ABSTRACTS BOOK

VENORAIMA

INTERNATIONAL CONGRESS OF VENOMOUS ANIMALS IN RORAIMA | BRAZIL

Boa Vista-RR
November **24 - 25**
2022

UFRR

SNAKEBITE
RORAIMA

SEBRAE

Welcome Message

Dear colleagues,

The scientific and organizing committee would like to greet you heartily here in our beautiful city Boa Vista for the I International Congress of Venomous Animals in Roraima – I VenoRaima to be held in the Federal University of Roraima, Brazil, from November 24th to 25th, 2022.

It is the first time that an International Venomous Meeting held in Roraima, the Northernmost state of Brazil. We are extremely glad that all our efforts brought results and that you accept our invitation to be here inside the Amazon Forest. Indeed, Roraima is not a common place to held international events; however, for Toxinologists, Roraima is a rich place, full of venomous and poisonous animals, which have been scarcely studied or even not yet described. Furthermore, Roraima is the state with the highest incidence of snakebites in Brazil and with many severe clinical outcomes, especially with indigenous people. Thus, holding an international congress here in the state capital is extremely relevant to Toxinology field.

We are also very proud to receive researchers from across the globe in the first edition of VenoRaima and we endeavor to keep this exciting scientific agenda in the future.

The I VenoRaima will encompass a broad range of sections, including Snakes and Snake Venoms, Snakebite Envenomings, Arachnid-derived Venoms, Therapeutic Potential of Venom-derived Toxins, Flash Talks, and a Poster Section. Thus, our congress main program is full of renowned speakers and leading Toxinology experts.

The scientific and organizing committee are fully confident that this meeting will be an unforgettable congress that will enrich the Toxinology knowledge of the attendees and foster scientific collaborations.

We wish you all a successful conference.

Dr. Manuela B. Pucca
Snakebite Roraima Coordinator
Full Professor of Medical School
Federal University of Roraima
Boa Vista-RR, Brazil

CONGRESS PROGRAM

DAY 1 (24/11/2022)

7h50 *Welcome desk opening / Poster placement*

8h30 *Opening Ceremony*

9h00 *Welcome to I VenoRaima*

9h30 **Opening Keynote Lecture** –Dr. Carl-Wilhelm Vogel (University of Hawaii Cancer Center, Honolulu, Hawaii, USA)

"*Cobra Venom Factor: Structure, function, biology, research tool, and lead for drug development*"

Section 1: Snakes and Snake Venoms

Chair: Dr. Ernesto Pinheiro Lopes-Júnior

10h00 Speaker 1 – Dr. Ana Moura da Silva (Instituto Butantan, São Paulo, São Paulo, Brazil)

"Snake venoms from Amazon: Composition and neutralizing capacity of antivenoms in preclinical tests"

10h30 ***Coffee Break, Networking & Poster Viewing***

11h00 Speaker 2 – Dr. Felipe Gobbi Grazziotin (Instituto Butantan, São Paulo, SP, Brasil)

"Revealing the unknown genetic and phenotypical diversity of the Bothrops jararaca complex: a preliminary approach to infer evolutionary processes that shaped morphological and venom variation"

11h30 Speaker 3 – Cecilie Knudsen (VenomAid Diagnostics, Lyngby, Denmark)

"Development of a lateral flow assay based on monoclonal antibodies for detection of Bothrops venoms in Brazil"

12h00 – 14h00 Lunch Break

14h00 **Keynote Speaker** – Dr. José Maria Gutiérrez (Instituto Clodomiro Picado, San José, Costa Rica)

"An overview of the antivenom landscape in Latin America: current situation and challenges"

Section 2: Snakebite Envenomings

Chair: Dr. Isadora S. Oliveira

14h30 Speaker 1 – Dr. Wuelton M. Monteiro (Fundação de Medicina Tropical Doutor Heitor Vieira Dourado, Manaus, Amazonas, Brazil)

"Mapping of resources, care sectors, and dimensions of access for snakebite treatment in the Brazilian Amazon"

15h00 Speaker 2 – Dr. Manuela B. Pucca (Universidade Federal de Roraima, Boa Vista, Roraima, Brazil)

"Snakebite in Roraima: clinical aspects and presenting educational programs"

15h30 Speaker 3– Dr. Felipe Murta (Fundação de Medicina Tropical Doutor Heitor Vieira Dourado, Manaus, Amazonas, Brazil)

"The professional sector health care for indigenous affected by snakebite envenomings in Roraima: an analysis of the health providers' perspective"

16h00 Coffee Break, Networking & Poster Viewing

16h40 **Flash Talks**

Chairs: Eweline Mikaely G. Monteiro (International Relation Coordinator – UFRR)
Laudelina F. da Cruz (UFRR Translator)

1	Rommel Correia Monte *(undergraduate student)*	*Crotalus durissus ruruima* venomics: advances through a novel mass spectometry method
2	Mário Jorge das Neves Filho *(undergraduate student)*	Revealing the differences of the *Crotalus durissus ruruima* white and yellow venoms: venom profile and biological functions
3	Érica da Silva Carvalho *(Ph.D student)*	Analgesic and antibiotic therapy in ophidic accidents from 2020 to 2022 in a reference hospital in Manaus
4	Eleanor Strand *(Professional)*	Perspectives on snakebite envenoming care needs across different sociocultural contexts and health systems: a comparative qualitative analysis among us and BR health providers
5	Luis Enrique Bermejo Galan *(M.D and Master's degree student)*	Acute mesenteric ischemia following lancehead snakebite: a rare case report in Brazilian Amazon
6	Gabriel Melo Alexandre Silva *(M.D)*	Healthcare in snakebite victims: a lookout on a bigger scene

7	Isadora Sousa de Oliveira *(post-doc)*	Discovering monoclonal antibody fragments targeting metalloproteases from *Bothrops* snake venoms
8	Isabela Gobbo Ferreira *(Ph.D student)*	Pioneering isolation and functional characterization of a vascular endothelial growth factor from *Crotalus durissus terrificus* snake venom
9	Thais de Almeida Correa Nogueira *(Ph.D student)*	Current knowledge on the Kambô (*Phyllomedusa bicolor*): A medically important and emblematic treefrog from Amazonia
10	Alícia Patrine Cacau dos Santos *(Ph.D student)*	The place of snake envenoming a riverside community in the Brazilian Amazon: a qualitative study
11	Ernesto Lopes Pinheiro-Junior *(Ph.D, Professional)*	Revealing a novel activity of 3-alkylpyridinium compounds from the sponge, *Haliclona (Rhizoniera) sarai*, on voltage-gated potassium channels
12	Hiran Satiro Souza da Gama *(Professional)*	The professional sector of health care for indigenous peoples affected by snakebite envenoming's in Brazilian Amazonia: an analysis the health provider's perspective
13	Alexandre Vilhena da Silva Neto *(Master's degree student)*	Assessment of antivenom administration in Brazil

18h00 – 20h00 ***Poster Presentation***

18h00 – 21h00 ***Cultural Market & Networking***

DAY 2 (25/11/2022)

8h30 **Keynote Speaker** – Dr. Luis Fernando García Hernándes (Eastern Regional University Center (CURE), University of the Republic, Treinta y Tres, Uruguay)

"Relationship between diet and venom: Case studies on spiders and scorpions"

Section 3: Arachnid-derived venoms

Chair: Dr. Felipe A. Cerni

9h00 Speaker 1 – Dr. Eliane C. Arantes (Universidade de São Paulo – FCFRP-USP, Ribeirão Preto, São Paulo, Brazil)

"Tityus serrulatus: a trajectory of more than 30 years of discoveries"

9h30 Speaker 3 – Dr. Lúcia Helena Faccioli (Universidade de São Paulo – FCFRP-USP, Ribeirão Preto, São Paulo, Brazil)

"Mechanisms of the scorpion venom-induced inflammatory response"

10h00 **Keynote Speaker** – Dr. Vidal Haddad Júnior (UNESP, Botucatu, São Paulo, Brazil)

"Envenomings by non-usual arthropods"

10h30 Coffee Break, Networking, & Poster Viewing

11h00 **Keynote Speaker** – Dr. Steve Peigneur (KULeuven, Leuven, Belgium)

"Functional Characterization of ion channel toxins from the longest animal on Earth"

11h30 **Keynote Speaker –** Dr. Joao Ricardo Nickenig Vissoci (Duke University, Durham, USA)

"Using artificial intelligence and secondary data to address healthcare resource allocation in remote settings: The Amazon Forest case"

12h00 – 14h00 Lunch Break

Section 4: Therapeutic potential of venom-derived toxins
Chair: Dr. Manuela B. Pucca

14h00 Keynote Speaker – Dr. Beatriz Rossetti Ferreira (Universidade de São Paulo - EERP-USP, Ribeirão Preto, São Paulo, Brazil) and Odônio dos Anjos Sales (Manager diretor at TTI of Brazil)

"The legacy of Dr. Sérgio H. Ferreira: captopril, adventures and more..."

14h30 Speaker 1 – Dr. Rui Seabra Ferreira Jr (CEVAP-UNESP, Botucatu, São Paulo, Brazil)

"From Venom to Drugs: An amazing trip!"

15h00 Speaker 2 – Dr. Maria Elena de Lima (PPG Sta. Casa de BH, Belo Horizonte, Minas Gerais, Brazil)

"PnPP-19, a synthetic and nontoxic peptide derived from a Phoneutria nigriventer toxin, is a potential drug to treat erectile dysfunction and glaucoma."

15h30 Speaker 3 – Dr. Denise V. Tambourgi (Instituto Butantan, São Paulo, São Paulo, Brazil)

"Loxoscelism: from basic research to a clinical trial"

16h00 Serpent Brazil app launch (Dr. Jacqueline Sachett, Universidade Estadual do Amazonas, Manaus, Amazonas, Brazil)

16h30 Keynote Closing Lecture – Dr. Jan Tytgat (KULeuven, Leuven, Belgium)

"A molecular and evolutionary basis that elucidates the selective love affair of scorpion toxins with voltage-gated sodium channels".

17h10 Toxins & Special Issue Launch – Dr. Maria Elena de Lima & Dr. Manuela B. Pucca

17h30 Snakebite Roraima Honors & Awards (Categories: Academics, Master, PhD, Pos-doc, Flash Talks)

18h15 Closing Ceremony

18h30 *Cocktail & Networking*

ABSTRACT 1

HYPERSENSITIVITY TYPE I FOLLOWING INFUSION OF SNAKEBITE ANTIVENOM THERAPY: A CASE REPORT AND REVIEW

Allan Q. Garcês-Filho[1], Gabriel M. Alexandre-Silva[1], Felipe A. Cerni[2], Luis Enrique B. Galan[1,2], Manuela B. Pucca[1,2]

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In northern Brazil, snakebite envenomings is an important cause of hospitalization. To deal with this accident, the unique and most effective treatment is the use of heterologous antivenoms, which are produced in horses. Despite the great effectiveness of the antivenom against snakebites, it is also known that it can also initiate hypersensitivity reactions (e.g., allergies, anaphylaxis, and Serum Sickness). Among the allergic manifestations, erythema and urticaria are the most prevalent, which are usually not life-threatening, albeit need medical attention and treatment. This study presents a case report of a 45-year-old female, from the city of Cantá - Roraima, bitten by a snake that developed an allergic reaction following antivenom administration. The victim was bitten while walking near her house at 6:10 pm. The patient killed the animal, allegedly of the Bothrops's genus, locally called "surucucu", and before going to the hospital, she ingested the traditional medicine “específico-pessoa”, a mix of substances which is commonly used to treat snakebites by the general population and has no proven effectiveness. The victim was admitted to the Hospital Geral de Roraima Rubens de Sousa Bento (HGR), the biggest hospital of the state, at 8pm, 2 hours after the accident. In the hospital, the patient presented punctate lesions on the right foot with edema and blood clotting, moderate pain on palpation along the right leg and more intense in the posterior region (gastrocnemius muscle), showing no systemic symptoms or macroscopic hematuria. At physical examination the patient presented dysphoric, arterial blood pressure of 130/90, and respiratory rate of 22 incursions/min. The patient received 8 intravenous ampoules of botropic antivenom (SAB), intravenous hydrocortisone 500mg, intramuscular prednisone 1g, intravenous dipirona 2g, intramuscular diclofenac 75mg, and intravenous Ondansetron 8mg, with none pre- administration of antiallergic drugs before antivenom therapy (e.g., diphenhydramine, loratadine, or dexclopheniramine). At 11:00 pm, nearly 30 minutes after the beginning of the slow-dripping infusion, the patient developed an allergic reaction through disseminated pruritic erythematous-papular manifestation. The physician immediately suspended the antivenom administration and controlled the hypersentivity reaction with antihistamine infusion and the physician in charge opted to abort the antiserum therapy altogether. The patient was kept under observation for 8 hours without any changes in the vital signs or in the diuresis and was discharged.

Keywords*:* Snakebite; Antivenom; Allergy; Allergic reaction.
Financial support*:* We thank the Programa de Iniciação Científica Institucional (scholarship to Gabriel M. Alexandre-Silva – PIBIC 2021-2022; scholarship to Allan Q. Garcês-Filho – PIBIC 2022-2023).

ABSTRACT 2

THE SNAKEBITE RORAIMA EDUCATIONAL PROGRAM: CHANGING THE SCENARIO OF OFIDISM IN RORAIMA

Amanda Maria A. Cunha[1], Kiara Cristhina T. Cardenas[1], Bruna B. Valério[1], Paulo F. Dias de Souza Cruz Neto[1], Eliseu A. Sandri[2], Bruna K. Bassoli[3], Felipe A. Cerni[3], Manuela B. Pucca[1,3]

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In 2017 the World Health Organization (WHO) included snakebites in the list of neglected tropical diseases and, in 2019, created a global strategy to reduce snakebites by 50% till 2030. Brazil is a country that has adequate environmental conditions for the reproduction and survival of snakes, favoring snakebites, especially in the Amazon region. Roraima is the Northernmost Brazilian state with the highest incidence and mortality of snakebites in the country, inhabiting four main genera of importance to public health: Bothrops, Crotalus, Lachesis, and Micrurus. Accidents involving snakes are common in rural workers and indigenous populations. Most of human accidents happen when feel provoked or threatened and, because of snakebites fear, many people kill snakes to avoid the accident or following it, which decrease snake population resulting on an ecological imbalance. Educational programs are the main tool to prevent and mitigate snakebites. The Snakebite Roraima group has been educating regarding snakebites since 2019. The present study is an epidemiological, observational, retrospective, and descriptive research, in which epidemiological data were collected from DATASUS during the period of 2019 to 2021, aiming to evaluate the relevance of Snakebite Roraima's educational actions in modifying the local snakebite scenario. During the studied period, the Snakebite Roraima team, through its extension activities, carried out educational actions for different audiences: military firefighters, army, health professionals, children, health students, indigenous students, etc. Our results demonstrated that the Snakebite Roraima educational program (from 2019 to 2021) provided a small reduction in the number of snakebites, resulting in a total three-year decrease of 7.73% in comparison to the previous three years (2016-2018). Indeed, it was observed an increase of snakebites over those years (2016 – 294; 2017 –398; and 2018 – 463). In conclusion, although slowly, Snakebite Roraima Educational Activities are mitigating positively the snakebite problem in the state, collaborating with the global goal of reducing snakebite till 2030.

Keywords: Snakebite Roraima; Educational Program; Mitigate snakebites.
Financial support: We thank the Pró-reitoria de Assuntos Estudantis e Extensão - PRAE (scholarship to Amanda M. A. Cunha and Kiara C. T. Cardenas - nº 44/2022-PRAE/UFRR).

ABSTRACT 3

FRESHWATER STINGRAYS ENVENOMINGS IN NORTHERN BRAZIL

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Freshwater stingrays are venomous cartilaginous fish. Although not aggressive, they can have a defensive reaction when they feel threatened and have stingers in their tails that are used for self-defense causing inflammation, pain, among other symptoms in victim. The present study is an observational and review research that aims to demonstrate the relevance and impasses that permeate stingray problem in the Northern of Brazil. The Northern Brazilian region is responsible for many accidents caused by aquatic animals, highlighting accidents by stingrays. Indeed, local freshwater rivers are the ideal habitat for them because of the rich biodiversity. High number of stingrays' envenomings can be related to the work activities of riverside dwellers, bathers who frequent lakes and rivers, fishermen, and indigenous communities. According to the Pará State Department of Public Health, 1,984 stingray accidents were reported between 2007-2017, occurring in Santarém (22.69%), Conceição do Araguaia (16.24%), and Belém (11.70%). At the 24-hour Health Unit in Alter do Chão (Pará), 600 patients were injured by stingrays were treated between 2009-2019. In addition, according to information from the Notifiable Diseases Information System (SINAN), between January 2018 and May 2019, 67 cases of stings by freshwater stingrays were recorded in Palmas (Tocantins), the most affected part was the feet with 92.5% (n=62) of the cases and all of them showed intense pain (n=67). In interviews conducted between 2014-2015 with 132 victims in Juruá (Acre), pain was reported (94.7%), edema and erythema (81%). Despite having low lethality, stingray envenomings induce severe symptoms triggered by the tail stingers presenting serrated barbs and coated with toxin-producing tissue. When penetrating the body, the stingray venom triggers an inflammatory reaction with intense pain, erythema, and edema. Necrosis, ulcers, nausea, and secondary infections may also occur. The treatment includes cleaning the wounds, prophylaxis for tetanus, and pain control (i.e., using analgesics and anesthetics). Immersion of the affected site in hot water can be performed to antagonize the vasoconstrictor action of the venom and relieve pain. Moreover, factors such as distance of the accident and hospitals can always aggravated the case. The evolution of symptoms varies from 20 days to a few months. In conclusion, this study highlights the important health problem that stingrays cause in the Northern region of Brazil, requiring medical treatment and public health attention, and thi problem may be even higher. Currently, stingrays are registered in SINAN as accidents by venomous animals, a general category that makes it difficult to measure the true situation.

Keywords: Stingrays; Aquatic animals; Envenomings.
Financial support: Not applicable.

ABSTRACT 4

AN OVERVIEW OF SNAKEBITE LETHALITY IN BRAZIL

Bruna Mariah M. Muller[1], Isabella Cristina S. Cardoso[1], Hellen B. Silva[2], Manuela B. Pucca[1]

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Given the regional differences that exist in Brazil, the lethality rates of snakebites can vary due to the delay to receive medical assistance and antivenom. This study aims to analyze and compare the lethality rates of accidents caused by venomous snakes between the states of Brazil during the period of 2010 and 2021. To analyze the lethality rates, data from the System of Notifiable Diseases Information - SINAN was used. The death percentages and total cases of the main Brazilian snake genus (Bothrops, Micrurus, Lachesis, and Crotalus) were evaluated. During the period, 345,677 snakebites were reported, with 1,395 deaths and a lethality rate of approximately 0.40%. Although the state of Pará had the highest number of related cases with Bothrops spp. (54,663 cases), the state with the highest lethality was Sergipe with 0.76%. It is worth mentioning that the lethality in the state of Roraima for bothropic accidents was in second place, with 0.78%. Minas Gerais presented the highest number of snakebites caused by Crotalus genus (6,688 cases), albeith the state of Amapá had the highest lethality rate, 4.23%. For Micrurus, the highest incidence was observed in Bahia (372 cases), but the highest lethality occurred in Roraima, with 3.03%. Regarding Lachesis snakebites, the highest accidents occurred in Amazonas (3,389 cases); however, the highest lethality was observed in Acre, 1.21%. This study demonstrated that the highest lethality rates of the four main snake genus in Brazil are concentrated in the North and Northeast regions, with emphasis on Sergipe, Amapá, Roraima and Acre. Thus, lethality rates may be directly related to environmental and social characteristics of the different regions in Brazil, with special attention to the Amazon region, suggesting the necessity of urgent political policies to mitigate the impacts of snakebites in the country.

Keywords: Epidemology; Snakebites; Lethality; Envenoming.
Financial support: Not applicable.

