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ARANEISM BY *Kukulcania cf tractans* IN MATURE ADULT MALE FROM MEXICO: A CASE REPORT

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ABSTRACT

In this paper the case of an adult man with spider bite of *Kukulcania cf. tractans* ("Kukulcanism") (family *Filistatidae*) presented in Mexico is described. The bite was caused in distal third of right leg, with development of dermatonecrosis. The patient received oral therapy with Paracetamol 500 mg tablets and Dicloxacillin 500 mg capsules. A topical cream containing Betamethasone + Gentamicin + Clotrimazole was also recommended. Complete healing occurred 37 days after the bite. Ulcer healed with hypochromia and peripheral hyperchromia. The epidemiology of araneism caused by *Kukulcania cf. tractans* is not well known, so it is important to record the cases when the precise identification of the spider involved including its biogeography is made.

KEYWORDS: Araneism, *Kukulcania*, dermatonecrosis, arachnoid accident.

INTRODUCTION

Since 1927, "the sting of harmful animals" has been reported for the first time as a public health problem in Mexico.[1] Spiders, like scorpions, stand out because their bite is occasionally harmful to humans. All use poison to kill insects and as a defense mechanism, but considering their size, the amount of inoculum and the fragility of their buccal organs rarely cause serious injuries in humans. Only those of the Uloboridae family are not poisonous. However, of the 117 families, 4,118 genera and 47,951 species recognized worldwide (WSC, 2018) only about 180 (0.38%) defend themselves aggressively and have chelicerae large enough to penetrate human skin. The most important medical species in the American continent are the "black widow spider" (*Latrodectus mactans*), the "brown recluse spider" (*Loxosceles spp.*) and the "Brazilian wandering spider" (*Phoneutria spp.*). In fact, the World Health Organization considers six genera of spiders of real medical interest for the clinical manifestations and the lethality of their poisons, five of which belong to the infraorder Araneomorphae: *Latrodectus* Walckenaer, 1805 (family Theridiidae); *Loxosceles* Heineken & Lowe, 1832, *Sicarius* Walckenaer, 1847 and *Hexophthalma* Karsch, 1879 (Sicariidae), and *Phoneutria* Perty, 1833 (Ctenidae). The sixth genus belongs to the infraorder Mygalomorphae, commonly known as spider of Sydney, of the genus *Atrax* O. Pickard-Cambridge, 1877 (Atracidae).[2] In the ICD-11, the following spiders are included: False widow spider, Hobo spider, Jumping spider, Mouse spider, Tarantula spider, Wolf spider, and Yellow sac spider.[3]

