Presentación de caso

Unusual toxic accident caused by *Calosoma alternans*, Fabricius 1792 (Coleoptera: Carabidae) in a Venezuelan patient

Accidente tóxico inusual provocado por *Calosoma alternans*, Fabricius 1792 (Coleoptera: Carabidae) en un paciente venezolano

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ABSTRACT

Coleopteran insects can produce toxic substances containing multiple components which have so far not been properly described. To report an unusual case of intoxication by excretion from *Calosoma alternans* Fabricius 1792 (Coleoptera: Carabidae) in a Venezuelan patient from a periurban neighborhood near the mesothermal raining forest. The toxic activity caused a clinical status characterized by digestive symptoms such as nausea, vomiting, epigastralgia, an increase in bowel movements and probable kidney inflammation with intense pain in both lumbar regions, which did not correspond to the classic dermal damage. In conclusion, a unique case is presented of intoxication by a coleopteran species, with a clinical description not previously reported.

Keywords: Adephaga; intoxication; Carabidae; coleopteran; *Calosoma alternans*.

RESUMEN

Los insectos coleópteros pueden producir sustancias tóxicas que contienen numerosos componentes que aún no han sido descritos adecuadamente. Presentar un caso inusual de intoxicación por excreciones de *Calosoma alternans* Fabricius 1792 (Coleoptera: Carabidae) en un paciente venezolano residente en un barrio periurbano cercano a la selva tropical mesotérmica. La actividad tóxica provocó un cuadro clínico caracterizado por síntomas digestivos como náuseas, vómitos, epigastralgia, aumento del número de deposiciones y probablemente inflamación renal, con dolor intenso en ambas regiones lumbares, lo que no se corresponde con el daño dérmico clásico. En resumen, se presenta un caso singular de intoxicación provocada por una especie de coleóptero, con una descripción clínica no reportada anteriormente.
Palabras clave: Adephaga; intoxicación; Carabidae; coleóptero; *Calosoma alternans*.

Received: 20/08/2020
Accepted: 12/11/2020

Introduction

Terrestrial coleopteran represents a broad-based family of beetles.[1,2] The beetle order, Coleoptera, is the greatest varied in the insect family with more than 350 000 species,[1] and the suborder Adephaga into the Carabidae family has more than 40 000 species global.

Many species generally known as bombardier beetles are regarded as able to send off a caustic liquid from their abdomen to their possible predators or aggressors with a loud cracking sound. These self-protective emissions are made and discharged by a paired pygidial glands in the dorsum of the coleopteran abdomen, which yields toxic or even corrosive secretions used to reject predators. These secretions are a mixture of hydroquinone and hydrogen peroxide (H_2O_2), with some anti-inhibitor enzymes, which remain in a chamber called “explosion chamber”.[3,4]

There is a smaller group, the Calosomatina subtribe, consisting of a single genus *Calosoma* that has 50 described species, which also emit a foul-smelling secretion, similarly to the so-called bombardier beetles, using it as a means of defense, which can cause poisoning. The defensive emissions of the genus *Calosoma* are not explosive, and as far as has been described are limited to very strong and unpleasant odors. Both sexes can produce such emissions. This odor, resulting

from volatile constituents, by 2,4-dinithrophenylhydrazone, salicylaldehyde and methacrylic acid.[5,6]

In the present work, we are describing an unusual toxic accident with *Calosoma alternans*, which presented a dissimilar clinical characteristic in a Venezuelan patient.

Clinical case

The present case happened in the patient's residence, in the Caiza Park, "Filas de Mariche" Parish, Sucre Municipality, Miranda state (Venezuela), located on an 11th floor of a building sited in a not very populated peri-urban neighbourhood.

On Sunday July 12, 2020, around noon, she took an insect (Coleopteran Spp.) in her hands, which after activating the defensin mechanism (strong sound and release of a sprayed substance, with an odour that she could not define), which sprayed her nostrils, generating surprise and a burning sensation. The insect did not attempt to flee, it walked very fast in circles and then stopped looking straight ahead of her and walked in her direction. The smell of the substance it emitted was not easily removed, after washing hands and even using alcohol, the intensity decreased, but it did not disappear completely.

Pass by this event, the patient, a 44 years old woman consulted with a 24 h history of central abdominal pain, two episodes of vomiting and loose stool. She had not a past history of important digestive diseases. She weighed 84 kg, 1.56 cm height with a Body Mass Index greater than 40. The patient was pyretic 37.6 °C and on examination was tender in the epigastrium.