ABSTRACT 5

EPIDEMIOLOGICAL OVERVIEW OF ACCIDENTS BY BEES IN THE POPULATION RESIDING IN THE STATE OF RORAIMA

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Although bees are typically docile and unable to overload health systems, since the accidental introduction of Africanized bees in Brazil in 1956 and the Americas, the incidence of attacks has been on the rise due to the increased aggressiveness of Africanized bees. To date, treatment of such stings is focused on controlling potential allergic reactions, as no specific antivenoms against bee venom currently exist. This study sought to establish an epidemiological panorama of accidents caused by bees in Roraima. The study is characterized as analytical, observational, cross-sectional, quantitative, epidemiological and retrospective, and used the Sistema de Informação de Agravos de Notificação (SINAN) database to analyze the period between January 2017 and July 2022, resulting in a sample population of 845 cases. In the comparison year by year, 2018 had the highest prevalence, concentrating 213 (33.8%) of the cases, followed by 2017 with 173 (27.4%) notifications, 2020 with 141 (22.3%), The other years accounted individually less than 20% of the cases each. Most of the cases occurred within the city of Boa vista with 510 (60.3%) of the accidents. Regarding the comparison between the biological sexes, the male population concentrated 587 (69.4%) of the cases, while the female population 258 (30.5%). Individuals between 21 and 40 years of age 323 (38.2%) accidents and mixed race 738 (87.3%) were the main victims. Most of the accidents occurred in the urban perimeter 537 (63.5%), with medical attention taking up to 1 hour in 279 (33.0%) of the cases, while only 59 (7%) of the cases took more than 24 hours to be attended. In terms of severity, the majority 668 (79%) of the cases were classified as mild, while moderate and severe represented 89 (10.5%) and 11 (1.3%) respectively. In terms of evolution, 755 (89.3%) of the cases were cured, against only 5 deaths, which represented 0.5% of the total. The most bitten regions were head, trunk, and hand, with 321 (37.9%), 104 (12.3%), and 78 (9.2%) cases, respectively. It is worthy to note that only 63 (7.4%) of the cases had systemic manifestations, with vagal manifestation being the most prevalent with 36 (57%) of the cases. The renal systemic manifestation was the least prevalent, with only 2 notifications (3.10%). Also, regarding local manifestations, pain and edema were present in 716 (84.7%) and 607 (71.8%) victims. The study concludes that the accidents caused by bees in the population of Roraima occur more frequently in men, mixed race, between 21 and 40 years old, in the urban perimeter of the cities of Boa Vista and Normandia, i.e., not necessarily in those with the largest population, but mainly located in the savannah region. Still, most cases are mild, which usually present only local manifestations and evolve with cure. Among those that evolve with systemic manifestation, the vagal manifestation corresponds to most cases.

Keywords: Epidemiology; Bee's accidents; Venomous animals; Bees; Roraima.
Financial support: Not applicable.

ABSTRACT 6

KNOWLEDGE ABOUT OFIDISM BY NURSING GRADUATES AT THE FEDERAL UNIVERSITY OF ACRE

Mylena Lilian de Souza Costa

Anne G. A. C. Marques[1], Dayan A. Marques[2], Marco A. S. Lima[1], , Luana B. S. Braga[1], Dafnin L. S. Ramos[3], Manuela B. Pucca[3]

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Snakebite is a global health problem, thus the World Health Organization included it in the list of neglected tropical diseases in 2017. Annually, it is estimated that about 400,000 leave permanent sequelae as a result of the total number of cases. In this sense, the importance of training professionals who will deal with this type of accident is highlighted, aiming at personalized care depending on the accident. The research was carried out with the graduating students of the nursing course at the Federal University of Acre through a form applied in the months of June and July 2021, with a quantitative, descriptive and exploratory approach, for identify whether they had knowledge about methods related to snake identification, diagnosis, emergency care and treatment for these accidents. As a result, it was observed that 70.58% of the participants reported not having theoretical or practical classes about snakebite during their graduation and 76.47% reported the lack of practical courses to snakebites care offered by their college. In addition, 100% of students do not consider themselves capable of managing these accidents. The questionnaire was divided into 4 blocks, the first being related to the characteristics of snakes that allow their identification, presenting only 13.74% of the correct answers. The second block was about the diagnosis of these accidents, including criteria for severity and clinical manifestations, presenting 19.85% of correct answers. Yet, the last two blocks showed better performance by the students, the third block focused on the correct conduction and treatment of cases and presented 39.91% of correct answers. Finally, the last block refers to accident prevention, and presented 70.58% of correct answers. With these results, it is evident the importance of including a discipline in the nurse graduation about snakebite. In addition, this discipline needs to cover patients with exogenous and endogenous intoxications, including poisonings by venomous animals. Thus, through the adequate training of new health professionals, it will be possible to better manage the patient, through the identification and correct management of cases of snakebites.

Keywords: Poisonous animals; Accidents; Notification; Training.
Financial support: Not applicable.

ABSTRACT 7

COMPARATIVE ANALYSIS OF SCORPION SPECIES FROM RORAIMA

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Scorpions are the oldest known arachnids from the world, with fossil records of 430 million years ago. It is often attributed that modern scorpions originate from euripterids since they have a common ancestor. In Brazil, the oldest scorpion fossil dates 260 million years old, when the earth still consisted of only one continental mass, the Pangaea. Scorpions are animals that have a great adaptive capacity and geographical distribution, where their presence is observed in regions with different temperature and humidity conditions. Indeed, they are present on all continents, with the exception of Antarctica. So far, about 2,000 species of scorpions have been cataloged in the world, with 172 inhabiting Brazil, although only few of them are of public health importance. In the Amazon region, especially in the state of Roraima, there is the occurrence of two species mainly: *Tityus silvestris* and *Rhopalurus crassicauda,* which are adapted to different environments. The aim of this work was to understand and analyze the behavioral differences between the scorpion species *Tityus silvestris* and *Rhopalurus crassicauda*, taking into consideration factors such as habitat, feeding, life habits, and adaptive capacity in the state of Roraima. The literature review was performed between January 2005 and August 2022, through databases, journals, and books. The scorpions *T. silvestris* and *R. crassicauda* show a similar diet, with preference to crickets and cockroaches. In captivity, both scorpions did not eat dead preys, so they present a predator behavior following feed. Regarding the habitat, both species are found in warm and humid forests, albeit *T. silvestris* seems to have a preference to inhabit forests or surrounding it. In contrast, *R. crassicauda* have shown higher preference for open fields (savannas) and low vegetation, and it is extremely adapted to urban areas, being the majorly found in the capital Boa Vista and responsible for the most cases of scorpion stings. In addition, *R. crassicauda* also showed easy adaptation in captivity, while *T. silvestris* not (high rate of death in the vivaruium). Regarding reproduction, both present sexual reproduction and are viviparous, i.e., the young develop inside the female's body. Moreover, due to the differences in habitat and ecological niche of the species, they show to coexist harmoniously minimizing competition. Thus, although Roraima presents a great biodiversity including scorpion fauna, the group research observed that *T. silvestris* and *R. crassicauda* are the species responsible for most of the accidents in the state. This study demonstrated the adaptability of two scorpion species from Roraima, which the different habitat preference may be a factor for the reduction of direct competition between them.

Keywords*: T. silvestris*; *R. crassicauda*; Scorpion behavior; Scorpionism; Habitat.
Financial support: Not applicable.

ABSTRACT 8

CLINICAL AND EPIDEMIOLOGICAL ASPECTS OF SCORPIONISM IN THE MAIN HOSPITAL OF BOA VISTA, RORAIMA

Humberto H. M. dos Santos[1], Samuel Vieira, Thays K. P. Prado Aguiar[1], Felipe A. Cerni[2], Manuela B. Pucca[1,2]

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Scorpionism is considered a public health problem. In Brazil, scorpion stings are distributed all over the country reaching numbers over 149,000 in 2021. Different from most states of Brazil where scorpionism represents the highest numbers of venomous animals' accidents, in Roraima accidents triggered by scorpions appear in second position following snakebites. Based on that, little is known regarding the clinical picture of scorpion envenomings in the state, probably due to the often-low toxicity of the venom from the local species. This study aims to obtain secondary epidemiological and clinical data at the main hospital of the state - Hospital Geral de Roraima Rubens de Sousa Bento - HGR, placed in Boa Vista (capital of Roraima). Our results demonstrated that the total number of accidents admitted at HGR from 2011 to 2021 were 668. The years 2018 and 2019 had a significant increase in the number of accidents with 93 and 136 cases, respectively. Moreover, we analyzed several parameters such as the time of recovery, the laboratory tests, and the frequent treatment performed to these patients. In respect to the clinical manifestations, most patients felt intense pain as the main symptom. In all cases the patients evolved to cure, and no death was registered. In conclusion, this study demonstrated that scorpion envenomings in Roraima is often mild and may not be recommended the use of antivenoms, since it can induce adverse effects and is not capable of neutralizing the local species, as was previously published by the research group. At last, our study highlights the importance of increasing the knowledge related to scorpion envenomings in the state of Roraima, to bring a better treatment approach in hospitals.

Keywords: Scorpionism; Treatment; Roraima; Envenoming, Scorpion sting.
Financial support: We thank the Programa de Iniciação Científica Institucional (scholarship to Humberto H. Machado dos Santos – PIBIC 2022-2023).

ABSTRACT 9

CLINICAL-EPIDEMIOLOGICAL PROFILE OF SPIDER BITES IN RORAIMA

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Roraima has a great biodiversity, water supply and favorable temperature for the reproduction of venomous animals, such as spiders. The most medically important spiders in the country are of genus Phoneutria (Brazilian wandering spider or armed spiders), *Loxosceles* (brown spider) and Latrodectus (black widow). Loxoscelism is marked by a barely perceptible sting and may clinically present a cutaneous and cutaneous-hemolytic form. Phoneutrism cases presents pain of variable intensity, which can radiate to the root of the limb, sweating, erythema, paresthesia, edema and two visible inoculation points. Latrodectism manifests local pain, generalized sweating, tremors, changes in pressure and heartbeat. Given the need for studies on spider bites in the state, the present study aims to describe the clinical and epidemiological profile of spider bites in Roraima between 2007 and 2021. Data from SINAN (Brazilian Notifiable Diseases Surveillance System) were analyzed in the period mentioned compiling combinations of row and column, such as municipality of notification, month of accident, municipality of residence, municipality of occurrence, age group, race, education, sex, pregnant woman, bite/care time, type of spider, type of accident and case evolution, interpreted with proporcionality calculations. The literature review, carried out by the Google Scholar database, associated with words such as spider bite, Roraima and epidemiological profile. In the analyzed period, there were 449 cases of spider bites, with the highest number of cases in 2018. The month that most reported acidentes was september and may had the lowest accidents. In the capital there were 199 cases, but only 157 cases occurred in Boa Vista. The most frequent age group was between 20 and 39 years old, the most affected sex was male, admixed ethnicity was prenominant and 5 pregnant women were among the injured. There were 3 deaths between 2007 and 2021, 2 in 2017 and 1 in 2019. The lethality in the state between 2007 and 2021 was approximately 0.66%. A total of 277 cases (61,6%) were recorded as white/ignored, that is, the classification of the type of spider was not analyzed in the notification form. On the other hand, 101 were classified as “another species”, 41 were *Loxosceles spp*. 29 were *Phoneutria spp*. and 1 was *Latrodectus spp*. The highest mortality was due to loxoscelism (2 from the 3 deaths). Approximately, 30% of the victims were notified between 0 and 1 hour, explaining the positive outcome of the majority and there are still 15% that are treated between 24 hours or more of the accident. Therefore, in view of challenges regarding the availability of sorotherapy for regional demand and the evident increase in cases, the importance of complementary studies on spider bites, with emphasis on the state of Roraima is configured.

Keywords: Spider bite; Roraima; Amazon; Clinical and epidemiological profile.
Financial support: Not applicable.

ABSTRACT 10

INFLAMMATORY EFFECTS OF Bothrops Atrox SNAKE VENOM ON PERIPHERAL BLOOD MOONONUCLEAR CELLS IN VITRO

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The *Bothrops atrox* (Ba) snake is responsible for most reports of accidents in the Brazilian Amazon. Among the disorders, the inflammatory response is responsible for local and systemic effects, however the participation of blood leukocytes in this event still neglected. The present work evaluated the in vitro inflammatory response induced by Ba venom (BaV) on peripheral blood mononuclear cells (PBMC), and the ability of anti-bothropic antivenom to reverse this effect. BaV total protein quantification was performed using the BCA technique. Peripheral mononuclear cells (PBMC) were isolated by density gradient from healthy donors (CAAE: 44561521.4.0000.0005), subsequently as cells were treated for 24 with BaV (25 µg/mL), antibothropic serum (dilutions of 1:5, 1:1, 1:20, 1:40 and 1:80); and with BaV + bothropic serum at the same dilutions mentioned above. After cell testing period cells were submitted to cytotoxicity assay using MTT method and supernatant stored at -80°C for cytokine quantification. BaV showed an IC50 = 16.75 µg/mL on PBMC. From these results, a concentration of 25µg/mL was chosen for the following assays. When BaV was pre-incubated with antivenom, inhibited the cytotoxicity from 50 to 100% among dilutions. Regarding the inflammatory profile, we observed that BaV was able to induce the production of the cytokine IL-1β, whereas the anti-bothropic serum was able to inhibit 100% of the production at a 1:5 dilution. Thus, our results demonstrate the efficacy of antibothropic antivenom in reducing the effects of cytotoxicity and cytokine production induced by BaV, its importance in its use in the treatment of bothropic accidents. However, further studies need to be carried out, considering the limitations of the antivenom on *Bothrops* snakebite local effects.

Keywords: Inflammatory effect; Bothrops atrox; Human immune cells; Antibotropic serum.
Financial support: Fundação de Amparo à Pesquisa do Estado do Amazonas (FAPEAM).

ABSTRACT 11

SNAKE-VENOM: A POSSIBLE NEW THERAPY FOR COLORECTAL CANCER

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During the last decades, Colorectal cancer has been a notable mortality and morbidity cause. According to CDC (Center for Disease Control and Prevention), this disease is the second leading cancer killer in the US, and although the efforts to discover the molecular intricacies in cancer the survival rate in advanced tumors still not being enough. Thus, demonstrating the relevance of finding new treatment options, then, recent studies about enzymes and peptides, like L-Amino Oxidase and Cytotoxin-1N purified from the venom of some snakes, arise as a valuable possibility. Therefore, this bibliographic review aimed to know and understand the biological performance of snake venom components that are being associated with the possible treatment of colorectal cancer. A bibliographic search in the National Library of Medicine (PubMed) was performed using the keywords Snake Venom and Colorectal Cancer from 01/2017 to 08/2022. The survey showed that the most reported components in the literature are phospholipases A2 (PLA2), L-Amino Acid Oxidases and Lebein, Apoptosis Induction Factor and Hydrogen Peroxide, and their actions involve the activation of apoptosis and the antiangiogenic action. In view of the above, it is concluded that the main components of snake venom associated with the treatment of colorectal cancer are enzymes, proteins, chemicals, and their actions involve the activation of tumor cell death or suppression of that cell's nutrition.

Keywords: Snake; Venom; Cancer; Colorectal; Apoptosis.
Financial support: Not applicable.

ABSTRACT 12

ANTIBIOTIC THERAPY FOR SNAKEBITE ENVENOMING

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Ophidian accidents are common in different parts of the world. Besides systemic complication as coagulopathy, compartmental syndrome, and oliguria, there is the possibility of secondary complications, like infections, which could be prevented or treated with antibiotics. Hence, this article aims to review the use of antibiotic therapy post-snakebite accident, desiring a rational use of medicine and counteract antimicrobial resistance. A bibliographic search in the National Library of Medicine (PubMed) was accomplished, using as descriptors the words "Antibiotic Therapy" and "Snakebite" from 01/2017 to 08/2022. The review evidenced the importance of Snake oral microbiota evaluation to purpose a treatment, due to heterogeneity bacteria colonies in different species in which biome. Thus, snake envenoming management diverges, because the drug profile of the microorganisms varies, although the antibiotic therapy using amoxiclav shows efficacy for some bacterial infections, for another there is beta-lactam resistance, being compulsory to administer a distinct drug, as a third-generation cephalosporin. In contrast, still being discussed the real efficacy of antibiotic profilaxy in every snake envenoming, some studies showed fibrinogen, alanine-transaminase, and C-reactive protein as infection markers which can be tools for advice when the drugs are mandatory. To conclude, it is essential to know the microbiota of endemic snakes to define precisely and produce guidelines to conduct better antibiotic therapy for each place, aspiring a smart use of drugs to improve the treatment, avoid systemic infections, and prevent antimicrobial resistance.

Keywords: Snake; Snakebite; Antibiotic; Bacteria; Infection.
Financial support: Not applicable.

ABSTRACT 13

BIOCHEMICAL AND IMMUNOLOGICAL CHARACTERIZATION OF *Tityus silvestris* VENOM FROM RORAIMA

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Scorpionism is a public health problem due to its high incidence in several regions of Brazil, with more than 26,000 cases reported from 2017 to 2021 only in the North region. One of the scorpion species found in the Amazon Forest is *Tityus silvestris* (Tsi), first described by Pocock (1897) in the Santarém region of the Brazilian Amazon, and later was found to be distributed throughout the Amazon region, including Roraima. Scorpion venoms are characterized by having between 30 to 75% of low molecular weight proteins in their dry mass, and the main components consist in enzymes (e.g., hyaluronidases and serine proteases), protease inhibitors, kallikrein inhibitors, histamine releasers and neurotoxins. Indeed, the best-known peptides in scorpion venoms are neurotoxins, which affect ion channels and are responsible for the clinical complications of envenomation. The aim of this study was to perform the biochemical and immunological analysis of Tsi venom. For this purpose, about 50 specimens were collected in the Serra da Corcova (region located in the municipality of Iracema-RR) and the venom extraction was performed using the telson electrical stimulation method (18V). Our results demonstrated that the venom profile using Tricine-SDS-PAGE was different when compared to Tsi venoms from different locations, such as Manaus and Santarém. Moreover, the venom fractionation using Fast Protein Liquid Chromatography (FPLC) demonstrated a different protein profile in comparison to venoms derived from *R. crassicauda*, *T. metuendus*, and *B. amazonicus* (scorpion species from Amazon region). In addition, ELISA results demonstrated that the commercial arachnid and scorpion antivenoms were not effective in recognizing antigens present in the Tsi venoms from the different locations: Roraima, Amazonas, and Pará. The absence of phosphodiesterase (PDE) activity was also verified in the Tsi venom. Regarding the venom ability to modulate de immune system using neutrophil extracellular traps (NETs) assay, Tsi demonstrated to induce low NET formation in comparison to *T. serrulatus*. In conclusion, this study reinforces the importance of studying scorpion species from Roraima to improve knowledge about the local biodiversity as well as to understand the pathological mechanisms involved in local scorpion envenomings. In addition, this study postulates that the commercially available antivenoms are not effective to treat Tsi envenomings.

Keywords: Scorpion; Venom; Roraima; Antivenom; NETs; Toxins.
Financial support: We thank the Programa de Iniciação Científica Institucional (scholarship to Karlos D. A. dos Santos – PIBIC 2022-2023).

ABSTRACT 14

SNAKEBITE-INDUCED SEQUELAE: A CLINICAL-EPIDEMIOLOGICAL REVIEW OF SECONDARY INFECTIONS FOLLOWING SNAKEBITES

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Snakebite envenoming is a neglected tropical disease that mainly affects poor and rural communities. Every year, around 5.4 million people around the world are bitten by snakes, with these accidents being underreported, more than 100,000 people die, and approximately 300,000 suffer amputations or other permanent disabilities. Snakebite tissue damage is one of the main induced effects of Brazilian snakes. Indeed, victims frequent present swelling, pain, redness, and blisters at the bite site. Moreover, in severe cases, there may be subsequent dermonecrosis and myonecrosis, occasionally requiring debridement and amputation. Furthermore, another important local injury is the development of a chronic ulcer at the site of the bite, specially induced by secondary infections. Snakebite specific treatment is performed with antivenom and supportive care. *Bothrops spp.* snakes trigger the highest number of envenomations in Brazil, with complications such as bleeding, acute renal failure, local necrosis and secondary bacterial infections that are underreported. This study aimed to review the literature on the profile of wounds resulting from snakebite followed with secondary infections, focusing on bothropic genera using PubMed and SciELO databases. The literature review was carried out considering articles from the last 5 years analyzing the snakebite epidemiology and the local complications. The results demonstrated that in a reference hospital in Amazonas, from 200 cases of snakebites 40% of the victims show secondary infections mainly induced by *Morganella morganii*. In another study also in Amazonas, a total of 545 snakebite cases were analyzed, of which 127 (23.3%) developed secondary bacterial infection, defined as the presence of cellulitis and/or abscesses up to 48 hours after admission. In the Amazon region, the distance from medical units is a great barrier, resulting very often on complications. Indeed, a study demonstrated that 31.6% of patients sought treatment ≥ 7 hours after the bite, a factor that may contribute to the incidence of secondary infection. Thus, as the longer the time elapsed between the bite and treatment, the greater the risks of infection. In conclusion, this study highlights the importance of adequate treatment and management of snakebites to avoid complications (e.g., secondary infections) and the resolution of the case. However, little is known about the frequency of secondary infections after snakebites, as well as the spectrum of bacteria responsible for wound infections.

Keywords: Snakebite; Sequelae; Complications; Infections.
Financial support: Not applicable.

