Fiery Caterpillar) and *Thaumetopoea* (pine processionary, pine caterpillar), reporting cases serious severe hemorrhagic poisoning, partial loss of tongue and deaths.[18] Outbreaks have been reported for different *Hylesia* species in Mexico.[24,28] In the housing unit where the case occurred, it is common to find caterpillars and moths in the areas destined to the recreation and the sport, as well as the lack of cleaning of these. The possession of pets is relevant, as some people may even have 4 dogs. It requires the timely intervention of medical health personnel and veterinary (urgent) to avoid important sequels.[26] Should be take advantage of technological advances and the obligation to report events in public health to enrich epidemiological databases for care adequate poisoning by animals at any level of medical care.[27] As we can see, this case was not due to the species considered of greater medical importance, which is why more observations to determine which caterpillars and moths can cause poisonings in other parts of the world. According to previous reports, this case is considered as direct Erucism (Figure 6).[9]

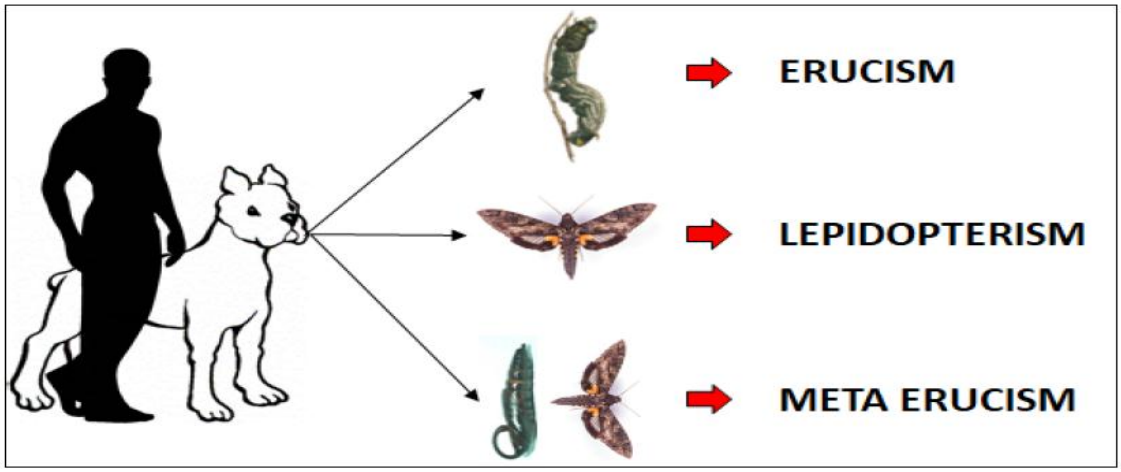

Figure. 6. Ways of affectation in animals and humans depending on contact with the development phase of lepidoptera.[29,30,31]

Although, the epidemiology of Erucism in Mexico is unknown, either by omission or by underreporting, because in most cases it is not presented to the insect involved is suggested to perform academic update events for raise awareness among health personnel (doctors and veterinarians) as well as patients and owners to try to identify this type of accidents. Finally, it is recommended that children and puppies stay away from caterpillars and moths to avoid serious accidents. Be careful during the care of people and animals to prevent secondary exposure to mushrooms and fluids.[22] Must consider that the highest incidence occurs between February and March,[22,23] however, the exposed case happened in December. The preservation of insectivorous birds that serve as control should be encouraged biological of caterpillars, moths and butterflies.[26]

AKNOWLEDGEMENTS

The authors thank Ana Luz Salgado for taking the photographs. Jovana M. Jasso Martínez and Adolfo Ibarra Vázquez of the Institute of Biology (UNAM), for the identification of the lepidopteran.

REFERENCES

1. Sánchez VMCS. In: Envenenamiento por Animales Ponzoñosos. México; Ediciones y Distribuciones Universum: 2015.
2. Segura GA. Picaduras y mordeduras por animales ponzoñosos. Hospital General de Obregón, Sonora (SSA), www.reeme.arizona.edu.
3. Ramos RH, Méndez JD. In: Araña "Violinista" (*Loxosceles sp*). México; Corposec. 2016.