The patient only reported slight discomfort on that day, but in the early morning (4-5 am), she began to present an epigastric stomach discomposure and nauseas, accompanied by 2 semi-solid bowel movements with some colic pain, but not diarrhoea, which evolved into general malaise, muscular abdominal pain, and severe epigastric pain (throbbing and constant), nauseas, which was accompanied by eventual reflux. The general discomfort continued and the temperature remained at 37.6 °C. After self-medicating with a gastric secretion inhibitor (pantoprazole (~ 7am) and an anti-allergy (Cetirizine 10mg at 8:30 am), then (9:30-11 am) she began to develop dull pain on both sides of the lumbar fossae, of great intensity that prevented her from being erect. At around 12 pm she took acetaminophen, and after an hour the pain began to decrease. At about 5 pm on the same day, nauseas and general discomfort decreased. The next day the temperature continued at 37.5 °C until noon, with less pain and no nauseas, now epigastric pain and nausea were post-prandial. After 48 h, the only symptom that persisted was epigastric pain (temporarily) when eating food, especially cold

food. The patient has been symptomatically treated with hydration, anti-acids and permanent observation.

Insect description

The current specimen of *C. alternans* is 25 mm long, dark brown almost glossy black, the elytra are ribbed, with small ocher spots along these channels. The jaws of the oral apparatus are shaped like forceps (Fig.). As for the behavior, it was very agile and fast. *C. alternans* has a wide distribution from southern Central America to northern Argentina. It has been described in Honduras, the Virgin Islands, Barbados, Dominica, Guadeloupe, Curaçao, Antigua, Barbuda, Martinique, Trinidad, Panama, Colombia, Chile, Ecuador, Brazil, Guyana, Peru, Paraguay, Bolivia, Uruguay, Argentina and Venezuela.[7]

Its presence in Venezuela has been known since 1927, existing throughout the north-central part of the country, including the insular region of the Nueva Esparta state.[7]

Fig. - Male specimen of *Calosoma alternans*.

Locality where the poisoning by *C. alternans* is described

The Caiza Park is located in Miranda state (Venezuela), at 30 km of distance from western Caracas (10.4293052 N - 66.7273385 W), at 940 m of altitude, close to a tropical wood;[8,9] it has an annual total precipitation of 1 350 mm and an annual temperature average of 26 ºC.[8] The vegetation that characterise the surrounding ecosystem belong to Loganiaceae, Malpighiaceae, Malvaceae, Meliaceae, Moraceae, Nyctaginaceae, Orchidaceae, Passifloraceae, Phytolacaceae, Poaceae,

Polygonaceae, Portulacaeae, Rubiaceae, Sapindaceae, Smilacaeae, Ulmaceae, Vitaceae, Zygophyllaceae and Mimosacea families.[9]

Discussion

All bombardier beetles are in one of two subfamilies of ground beetles named Brachininae and Paussinae, with further than 50 genera pooled.

For the patients getting "bombed" by a bombardier beetle is an unquestionably disagreeable experience. What is Bombardier beetle generally bothers are described as a vesicant activity on the skin. But in this case, there was gaseous penetration through the upper airways and we have wonder, if this species, in addition to the described substance, does not have the property of generating something similar to Cantharidin, since the clinical picture of the current case, corresponded more to the classic symptoms of cantharid harming than the skin irritant damages, characteristic of this species.

These toxic effects that were noticed post nasal ingestion could include symptoms that are classical described after oral ingestion, such as ulceration of the gastrointestinal and genitourinary tracts, along with electrolyte and renal function disturbance, as described[10 in humans and animals. Symptoms of cantharidin envenomation comprise flaming of the mouth, dysphagia, nauseas, epigastralgia as and both lumbar flank pain. In severe intoxication are described haematuria, dysuria and hematemesis. Urogenital dysfunction is common and related to acute tubular necrosis, glomerular destruction and priapism in males.[10] In these cases, the main gastrointestinal damages are located in the upper tract showing mucosal erosion and haemorrhage.[10]

In the present case, the patient observed a response similar to what would occur in front of a cantharid beetle, so it is of interest to carry out detailed biochemical studies on the expelled substance that we will perform.

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Conflict of interest

None of the authors has a conflict of interest.

Authors contribution

Gisselle C. Gil-Zambrano: Planned and scheduled research, analysed data and wrote the manuscript.

Rafael M. Reyes-Lugo: Planned and scheduled research, carried out the entomological description, analysed data and wrote the manuscript.

Iván Salvi: Carried out the entomological description.

Alexis Rodriguez-Acosta: Planned and scheduled research, analysed data and wrote the manuscript.