ABSTRACT 15

THROMBOTIC MICROANGIOPATHY IN PATIENTS VICTIMS OF BOTHROPIC ENVENENOMINGS IN THE BRAZILIAN AMAZON

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Bothrops snakebites are known for coagulation disorders, responsible for bleeding and thrombotic events. Among the coagulopathy events, thrombotic microangiopathy (TMA) is characterized by the deposition of microthrombi in the circulation causing hemolytic anemia, responsible for organ damage such as kidneys. In the Brazilian Amazon, the snake *Bothrops atrox* is the primary cause of snakebites, but no study in the region has been conducted to investigate the TMA associated with envenoming. Considering the importance of TMA in the pathophysiology of snakebites, the study aims to evaluate hematological, biochemical and coagulation alterations associated with TMA in patients' victims of *Bothrops* snakebite in a reference unit in the Brazilian Amazon. This is an observational, descriptive and longitudinal study carried out with patients who were victims of bothropic envenoming treated at the Fundação de Medicina Tropical – Dr. Heitor Vieira Dourado (FMT-HVD) from July/21 to May/22. This study was approved by the Research Ethics Committee (REC) of the FMT-HVD, under CAAE 39345520.9.0000.0005 and opinion number 4.478.678. Venous blood samples were collected from patients who agreed to participate in the study at admission (T0 – pre- serum therapy), 24h (T1), 48h (T2), 72h (T3) and 7 days after serum therapy (T4). The diagnosis of TMA was characterized by a decrease in hemoglobin values, thrombocytopenia and the presence of schizocytes in the blood smear. Of the 57 patients included in the study, 5 were diagnosed with TMA (8.77%), all male, 60% over 60 years of age (patients without TMA = 13.46%) and all envenoming occurring in rural areas. In addition, 40% of patients who developed TMA took more than 6 hours to get medical attention. Patients with TMA presented a hematological profile with mild thrombocytopenia, leukocytosis and neutrophilia, in addition to levels above the reference values of urea and creatinine. Furthermore, we observed that 60% of patients with TMA presented acute renal injury (AKI), compared to 7.69% in patients without TMA. The results show for the first time that TMA is an event observed in bothropic envenoming in Amazon, being associated with hematological and biochemical alterations being more likely to progress to renal disorders. Thus, an important attention to the development of TMA in patients' victims of bothropic envenoming deserves to be offered as a way to improve the treatment of patients victims of *Bothrops* envenoming in the region.

Keywords*: Bothrops atrox*; Thrombotic microangiopathy; Blood disorder; Acute kidney injury.
Financial support: Fundação de Amparo à Pesquisa do Estado do Amazonas (FAPEAM).

ABSTRACT 16

HARNESSING THE POWER OF VENOMOUS ANIMAL-DERIVAD TOXINS AGAINST COVID-19

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In 2020, the world suffered a chaotic situation from the pandemic of COVID-19, a disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) first emerged from China. Coronavirus has crown-shape glycoprotein spikes projecting from its surface. Cell entry of SARS-CoV-2 occurs through the binding of the spike glycoprotein (glycoprotein S) to angiotensin-converting enzyme (ACE2) expressed on the surface of the host cells. Therefore, intervention at the stage of adsorption/binding or replication of the virus using therapeutic agents can effectively block viral infection. Additionally, SARS-CoV-2 presents encoded non-structural proteins which participates in viral replication and pathogenesis. One of these proteins, cysteine protease papain-like, is essential for the viral replication and it affects post-translational modifications on host proteins, contributing to the evasion of host immune responses. Patients infected with COVID-19 presents high serum levels of inflammatory cytokines, such as IL-6, TNF-α, IL-1β, IL-8, resulting in a mechanism named cytokine storm. Although venom-derived toxins are known to their potential of causing harm to victims, toxins can also act as a pharmacological agent. As an example,the PLA2 HDP-2 from the Nikolsky's viper (Vipera nikolskii) presented nanomolar virucidal activity, inhibition of virus-host cell fusion, due to its's phospholipolytic activity, being responsible for the destruction of the viral envelope . Also from snake venoms, three peptide dimers derived from the C-terminus of the myotoxin bothropstoxin-I, from *Bothrops jararacussu* targeted the viral papain-like cysteine protease with low, and micromolar potency. Still, we can cite the Cobrotoxin, from *Naja naja atra* snake which could be a candidate for alternative therapy for COVID-19 because it may have a role as inhibitory effect on the cytokine storm caused by SARS-CoV-2 in COVID-19. Regarding bee venom, some studies have been published regarding its action on SARS-CoV-2, authors hypothesized that it may attenuate cytokine storm caused by SARS-CoV-2 and could be used for prophylactic context for COVID-19. This article, based on the literature review, explores the crosstalk of animal toxins and COVID-19, aiming to map potential therapeutic agents derived from venoms targeting COVID-19.

Keywords: SARS-CoV2; COVID-19; Coronavirus; Animal toxins; Venoms.
Financial support: Not applicable.

ABSTRACT 17

CLINICAL AND EPIDEMIOLOGICAL CHARACTERISTICS IN LAQUETIC ACCIDENTS ATTENDED IN A REFERENCE HOSPITAL IN THE WESTERN AMAZON

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Popularly known as surucucu, pico-de-jaca, surucucu pico-de-jaca, surucutinga, or even fire mesh, *Lachesis muta muta* is one of the snakes of medical interest in Brazil. Ophidian accidents with snakes of this genus are considered a neglected tropical disease, and there are few records in the literature. The objective of this study was to classify laquetic accidents syndromically and to characterize the profile of victims treated at a reference center in the western Amazon. Epidemiological and clinical data were collected from one hundred and eleven victims of snakebites of the genus Lachesis admitted to the Fundação de Medicina Tropical Dr. Heitor Vieira Dourado (Manaus, Amazonas) from 1996 to 2021, based on physical and electronic medical records. The syndromic diagnosis of accidents was performed by the most common signs and symptoms in laquetic accidents: bradycardia, abdominal cramps, diarrhea, dimming of vision, hypotension, dizziness, and vomiting. Data were collected from ten laquetic accidents, of which eight were male and two were female. The mean age was 40 years. 80% (n=8) of the patients were from rural areas, and 20% (n=2) were from the peri-urban area. The greatest accidents were from 6:00 to 12:00 (50%). The body portion most affected were the lower limbs (n=9, 90%). Ninety percent (n=9) of the accidents occurred in the year's first half. 70% took between 1 hour and 6 hours to get medical attention; 20% took more than 6 hours. The mean number of days of hospitalization was 6.6 days. The local manifestations described were: local pain (100%); edema (90%); local bleeding (40%); erythema (30%); bubble (20%); secondary infection (20%); necrosis (10%). The systemic manifestations were: vomiting (60%); blurred vision (50%); systemic hemorrhage, nausea, dizziness, and headache 40%; confusion, fainting, sweating, abdominal pain, and hematuria 10%. Half of the patients had an incoagulable clotting time. All patients used bothropic-lachetic antivenom, and the most frequent route of administration was intravenous (90%), and only one patient reacted to the antivenom. Considering the above, the profile of patients who are victims of laquetic accidents treated at the institution is male, of working age, farmers, from the rural area, and with the lower limbs as the most affected body in accidents.

Keywords: Snakebites; Laquetic accidents; *Lachesis muta muta*; Epidemiological characteristics; Clinical features.
Financial support: Amazonas State Research Support Foundation (FAPEAM).

ABSTRACT 18

FASCIOTOMY FOLLOWING SNAKEBITE: A CASE REPORT OF A COMPARTMENT SYNDROME

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The World Health Organization included snakebite in the list of neglected tropical diseases in 2017. In Brazil, because of the number of cases, snakebites need compulsory notification, aiming to promote a reliable follow-up to the number of cases and to mitigate disease. Snakebites in the country can be attributed to laquetic, bothropic, crotalid, and elapid accidents, and the specific treatment is performed with antivenoms, associated with life support and treatment for symptoms. The main complication is amputation due to compartment syndrome caused by edema and vessels/nerves compression, being fasciotomy an approach that may bypass amputations. This study presents a case report of a 58-year-old man, a farmer in the municipality of Uiramutã, from the state of Roraima. He was bitten by a snake on the left ankle while he was performing rural activities. The snakebite happened on September 25, 2018, around 8:30 am. One hour following snakebite, he tried a tourniquet himself, keeping it for approximately six hours. The victim sought medical attention at the Hospital Geral de Roraima (HGR) about 8 hours after the bite. On admission, the victim was eupneic, tachycardic, normocolored, anicteric, acyanotic, afebrile, hydrated, blood pressure of 140/85 mmHg, heart rate of 112 (bpm), respiratory rate of 20 (irpm), and axillary temperature of 36.3 °C. The victim described blurred vision, dizziness, intense pain, ecchymosis, and presence of edema in the left leg. The likely snake was Lachesis spp. and the envenoming classified as severe. After the initial evaluation, the patient received a pre-medication with hydrocortisone, dexamethasone, dipyrone, and cephalothin. Following the pre-medication, the victim received 12 ampoules of lachetic antivenom intravenously. There was no adverse effect during the administration of the antivenom. Meanwhile, laboratory tests were requested. A local vascular evaluation was performed, and circulation showed to be compromised because of the severe edema. The patient was diagnosed with compartment syndrome and was referred to the operating room to perform a fasciotomy with two incisions in the left leg. The patient evolved satisfactorily during the hospitalized period (15 days), improving the clinical aspects and the values of laboratory tests, being discharged on day October 9, 2018 with prescription of analgesia and orientation. This case report demonstrates the need for the correct clinical evaluation of snakebite victims, since, in the present case report, fasciotomy prevented a possible amputation.

Keywords: Snakebite; Fasciotomy; Antivenom therapy; *Lachesis*; Envenoming.
Financial support: Not applicable.

ABSTRACT 19

EDUCATIONAL ACTIONS AS A METHOD OF SUBTRACTION IN CASES OF SNAKEBITES DEVELOPED IN A RESEARCH CENTER IN THE BRAZILIAN WESTERN AMAZON

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The identification of snake species after an accident is essential for diagnosing the type of snake aggressor and initiating specific antivenom therapy, in addition to contributing to the reduction of annual rates of disability, mortality, loss of income, and debts that affect population. The Amazon Museum (MUSA) located in the Adolpho Ducke Forest Reserve in Manaus, Amazonas, works by developing research, education and scientific tourism programs related to the biomes and cultures of the Amazon region. The present work aims to guide and educate visitors about snakebites, specifically about prevention methods, measures and recommendations that should be followed in cases of snakebites with emphasis on snakes considered of medical importance. These are educational actions carried out at the MUSA Serpents Laboratory during the year 2022 in Manaus. The MUSA snake laboratory has 18 snakes in captivity and dead individual maintained in formol for public observation and educational informations, used in research, comprising snakes of the genus *Bothrops atrox*, *Crotalus durissus ruruima*, *Lachesis muta*, *Micrurus lemniscatus*, also the snake popularly known as the green snake *Chlorosoma viridissimum*, a fake coral of the *species Anilius scytale*. As a methodology, a photovoice was used with images of snakes camouflaged in nature, jararaca prey, murals with snake teeth and a visual approach with laboratory animals to teach the public to identify a venomous snake. The individuals involved in the study were medical and nursing students from universities in Manaus, during the first half of 2022 (15 total participants). The study consisted of collecting information after the visitation period, and the data collection period took place in the second half of the same year, where through an online form was applied to measure the level of impact after the educational action in view of popular knowledge. 90% of the public reported not having studied animal accidents venomous snakes in the curriculum of their universities, 95% had never had previous contact with venomous snakes and when applying the form, after the action, 88.9% knew how to identify snakes of medical importance in Brazil. 100% were able to cite prevention measures, and 100% knew what precautions to take after a snakebite. It was evidenced that the individuals were able to identify the snake aggressor and cite the prevention methods against snakebites, there was a satisfactory learning in relation to the recommendations of non-medical interventions in cases of snakebite, aware of the risks and complications. The work shows the importance of future health professionals are trained to deal with these accidents, and to educate the community about preventive actions involving snakebites.

Keywords: Snakebite; Education; Snake identification.
Financial support: Amazonas State Research Support Foundation (FAPEAM).

ABSTRACT 20

THE IMPORTANCE OF SNAKEBITE TRAININGS TO MEDICAL STUDENTS

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Snakebite is a huge public health problem present in Brazil, although most of Medical Courses does not include the content in the study programme. Since 2017, snakebites are classified as a Neglected Tropical Disease by the World Health Organization; however, the disease continues to have little visibility in the academic background. Indeed, the snakebite management is completely neglected in medical education, resulting in graduate physician lacking knowledge and skills that make them performing a wrong care to the patient, which may aggravate the clinical picture. The present study aims to elucidate the importance of training medical students regarding snakebite management. This is a descriptive observational study conducted with data from academics who participated in two courses, between 2021-2022, on snakebite management: "Protocol for Handling Ophidian Accidents", carried out by the Fundação de Medicina Tropical Doutor Heitor Vieira Dourado (FMT-HVD), and the "Training on Ophidian Accidents in Roraima", realized by the research group Snakebite Roraima. Both trainings offered theoretical knowledge, discussion of clinical cases, and practical activities to students and health professionals. The data obtained showed that most medical students do not have the necessary knowledge to the management of the snakebite, presenting elementary diagnostic errors such as lack of knowledge about the main clinical signs and symptoms and their relation to the snake species responsible for the accident. This identification is fundamental for therapy and the administration of the specific antivenom. The study also observed the imprecision about the first aid in the care of the victim, mainly regarding the use or not of the tourniquet, hydration of the victim, debridement of the bite site, and application of several substances in the bite site. This work demonstrates the lack of including snakebites in the curriculum of the medical area, especially in the Brazilian Amazon, prevailing cultural and generic knowledge. In conclusion, professional snakebite training, which includes theoretical and practical classes, are extremely necessary for medical students, since the future physician will be able to proper care of snakebite victims, avoiding situations of sequelae. Moreover, a well-trained doctor will also spread knowledge in the workplace to other health professionals. Therefore, investing in medical education regarding snakebites, through debates and training, is the best effective approach to mitigate complications caused by snakebite envenomings in Amazon and Brazil.

Keywords: Snakebite; Medical Students; Training Demonstration; Care.
Financial support: Not applicable.

ABSTRACT 21

CURRENT OVERVIEW OF EDUCATION ABOUT SNAKE AND SNAKEBITES IN BRAZIL

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The existence of conflicts in human-snake relationship is harmful to public health and conservation of biodiversity and this negative perception occurs due to the lack of knowledge about the species' benefits in the pharmacological and ecological scope, for example. Brazil has a deficient education in snakebite even with a high diversity of species, requiring the joint action of biologists and health professionals in this field. This is a descriptive systematic review article. Research was done on PubMed, SciELO and LILACS databases and 13 articles were analyzed, delimited between the years 2018 and 2022, originally in Portuguese and English. Observing the perception of future educators about the basic knowledge in the identification and management in cases of snakebites, it was seen that only 60% of them claim to have some knowledge in the classification of venomous animals, but more than 90% says this is essential in academic practice. As for the need for pedagogical tools to work on the theme, 93% claimed to be essential, especially when working in rural areas. Furthermore, it was noted that the perception of students up to high school about the importance of these animals in the ecosystem, before and after a moment of teaching on the subject, was changed with gain of knowledge about snakes and with shift in the type of perception classified as negative about them. It is concluded that there is a considerable lack of connection between this topic and students, given that less than half of future pedagogues claim to have some knowledge about it. As educators are the authority in the school setting, this domain is important for both accident prevention and first aid provision, especially in areas where contact with these animals is more frequent, such as rural and peripheral areas. High school students, in general, have little knowledge of the technical nature of snakebites, apart from those in the state of Roraima, who know how to identify the most frequent cases and main species that cause accidents, which is crucial in practical conduct and in rescue of victims, as it speeds up the administration of the appropriate serum. Beyond that, it was seen that this insufficient knowledge occurs, for example, due to the use of outdated textbooks with conceptual errors and unrealistic images. The negative perception linked to snakes is largely because of the lack of knowledge about different species and their particularities, interfering on diagnose and proper treatment of their victims due to the failure in correctly identifying these animals. Despite this panorama, an increase in gained knowledge and positive impressions about the importance of snakes to the ecosystem was noted after minimal education on the subject. Therefore, snakebite education is important for accident prevention, provision of first aid care and adequate treatment for better prognosis for the patients.

Keywords: Education; Snakebite; Snakes; Prevention.
Financial support: Not applicable.

ABSTRACT 22

BIOPROSPECTION OF IMMUNOMODULATING TOXINS FROM THE SCORPION Rophalurus crassicauda

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In Brazil, accidents by venomous animals represent a public health problem and are often neglected. The scorpionism in the country represents the greatest number of these accidents, in which *Tityus serrulatus* is the species responsible for the envenomings. However, it is known that in the Brazilian biome there are uncountable species of scorpions such as *Rhopalurus crassicauda* (Rc), a scorpion species known to inhabit exclusively the state of Roraima and southern Guyana. Despite more than 70 years since the description of the species, envenomings caused by *R. crassicauda* as well as the composition of its venom are still scarce. This study aims to explore structurally and functionally the toxins present in the venom of Rc. The species (n=30) were collected in the natural environment, authorized by the Sistema de Autorização e Informação em Biodiversidade - SISBio (n. 57491-10). The scorpion venom was extracted using the telson electrical stimulation method (18V) and the venoms obtained were stored at -20 °C. For studying the venom composition, Fast Protein Liquid Chromatography (FLPC) was used, and to evaluate the fractionation profile a Tricine-SDS-PAGE electrophoresis was performed. Among the fraction, the fraction 5 (P5) was selected for in vitro immunomodulation assays using neutrophil from the peripheral blood. Our results demonstrated for the first time that both the Rc venom and the P5 were able to induce the formation of NETs (Extracellular Traps of Neutrophils). Although the results are still preliminary, it evidences the need of further studies on Rc venom to understand deeply the role of NETs in Rc envenomings, besides identify novel molecules present in scorpion venom cocktails with potential therapeutical application. In conclusion, this study shown that NETs may be a therapeutic target to scorpion envenomings in Roraima, considering that the scorpion antivenom produced in Brazil is not capable of recognizing Rc venom and its toxins.

Keywords: Scorpionism; Poisoning; *Rhopalurus crassicauda*; Bioprospecting; Toxins.
Financial support: We thank the Programa de Iniciação Científica Institucional (scholarship to Vitória S. Silva – PIBIC 2021-2022).

ABSTRACT 23

CLINICAL-EPIDEMIOLOGICAL PROFILE OF A SERIES OF CASES OF SNAKEBITE ENVENOMINGS AT THE MAIN HOSPITAL OF RORAIMA, BRAZIL

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Snakebites are classified as a Neglected Tropical Disease that mainly affects rural and indigenous communities, resulting in thousands of deaths and permanent sequelae worldwide annually. In Brazil, the state of Roraima is the federative unit with the highest incidence of snakebites (~100 snakebites per 100,000 inhabitants), where bothropic accidents prevail, corresponding to 86.8% of snakebites reported in the country, followed by rattlesnake (8.9%), laquetic (3.5%), and elapidic (0.8%) envenomings. The clinical manifestations of snakebites vary according to the characteristics of the inoculated venom, and can be divided into local and systemic manifestations, and into mild, moderate, and severe. Complications such as secondary infections, compartment syndrome, and necrosis can also occur. Despite the importance of snakebites as a public health problem in Roraima, there is a lack of clinical studies in the state. Thus, this study aimed to analyze the clinical-epidemiological profile of snakebites in the main hospital in the state, Hospital Geral de Roraima Rubens de Sousa Bento. We followed 15 snakebite patients during a period of 5 months, being 9 bothropic, 4 crotalic, and 2 unidentified accidents. Our results showed that most victims were male (80%); 20% of the cases occurred in indigenous patients of the Yanomami ethnic group; and that the age of the victims ranged from 21 to 62 years-old, demonstrating the predominance of cases in people of working age. As expected, most accidents occurred in rural areas and that at the time of the accident, most victims were performing work activity, such as hunting and mining. Of the 15 snakebites, 6 were classified as mild, 5 moderate, and 4 severe requiring hospitalization, being 2 of them in indigenous patients. Three of the severe cases were caused by the *Bothrops* genus. In one of the severe cases, the snake was not identified, but due to the signs and symptoms presented by the victim (e.g. myasthenic and myoglobinuria facies), and considering the local epidemiology, the snake of the genus *Crotalus* is the most likely to be responsible. Regarding the clinic, bothropic accidents presented manifestations like those reported in other regions of the country, such as pain and edema. In relation to *Crotalus* accidents (n=4), a peculiarity was noted - patients reported intense and prolonged pain. This data differs from the literature on snakebites from other regions of the country, which shows that *Crotalus* accidents do not cause or cause low-intensity pain. Such evidence, although observed in a small sample number, suggests that possibly the Roraima rattlesnake-derived venom may have a different profile, explaining the important pain condition. The recovery time for patients varied widely, from a few hours in mild cases to days in severe cases. No patient evolved to death or long-term sequelae.

Keywords: Snakebite envenoming; Clinical-epidemiological profile; Rattlesnake; Roraima.
Financial support: We thank the Programa de Iniciação Científica Institucional (scholarship to Vitória S. de Souza – PIBIC 20221-2022.