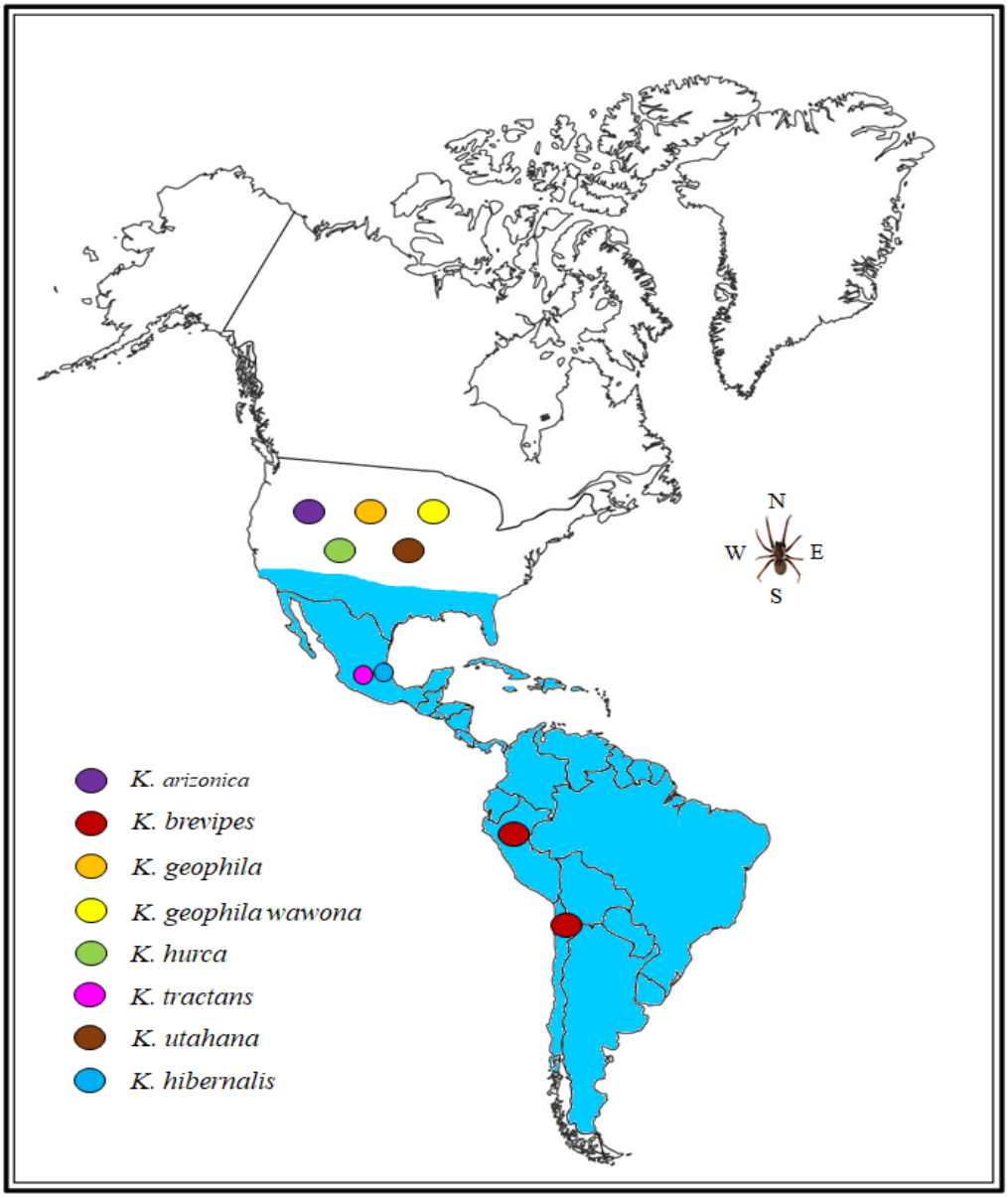
It is known that the bite of spiders such as *Diaea sp.* (Thomisidae) and *Anyphaena sp.* (Anyphaenidae), produce mild reactions characterized by maculopapular lesions with erythema and pruritus of low to moderate intensity, without systematization, which responded to conservative treatment based on antihistamines, analgesics and cleansing of the affected area in 24 to 48 hours.[4,5] The genus *Kukulcania* Lehtinen, 1967, (Filistatidae) is composed by eight species widely distributed in America (Map 1). They are haplogyne spiders, sedentary, with uniform somatic morphology and eight eyes placed on a promontory, long legs and hairy appearance.[6, 7] However, it must be borne in mind that characteristics such as color, brands, total size and shape may vary among species according to age, gender, diet, hydration level, climate and habitat. The size varies from 9 to 25 mm. The cobweb is mesh.[7] They are often found in or around buildings because their prey are insects attracted by light. They hide in cracks, crevices and window coverings.[8] Although the presence of sphingomyelinase D (present in the genera of the family Sicariidae) in its venom has not been

determined, other components are known. Larger peptides (> 8 kDa) with Ca_v channel specificity have also been described from spider venoms, such as DW13.3 (peptide with 74 residues) from *Kukulcania hibernalis* ("black hole spider", "southern house spider"). This peptide causes a potent, but transient block of Ca_v 2.1 channels (P/Q-type) with less potent effects on Ca_v 2.2 (N-type) followed by Ca_v 1.x (L-type) and Ca_v 2.3 (R-type) channels, but with no effect on Ca_v 3.x (T-type) currents.[9,10] The inhibition of different subtypes of calcium channels by DW13.3 reflects a common "macro" binding site present on all calcium channels except T-type (Table 1).[11] The LD_{50} of crude venom is 0.3 ng dry venom/mg insect (cockroach, *Blatta orientalis*).[12]

Table 1: Substances contained in the venom of Kukulcania hibernalis Hentz, 1842.[13]