4. Betancur G. Lepidopterismo: Las mariposas y sus orugas urticantes, https://www.researchgate.net/publication/324051632.
5. de Rodt A. In: Lepidópteros (mariposas, polillas y orugas). No. 7. Serie: Salud Ambiental en pocas palabras. Argentina. 2015, www.msal.gov.ar/determinantes/ 6. Rubio LM. El peligro de la "Procesionaria del pino", www.cvmirasierra.es
6. La Oruga Procesionaria, www.arcadenoe.org
7. Kaszak I, Planellas M, Dworecka KB. Pine processionary caterpillar, *Thaumetopoea pityocampa* Dennis and Schiffermüller, 1775 contact as a health risk for dogs. Annals of Parasitology, 2015; 61(3): 159-163.
8. Gómez CJP. Lepidopterismo y Erucismo en Colombia. Revista Biosalud, 2014; 13(2): 59-83.
9. Harwood RF, James MT. In: Entomología Médica y Veterinaria. Capítulo 17: Venenos, Secreciones de Defensa y Alergenos de Artrópodos. México; Limusa, 1987.
10. de Oliveira AA, Bernardes FF. Erucism due to cup moth. PAMJ, 2018; 30: 16.
11. García SAK. Mecanismos de defensa de los artrópodos: Venenos. Artrópodos y Salud, 2015; 2(1): 14-19.
12. Fernández RF. Etimología de algunos géneros de Noctuidae (Lepidoptera). España: Boletín SAE, 2001; 1: 7-22.
13. Balcázar LMA. Polillas esfinge (Sphingidae). In: La Biodiversidad en Colima. Estudio de Estado. México. CONABIO, 2016. pp. 376-381.
14. Kitching IJ. The phylogenetic relationships of Morgan's Sphinx, *Xanthopan morganii* (Walker), the tribe Acherontiini, and allied long-tongued hawkmoths (Lepidoptera: Sphingidae, Sphinginae). Zoological Journal of the Linnean Society, 2002; 135: 471-527.
15. Balit CR, Geary MJ, Russell RC, Ibister GK. Prospective study of definite caterpillar exposures. Toxicon, 2003; 42: 657-662.
16. Lee LR. A Review of venomous animal bites and stings in pregnant patients. WEM, 2004; 15: 207-215.
17. Hossler EW. Caterpillars and moths. Part I. Dermatologic manifestations of encounters with Lepidoptera. J Am Acad Dermatol, 2010; 62(1): 1-10.
18. Contreras AS, Quiroz MH. Orugas urticantes (Insecta : Lepidoptera) de importancia médica en el Estado de Nuevo León, México. Artrópodos y Salud, 2014; 1(1): 45-51.
19. httparchivo.infojardin.comtemaoruga-de-una-polilla-esfinge-foto-y-con-quealimentar.
20. 257892. jpg
21. www.insectologia.com.br/2018/05/lagarta-de-mariposa-falcao-cocytiusem. html

22. Bruchim Y, Ranen E, Saragusty J, Aroch I. Severe tongue necrosis associated with pine processionary moth (*Thaumetopoea wilkinsoni*) ingestion in three dogs. Toxicon, 2005; 45: 443-47.
23. Niza ME, Ferreira RL, Coimbra IV, Guerreiro HM, Félix NM, Matos M, de Brito TV, Vilela CL. Effects of Pine Processionary Caterpillar *Thaumetopoea pityocampa* contact in Dogs: 41 cases (2002-2006). Zoonoses and Public Health, 2012; 59: 35-8.
24. Hossler EW. Caterpillars and moths. Part II. Dermatologic manifestations of encounters with Lepidoptera. J Am Acad Dermatol, 2010; 62(1): 13-28.
25. Gilmer, 1925; Ann. Entomol Soc Am, 18: 203-39.
26. Bermejo ML. Descubrimos la procesionaria del pino. Rev FUNCAE Digit, 2013; 42.
27. Rodríguez VAL, Rodríguez BJR, Díaz GJ. Comportamiento general de los accidentes provocados por animales venenosos en Colombia, 2006-2010. Rev Salud pública, 2012; 14(6): 1001-1009.
28. Cabrerizo S, Spera M, de Rodt A. Accidentes por lepidópteros: *Hylesia nigricans* (Berg, 1875) o "mariposa negra". Arch Argent Pediatr, 2014; 112(2): 179-182.
29. http://www.bio-nica.info/Ento/Lepido/sphingidae/Cocytius%20antaeus.htm.
30. http://www.godofinsects.com/index.php/museum/butterflies-and moths/moths/giant-sphinx-moth-cocytius-antaeus/.
31. https://www.alamy.com/stock-photo-giant-sphinx-moth-cocytius-antaeus caterpillar-and-pupa-annona-sphinx-78835623.html.