ABSTRACT 24

THE HISTORY OF OPHIDISM IN THE BRAZILIAN AMAZONIA OVER 37 YEARS: THE FMT-HVD COLLECTION OF ANIMALS OF MEDICAL INTEREST

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Biological collections are fundamental for the conservation of biodiversity and the promotion of science, in addition to having an important didactic role. A scientific collection of venomous animals has been housed at the Tropical Medicine Foundation Dr. Heitor Vieira Dourado (FMT-HVD) since 1985, in Manaus, Amazonas, Brazil. This collection began with the former Venomous Animal Center, which at the time was organized by Prof. Dr. Paulo F. Bührnheim, to receive and store specimens of snakes brought by injured patients. Currently, the collection is known as the Collection of Animals of Medical Interest (ANIME) and includes specimens of spiders, scorpions, and snakes. Due to the high rate of snakebites in the region, most of the collection is formed by snake specimens, which nowadays accounts for more than 4300 entries in the collection's record books. The ANIME Collection has grown over time, and in addition to the animals that cause accidents, some specimens have been donated or exchanged between FMT-HVD researchers and other institutions. There are also voucher specimens from expeditions and enterprises. In this regard, an extension project that will support the preservation and promotion of the ANIME Collection is now being developed. To achieve this, we began sorting the specimens that make up the collection, taking an inventory of them, and performing routine maintenance on them. A total of 583 specimens, including 4 amphisbaenians and 579 snakes, have been assessed thus far. These animals are distributed in a high taxonomic richness, which comprises 10 families, 43 genera and 74 species. Among these records, Dipsadidae is the family with the highest number of specimens (n=241) as well as the most diversified with 47% (n=35/74) of the recorded species. Viperidae (n=150) and Elapidae (n=41), two families of venomous snakes with medical importance, are presented in the ANIME collection with a richness of 7 and 5 species, respectively. The most abundant species is *Bothrops atrox* (n=131), followed by *Mastigrodryas boddaerti* (n=33) and *Helicops angulatus* (n=28). Most of the specimens in the collection, except for three individuals from the Southeast part of Brazil, are from the North region, specifically from the States of Amazonas (n=538), Roraima (n=16), Pará (n=13) and Rondônia (n=11). Regarding the accident-related specimens, excluding records without information (n=8), there are 113 animals of 34 different species involved in accidents, of which *B. atrox* (n=36) and *H. angulatus* (n=22) are the main related snakes. In sum, the collection compiles biological and historical data on snakebite in the Amazonia and contributes to the increasing body of knowledge on the subject by providing subsidies for the development of theses and dissertations. Additionally, through receiving visitors, supporting talks, and assisting training on the identification of venomous snakes, the collection has played a significant role in education.

Keywords: Amazonia; Biodiversity; Medical Importance; Scientific Collection; Snakes.
Financial support: Amazonas State Research Support Foundation (process no. 011/2021 - PCGP/FAPEAM).

ABSTRACT 25

HEPATOZOON PARASITES (APICOMPLEXA: HEPATOZOIDAE) IN VIPERID SNAKES FROM THE BRAZILIAN NORTH AND NORTHEAST

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Hemogregarines are a common group of intraerythrocytic parasites from the phylum Apicomplexa and those belonging to the genus Hepatozoon are extraordinarily diversified across their vertebrate hosts, especially among snakes. In Brazil, 40 species of Hepatozoon have been found in at least 35 different snake species. However, among these snake species, only a few (5 spp.). are venomous of medical importance and most of these reports were from Southeastern Brazil. In this sense, we performed a survey of Hepatozoon parasites in snakes from the family Viperidae in the North and Northeast regions of Brazil. In this way, samplings were carried out from February to July 2022 in the States of Ceará (municipalities of Baturité, Guaramiranga and Pacoti), Amapá (municipality of Macapá) and Amazonas (municipality of Manaus). In the Ceará and Amapá sampling sites, snakes were captured by active search in peri-urban and remaining forests areas, while in Amazonas the animals used came from the serpentarium of the Museu da Amazônia (MUSA). After mechanical restraint of the animals, blood samples were collected by caudal vein puncture. For microscopic examination, blood smears were prepared, fixed in absolute methanol, and stained with Giemsa solution (10%). Blood smears were examined under a microscope at ×400 and ×1,000 magnification. Parasitemia was estimated by looking for parasite forms in 20 replicates of 100 erythrocytes (parasites/2,000 cells). We captured a total of 17 viperid snakes from the following species and sites: *Bothrops atrox* [Amapá (n = 1); and Amazonas (n = 7)]; *Crotalus durissus* [Amazonas (n = 1) and Ceará (n = 5)]; and *Lachesis muta* (Ceará; n = 3). Hepatozoon parasites were found in 52.9% (n = 9/17) of the snakes and the positive individuals were *B. atrox* (Amapá; n = 1/1), *C. durissus* (Ceará; n = 5/5) and *L. muta* (Ceará; n = 3/3). All animals kept in captivity by MUSA were negative for this hemoparasite. The mean parasitemia for *B. atrox* was 28/2,000 erythrocytes (1.4%), *C. durissus* was 181.8/2,000 erythrocytes (9.0%) and *L. muta* was 214.3/2,000 erythrocytes (10.4%). Since there have not been any studies of this nature for the State of Ceará, despite reports of this parasite in *C. durissus* in other parts of Brazil, this survey marks the first time that Hepatozoon has been found in snakes in the area. Additionally, our study is the first to show Hepatozoon infection in *B. atrox* and *L. muta*, two critically important species for medicine whose hemoparasites are poorly understood. In conclusion, our research indicates that the viperid snakes may harbor a wide variety of Hepatozoon parasites.

Keywords: Hemogregarines; Hemoparasites; Infection; Phylum Apicomplexa; Snakes.
Financial support: PCGP/FAPEAM (011/2021); PROEPE/FIOCRUZ; CAPES (Finance Code 001); Rattlesnake Conservancy (Venomous Reptile Research Grant); The Rufford Foudantion (37317-1); Doppel Store.

ABSTRACT 26

SCORPIONS FROM BRAZILIAN AMAZON: BIOLOGY AND CLINICAL-EPIDEMIOLOGICAL ASPECTS OF ACCIDENTS

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The Amazon region has the greatest diversity of scorpions in Brazil, comprising about 70 species, distributed among three families: Buthidae, Chactidae and Hormuridae. Among these, Buthidae is considered of great importance in health, as it includes members of the *Tityus* genus, such as *Tityus obscurus, Tityus metuendus* and *Tityus silvestris*, which can cause moderate envenomation, accompanied by neurological manifestations (for example, myoclonus, dysarthria and sensation of electric shock) that are not seen in clinical pictures of scorpionism in other parts of the country. The causes for occurrence of these symptoms are still poorly understood. Additionally, there is huge gap in knowledge regarding the biological aspects of other genera of Buthidae (*Ananteris* and *Rophalurus*, mainly) and other families of scorpions that live in the Amazon Forest. This lecture will initially demonstrate recent advances in evolutionary, genetic, ecological and biogeographic analyzes of Amazonian scorpions, with emphasis on cases of phenotypic plasticity and formation of cryptic species; then, the current panorama of the epidemiology and clinic of scorpion envenomations in Northern Brazil will be demonstrated. Finally, lines of investigation still little explored in relation to the other Scorpiones families of the Amazon biome will be indicated.

Keyword: Scorpiones; Amazon Forest; Biology; Scorpionism.
Financial support: Not applicable.

ABSTRACT 27

CHROMOSOMAL DIVERSITY AMONG POPULATIONS OF *Brotheas amazonicus* (Scorpiones, Chactidae) SUGGESTS EXISTENCE OF CRYPTIC SPECIES

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The scorpion *Brotheas amazonicus* is an endemic species of the Amazon rainforest, with wide distribution in the brazilian states of Amazonas, Roraima and Rondônia. In this study, we analyzed classical and molecular cytogenetics of two populations of this species from the municipalities of Manaus and Parintins, Amazonas, Brazil. Our results showed 2n = 50 and a karyotypic formula consisting of 24 metacentric, 4 submetacentric and 22 acrocentric in individuals from Manaus (cytotype A), and 2n = 52 in specimens from Parintins (cytotype B), with a karyotypic formula 20 metacentric, 10 submetacentric and 22 acrocentric. In cytotype A, the 45S rDNA is in the distal region of pair 16, while in most specimens of cytotype B this rDNA was recorded in pair 4; additionally, some specimens of cytotype B showed different 45S rDNA cluster size heteromorphisms, with NOR-bearing chromosomes involved in quadrivalent and hexavalent associations during meiosis I. Telomeric sequences were visualized only at the ends of the chromosomes. We suggest that the amplification and degeneration of 45S rDNA clusters explain the different configurations of this rDNA in the genome of this species. Together, our results indicate possible formation of cryptic species in *B. amazonicus*.

Keywords: Karyotype; Scorpions; Brazilian Amazon; 45S rDNA.
Financial support: This research was funded by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) to C.Y.N (047/2012) and the Banco Nacional de Desenvolvimento Econômico e Social to J.C.P (2,318,697,0001).

ABSTRACT 28

RORAIMA SNAKEOPÍDIA: A PRACTICAL GUIDE ABOUT VENOMOUS SNAKES OF RORAIMA

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Accidents caused by venomous snakes are an important public health problem worldwide, bringing relevant social and economic effects, considering that in the Amazon region, most of the affected population involves a very representative indigenous population that lives in the forest. In Brazil, jararaca (*Bothrops spp*.) bites account for about 90% of all human accidents involving snakes. Roraima also suffers from this problem in a serious way, as it is the Brazilian state with the highest rate of snakebites in Brazil, with almost 100 snake envenomings per 100,000 inhabitants. When it comes to indigenous territories, the most prevalent problems are in the Yanomami indigenous land, due to the favorable habitat (tropical forest area) and the greater exposure of indigenous people to risk. This study aimed to develop a practical guide on venomous snakes found in Roraima, divided into four types: bothropic accident, with snakes of the genera *Bothrops* and *Bothrocophias*; crotalid accidents, with snakes of the genus *Crotalus*; laquetic accidents, with snakes of the genus *Lachesis*; elapidic accidents, with snakes of the genera *Micrurus* and *Leptomicrurus*. Snakes of the *Bothrops* and *Crotalus* genera, popularly known as *jararaca* and *cascavel*, respectively, lead in the number of recorded accidents. The developed guide will serve to update health professionals in relation to venomous snakes existing in Roraima, given the risks and contribution to decision-making in the treatment of snakebites that occur in the region. In this practical and illustrated guide, strategies to prevent snakebites are presented, containing information such as: the main individual protection measures, measures to protect the residential environment and/or leisure areas, care for injured individuals, and other strategic actions. In addition, the importance of identifying the animal causing the accident is highlighted, a procedure that allows the immediate dismissal of most patients bitten by non-venomous snakes, besides helping in the most accurate indication of the specific antivenom. Finally, the educational instrument can contribute to the knowledge of the epidemiology of snakebite cases in the state, favoring the development of preventive strategies.

Keywords: Ophidian Accidents; Venomous Snakes Guide; Roraima.
Financial support: Not applicable.

ABSTRACT 29

CASE REPORT: KIDNEY FAILURE DUE TO MASSIVE ENVENOMATION OF AN ELDERLY MAN CAUSED BY BEE STINGS

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Africanized bees are aggressive and the attack of a swarm can result in anaphylaxis and death from massive envenomation. The aim of this abstract is to describe clinical symptoms, management and sequelae of a severe case of bee stings in an elderly man with development of kidney failure treated at Fundação de Medicina Tropical Doutor Heitor Vieira Dourado (FMT/HVD), Manaus, AM, Brazil. Case: 64 years old male patient, retired, residing in a rural community of Silves, municipality in the state of Amazonas (approximately 267 km from Manaus). Has a history of long-term arterial hypertension with irregular treatment, no allergies. The bee attack occurred during a fishing activity and the immediate action was to remove the stingers by hand, without aid of tools. The patient remained at home until signs and symptoms worsened and was admitted to the Silves hospital 20 hours after the attack, with skin inflammation, mainly on the face, chest and upper limbs, severe myalgia, dysphagia and anuria. At the hospital, dexamethasone 10 mg, promethazine 25 mg, hydrocortisone 500 mg and furosemide 40 mg were administered. After diuretic intake, his urinary output was of 150 mL with hematuria. Two days after the attack he was transferred to FMT/HVD emergency department for specialized medical evaluation. Physical examination showed numerous sting marks (over 300), mainly on the head, upper limbs and chest, with edema, severe pain and itching in affected areas. He also had dysarthria, dyspnea, intense myalgia, sparse wheezing and rhonchi in the right lung, tachycardia, tachypnea, hypertension, distended, rigid, tender abdomen and oliguria. Epinephrine 0.3 mg, hydrocortisone 500 mg, aminophylline 24 mg and tramadol 100 mg were administered. Laboratory tests revealed hyponatremia, hyperkalemia, increased aminotransferases, moderate thrombocytopenia, leukocytosis, and renal failure with altered levels of creatinine (6.8 mg/dL) and urea (159 mg/dL). On second day of hospitalization, Creatine kinase (CK) (7588 U/L) and lactate dehydrogenase were signficantly altered, revealing rhabdomyolysis; C-reactive protein (48 mg/L) and Erythrocyte Sedimentation Rate (70 mm) were increased. He was admitted to Intensive Care Unit (ICU) on third day of hospitalization, after worsening in rhabdomyolysis (CK 14830) and thrombocytopenia (102,000/mm³), initiating renal replacement therapy, remaining for 6 days. He continued receiving Hydrocortisone 1000 mg/day (5 days) and Dexchlorpheniramine 8 mg/day (10 days). During hospitalization, he underwent hemodialysis on alternate days (15 sessions total) with gradual improvement in levels of aminotransferases, muscle enzymes and renal function markers. Patient was discharged 42 days after admission, with creatinine levels of 2.9 mg/dL, preserved diuresis (2.6 ml/kg/hour) and chronic renal failure diagnosis, awaiting erythropoietin to correct anemia. He was referred for follow-up and hemodialysis at an external specialized clinic.

Keywords: Africanized Bees; Envenomation; Kidney Failure.
Financial support: Not applicable.

ABSTRACT 30

THE MYSTERIOUS TOXIC PROFILE THE PHILODRYADINI TRIBE: 'OMIC' TECHNIQUES REVEAL VARIABILITY IN THE VENOMS OF THESE SNAKES

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Philodryadini snakes belong to one of the most diverse families in the world and are the main opisthoglyphous snakes involved in human envenomation. These snakes play a fundamental ecological role, with most of them having generalist feeding habits. However, some species like *Philodryas agassizii that* feed exclusively on arthropods, have a more specialized diet. Despite all the diversity found in this group, there are still few studies on the composition and variability of its venoms. Thus, this work aims to carry out the biochemical and functional characterization of the venom of five species of the genus *Philodryas* (*P. patagoniensis*, *P. olfersii*, *P. nattereri*, *P. mattogrossensis* e *P. agassizii*), two species of the genus *Chlorosoma (C. viridissimum,* previously known as *Philodryas viridissima* and *C. laticeps,* formerly known as *Philodryas laticeps)* and one species of the genus *Xenoxybelis* (*X. argenteus*), through transcriptomic analyses combined with proteomics and functional analyses of venoms through enzymatic assays. The most abundant components identified in the venoms were Snake Venom Metalloproteinases (SVMPs), Cysteine-rich Secretory Proteins (CRISPs) and C-type Lectins (CTLs), Snake Endogenous Matrix Metalloproteinases type 9 (seMMP-9) and Snake Venom Serinoproteinases (SVSPs). However, these protein families showed quantitative variability and a different expression profile in each analyzed genus. SVMPs were the most abundant components in *Philodryas*, while seMMP-9 and CRISPs were the most expressed in *Chlorosoma* and *Xenoxybelis respectively*. Furthermore, we observed intrageneric variability, where *P. olfersii* presented a greater amount of SVSPs than the other species of the genus. Venom composition variability reflected differences in the functional assays. As expected, only *P. olfersii* showed proteolytic activity for the substrate of SVSPs, while the other *Philodryas* were the most active on the substrate of SVMPs. *Chlorosoma* species showed higher activity in gelatin degradation with activity only partially inhibited by EDTA. The gel bands with the greatest degradation were identified by mass spectrometry and indicated the presence of seMMP-9, confirming the hypothesis that the proteolytic character of these proteins is maintained. Thus, our results indicate that within the Philodryadini tribe the *Philodryas*, *Chlorosoma* and *Xenoxybelis* genera are not distinguished only by morphological characteristics, but also by the biochemical composition of their venoms. In addition, we describe for the first time the complete transcriptome of seven species of the Philodryadini tribe and the proteome of five individuals of different species of the tribe.

Keywords: Variability; Snake venoms; Dipsadidae; Snake Venom; Matrix Metalloprotease type-9.
Financial support: FAPESP n. 2016/50127-5.

ABSTRACT 31

EPIDEMIOLOGY OF OPHIDIAN ACCIDENTS BY SNAKES IN THE YANOMAMI INDIGENOUS LANDS, IN RORAIMA

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Ophidian acidentes are serious health problems. The World Health Organization treats ophidism as a Neglected Tropical Disease, as there is more than 1,5 million accidents and 35 thousand deaths per year. In Brazil, we have 250 snake species (70 of them are venomous), causing 19-22 thousand accidents per year. In the Brazilian Amazon, the ophidian accidents are poorly studied, specially in remote areas, like the Yanomami Indigenous Lands (YIL), which rises the chances of sequels and/or deaths. Because of that, we realized a survey of the ophidian accidents that happened in the YIL, using data from the Distrito Sanitário Especial de Saúde Indígena Yanomami (DSEI-Y) - in English would be something like Yanomami Indigenous Health Special District (IHSD-Y) - qualifying epidemiological information. The Yanomami habit a territory in the frontier between Venezuela and Brazil (190.000 km²). In Brazil, the YIL were delimited in 1992, with 96.560 km². The relation between Yanomami and the snakes is that the latter are malefic, but, at the same time, help to protect the YIL from invaders. Studying the epidemiology of the ophidian accidents in the YIL is extremely relevant for a better understanding of the ophidism in the Brazilian Amazon. For that, we will avaliate: placement of the accidents (Community, Region), date, death, sex and age of the snake victims, notified in the YIL by the DSEI-Y, in Roraima, from 2017 to 2022. The YIL, in Roraima, is part of 5 municipalities, 23 Indigenous Health Centers which comport 215 villages. It was registered 766 cases of snakebites in the YIL (2017-22): Alto Alegre (67,1%), Amajarí (19,1%), Caracarí (5,2%), Iracema (5,9%) and Mucajaí (2,7%). The Variance Analysis (ANOVA, p=0,5166) revealed that there is no significative variance between the years, with an average of 140±20,08. The Yanomami men (61,3%) and women (38,7%) presented statistic differences (Teste T Pareado, p =0,0348). With the average rate for Yanomami women above the national (8%), as they help in forest activities. The age group that was most affected is from 20 to 39 years old (35,2% of the cases), followed by 15 to 19 (17,6%), 10 to 14 years (16,9%), 40 to 59 (16,0%), then 5 to 9 years (10,4%), 60 to 79 (2,1%), until 4 years old (1,3%) and above 80 years (0,5%). The chi-square revealed that there is a significative difference between the months in which happen the most ophidian accidents in the YIL (p=0,001), being it from May to June the majority and November to December the minority. Alto Alegre is the municipality with the highest number of accidents, especially in the Serra dos Surucucus' Region (extreme West). The lethality in the YIL, was 2,86% and the rates for 100 thousand are 906 indigenous and the lethality is of 24 indigenous. The ophidian accidents in the YIL are frequent, especially in women, causing bigger lethality in the Yanomami people, probably due to the way the Yanomami live their lives and the difficulty in health care on that region.

Keywords: Snakes; Venom; Lethality; Ophidians; Health.
Financial support: Not applicable.

ABSTRACT 32

Crotalus durissus ruruima SNAKE: MAPPING THE HABITAT, BEHAVIOR, MORPHOLOGIC FEATURES, AND VENOM PROFILE

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The rattlesnake *Crotalus durissus* is a snake that has an extensive distribution in South America, extending from Colombia to Argentina, being divided into 11 subspecies (*C. d. durissus*, *C. d. cascavella, C. d. collilineatus, C. d. cumanensis, C d. marajoensis, C. d. maricelae, C. d. ruruima, C. d. terrificus, C. d. trigonicus, C. d. unicolor, and C. d. vegrandis*). The species *C. durissus* is distributed throughout Brazilian biomes, being more adapted and abundant in arid and semi-arid environments. Rattlesnakes has a robust and heavy body, reaching 1 to 1,8 m in length, are not agile, has light brown color with a row in the dorsal part, and show terrestrial activities. In Roraima, a state placed on north of the Brazilian Amazon, the only rattlesnake subspecies encountered is *Crotalus durissus ruruima* (*Cdr*), which inhabits regions with different phytosonomy, from open regions (savannas) to tropical forest. Considered a public health problem, *Cdr*, is the second largest cause of snakebite in the state. *Cdr* venom is very complex showing differences among other subspecies venoms, besides presenting two different color patterns (white and yellow venoms). The envenomings are characterized by neurotoxic and myotoxic activities. This study aimed to evaluate the habitat, behavior, morphologic features, and venom profile of *Cdr* for 18 months (rainy and dry seasons) in Roraima. Our results demonstrated that *Cdr* inhabit different environments, being more distributed in open areas (savannas or *lavrados*), where they avoid high temperatures during the day inside burrows and tunnels. In contrast, the rattlesnakes inhabiting forest areas are usually exposed and do not hide in holes. Regarding morphology, *Cdr* males had greater measurements, tail length, total length, vent length-vent, and head length. We also observed ritual combat between males, a behavior associated with reproductive sexual selection, where larger males have advantages. Regarding the venoms, both colors were milked: white and yellow. The color variation of the venoms indicate that they have different compounds that could result in different envenomings severity and the local envenomings have been evidencing that. Our next step is to perform proteomic analyzes with *Cdr* with and yellow venoms to understand the venom profile and induce-effects during envenomings trigged by this subspecies.