SUBSTANCE	FORMULA	ACTION
Cytochrome C oxidase subunit 1	10 20 30 RMNNLSFWLL PPSLILLLIS SMVDVGVGAG 40 50 60 WTIYPPLSSS IGHSGLSVDF AIFSLHLAGA 70 80 90 SSIMGSINFI STIFNMRTVG MSMEKVPLFV 100 110 120 WSVLVTTILL LVSLPVLAGA ITMLLTDRNF 130 140 150 NTSFFDPAGG GDPILFQHLF WFFGHPEVYI	Cytochrome C oxidase is the component of the respiratory chain that catalyzes the reduction of oxygen to water. Subunits 1-3 form the functional core of the enzyme complex. COI is the catalytic subunit of the enzyme. Electrons originating in cytochrome c are transferred via the copper A center of subunit 2 and heme A of subunit 1 to the bimetallic center formed by heme A3 and copper B
Omega-filistatoxin-Kh1a ω-filistatoxin-Kh2b[14]	10 20 30 AECLMIGDTS CVPRLGRRCC YGAWCYCDQQ 40 50 60 LSCRRVGRKR ECGWVEVNCK CGWSWSQRID 70 4 DWRADYSCKC PEDQ 15 PEPTIDES	Potently blocks vertebrate calcium channels Cav1 and Cav2. Is the most active on Cav2.2/CACNA1B (from HEK) (IC_{50}=2.3 nM), followed by Cav2.1/CACNA1A (IC_{50}=4.3 nM), Cav2.2/CACNA1B (from oocyte) (IC_{50}=14.4 nM), Cav1.2/CACNA1C (IC_{50}=26.8 nM), and Cav2.3/CACNA1E (IC_{50}=96.4 nM)
Histone H3	10 20 30 KSTGGKAPRK QLATKAARKS APATGGVKKP 40 50 60 HRYRPGTVAL REIRRYQKST ELLIRKLPFQ 70 80 90 RLVREIAQDF KTDLRFQSSA VMALQEASEA 100 8 YLVGLFEDTN LCAIHAKR	DNA binding Protein heterodimerization activity

A case of dermatonecrosis due to bite of *Kukulcania hibernalis* is reported in a 35-year-old male, who developed a violaceous plaque (5x12 cm), pain, redness and confluent vesicles on the right side of the neck, 16 hours after the bite.[15] Treatment was prescribed with ceftriaxone (*i.m.)*, ibuprofen, diphenhydramine and trimethoprim / sulfamethoxazole, only the first being applied. In the reassessment, they took care of the wound and indications of tetanus vaccination and without antibiotics, on the seventh day the resolution was almost complete.



Map 1: Geographical distribution of the *Kukulcania* species in the American Continent according to the WSC, version 19.5 (Ramos, 2018).

CLINICAL CASE

48-years-old male, originally from Mexico City and resident in Morelos colony (suburb of Tepito). Currently residing in the state of Morelos (Appendix A, Map 2). Coexistence in overcrowding, irregular access to health services, positive smoking with 2-3 / day without preference and intravenous heroin addiction. He does not remember vaccination scheme. Poor feeding. The condition began on December 27, 2015, at 7:30 hours when the socks with a mobile strange body sensation were placed on the right ankle, which when removing the sock, fell a dark brown spider (Figure 1), which covered it with a disposable cup and then the

placed in a plastic bottle, realizing that he lost a leg. At 22:00 hours, there is intense pruritus, moderate pain, burning, erythema and ampulla. One week later, ulceration of approximately 1 cm in diameter in the distal third of the anterior face of the right leg with moderate to intense pruritus. Go to medical service with indication of daily healing of the wound with soap and water, and oral therapy with Paracetamol 500 mg tablets, every 8 hours for 5 days and B complex tablets, every 24 hours for 30 days. Also, they suggest you use oxygenated water and iodine solution to eliminate the purulent exudate. The following week, chills, unregistered hyperthermia, myalgia, arthralgia, headache, vomiting and diarrhea (3-4 / day / 3 days), hyposthenia, dizziness, ulcer with exudate and foul odor; claudicatory march. In the third week, the presence of ulcer with necrotic eschar and cyanotic halo; with shedding three to four days later. It is revaluated and treated with Dicloxacillin 500 mg capsules, every 6 hours for 10 days orally, Paracetamol 500 mg tablets, every 8 hours orally and Betamethasone + Gentamicin + Clotrimazole every 12 hours topical cream. At the fourth week, ulceration without necrotic eschar of 3.0 x 2.5 cm with granulation tissue, without purulent exudate and moderate pruritus (Figure 2). Complete healing occurred 37 days after the bite, ulcer healed with hypochromia and peripheral hyperchromia (Figure 3, February 2018). Patient refers to itching from mild to moderate, occasional and predominantly nocturnal, which generates a sleep disorder.

Figure 1: Specimen of *Kukulcania cf. tractans* involved in the presented case of araneism. Incomplete third leg left (loss of tibia, metatarsus and tarsus).

Figure 2: Ulcerated lesion one week after the bite (2a). Ulcer of smaller size without purulent exudate (2b). Ulcer in the process of healing without necrotic eschar and granulation tissue, at the end of the third week (2c). Ulcer in the process of healing with regular edges without apparent exudate (2d) (Ramos, 2016).