Keywords: Rattlesnake; Snakebite; Roraima; Envenomings.
Financial support: Not applicable.

ABSTRACT 33

EVALUATION OF LONG-TERM SEQUELAE OF BOTHROPS SNAKE ACCIDENTS IN CHILDREN IN A REFERENCE HOSPITAL IN AMAZONAS

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Snakebites are characterized by their morbidity and mortality worldwide. Despite the evident seriousness of *Bothrops* accidents and the frequent occurrence in children, little is evaluated about the clinical aspects of these envenomations and their differences in comparison to adults. This research surveyed epidemiological and clinical data of *Bothrops* snake accidents in children in the state of Amazonas in Brazil and correlated it with the time elapsed between the accident and the beginning of medical care. The sample consisted of 15 children admitted to the Emergency Department and Dermatology between the years 2010 and 2015. Data collection was divided into two phases. The first phase was carried out through medical records of the I-doctor software, where through a questionnaire developed by the researcher, the following socio-demographic and clinical variables were collected: age, gender, location of the accident (rural or urban area), telephone number, affected anatomical region, immediate sequelae of the accident, number of ampoules used, the time elapsed between the accident and the treatment. The second phase consisted in interviewing the participants using a cell phone call to collect, through verbal reports, possible late sequelae of the accident. The immediate sequelae found were erythema, bleeding, edema, and pain. The late sequelae found were decreased muscle strength in the affected limb, impaired ambulation, or developed altered gait in the affected limb. Patients who had medical care before 6 hours had a 14.27% rate of long-term sequelae, while patients who had medical care after 6 hours had an 85.71% rate of long-term sequelae. Quick access to the beginning of medical care soon after the accident is extremely important, thus guaranteeing, according to the data found, a rate of 85.71% of the chance of not developing long-term sequelae in case of suffering an ophitic accident caused by *Bothrops* snakes.

Keywords: Snake Bite; *Bothrops* Venom; Children's Health.
Financial support: Not applicable.

ABSTRACT 34

ECOLOGY OF SNAKEBITES: THE RELATIONSHIP BETWEEN CANOPY OPENING AND THE OCCURRENCE OF AMAZONIAN LANCEHEAD (*Bothrops atrox*) IN CENTRAL AMAZONIA

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Most snake species found in the Brazilian Amazon are geographically spread throughout the biome. The distribution of species, however, is filtered by environmental conditions, which determine where they can be found. Thus, we investigated the distribution of the Amazonian Lancehead (*Bothrops atrox*) species and its relationship with canopy opening in an area of upland forest located at the Experimental Farm of the Universidade Federal do Amazonas in Manaus, Brazil. Data collection was carried out in 24 standardized plots (250 meters each) of the RAPELD/PPBio (Rapid Assessment - Long-Term Ecological Program). Each plot was sampled four times between July 2015 and April 2017 using the active search method. We recorded 83 individuals of 29 species belonging to six families. Richness in the study area corresponded to 78% of snake species and 100% of families previously recorded for Manaus. It was observed that the most abundant species was Bothrops atrox. Quadratic polynomial regression models revealed that intermediate percentages of canopy opening positively influence snake richness and abundance. Linear regression models showed a positive relationship between canopy opening and the abundance of Bothrops atrox individuals. It is possible that the behavior is related to a tradeoff between the thermoregulation performed by these animals and the prey/predator relationship. In this study, we observed a greater number of records of Bothrops atrox in relation to the increase in canopy opening (deforested areas), so we can conclude that deforestation in the Amazon can leverage the occurrence of bothrops accidents in the region.

Keywords: Ecology; Manaus; RAPELD; Squamata; Snakes.
Financial support: Federal University of Amazonas (UFAM)/ National Council for Scientific and Technological Development (CNPq), process no. PIB-B/040/2015.

ABSTRACT 35

Bothrops atrox VENOM-INDUCED INFLAMMATORY EFFECT ON MACROPHAGES VIA NFKB ACTIVATION

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Bothrops atrox snakes are responsible for most reports of snakebites in northern Brazil, accounting for 80 – 90% of cases. The venom of *B. atrox* is characterized by proteolytic, coagulant, and hemorrhagic action, with emphasis on local tissue damage. The main serious local effects are caused due to the intense inflammatory process generated by the venom. However, some inflammatory signaling pathways that participate in this response are still poorly studied. The present work aimed to evaluate the participation of inflammatory signaling pathways in the cytotoxicity process of cell line macrophages. *Bothrops atrox* venom (BaV) was collected from male and female specimens from the Museu da Amazônia (MUSA) showing protein concentrations from 365 to 398 mg/mL. We used tumor cell lineage macrophages as a model to evaluate the process of cell death mediated by the inflammatory process called pyroptosis. Macrophages of J774.2 and RAW 264.7 strains were cultured and a cytotoxicity curve with BaV was performed, showing an IC50 value of 18.55 and 47.39 µg/mL, respectively. The objective of evaluating the participation of inflammatory pathways in the cell death process (pyroptosis), cell lineages were treated with antagonists/inhibitors of the TLR-4, NALP3 or P2X receptors, inhibitor of the NF-κB pathway or Caspase-1. Then, the cells were treated with BaV and cell viability was assessed. When treating cells with antagonist drugs/inhibitors of inflammatory pathways, the NFκB inhibitor was solely responsible for reducing the cytotoxicity of BaV in J774 cells, and the other inhibitors did not influence the cytotoxicity of BaV in the Raw lineage. Therefore, we conclude that the cell death process induced by *Bothrops atrox* venom involves the activation of an inflammatory signaling involving NFκB, in addition to the possible action on the non-canonical inflammasome pathway involving the ASC protein in this process (since the Raw strain is deficient in this protein), indicating that BaV is responsible for a process of cell death by pyroptosis. The confirmation of this process of cell death by BaV is of great relevance, being responsible for the massive release of many inflammatory mediators, being able to amplify the inflammatory response in envenomation. These presented data open perspectives for new pharmacological therapies aimed at NFκB inhibitor drugs to control this inflammatory response in envenomation.

Keywords: Pitviper; Inflammation; Pyroptose; Signaling pathways.
Financial support: Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq.

ABSTRACT 36

THE SEVERITY OF ACUTE KIDNEY INJURY CORRELATES WITH PLASMA VENOM LEVELS IN BOTHROPS ATROX ENVENOMINGS

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The Brazilian Amazon has high rates of snakebite envenomings (SBEs), with ~90% caused by *Bothrops atrox*. One important systemic complication of Bothrops envenomations is acute kidney injury (AKI), which has a great impact on the morbidity and mortality of the victims. Our aim was to identify predictors of AKI in *B. atrox* envenomations, including plasma venom levels. Ethics Statement: CAAE 31535420.1.0000.0005. METHODS Prospective study involving SBEs admitted to Fundação de Medicina Tropical Dr. Heitor Vieira Dourado. The *B. atrox* envenoming confirmation and the venom level measurement were performed by a quantitative enzyme-linked immunosorbent assay (ELISA) of the patient's serum samples. Venom concentration was measured in the plasma obtained on the patient's admission, before antivenom (AV) treatment. For antigen capture, microtiter plates were sensitized with Bothrops-Lachesis AV, incubated with *B. atrox* venom and patient samples, then reincubated with anti-*B.atrox* specific rabbit IgG. The optical density reading was performed using a microplate reader (SpectraMax M2e). The mean absorbance for 30 negative-control samples plus two standard deviations was used as the cut-off to discriminate positive and negative results. The AKI diagnosis was based on the Acute Kidney Injury Network. All participants had at least two serum creatinine (sCr) measurements, the first before AV treatment, and the second one 48h later. Patients who had a primary change in sCr of ≥0.3 mg/dL or ≥150 to 199% in relation to their baseline value were considered to have AKI, and the severity stages were classified as Stage I: increase in sCr of >0.3 mg/dL or ≥150 to 199% in relation to baseline sCr; II: 200 to 299%; and III: ≥4.0 mg/dL or ≥300%. Statistical analysis: STATA® 17, linear regression between sCr levels and venom concentrations, correlations were considered statistically significant if $p<0.05$. A total of 38.6% of patients presented AKI as a clinical outcome. Regarding the severity grading, 61.2% developed AKI stage I; 34.7% II; and 4.1% III. There was a significant positive correlation between circulating venom levels and the highest sCr values during the hospital stay ($p=0.03$) and the difference between the maximum sCr and the sCr levels on admission ($p=0.02$). A positive correlation between serum venom concentrations and sCr levels suggests a direct or indirect dose-dependent participation of the venom toxins in the pathogenesis of AKI. In our cohort, 38.6% of patients developed AKI, which demonstrates this to be a frequent complication in *B. atrox* envenomations. Higher levels of venom in the patient's serum levels correlated with high sCr levels, thus suggesting that the direct action, or a dose-dependent indirect action, of venom toxins, is responsible for the nephrotoxicity involved in the development of AKI.

Keywords: Amazon; *Bothrops*; Snakebites; Envenoming; Acute kidney injury.
Financial support: CAPES and FAPEAM (010/2021) CT&I.

ABSTRACT 37

THE CROTOXIN ANTI-INFLAMMATORY EFFECT ON MACROPHAGES IN VITRO: THE FORMYL PEPTIDE RECEPTORS ROLE

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Crotoxin (CTX), a toxin present in rattlesnake *Crotalus durissus terrificus* venom, has anti-inflammatory and immunosuppressive effects related to the participation of formyl peptide receptors. Objective: to evaluate the anti-inflammatory action of CTX in an *in vitro* endotoxemia model, by stimulating macrophages with lipopolysaccharide (LPS) in cell culture. Macrophages were obtained from mice (CEUA 15.1.807.60.1) and CTX from *C. d. terrificus*. The selection of non-cytotoxic doses was performed through cell viability assays (MTT) and annexin/PI assay. Regarding the anti-inflammatory evaluation, macrophages were exposed to CTX at 1, 0.2 and 0.04µg/mL concentrations. In the control group, the cells were just growth in the medium, and in the positive control group exposed to LPS (1µg/mL). The CTX + LPS groups were exposed to CTX 2h before LPS. The culture was incubated at 37°C, 5% CO_2 5%, for 24h. In the formyl peptide receptors evaluation, we exposed the cells to the antagonist drug Boc-2 (100µM) for 30min., followed by CTX and LPS. The pro-inflammatory cytokines measurement, IL-6, TNF-α, and NO_2^-, were performed on the cell growth supernatant. Statistical analysis: GraphPad Prism software version 5.01, ANOVA, Turkey's post-test, $p < 0.05$ were considered statistically significant. In macrophage viability evaluation both MTT and annexin/PI assay showed that CTX concentrations did not induce any change. Regarding the ability of CTX to modulate the production of cytokines, the isolated toxin does not have an inflammatory character, however, CTX (0.2µg/mL) showed decreased production of IL-6, TNF-α, and NO_2^- induced by LPS. The 0.04µg/mL concentration of CTX reduced TNF-α and NO_2-, but not IL-6. There was no change in the 1µg/mL. The most effective concentration (0.2µg/mL) was evaluated in the presence of Boc-2, where we observed that the macrophages pre-exposure to the drug ceased the anti-inflammatory CTX activity against LPS, as well as the mediators IL-6, TNF-α, and NO_2^- concentrations restoration. The study shows the CTX and its anti-inflammatory therapeutic action aspect in an *in vitro* endotoxemia-induced LPS model. This action is associated with resident macrophage modulation, inducing them to respond to LPS and reducing the inflammatory response. The CTX's ability to act on formyl peptide receptors, activated by lipoxin A4, indicates that a toxin can modulate lipid metabolism and induce the eicosanoids expression as a lipoxygenase result. Our results credit the crotoxin as a possible immunotherapeutic agent to be used in inflammatory-associated pathologies treatment.

Keywords: Crotoxin; Anti-inflammatory; Macrophages; Venomous animals.
Financial support: FAPEAM (010/2021) CT&I.

ABSTRACT 38

EDUCATIONAL TECHNOLOGY PRODUCT ON THE PREVENTION OF POISONOUS ANIMALS POISONING FOR PEOPLE LIVING IN REMOTE AREAS

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Studies on the prevention of poisoning by venomous animals are scarce in Brazil. This work was carried out, given the relevance, on poisoning with venomous animals, called a global public health problem. People who live in remote areas, mainly in the interior of the Amazon are more vulnerable to these poisonings, which can cause sequelae such as loss of a limb or even death. Objective: to produce an educational technology based on scientific evidence on the prevention of poisonings by venomous animals for people living in remote areas. Descriptive methodological research was carried out, carried out in three phases: 1st. Integrative Review of Literature in database: Scientific Electronic Library Online, Latin American Literature in Health Sciences, Portal of Periodicals of the Coordination for the Improvement of Higher Education Personnel and Google academic and 2nd. stage - generating themes on the theme and the 3rd. stage - production of educational technology (folder). After the Survey of the generating themes, a folder was produced, with simple language, figures and with the main prevention guidelines on poisoning by venomous animals, such as the use of personal protective equipment, carefully observing the places where walking in the forest were some of the prevention guidelines and also, guidance when the accident occurs, how not to make a tourniquet and not to kill the venomous animal. The objective of the study was achieved, because through the collection of scientific evidence, it was possible to produce the folder on prevention and some care through poisoning with venomous animals, and it is expected that after the validation process, it can reach the population -target. And even though this study may encourage the expansion of prevention programs, new studies and educational technologies, with educational measures in health care levels, aiming at the prevention of new poisonings by venomous animals in Brazil.

Keywords: Venomous animals; Educational technology; Prevention; Remote areas.
Financial support: PAIC/ SISPROJ/ FAPEAM – Nº 31832.

ABSTRACT 39

THE ROLE OF THE MEDICAL PROFESSIONAL IN THE MANAGEMENT OF SNAKEBITE: PERCEPTIONS FROM ACADEMIC TRAINING TO PROFESSIONAL PERFORMANCE

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Accidents by venomous animals are a serious public health problem in the world. In Brazil, they occupy the second place among the largest groups of accidents. The northern region stands out, notifying a third of accidents per year, with the rural population being the most affected due to their difficulty in accessing health care. Professionals who work in these areas must be grounded and updated by their academic training to better manage this condition. To understand the academic training and performance of doctors in the management of snakebite, to report the experiences of academics and medical professionals who accompanied a victim of snakebite. Exploratory research with a qualitative approach, developed in a reference hospital in Manaus - AM in 2021. Professionals were trained to use the Guide for the treatment of snakebites for five days, adopting the focus group strategy for collection of data. The participants were medical students and medical professionals who work in health services in the interior of Amazonas. Data transcription and corpus processing were performed using the MAXQDA 20 software, exploring the material by coding. The study was approved by the Research Ethics Committee - CAAE No. 35855820.2.0000.5016. From the codification some themes emerged, such as: 1) Academic Formation: where the lack of depth on the theme snakebite was reported both in undergraduate and in continuing education for professionals; 2) Medical performance: the importance of adequate medical conduct in the management of accidents in the interior of the state to reduce the possibility of aggravation of the accident, the lack of guides and protocols in the health services, the absence of the medical professional and the rotation of the same can harm the management of these accidents; 3) Experiences in the management of the snakebite: mentioned traditional practices carried out, including indigenous practices, the difficulty in accessing health services in the municipalities of the interior due to the great distances within the states of Amazonas and Roraima; 4) Perceptions about snakebites and future perspectives: knowledge and skills acquired in training and perspectives of greater safety and empowerment, in addition to being able to disseminate knowledge in the health services where they are inserted. Gaps in the academic training of these professionals and the absence of updates on the subject were identified, which directly reflects on the management of snakebites. In this way, the snakebite guide can be a theoretical and legal basis and be inserted in this reality. We suggest greater investment in continuing education for these professionals, in addition to improving infrastructure and adequate human resources for a better prognosis for the victim of snakebite.

Keywords: Snakebite accident; Doctors; Management; Medical training; Permanent education.
Financial support: Not applicable.

ABSTRACT 40

NURSES' PERCEPTIONS ABOUT THE MANAGEMENT OF SNAKE POISONING: LIMITS AND POSSIBILITIES

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Snakebites can be caused by harmless or venomous snakes and, due to their severity and frequency, they are considered events of medical importance. In health units in remote areas, nurses work in the first care of patients who are victims of these poisonings. To know the perception of nurses about the management of snakebite, its limits and possibilities, with a view to professional empowerment in the context of primary health care. Exploratory and descriptive research, with a qualitative approach, developed at the FMT-HVD of Manaus/AM, in the year 2021. The participants were nurses who worked in Basic Health Units in the municipalities Careiro da Várzea, Ipixuna and Boa Vista do Ramos in the state of Amazonas. For data collection, the Focus Group strategy was adopted. The professionals were randomly distributed, in order to avoid agglomeration, in view of the current pandemic moment, divided into three groups: GF1, GF2 and GF3. For corpus processing and initial categorization, the MAXQDA software was used. We opted for thematic content analysis. The study was approved by the Research Ethics Committee of the State University of Amazonas, according to CAAE: 35855820.2.0000.5016. As for the participants (N=20), 80% were women and 20% were men, aged between 28 and 64 years. As for the processing of the corpus, of the coding, four themes emerged: Theme 1 – Limitations in the first consultation. Theme 2 – Need for infrastructure and personnel. Theme 3 – Need for permanent education. Theme 4 – The perception of training on the management of snakebite poisoning. There was a lack of antivenom in the units where nurses work, as well as the absence of a medical professional at the scene of the accident to perform the first care or out of hours in the units. In the nurses' perception, antivenom should be distributed to rural and indigenous health units, where most poisonings have their first care so that cases are treated and resolved or stabilized, but antivenom treatment is usually available only at the municipal headquarters, where there is the presence of a medical professional. The nurses' perceptions showed limits in relation to management, such as the lack of antivenom, poor infrastructure in the units and lack of medical professionals. The decentralization process emerges as a possibility, since it is nurses who are most present in primary health care, in addition to the significant incidence of snakebite in the Amazon region.

Keywords: Snakebite envenomation; Perception; Nursing care; Antivenom.
Financial support: Not applicable.

AABSTRACT 41

EVALUATION OF THE PROFILE OF SNAKEBITE ENVENOMINGS DATABASES IN BRAZIL FROM 2007 TO 2020

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In the world, snakebite envenomings (SBEs) occur frequently and severely. Underdeveloped and developing countries are significantly affected. In Brazil, the epidemiological surveillance of SBEs provides an overview of the frequency of cases, importance to public health and quality of Information reported to the Ministry of Health. Therefore, this study aims to evaluate the profile of the database of the notification system of Notifiable Diseases (SINAN) from 2007 to 2020. The database was obtained through the Department of informatics of the Brazilian health system. The available data were processed in the Rstudio software (version 4.2) to evaluate the criteria completeness, reliability, inconsistency, and validity. Completeness was defined as the proportion of records with values other than empty, null, or ignored. Reliability is the agreement between different measurements in similar conditions and was performed by comparing information on SBEs from SINAN and the mortality Information System (SIM), also provided by the Ministry of Health. Inconsistency is the degree of inconsistency between correlated variables and its determination was performed following the guidelines for filling out the SINAN notification forms. The completeness revealed that, of the 77 variables analyzed, 5 were below 80%, education (62.02%), health establishment code (58.42%), location of occurrence of SBEs (57.27%), productive activity of the victim (52.30%) and date of death (74.18%). Inconsistencies were detected in local or systemic manifestation/complication variables, with higher values in the North (0.4%) and Northeast (0.4%) regions. The reliability assessment verified a higher concentration of deaths registered in SINAN (1615) than in SIM (1389). Through the ratio of records between SINAN and SIM, deaths were distributed in: Midwest 249/198 (125%), Northeast 549/465 (118%), North 555/478 (116%), Southeast 85/79 (107%) and South 177/169 (104%). Inconsistencies were associated with a higher number of death reports in SINAN (1615) when compared to SIM (1389). Proportions of records obtained from SINAN by SIM were: Center-west 249/198 (125%), Northeast 549/465 (118%), North 555/478 (116%), Southeast 85/79 (107%) e Sul 177/169 (104%). For the validity of the information, SBEs were identified as ignored 46,878/400,848 (11.69%). Such records are lower for the botropic genus 287353/400848 (71.69%), however, higher than the others (crotalic 31290/400,848 (7.81%), non-venomous 21359/400,848 (5.33%), lachetic 10677/400,848 (2.66%) and elapidic 3291/400,848 (0.82%). Records of ignored SBEs were more evident in the Northeast 19,080/46,878 (41%). Epidemiological studies allow a differentiated view on databases in health surveillance. The quality of information is crucial for the monitoring of SBEs. Prevention strategies, antivenom decentralization, and proper victim management cannot be neglected.

Keywords: Completeness; Reliability; Inconsistency; Snakebite; Validity.
Financial support: Not applicable.

ABSTRACT 42

EPIDEMIOLOGICAL OVERVIEW OF ACCIDENTS BY VENOMOUS ANIMALS IN THE EXTREME NORTH OF BRAZIL

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Accidents by venomous animals represent a serious public health problem in tropical countries. The National System of Toxic-Pharmacological Information (SINITOX) shows that venomous animals are the second major agent of human intoxication. In Brazil, the most important venomous animals in relation to the incidence and severity of accidents are snakes (genera *Bothrops*, *Crotalus*, *Lachesis,* and *Micrurus*), scorpions (*Tityus* genus), spiders (genera *Phoneutria*, *Loxosceles*, and *Latrodectus*) and in smaller numbers but with increasing occurrence over the years, bees. This study analyzed the epidemiological profile of accidents by venomous animals in the state of Roraima. A total of 5,886 cases of accidents by venomous animals were recorded between January 2017 and July 2022. The years of 2019 and 2018 stand out with 1,313 (22.30%) and 1,139 (19.35%) accidents, respectively. The other analyzed years presented a median of 951 accidents per year. The municipalities with the highest occurrences of accidents were Boa Vista 1757 (30%), Alto Alegre 853 (14.5 %), and Mucajaí with 479 (8.2%). The most affected sex was male with 3,848 (63.3%), and range of age was 21 to 40 years (2,135 accidents, 37%). Accidents occurred frequently in rural areas, totaling 3,348 (57%) cases. Regarding the animal responsible for the accident, 2,829 (48%) were snakebites, 1,155 (19.62%) scorpion accidents, 845 (14.3%) bees, 365 (6.2%) stingrays, and in smaller percentages accidents by caterpillars, wasps and others. It is important to highlight that 1,823 (31%) accidents were notified in indigenous population. The time elapsed between the accident and health assistance was 0h - 1h for 1,540 accidents (26%), and delayed treatment in more than 24 h was identified 507 (8.6%) patients. The most affected body parts were foot, hand, and leg with 2488 (41%), 748 (12%), and 625 (10%), respectively. The most frequent clinical manifestations were: pain 5,087 (86.42%), edema 3,897 (66.2%), ecchymosis 400 (6.7%), signs of neurotoxicity 238 (4.04%), vagal syndrome 208 (3.5%), and myotoxic 155 (2.6%). Most cases were classified as mild 3,746 (63.6%), moderate represented 1,378 (23.4%), and severe shown 304 cases (5.1%). Regarding the evolution of the cases, 5,370 (91.2%) of the victims evolved to cured, and 21 (3.5%) died. In conclusion, this study demonstrates the epidemiological profile of accidents caused by venomous animals in Roraima.

Keywords: Epidemiology; Venomous animals; Public health.
Financial support: Not applicable.

ABSTRACT 43

EPIDEMIOLOGICAL OVERVIEW OF ACCIDENTS BY VENOMOUS ANIMALS IN THE INDIGENOUS POPULATION RESIDING IN THE STATE OF RORAIMA

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This study sought to establish an epidemiological panorama of accidents caused by venomous animals in the indigenous population living in the state of Roraima. The study was cross-sectional, quantitative, descriptive, epidemiological, and retrospective in which the database of the *Sistema de Notificação de Agravos de Notificação* (SINAN) was used in the period from January 2017 to July 2022. The total number of accidents caused by venomous animals in the state of Roraima was 5,886 accidents, of which the indigenous population represented 1,824 occurrences (30,9%). Among indigenous, the year of 2018 had the highest number of cases with 407 (22.3%), followed by 2020 with 356 notifications (19.5%), and 2017 with 351 cases (19.3%). The municipalities of Alto Alegre, Uiramutã, and Amajari had the highest number of indigenous snakebites with 593 (32%), 355 (19.5%), and 243 (13.5%) respectively. Most of the accidents were caused by snakes, totaling 1,612 (88.3%), among which the bothropic accidents stood out with 1,190 (73%) of occurrences, followed by crotalic accidents (222, 14%). Scorpion stings did not prevail among indigenous in the state, presenting only 80 (4.3%) notified accidents. Regarding the gender, 1,176 (64.4%) indigenous victims were men, and 647 (35.5%) women, being the individuals between 11-20 years old the most affected, with 593 (32.5%) of occurrences. Most accidents happened in rural/ indigenous areas with 1722 (94.5%). The time elapsed from the accident to the medical attention in most cases was from 1 to 3 hours (367, (20%). Those that took more than 12 to 24 hours or higher than 24 hours to seek medical attention corresponded to 24% of the total. According to the classification of the case, most were classified as mild 943 (51%), followed by moderate 636 (35%), and severe 180 (10%). The most common local clinical manifestations in patients were pain 1,677 (92%) followed by edema 1408 (77%). The systemic clinical manifestations occurred in 364 (20%) of the cases, being neurotoxic signs/symptoms the most common with 115 (31%) notifications, followed by myotoxic alterations with 97 (26%). About the evolution of the cases, 1,720 (94%) of the patients evolved to cure, while 10 (0.55%) have died. Considering the number of deaths of the general population of the state, the indigenous population had 50% of the total of deaths (n=21 deaths). The study concludes that accidents caused by venomous animals in the indigenous population occur more in males, affecting more people between 11 and 20 years of age, and that the municipalities with the highest number of cases are where most of the indigenous population of the state resides. The most prevalent accidents were caused by snakes highlighting the bothropic accident which is related to these vipers to the tropical forest environment.

Keywords: Epidemiology; Indigenous population; Venomous animals; snakes; Roraima.
Financial support: Not applicable.

ABSTRACT 44

EVALUATION OF INDIGENOUS BASIC HEALTH UNITS FOR THE RECEIPT OF SNAKEBITE ANTIVENOM IN THE STATE OF AMAZONAS

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Animal envenoming are a problem that represent a high cost to the health of the country, especially when we consider the northern region because of the difficult access to treatment for victims from the most remote communities, the peculiar topography of the region composed of a complex fluvial network makes it difficult for victims to move, causing delay in treatment, the only effective treatment for Snakebite is antivenom, currently available only in hospitals, in urban areas, the delay in treating the victim increases the risk of serious sequelae, and death, however, the decentralization of antivenom will make treatment more accessible to this portion of the population. The aim is to evaluate infrastructure of Indigenous Basic Health Unit in the state of Amazonas. An instrument was developed to evaluate health facilities with the minimum items necessary to ensure the effectiveness of the treatment of the victim of SBEs, as well as the correct storage of antivenom. The instrument was applied in the Units, wich were classified into 3 types: Type 1-unit capable of providing assistance to patients, including treatment with antivenom, but refers all patients to a higher-level unit after this procedure. Type 2-unit that can provide care to patients, including antivenom treatment, but refers critically ill patients to a higher-level unit after this procedure. Type 3-units capable of caring for patients, including antivenom treatment for all severity levels of patients, items were classified as essential (the presence of the item is mandatory for the storage of the antivenom and administration to the patient), non-essential (the presence of the item is indifferent), desirable (the presence of the item is not mandatory) and undesirable (the presence of the item may be harmful for the storage of the antivenom and administration to the patient). The instrument was applied in 14 Indigenous Basics Health Units that were classified as Type 1, more than 80% of the essential items were verified in the units, but only 25% of the desirable items, of the 22 essential equipment the units had 61% of them, of the other desirable items the units contained only 14% of them, of the 26 essential consumer materials the units contained 90% of them, the units have 46% of the two non-essential items, and all the units have the item classified as desirable, of the 8 Essential Medicines the units contained 79% of them. However, to ensure the treatment of the antivenom and the correct storage of the antivenom, the units need to be prepared with minimal resources, especially with items considered essential, the most critical missing items are intubation kits for children and adults, stretcher cart, water bath, glass tubes, stop/emergency cart, wheelchair skin marker brush and opioids, all with less than 50% presence in the units.

Keywords: Snakebite; Primary health care; Antivenom; Heath evaluation; Health care.
Financial support: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior **(**CAPES) e Ministério da Saúde.

ABSTRACT 45

CLINICAL-EPIDEMIOLOGICAL PROFILE OF SPIDE ENVENOMATION IN A REFERENCE HOSPITAL IN THE BRAZILIAN AMAZON

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Spiders are one of the main responsible for envenomation by animals, the term used for this type of accident is araneism. In Brazil, there are three genera of medically important spiders: *Phoneutria*, *Loxosceles* and *Latrodectus*. The bite of these spiders can trigger clinical and systemic changes, being classified as mild, moderate or severe. The objective of this work is to characterize the clinical and epidemiological aspects of envenomations caused by spider bites in a referral hospital. This is a cross-sectional study, of a descriptive nature, with a quantitative approach, where medical records were evaluated from 1999 to 2020 of spider bites victims treated at the Fundação de Medicina Tropical Doutor Heitor Vieira Dourado. This project was approved by the Research Ethics Committee under protocol number 713.140/2014. In the period studied, spider bites were more prevalent in 2008 (17.2%), mainly in urban areas (35.5%), with a higher frequency in males (67.7%), and the age group most affected was 31-40 years old (24.7%). The upper limbs were the most affected (48.4%), and the left side was the most affected (44.1%). The *Phoneutria* genus was responsible for 9.7% of the cases. Only 26.9% received care at other health units and the time taken to seek the first care was <6 hours (58.1%). Most envenomations were classified as mild (91.4%) or moderate (8.6%). Regarding treatment, 5.2% received antivenom, 76.3% analgesia and 6.4% antibiotic therapy. The most frequent clinical manifestations were pain (81.7%), edema (52.7%), paresthesia (31.2%), erythema (30.1%), hyperemia (12.9%), pruritus (11, 8%), headache (10.7%), fever (8.6%), nausea (7.5%), heat (6.4%), dizziness and vomiting (4.3%), sweating (3, 2%), blurred vision, hematuria, local bleeding and necrosis (2.1%). Although most envenomations are considered mild, bites by spiders are still a public health problem and are neglected. With this, the need for more studies focused on the area of venomous animals is still great, as is the training of health professionals to care for these victims.

Keywords: Arachnids; Araneae; Public Health; Tropical Medicine; Venomous animals.
Financial support: Fundação de Amparo à Pesquisa do Estado do Amazonas – FAPEAM.

ABSTRACT 46

CLINICAL-EPIDEMIOLOGICAL PROFILE OF SNAKEBITES IN CHILDREN IN A REFERENCE HOSPITAL IN THE BRAZILIAN AMAZON 2010-2019

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The genus *Bothrops* is the main responsible for snakebites in Brazil. In the state of Amazonas, the main cause of bites is *B. atrox*. The state holds the highest percentage of registered cases of snakebite in children and adolescents, corresponding to 23.2% of victims. These bites usually occur when children work or help their parents in agriculture or when they play near the house. The pediatric population is considered vulnerable, some studies have found that children have different complications from adult patients. The objective of this work is to describe the clinical-epidemiological characteristics of snakebites in children in a referral hospital in the Brazilian Amazon. This is a cross-sectional, descriptive study, with a quantitative approach, where the medical records from 2010 to 2019 of snakebite victims treated at the Fundação de Medicina Tropical Doutor Heitor Vieira Dourado-FMT/HVD were evaluated. This project is part of a larger project and was approved by the Research Ethics Committee under protocol number 5,436,502. In the period studied, 2019 had the highest number of reported cases (17.7%), followed by 2018 (15.4%), mainly in rural areas (95.4%). Most of the victims were male (63.4%) and the most affected age group was between 9-13 years old (76%). The lower limbs were the most affected (92.5%) and most of the bites were in the right side of the victims (53.2%). 80% of patients brought the snake. Most of the victims arrived in the hospital in less than 6h (56.6%), 80.3% of the patients underwent conducts before reaching the FMT/HVD. The most common symptoms were pain (98.3%), edema (95.4%), erythema (40%), heat (37.1%), local bleeding (26.3%), fever (21.7%) and ecchymosis (21.1%). Other manifestations were found in 56% of patients, including abscess, lymph node enlargement and dizziness, among others. The vast majority of envenomation were classified as moderate (54.2%) and severe (21.1%), 70.8% had complications. 90.8% of patients were discharged and the most common time of stay in the hospital was up to two days (32%). Although cases of snakebite in children are less frequent than in adults, they have a higher severity index than other age groups, even though they are brought to the hospital early. In the population studied, there were more complications when compared to bites in adults. In view of this, bites in children require greater attention in care and in their outcome in the face of complicating factors in these envenomation.

Keywords: Lanceheads; Pediatric Health; Public Health; Tropical Medicine; Venomous animals.
Financial support: Fundação de Amparo à Pesquisa do Estado do Amazonas – FAPEAM.

ABSTRACT 47

EPIDEMIOLOGICAL AND CLINICAL ASPECTS OF SCORPION ACCIDENTS IN RORAINÓPOLIS, STATE OF RORAIMA, BRAZIL, FROM 2015 TO 2021

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Accidents caused by scorpions are an important public health problem that affects the whole planet. In Brazil, the number of reported accidents has increased, but some regions still need in-depth and further investigations. In this regard, in the municipality of Rorainópolis, located in the south of the state of Roraima, there is a lack of information and studies. Therefore, this work aims to perform a retrospective epidemiological study of the scorpion sting cases recorded from 2015 to 2021 in Rorainópolis. Data were collected from the online Tabnet of the Informatics Department of the Unified Health System (DATASUS) and the Municipal Health Surveillance Coordination (SMS). They were tabulated and processed in Excel and BioEstat through normality, comparative, regression, and correlation tests. A total of 48 accidents were recorded during this period, with an average incidence of 22.54±19.17 per 100 thousand inhabitants/year, showing an increase in reporting within the period and a strong association between accidents and human territorial settlement. Scorpionism corresponded to an average of 11.36% of venomous animal accidents in the municipality per year, ranging from zero to 19.28%, with the highest percentage observed for the year 2020. June represented the month with the highest average number of accidents, but the analysis showed no significant difference among the months. Among the 15 municipalities of Roraima, Rorainópolis ranked 10th in average incidence and 4th in absolute number, representing 3.91% of cases in the state. The accidents affected all age groups, genders, and educational levels. However, the brown population was the most affected. Two cases (4.2%) needed serotherapy. Most cases were mild, with pain and edema and few systemic manifestations, without any type of complication and deaths, indicating the low medical importance of the scorpions involved. Future studies on the species involved in the scorpion envenomation are required to describe better and understand the accidents.

Keywords: Scorpionism; Epidemiology; Venom; Intoxication; Roraima.
Financial support: Not applicable.

ABSTRACT 48

EPIDEMIOLOGY OF ACCIDENTS CAUSED BY VENOMOUS ANIMALS IN THE VENEZUELAN IMMIGRANT POPULATION INHABITING BOA VISTA, RORAIMA

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The World Health Organization (WHO) has included envenomings caused by venomous animals in the list of Neglected Tropical Diseases because they are an important public health problem, especially in tropical or subtropical countries. In Brazil, the most important venomous animals in relation to the incidence and severity are snakes (*Bothrops*, *Crotalus*, *Lachesis*, and *Micrurus* genera), scorpions (mostly *Tityus* genus), spiders (*Phoneutria*, *Loxosceles*, and *Latrodectus* genera), and, to a lesser extent, but with increasing occurrence over the years, bees. This is a cross-sectional, quantitative, descriptive, epidemiological, and retrospective study, during January 2019 and July 2022, using the *Sistema de Notificação de Agravos de Notificação* (SINAN). Our results showed that the total number of venomous animal accidents in Venezuelan immigrants during the period was 122: in 2019 there were 52 notified cases (%), 2020 showed 35 (29%), 2021 registered 25 (21%), while the year 2022 (until July) totaled 10 occurrences. Most accidents were caused by scorpions 44 (36%), followed by snakes 30 (24.5%), bees 24 (20.3%), and stingrays 11 (9.7%). Regarding gender, 75 (61.4%) were males. In respect to the age range, individuals between 20-40 years old were the most affected, with 65 (53%). Most accidents happened in urban areas, 78 (63.5%). The time elapsed from the accident to the medical attendance in 42 (34%) was ignored, followed by the cases that took about 0h-1h, a total of 30 (24.5%). Most patients reported pain 100 (82%) followed by edema 67 (54%). Systemic clinical manifestations occurred in 16 (13.5%) of the cases. The classification of the cases was mostly mild 92 (75.5%) followed by cases considered moderate 18 (15%), and severe 3 (2.5%). As for the evolution of the case, 100% of the cases evolve to cure with no death. The findings of the study show that most accidents occurred in the urban area, indicating an established synanthropic fauna. In conclusion, the high incident of accidents by venomous animals in the Venezuelan immigrants may be related to the living conditions, basic sanitation, social, and environmental conditions to which this population is subjected.

Keywords: Epidemiology; Venomous Animals; Envenomings; Public Health.
Financial support: Not applicable.

ABSTRACT 49

THROMBOTIC MICROANGIOPATHY FOLLOWING *Bothrops atrox* SNAKEBITE: CASE REPORT IN THE BRAZILIAN AMAZON

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Thrombotic events consist of a neglected event in *Bothrops* snakebites in the Brazilian Amazon, which no study in the region has been conducted to investigate the thrombotic microangiopathy (TMA) events associated with accidents. TMA is an uncommon group of disorders characterized by the deposition of microthrombi in the circulation causing hemolytic anemia. Case: In this report, we described the case of a 57 year-old-women with a history of systemic hypertension for 5 years who developed TMA. She entered the emergency room of the Fundação de Medicina Tropical – Dr. Heitor Vieira Dourado (FMT-HVD) on July 9, 2022, one hour after being bitten by the *B. atrox*. She developed hematoma, vertigo, "blurred vision", frontal headache, asthenia, dyspnea (without the use of accessory muscles), nausea and vomiting (denying the presence of blood) after the envenomation. Laboratory features upon admission (D1) revealed elevated prothrombin time (PT) (16.2s/54% activity), increased INR (1.36) and LDH (428U/L). Exams in D2 presented moderate thrombocytopenia (80.200mm³), high LDH (6,422mg/dL), hyperbilirubinemia (total: 3.93; indirect: 3.23mg/dL), an increase of more than 50% in baseline serum creatinine (4.6 g/dL) and urea (175mg/dL), in addition to TP and INR also increased (18s/41% activity, INR: 1.55). In D3 when the renal function parameters were evaluated, an increase of 8x the baseline serum creatinine value (9.6mg/dL) and 5x the urea value (238mg/dL) was observed. During evolution, her thrombocytopenia and anemia worsened, with blood films showing fragmented red cells, increase in serum LDH, and progressive increase of serum creatinine. The patient was submitted to seven sessions of renal replacement therapy (RRT) due to acute renal injury (AKI) in D4, D5, D7, D9, D10, D13 and D19, five sessions of plasmapheresis in D6, D7, D8, D9 and D11 and packed red blood cell infusion in D6 and D10. After 29 days of hospitalization, the patient was discharged, with no further need for RRT, however it was still possible to observe elevated serum creatinine (3.8mg/dL). The patient was referred for follow-up with a nephrologist from the FMT-HVD. The present report described the first case of thrombotic microangiopathy after *Bothrops atrox* envenomation in the Brazilian Amazon, providing insights into the importance of TMA associated with snakebite of the *Bothrops* genus, as an alert to this problem and a way to improve the treatment of patients with bothrops accidents in the region. Ethical approval: This study was approved by the Research Ethics Committee (REC) of the FMT-HVD, under CAAE 39345520.9.0000.0005 and opinion number 4.478.678.

Keyword: *Bothrops atrox*; Thrombotic microangiopathy; Hemolytic-uremic syndrome; Acute kidney injury.
Financial support: Not applicable.

ABSTRACT 50

EPIDEMIOLOGICAL PROFILE OF SNAKEBITES IN THE MUNICIPALITY OF BOA VISTA, RORAIMA

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Snakebites are considered a major public health problem. In Brazil, snakebites represent approximately 29,000 cases annually, with an average of 125 deaths. The snake family that causes most accidents in Brazil Viperidae, which are composed of solenoglyphous snakes, and is represented by *Bothrops* (pit vipers), *Crotalus* (rattlesnake), and Lachesis (surucucu) genera. Roraima is the Brazilian state with the highest snakebite rate in Brazil, with almost 100 cases per 100,000 inhabitants. The aim of this study was to analyze the epidemiological profile of snakebites in the municipality of Boa Vista, Roraima. The study was cross-sectional, quantitative, descriptive, epidemiological, and retrospective in which the databases of the Notification System of Notifiable Diseases - SINAN from the period from 2019 to July 2022. In the period studied, 664 snakebites were reported, and 2020 had the highest number with 200 cases (30%). The median between the years 2019-2021 was 187 cases/year, although the year 2022 has not yet ended; however, by July 117 occurrences have been reported. Most accidents occurred in males, 479 (72%), while females had 184 (27.7%). In relation to the age, individuals between 20-39 years old represented 229 (34.4%) cases, followed by 40-60 years old, with 160 (24%) occurrences. Most accidents happened in rural areas 533 (87.20%). Regarding the body site of snakebites, the foot was the most affected with 388 (58.4%), followed by the leg with 94 (14.5%). The prevalent snake genus was brothropic with 370 (55.7%), followed by crotalic with 127 (19.7%), laquetic with 65 (9.8%), and elapid with 6 (0.90%). The time elapsed from accident to treatment was 1-3h in most cases 127 (19%), followed by cases that took more than 24h for treatment (109, 16.50%). Regarding local clinical manifestations, most patients reported pain 570 (85.80%), followed by edema 491 (73%). Systemic clinical manifestations occurred in 137 (20.63%) of the cases, with signs of neurotoxicity the most common alteration (54, 39%) followed by vagal syndrome (34, 24.80%). The classification of cases was mostly mild (290, 44.10%) followed by cases considered moderate (263, 39.6%) and severe with (94, 14.5%). Regarding the evolution of the case, the majority (616, 92.77%) evolved to a cure, with 4 deaths registered during the studied period. This study demonstrates the importance of investigating epidemiology of snakebites and reinforces the need of prevention strategies in the Northernmost state of Brazil – Roraima.