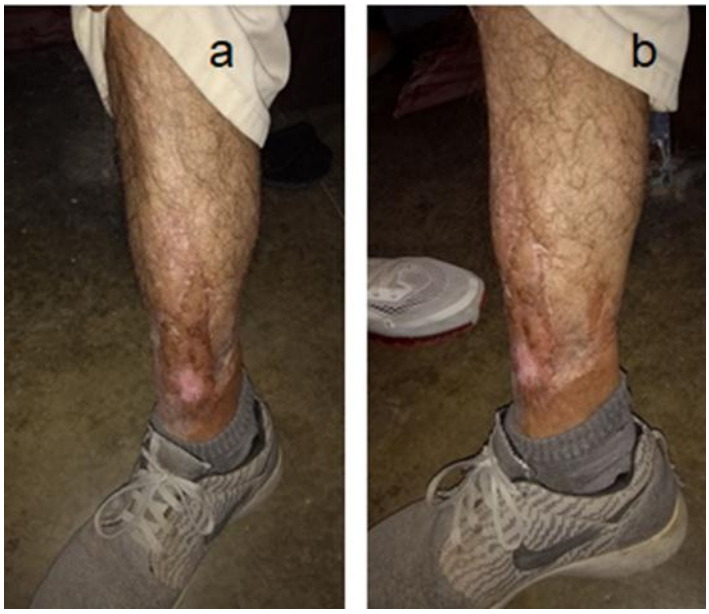


Figure 3: Hypochromic scar in distal third, anterior face of right leg in place of bite by *Kukulcania cf tractans* (3a). Also, hyperchromia with depression due to loss of subcutaneous tissue in the periphery and distal third of the leg (3b) (Ramos, 2018).

DISCUSION AND CONCLUSIONS

The most well-known cases of necrotic araneism are those caused by spiders of the genus *Loxosceles*, whose poisonings can cause cutaneous and cutaneous-visceral or systemic loxoscelism, some of which become fatal.[2] In Mexico many cases related to this arachnoid accident are reported, however, most of the times the aggressor arachnid is not trapped or identified, which makes it impossible to know its epidemiology. Likewise, the first case of necrotic araneism by *Zorocrates guerrerensis* Gertsch & Davis, 1940 from Mexico is known,

with medical treatment and satisfactory evolution.[16] However, they are not the only species that cause dermatonecrosis, it is also reported with the bite of species of the genera *Badumna*, *Araneus*, *Lampona*, *Sicarius*, *Argiope*, *Liocranoides*, *Lycosa*, *Neoscona*, *Phidippus*, *Cheiracanthium*, *Tegenaria*, *Brachypelma*, *Aphonopelma*, and *Dugesiella*.[2]

In this case, if all spiders are poisonous except Uloboridae, but only some are considered of medical importance (see Introduction); the magnitude of the lesion, the semiology, the functional and aesthetic sequelae, and their evolution could be determined within the international classification of diseases (ICD-11; Injury, poisoning or certain other consequences of external causes) as Code NE61 Harmful effects of or exposure to noxious substances, chiefly nonmedicinal as to source not elsewhere classified; XM6NN5 spider venom (Table 2).[3] Although the species of *Kukulcania* are not included in the list of spiders, we believe that it should be considered due to the injuries that it produces. However, the consensus of the specialists in the areas involved is required to define such consideration.