Keyword: Epidemiology; Snakebites; Public health; Roraima.
Financial support: Not applicable.

ABSTRACT 51

SERIOUS CASES OF SCORPIONISM SEEN AT A REFERENCE CENTER IN THE AMAZONAS

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Annually, millions of cases of scorpion envenomation are reported around the world. Although scorpionism affects most continents, the high incidence and severity are concentrated in tropical and subtropical territories, such as Brazil. The risks are further increased by climate change, disorderly population expansion and poor sanitation. In general, poisonings in humans are clinically associated with the genus Tityus, composed of species widely distributed in the country, especially in the Brazilian Amazon. The venom is responsible for clinical aspects that range from local pain, paresthesia, edema, erythema, sweating, piloerection to neurotoxicity. Treatment is defined according to the severity of the case and antivenom is administered in the presence of systemic repercussions. The damage caused by scorpionism is serious and often irreversible. The damage affects both the well-being of victims and socio-economic issues. Therefore, this study aims to describe cases of scorpion envenomation treated at a hospital referral center in the state of Amazonas from 2015 to 2022. Clinical data from the victims were collected using electronic medical records from the Fundação de Medicina Tropical Doutor Heitor Vieira Dourado, Manaus. Information such as age, treatment, adverse reaction to treatment, days of hospitalization and ICU stay, acute pulmonary edema, use of vasoactive drugs and mechanical ventilation were analyzed. During the research, 16 patients, aged between 3 and 33 years, were admitted to the hospital. The treatment, carried out through the administration of antivenom, varied between 2 and 8 ampoules. The length of hospital and ICU stay ranged from 2 to 20 and 2 to 13 days, respectively. None of the victims had allergic reactions to the treatment. However, of the total number of patients, two progressed to a serious condition. One, 6 years old, developed acute pulmonary edema, requiring mechanical ventilation and the use of vasoactive drugs (noradrenaline). The ICU stay lasted 6 days. The other affected, aged 6 years, presented respiratory compromise, requiring ventilatory support and vasoactive drugs (noradrenaline and dobutamine). There were three cardiorespiratory arrests, three unsuccessful extubation attempts and evolution to tracheostomy. She was discharged from the tracheostomized ICU after three days, however, with neurological (spastic) sequelae. In this study, the presence of severe cases was observed, requiring hospitalization in the ICU, use of vasoactive drugs and the occurrence of pulmonary edema as a clinical complication. In addition, one of the affected children developed neurological sequelae. The most affected populations are found in rural areas and subject to vulnerabilities. Even with the free distribution of antivenom in Brazil, scorpion cases are still subject to negligence and require the formulation of policies and actions aimed at these problems.

Keywords: Scorpions tings; Envenoming; Antivenom; Intensive Care Unit**.**
Financial support: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior **(**CAPES) e Conselho Federal de Enfermagem.

ABSTRACT 52

CLINICAL-EPIDEMIOLOGICAL PROFILE OF SCORPIONISM IN RORAIMA

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Accidents caused by venomous animals have an important role in public health, including scorpion stings. In Brazil, scorpion stings have high visibility due to the high frequency of accidents in urban areas. Furthermore, scorpion stings can cause severe cases of envanomings, since scorpion venoms consist of a complex group of compounds including proteins and peptides. This study aims to evaluate scorpion stings clinical-epidemiological profile in Roraima, from January 2019 to June 2022. The study was cross-sectional, quantitative, descriptive, epidemiological, and retrospective, where the database of the *Sistema de Notificação de Agravos de Notificação* - SINAN was used. A total of 518 scorpion envenomings were reported, showing the relevance of the disease in the Roraima state. The years of 2019 notified 203 cases (39%), 2020 151 cases (29%), and 2021 a total of 122 cases (23.5%), while the year 2022 until July 2022 demonstrated 201 occurrences. Regarding sex, 261 (50%) of the victims were men and 256 (49%) women. In relation to the age, the individuals between 21-39 years-old represented 226 cases (43.6%), followed by those between 41-60 years old, with 104 (20%) occurrences. Most accidents happened in urban areas, 385 (74.32%), being the foot the most affected (125, 24%) part of the body, followed by the hand (118, 22.7%). The time elapsed from accident to treatment was 0h-1h in most cases (224,43.2%) followed by cases that took 1h-3h for treatment (119, 23%). Regarding local clinical manifestations, most patients reported pain (418, 80.6%), followed by swelling (225, 43%). Systemic clinical manifestations occurred in 32 (6.1%) of the cases, with neurological signs being the most common (14, 43.7%) followed by vagal syndrome (13, (40.6%). The classification of the cases was mostly mild (424, 82%) followed by moderate (38, 7.3%), with no scorpion-related deaths in the period, meaning that 100% of the cases progressed to cure. In conclusion, this study demonstrates that scorpion stings in Roraima did not cause severe envenomings and deaths, although shown high number of accidents, highlighting the importance of preventive measures and educational actions regarding these accidents.

Keyword: Epidemiology; Scorpionism; Roraima; Envenomings.
Financial support: Not applicable.

ABSTRACT 53

EPIDEMIOLOGICAL PROFILE OF BOTROPIC ACCIDENTS IN THE STATE OF RORAIMA

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Ophidian accidents have great relevance worldwide, being classified by the World Health Organization as one of the Neglected Tropical Diseases. The Brazilian territory presents several species of serpents, being considered approximately 11 families. Historically, the *Bothrops* genus, containing among its most famous species the jararaca, has played a key role in the casuistry, being responsible for the largest number of notifications in the country. They are found in various environments such as riverbanks and even in urban and peri-urban areas. Accidents by this genus can be classified as mild or even severe, with toxins that combine proteolytic, coagulant, and hemorrhagic actions. Still, the North region presents relevant indices of ophidism in the national scenario, thus presenting the importance of the epidemiological description in Roraima. The objective of the study was to analyze the epidemiological profile of accidents caused by the *Bothrops* genus in the state of Roraima, in the extreme north of Brazil. The methodology of the study was transversal, quantitative, descriptive, epidemiological and retrospective, where the databases of the *Sistema de Notificação de Agravos de Notificação* - SINAN in the period of 2019, 2020 and 2021 were used. Over the course of these years, 1006 ophidic accidents involving the genus *Bothrops* were reported. The year 2019 recorded 377 cases (37.5%), in 2020 308 accidents (30.7%) were reported, and in 2021 a total of 321 occurrences (32%). Regarding the sex involved, there was a predominance of male accidents 706 (70%), and 300 (30%) corresponded to women. As for the most affected age group, individuals from 21 to 40 years old represented 353 cases (35%), followed by those from 11 to 20 years old, with 270 (27%) occurrences. About 87% of the accidents happened in rural areas (881). The municipalities of Alto Alegre and Uiramutã had the highest number of notifications, representing 28.7% (289) and 11.5% (116) of cases, respectively. The most affected area was the feet, with 61.3% of the reports. Most cases were reported between one to three hours after the bite (21.7%). The classification of cases was mostly mild, 49% (496), followed by moderate, 38.3%, and the most reported local clinical manifestations were pain in 92.5% of patients and edema, 81.6%. Some systemic manifestations were identified as vagal and myolytic actions, characteristic of the action of the venom of these snakes. Around 94% (949) of those reported evolved to complete cure after treatment. This study shows that the *Bothrops* sepsis bites in Roraima present high casuistry, but the envenomations are mostly mild, which if treated correctly and in a timely manner, evolve to total cure. Still, prophylaxis measures and health education actions around the theme are necessary.

Keyword: Epidemiology; Roraima; Ophidism; *Bothrops* genus.
Financial support: Not applicable.

ABSTRACT 54

EPIDEMIOLOGICAL PROFILE OF VICTIMS OF OPHIDIC ACCIDENTS IN THE STATE OF RORAIMA IN THE YEAR 2021

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In Brazil, accidents caused by venomous animals are considered a serious public health problem, due to their high frequency and severity in all regions of the country. Among these, the snakebites caused mainly by snakes of the genera *Bothrops*, *Crotalus*, *Lachesis* and *Micrurus* stand out. The objective of this research is to describe the epidemiological profile of victims of snakebites in the state of Roraima in the year 2021. This is a descriptive, retrospective study with a quantitative approach developed from secondary data regarding the notifications of snakebites in the state of Roraima in the year 2021 registered in the Information System for Notifiable Diseases (SINAN). As a result, 416 notified reports were identified. With regard to the profile of the victims, a predominance of males was found with 283 cases; the age group most affected was from 20 to 39 years old with 155 cases, followed by the age group from 40 to 59 years old with 97 occurrences; 202 victims belonged to the indigenous race, followed by the mixed race with 195. Regarding the municipalities, Alto Alegre stands out with the highest number of occurrences, with 81 incidents. Regarding the characteristics of the accident, accidents with snakes of the *Bothrops* genus prevailed, with 280 reported cases. Regarding the time of occurrence, most cases were treated between 1 to 3 hours. Of the accidents that occurred, 212 were classified as mild, 141 moderate and 37 serious. Of the total, 375 evolved clinically with cure and 2 died. The snakebites in the state of Roraima represent a health problem as well as in other states of the northern region, corroborating with other studies the high prevalence of accidents related to the genus *Bothrops*, in males, of the same age group and severity. It was concluded that the epidemiological profile data demonstrate relevant indicators for the targeting of therapeutic resources, according to the reality of the region.

Keywords: Epidemiology; Public Health Surveillance; Snake Bites.
Financial support: Not applicable.

ABSTRACT 55

SERIES OF CASE STUDIES OF PEDIATRIC SNAKEBITES AT HOSPITAL GENERAL DE RORAIMA

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Envenomings caused by snakebites represent a public health problem, especially in tropical and subtropical countries, such as Brazil, which registers about 29,000 cases per year. Most victims of snakebites in the country are adults between 20 and 40 years old; however, pediatric accidents and accidents involving under-age children are usually more severe, being considered a vulnerable group. The present study aimed to analyze snakebites in minors treated at the General Hospital of Roraima Rubens de Sousa Bento (HGR) during a period of 6 years (2016-2021) in order to investigate the clinical and epidemiological profile of snakebites in minors in Roraima. Our results showed 2,404 reports of snakebites in HGR during the period analyzed, among them 78 were minors, with the highest number of records (20 cases) in 2018. Regarding the profile of accidents, according to the snake's gender, *Bothrops* were the most frequent (n=26), followed by *Crotalus* accidents (n=14). There was no notification with *Micrurus* genus. The snakebites were mostly classified as moderate. The most affected limb among the victims were the lower limbs (n=56). The most reported/presented symptoms were edema (n=44), local pain (n=31), phlogosis (n=06), followed by bleeding (n=05), drowsiness (n=04), eyelid ptosis (n= 03), among others. The time that victims stayed in the hospital range from 8 hours and 2 months due to complications. Regarding the age of the victims, the most affected age group was 15 and 16 years old, adolescents (student age), being 70% male (n=54). It is important to mention that HGR only receive minors older than 12 years old. In the period we had only one death (2016). In conclusion, this study revealed the importance of carrying out public policies for young people and children aimed to prevent snakebites, considering the prevalence of severity of these cases. In addition, the reduction in the number of reported cases in the years 2020 and 2021 could be a reflection of COVID-19 pandemic, which probably influenced both the underreporting of cases, as people avoided medical care during this period, and the reduction of accidents due to social isolation.

Keywords: Envenoming; Snakebites; Minor; Under-age children.
Financial support: Not applicable.

ABSTRACT 56

MAGNITUDE OF SNAKEBITES IN THE INDIGENOUS POPULATION IN THE YANOMAMI INDIGENOUS SPECIAL HEALTH DISTRICT IN THE STATE OF RORAIMA (BRAZIL)

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Snakebites represent a serious problem for public health in tropical countries, due to their high frequency, morbidity, and mortality. In Brazil, the indigenous population is of greater vulnerability, due to the regions in which they inhabit such as are forests, riverbanks, rural and extractive regions. This study analyzed the magnitude of snakebites among Yanomami indigenous population in the state of Roraima, according to official records, Notifiable Diseases Information System, Mortality Information System, and Indigenous Health Care Information System. This is a documentary research throught secondary, retrospective, which evaluated all reported cases of snakebites that occurred in the Yanomami indigenous population between 2011-2020. The data were made available by the Yanomami Special Indigenous Sanitary District (DSEI-Y). The results showed a total of 1,250 snakebites. Snakebites caused by *Bothrops* genus represented the most reported cases 1,190 (95.2%), followed by accidents caused by *Laquesis spp.* with 27 cases (2.2 *%), Crotalus spp*. with 11 cases (0.8%), Elapids with 6 cases (0.5%), and 16 cases with non-venomous snakes (1.3%). Regarding the regions with the highest incidence, the Xitei region had the highest number of cases, 33.8% of the total, followed by Auaris region with 9.1% and Waputha region with 8.2%. Regarding the severity of the cases, of the 894 snakebites, the vast majority occurred with Bothropic accidents, with 477 mild cases (53.4%), 249 moderate (27.9%), and 129 severe (14.4%). In second place, laquetic accidents were represented by 17 cases, being 0.4% mild, 0.7% moderate, and 0.8% severe. Records by Elapidic and Crotalid accidentes account for less than 1% of cases, with 0.3% of severity. Based on the data analysis, it can be concluded that snakebites are mostly caused by snakes of the Bothrops genus (probably by the unique species *B. atrox*) and in terms of severity, most were classified as mild cases.

Keyword: Snakebite; Yanomami; Roraima; Indigenous; Amazônia.
Financial support: Not Applicable.

ABSTRACT 57

EPIDEMIOLOGICAL PROFILE OF SNAKEBITES IN THE INDIGENOUS POPULATION OF THE EAST SPECIAL INDIGENOUS HEALTH DISTRICT OF RORAIMA (BRAZIL)

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In Roraima, accidents caused by venomous animals, especially snakes, are an important cause of morbidity and mortality, as in other regions of Brazil. The indigenous population of Roraima is on greater vulnerability to snakebites due to the regions they inhabit, such as forests and riverbanks, in addition to the difficulty of access to the specific treatment. This study is a documentary research of secondary data, with a quantitative approach of all reported cases of snakebites in the East special Indigenous Health District of Roraima - DSEI-East, between January 2011 and January 2020. The data were analyzed through the notifications of snakebites from the database Information System Notifiable Diseases, Information System Mortality, and Information System of Indigenous Health Care of the Ministry of Health, which are available in the coordination of epidemiological surveillance of the State of Roraima, Special Sanitary District Indigenous, and Special Secretary of Health. The results demonstrated a total of 121 snakebites during the period, with the years 2011 and 2016 presenting the highest number of notifications, with 24 and 40% of cases, respectively. The regions with the highest incidence of snakebites were Serra Do Sol (12.4%), Caraparu I (9.1%), Raposa I (9.1%), Caracanã (7.4%), Pedra Preta (7.4%), and Campo Formoso (6.6%). Due to the results obtained, a large annual variation of cases can be verified, with periods of low notification, probably indicating underreporting of cases in the evaluated period. The data presented by the DSEI-East did not allow assessments of the genera of the snakes causing them, nor of other information relevant to the cases, such as severity.

Keyword: Snakebite; Amazônia; Indigenous; Special Indigenous Health District; Roraima.
Financial support: Not Applicable.

ABSTRACT 58

MATERNAL DEATHS DUE TO SNAKEBITE IN THE STATE OF AMAZONAS

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Impoverished areas of the tropics and subtropics of the world are most affected by Snakebite Envenomings (SBEs), in Brazil, snake genus *Micrurus, Lachesis, Crotalus* and *Bothrops* are responsible for important clinical events in victims and, therefore, are considered of medical importance, even less frequently, pregnant women also suffer SBEs and present clinical manifestations capable of compromising neonatal/fetal and maternal health, the main maternal and obstetric effects are hemorrhages, hypotension, hypovolemic, anemia, placental abruption, part premature, teratogen, spontaneous abortions, intrauterine and neonatal fetal death, although the impacts are significant, informs the literature still about the leaks and may mask the real burden of SBEs. The aim of this study is to discover causes of deaths of mothers in childbearing age and pregnant women who suffer from snakebite envenomings in the Amazon between 2007 and 2021. For this, the *Record Probabilistic Linkage* technique was used to pair two Brazilian databases: Notifiable Diseases and Mortality Information System. The definitions of exposure to SBEs and of women of childbearing age (10-49 years) followed the guidelines of the Ministry of Health in Brazil. The causes of death were based on the International Classification of Diseases. The databases were made available upon approval of the study by the Research Ethics Committee of the Fundação de Medicina Tropical Doutor Heitor Vieira Dourado, Manaus, N. 5169112. The crossing of clinical-epidemiological information revealed a total of 36,786 SBEs in the state during the study period, of these, 9 deaths occurred with women of childbearing age and 1 in pregnant women, this pregnant woman was 39 years old and was in the first trimester of pregnancy, was of Amerindic ethnicity and resident in the municipality of Tabatinga, she was bitten on the foot by a *Bothrops* snake. The case was classified as severe and 8 vials of botropic antivenom were prescribed, she died one day after admission, the clinical description and cause of death were not available in the databases. Eight non-pregnant women also died in the study period, five of whom were Amerindian, ranging in age from 26 to 49 years. The main local complications were secondary bacterial infections and necrosis. Acute renal failure was the most common systemic complication during hospitalization. Acute respiratory failure, sepsis and acute renal failure were the main immediate causes of death. Six women received antivenom treatment and two died without medical attention. Pairings between databases are capable of generating temporal information about the clinical history of patients and are considered of great relevance to public health. The results demonstrate that SBEs in women of childbearing age have severe clinical outcomes, especially in pregnant women, fetuses, and neonates, in addition, adequate clinical management and treatment during SBEs cannot be neglected.

Keywords: Snakebite envenoming; Pregnancy; Maternal morbidity; Public health; Healthcare.
Financial support: Not applicable.

ABSTRACT 59

VALIDATION OF THE MINIMUM REQUIREMENTS FOR SNAKEBITES PATIENT TREATMENT BY THE PUBLIC HEALTH UNITS IN BRAZIL

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Snakebite represent a major public health problem worldwide, in Brazil, an average of 29,000 cases and 130 deaths are recorded per year, with the highest incidence reported in the Amazon, where the highest rates of complications and lethality of these cases are recorded, the difficulties in access to health services for the provision of adequate treatment with antivenom and first aid are aggravating factors, these barriers are due to the need for trained professionals, availability of specific equipment and essential supplies in health units close to these populations in remote areas. The aim of this study was to elaborate and validate the minimum requirements for the provision of antivenom treatment by public health units in Brazil. One instrument in the form of a checklist was prepared to evaluate the minimum requirements for the availability of antivenom treatment, for this, the construction of the instrument was designed so that the form of filling and evaluation was judicious and continuous flow in an easy way, in this document it has necessary information such as the identification and classification of the units in which the instrument is applied, for a better organization the document has a division into 5 sections of the items to be evaluated, session 1 evaluates the location, type and identification of the health unit, energy resources and which services are present, session 2 assesses human resources, information on the availability of health professionals during opening hours in the unit, permanence of professionals throughout the unit's opening hours, if the team performs or receive some form of training in snakebite treatment protocol and continuing education, session 3 evaluates the availability of equipment in the unit for clinical assistance, such as: pulse oximeter, thermometer, sphygmomanometer, kits for intubation of adults and children, session 4 evaluates the consumables used in clinical management of trauma, wound care, medication administration and other management for snake envenomation cases, session 5 evaluates the availability of medications in the unit, they are used as treatments for adverse reactions, pain management, hydration, treatment of secondary infections. The instrument created will help the decentralization and availability of antivenoms in more remote areas, evaluating the necessary requirements, where cases are aggravated by the lack of minimum resources in antivenoms treatment, the units that are able and that have the minimum resources for this offer will be of great importance. value for Brazilian public health, we will also count on the propagation of this instrument in other areas where the treatment service has not yet arrived.

Keywords: Snakebite; Antivenom; Public health; Treatment; Healthcare.
Financial support: Coordination for the Improvement of Higher Education Personnel (CAPES) e Health Ministry.