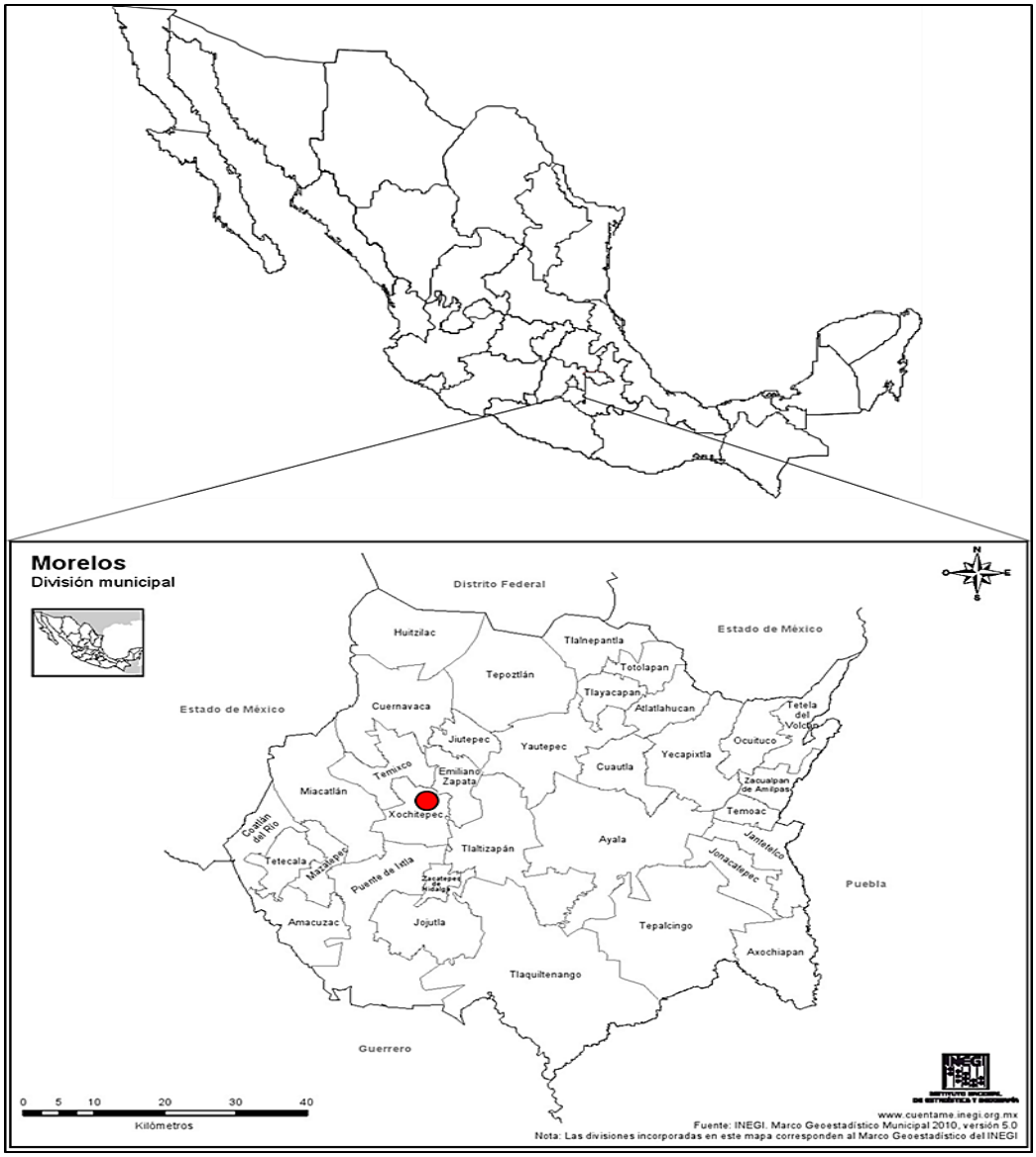
Table 2: Coding of spiders in the International Classification of Diseases.[3]

XM6NN5 Spider venom
XM2RM6 Brown recluse spider venom
Violin spider venom
XM6SD4 False widow spider venom
Rabbit hutch spider venom
XM3KD6 Funnel web spider venom
XM57S7 Hobo spider venom
XM0C68 Jumping spider venom
Zebra spider venom
XM1LF5 Mouse spider venom
XM6QH2 Six eyed sand spider venom
Six eyed crab spider venom
XM8095 Tarantula spider venom
XM8FT7 Wandering spider venom
Banana spider venom
Brazilian wandering spider venom
XM7JS2 Widow spider venom
XM7M21 Black widow spider venom
XM9Z42 Brown widow spider venom
XM1TF6 Redback spider venom
XM2JA0 Red widow spider venom
XM2WM2 Wolf spider venom
XM3UW9 Yellow sac spider venom

In conclusion, attention should be paid to all cases of araneism regardless of the species involved, since most of the times the aggressor arthropod is not trapped, and some spiders may have certain morphological similarity, which would ignore *Loxosceles* as etiology,

whose poisonings can be fatal. Do not self-medicate and go to health services, it is the best option. Not all cases evolve without complications, some may present functional and aesthetic sequelae, such as the one presented in this article. In addition, studies are required to determine if there is another substance in the venom of species of the genus *Kukulcania*, other than sphingomyelinase D,[17] which triggers the dermatonecrosis process; since both poisons contain Histone 3 and Cytochrome C oxidase 1. Finally, it should be mentioned that the best way to prevent these accidents is with thorough cleaning, avoiding the accumulation of waste, not storing clothes for long periods and, repairing cracks and crevices on ceilings, floors and walls.

APPENDIX A



Map 2: Municipal location of the case of araneism caused by *Kukulcania cf. tractans* (Ramos, 2018).

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