ABSTRACT 60

Bothrops atrox VENOM: CORRELATION OF COAGULANT POTENCY AND THE COAGULATION PARAMETERS FROM ENVENOMING PATIENTS

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The *Bothrops atrox* snake is the main species responsible for snakebites in the state of Amazonas, and this envenomation is responsible for several clinical manifestations, including clotting disorder. The composition of the venom is directly related to the clinical manifestations in which the snakebite occurred, showing that the potency of the biological activity of each venom may be related to clinical outcomes in the patients. Therefore, the present study aims to correlate the coagulation activity of the venom of snakes that cause envenoming's with the laboratory coagulation profile of patients. This is an observational, descriptive and transversal study carried out with bothropic accidents patients treated at the Fundação de Medicina Tropical – Dr. Heitor Vieira Dourado (FMT-HVD), who brought the snake within three hours of the bite. From the snakes, the venom was collected, and protein quantification performed by BCA method. Then, *in vitro* plasma clotting time assay using platelet poor plasma from health donor (CAAE: 44561521.4.0000.0005) was performed with venom concentrations ranging from 0.05 – 0,00625mg/mL, and the minimal coagulant dose calculated (dose capable to coagulate plasma in100s) for each venom. From patients, the laboratorial parameters prothrombin time (PT), clotting time (CT) and platelet counting were obtained at the hospital admission (before antivenom administration). From 52 patients admitted in the study, 5 venoms were collected from five different patients (#1 to #5). The MCD were calculated showing that the venom from the snake brought by patient #4 presented the most potent venom (MCD = 0,0071mg/mL), followed by patient #5 (MCD = ,0158), patient #2 (MCD =0,028mg/mL), patient #3 (MCD = 0,035mg/mL) and patient #1 (MCD = 0,05mg/mL). Concerning severity classification, patient #2 was mild, patients #1, #4 and #5 were moderate and patient #3 severe. Regarding the coagulation parameters, patients #2, #3, #4 and #5 presented PT and CT unclotable, with patient #1 presenting a slightly altered PT (14s - ref <13s) and normal CT (8 min - ref < 10min). As related to platelets counting, patients #2, #3, #4 and #5 had values within the normal range, but with similar values between these patients (from 204,200 to 261,000/mm³), where patient #1 had normal but elevated platelet counting values compared to other patients (431,000/mm³). The present study has evidence that the patient who brought the snake presenting the venom with the lower clotting activity (higher MCD) showed improved coagulant parameters compared to the other patients, indicating that the potency of the venom is in fact related to the envenoming effects. An increased number of venoms and patients are necessary to confirm this hypothesis, which are being conducted presently.

Key words: Snake venom; Cloting; Coagulopathy; Activity potency.
Financial support: Amazonas State Research Support Foundation (FAPEAM).

ABSTRACT 61

EPIDEMIOLOGY OF CROTALIC ACCIDENTS IN EXTREME NORTH OF BRAZIL

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In the Amazon region, among the predominant labor activities, extractivism is included, thus corroborating the increased occurrence of ophidian accidents due to the vulnerability of the population. Thus, constituting a serious public health problem in the region due to its high frequency, high morbidity and mortality and difficulty of locomotion to health units. This study aims to describe the epidemiological profile of rattlesnake accidents in the extreme north of Brazil. This is a descriptive epidemiological study based on data reported to the Sistema de Informação de Agravos de Notificação (SINAN) between the years 2017 and June 2022. Ophidic accidents had the highest incidence in 2018, with 101 (26.72%) cases, followed by 2021 with 69 (18.25%) and 2017 with 65 (17.20%) cases. The municipalities of Uiramutã, Bonfim, Boa Vista and Normandia had the highest numbers of cases with 68 (18%), 64 (16.2%), 61 (16 %) and 48 (11.8%) respectively. A total of 377 ophidic cases were notified in SINAN, of which 78.83% were male and 21.19% female were involved in accidents. Regarding race, most of the victims declared themselves as indigenous 222 (58.73%) and mixed race 138 (36.51%). Regarding age, individuals between 21-40 years old were the most affected, with 128 (33.33%) of the occurrences. Most accidents occurred in rural areas, with 335 (88.66%) of the reported cases. The time elapsed from the accident to medical attention in most cases was 3 to 6 hours, with 83 (21.96%) of the cases. Those who took more than 12 to 24 hours and more than 24 hours to seek medical attention due to access conditions add up to 32.4% of the total. According to the case classification, most were classified as mild and moderate both with 157 (41.4%) of the cases and severe 52 (13.7%). The most common local clinical manifestations in patients were pain 329 (86%) followed by edema 268 (70.7%). Systemic clinical manifestations occurred in neuroparalytic 81 (21%) followed by myolytic 40 (10.5%), vagal syndrome 24 (6.33%) and renal with 19 (5.03%). Considering the site of the bite, the foot was the most affected site with 236 (62.43%), followed by the leg with 57 (15.07%) and hand with 33 (8.07%) of the cases. Regarding the evolution of the cases of ophidian accidents caused by rattlesnake bites recorded during the period of analysis, we observed that the death rate was 4 (1.05%) and the healing rate was 322 (89.15%) of the cases. The findings of this research point to a relevance for the maintenance of public policies and the maintenance of health services, considering the high demand and the vulnerability of the affected population, it is worth mentioning the difficulty of logistics to areas of difficult access. For, it is clear that there is a constant tendency for ophidic accidents in the male population, rural and indigenous residents.

Keyword: Epidemiology; Snakebites; Rattlesnake.
Financial support: Not applicable.

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COMPOSITION, FUNCTIONAL ACTIVITIES, AND NEUTRALIZATION OF VENOMS FROM *Bothrops* AND *Bothrocophias* SNAKES FROM ACRE

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Bothrops snakes are abundant in the Amazon rainforest, where they are responsible for most of the snakebites. However, for some species venom composition and functional activities are not fully understood, particularly in specimens from Acre. In this study, we analyzed the venoms of *Bothrops brazili, B. taeniatus, B. bilineatus smaragdinus,* and *Bothrocophias hyoprora* from Acre and compared *B. atrox* venoms from Acre, Para, and Roraima. To access the composition, venoms were fractionated by SDS-PAGE and RP-HPLC chromatography. The functional analysis included SVMP and PLA_2 enzymatic assays with fluorescent and colorimetric substrates and venom-induced lethality (CEUAIB 631206918). Venoms were also tested for reactivity with antivenoms by Western blotting and antivenom neutralization of lethal activity. The composition and enzymatic activities of *B. atrox* venom from snakes collected in different areas of the Brazilian Amazon were comparable, revealing the predominance of SVMPs. *B. bilineatus* venom composition was comparable to *B. atrox* venom, in which SVMPs were also the predominant class of toxins. In opposition, the other venoms presented remarkable differences: *B. brazili* venom revealed a large peak in RP-HPLC containing K49 PLA_2s and consequently, showed moderate SVMP and PLA_2 activities. *B. taeniatus* and *B. hyoprora* presented a distinct chromatogram compatible with high levels of D49 PLA2s and lower levels of SVMPs, confirmed in the enzymatic assays. All venoms induced mice lethality in comparable periods. Antivenoms were efficient for neutralizing the effects of all tested venoms in experimental models. This data added to the knowledge of *Bothrops and Bothrocophias* venoms from Amazonian snakes, and the treatment of the accidents they evoke.

Keyword: *Bothrops*; Antivenom; Metalloproteinases; Phospholipases.
Financial support: FAPESP n. 2016/50127-5.

ABSTRACT 63

THE LEGACY OF DR. SÉRGIO H. FERREIRA: CAPTOPRIL, ADVENTURES AND MORE…

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It was at USP's Ribeirão Preto School of Medicine where the then young researcher/lecturer Sérgio Henrique Ferreira made a major discovery, which turned him world-renowned, just following his doctorate (1964). He identified the bradykinin potentiating factor (BPF) in the jararaca venom. This peptide enabled different pharmaceutical industries to develop oral drugs currently used on a large scale in the treatment of arterial hypertension and heart failure, the so-called angiotensin conversion inhibitors, including captopril.

As tribute to this great researcher, we will present to the audience of I VenoRaima a Sérgio far beyond the excellent researcher he was. We will report some adventures lived by this curious man, passionate about life, who loved a good discussion – about science or anything else. We will tell you about his participation in society as an attentive citizen, who encouraged equal opportunities for everyone. Sérgio coordinated various scientific entities and played an extraordinary role in Cineclube Cauim, much more than a mere film club, alongside Sócrates Brasileiro (the famous soccer player), in Ribeirão Preto. Once, he was the theme of Bloco Berro, Bloco Carnavalesco do Cauim, a carnival street band, when he was honored with the carnival "marchinha": "Dropping the pressure of the Jararaca", which has revealing lyrics. He encouraged the publication of Revista o III Berro, which defended "the right to have rights", in addition to actively participating in discussions at the Templo da Cidadania, The Citizenship Temple. Besides playing a good knife and fork, Sérgio was an excellent cook! Spending hours experimenting with food. And what amazing recipes came out! Whenever he traveled, he would bring with him new experiences that he shared with everyone. At home, within the family, we volunteered ourselves as guinea pigs, both for newly discovered drugs and exotic foods, always washed down with a good wine and lots of laughs. We were constantly provoked by the eternal challenger, to think about topics, from pharmacology to world economy theories, always with great passion. When he passed away (2016), he was described by his friends as "A bigger than life character"!

Keywords: Sérgio Henrique Ferreira; Captopril; BPF; Life.
Financial support: Not applicable.

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COBRA VENOM FACTOR: STRUCTURE, FUNCTION, BIOLOLGY, RESEARCH TOOL, AND LEAD FOR DRUG DEVEDLOPMENT

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Cobra Venom Factor (CVF) is the anti-complementary protein in cobra venom. It is a structural and functional analogue of complement component C3, forming a bimolecular complex with complement Factor B, an enzyme that cleaves C3 (C3 convertase). The convertase formed with CVF is, in contrast to C3b, stable and resistant to inactivation by regulatory proteins, leading to depletion of plasma complement. Whereas complement depletion is not toxic, exhaustive complement activation by the stable convertase at the envenomation site aids the toxic venom components to enter the bloodstream. Complement is also part of the pathogenesis of many diseases. Pharmacological inhibition of complement is therefore a desired goal. We created chimeric proteins of human C3 with CVF by exchanging the functionally important region in human C3 with the corresponding homologous region from CVF. These chimeric proteins (called humanized CVF (hCVF)) are human C3 derivatives with the CVF-specific function of forming a stable convertase, causing complement inhibition by consumption. Beneficial therapeutic effects of complement depletion have been shown in multiple preclinical models of disease, including myocardial and gastrointestinal reperfusion injury, age-related macular degeneration, myasthenia gravis, paroxysmal nocturnal hemoglobinuria (PNH), and others. No toxic side effects were observed in any disease model, or after intra-arterial administration to healthy primates. Moreover, although hCVF is mildly immunogenic in mice - in contrast to natural CVF which is highly immunogenic -, no neutralizing antibodies were formed in mice, even after repeated administration of hCVF. Recently, we created new hCVF clones for consistent recombinant expression and better pharmacokinetic properties (referred to as iC3). Our results show that complement depletion with hCVF represents a promising therapeutic concept for complement-mediated diseases, and that venom components can serve as valuable lead compounds for drug development.

Keywords: Cobra venom factor; CVF; Humanized cobra venom factor; Therapeutic complement depletion; Drug development.
Financial support: Not applicable.

ABSTRACT 65

PROTOTYPING OF A LATERAL FLOW ASSAY BASED ON MONOCLONAL ANTIBODIES FOR DETECTION OF *Bothrops* VENOMS

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Brazil is home to a multitude of venomous snakes, perhaps the most medically relevant of which belong to the *Bothrops* genus. The diagnosis of a bothropic envenoming can be made based on expert identification of a photo of the snake or based on a syndromic approach wherein the clinician examines the patient for characteristic manifestations of envenoming. This approach can be very effective but requires staff that has been trained in clinical snakebite management, which, unfortunately, far from all relevant staff has. Here, we describe a prototype of the first lateral flow assay (LFA) capable of detecting venoms from Brazilian *Bothrops* spp. The monoclonal antibodies for the assay were generated using hybridoma technology and screened in sandwich enzyme-linked immunosorbent assays (ELISAs) to identify *Bothrops* spp. specific antibody sandwich pairs. The sandwich pairs were used to develop a prototype LFA that was able to detect venom from several different *Bothrops* spp. The limit of detection (LoD) of the prototype was evaluated using Brazilian *B. atrox* whole venom and was determined to be 8.0 ng/mL in spiked serum samples and 9.5 ng/mL in spiked urine samples, when using a portable reader. The work presented here serves as a proof of concept of a genus-specific venom detection kit, which could support physicians in diagnosing *Bothrops* envenomings. Although further optimization and testing is needed before the LFA can find clinical use, such a device could aid in decentralizing antivenoms in the Brazilian Amazon and help ensure optimal snakebite management for even more victims of this highly neglected disease.

Keywords: Snakebite; Envenoming; Diagnostics; Lateral flow assay; Monoclonal antibody.
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ABSTRACT 66

LOXOSCELISM: FROM BASIC RESEARCH TO A CLINICAL TRIAL

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Envenomation by *Loxosceles* spiders is characterized by the development of dermonecrosis. Sphingomyelinase D is the main venom toxin of these spiders. Several isoforms present in *Loxosceles* venoms can be structurally classified in two groups. Class I Sphingomyelinase D contains a single disulphide bridge and a variable loop. Class II Sphingomyelinase D presents an additional intrachain disulphide bridge that links a flexible loop with a catalytic loop. These classes exhibit differences in their toxic potential. In previous studies, we have demonstrated that increased expression/secretion of matrix metalloproteinases 2 and 9, induced by *L. intermedia* venom Class 2 SMases D, contribute to the development of cutaneous loxoscelism. Moreover, we showed that the most potent venom containing the Class 1 SMase D, i.e., from *L. laeta*, in addition to increasing the expression/secretion of MMP-2 and MMP-9, also stimulates the expression of MMP-7, which was associated with keratinocyte cell death. Tetracycline, a matrix metalloproteinase inhibitor, prevented cell death and reduced MMPs expression *in vitro* and *in vivo* experimental models. Moreover, *Loxosceles* venoms and SMases D are able to induce a significant increase in superoxide and peroxynitrite production in keratinocytes, mononuclear and polymorphonuclear cells from humans. Thus, after working during more than twenty years with the venoms of Brazilian species of *Loxosceles* spiders, and unraveling the main molecular mechanisms involved in *Loxosceles* envenomation, our group has proposed the use of tetracycline as a potential therapy for dermonecrosis, based on its action as a matrix metalloprotease inhibitor. Currently, the topic use of tetracycline for the treatment of cutaneous loxoscelism is being tested in a randomized, double-blinded, placebo-controlled clinical trial in Santa Catarina, Brazil, under the coordination of our group. This project is a partnership of Butantan Institute, CeTICS/FAPESP (Center of Toxins, Immune Response and Cell Signaling/São Paulo Research Foundation), Federal University of Santa Catarina, CIATox/SC (Center of Information and Toxicological Assistance of Santa Catarina) and Santa Catarina State Secretary of Health. In this study, the lesion extension and healing time is being evaluated, and the other recommended treatments, such as corticosteroids and antivenom therapy, are being maintained. Once promising, the results of this study will allow a new complementary treatment for cutaneous loxoscelism.

Keywords: Envenomation; Snake bite; *Loxosceles;* Basic Research.
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ABSTRACT 67

Tityus serrulatus: A TRAJECTORY OF MORE THAN 30 YEARS OF DISCOVERIES

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The scorpion *Tityus serrulatus* is widely distributed in the Brazilian territory, especially in the most inhabited regions of the country, being responsible for severe envenoming and deaths, especially in children, resulting in a public health problem. *Tityus serrulatus* venom (Tsv) is a complex source of components naturally selected, with diverse pharmacological activities and that act in a synergistic and very effective way. Dr. Arantes academic career was entirely dedicated to the isolation and structural and functional characterization of Tsv components, seeking to improve the envenoming therapy, as well as to the discovery of pharmacological tools or molecular models for the development of new drugs. The studies performed by Arantes' research group resulted in the isolation and structural and functional characterization of Tsv neurotoxins, the main responsible for the toxicity of the venom, with diversified actions on sodium or potassium channels. The group also studied the actions of Tsv enzymes, such as hyaluronidase, which facilitates the dispersion of neurotoxins, and metalloproteases, which probably participate in the maturation of toxins and interfere with the complement system. Several studies were also carried out to evaluate the action of Tsv and some toxins on the immune system, which generated very relevant information and could result in a better therapy for envenoming. Additionally, many studies were conducted with heterologous expression of molecules with greater biotechnological potential, to obtain larger amounts of active molecules, aiming to expand their functional characterization *in vivo* and possible clinical studies. Despite all studies already carried out, Tsv still has many unknown and poorly characterized components and, therefore, should be further explored. Dr. Eliane C. Arantes is the main researcher to elucidate Tsv cocktail, pioneer to discover Tsv toxins and their functions, demonstrating a distinguished academic career. Moreover, she has being a professor from the University of São Paulo since 1981, where she published 138 articles and supervised 53 students (master's, doctoral and post-doctoral), besides teaching Physico-Chemistry at the Pharmacy School for over 40 years, being a servant of education and science.

Keyword: *Tityus serrulatus*; Scorpion venom toxins; Enzymes; Heterologous expression.
Financial support: FAPESP, CNPq, CAPES.

ABSTRACT 68

REVEALING THE UNKNOWN GENETIC AND PHENOTYPICAL DIVERSITY OF THE *Bothrops jararaca* COMPLEX: A PRELIMINARY APPROACH TO INFER EVOLUTIONARY PROCESSES THAT SHAPED MORPHOLOGICAL AND VENOM VARIATION

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The molecular mechanism of rapid adaptive evolution is still unclear. We still do not have a complete understanding of how complex evolutionary traits are fixed during the process of recent speciation. Venomous snakes isolated on islands are considered a powerful model to study the processes that create phenotypic diversity. Populations of *Bothrops jararaca* underwent several episodes of recent speciation on the continental island off the southeastern coast of Brazil. This repeated speciation process makes this species-complex an extreme case of repeated recent adaptations to distinct niches. Since 2000 I have been developing studies on this complex. Initially, I inferred evolutionary processes using the information provided by one mitochondrial gene fragment. More recently I have participated in studies using morphological evidence to unveil the hidden diversity present on these islands. Now, my collaborators and I have generated venom gland transcriptomes, venom HPLC profiles, complete mitochondrial genomes, and low coverage whole genomes for a comprehensive sampling within the *B. jararaca* complex. These data are allowing us to evaluate the evolutionary forces and mechanisms that shaped the variability of genotypes and phenotypes on the islands and in the mainland. Here, I will describe some results of these new approaches and the advances regarding the understanding of the speciation process in the *B. jararaca* complex.

Keywords: *Bothrops jararaca*; Venoms; Snake bite; Brazil.
Financial support: Not applicable.

ABSTRACT 69

THE PROFESSIONAL SECTOR HEALTH CARE FOR INDIGENOUS AFFECTED BY SNAKEBITE ENVENOMING IN RORAIMA: AN ANALYSIS OF THE HEALTH PROVIDERS' PERSPECTIVE

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There is an inequality regarding the burden of neglected tropical diseases in indigenous communities in Brazil compared to the non-indigenous population. The high incidence rate of these diseases is also accompanied by high morbidity and mortality rates in this population. Snakebite envenoming represents an important cause of disability and strongly impacts the lives of those people. In this sense, access to health services and antivenom is a key factor in reducing the burden of this disease. In this work, we describe the professional sector of health care for indigenous peoples affected by snakebite envenoming in the Brazilian Amazon, from the health providers' perspective. This study is an exploratory qualitative study and data were collected through focus groups with health professionals who serve indigenous populations in the Brazilian Amazon, and we performed a thematic analysis of the transcripts. The low coverage of health infrastructure is one of the biggest bottlenecks pointed out by HCPs who work in indigenous areas in the Brazilian Amazon. The difficulty of communication between Amazon indigenous people and general HCPs was reported in other studies as an important obstacle in the access of these patients. The reports collected in our study suggest that HCPs who work exclusively with indigenous people create empirical intercultural health communication strategies and share successful approaches with other HCPs.

Keywords: Amazon; Healthcare; Indigenous people.
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ABSTRACT 70

A MOLECULAR AND EVOLUTIONARY BASIS THAT ELUCIDATES THE SELECTIVE LOVE AFFAIR OF SCORPION TOXINS WITH VOLTAGE-GATED SODIUM CHANNELS

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The growing resistance of insects to chemical pesticides restricts the effectiveness of conventional methods for pest control and hence, the development of novel insecticidal agents is essential. Scorpion toxins specific for insect voltage-gated sodium channels (Navs) have been considered as one of the most promising insecticide alternatives thanks to their selectivity, quickly evoked toxicity, biodegradability, and lack of resistance. However, they have not yet been developed for uses in agriculture and public health, mainly because of a limited understanding of their molecular and evolutionary basis controlling their phylogenetic selectivity. Here, we show that the traditionally defined insect- selective scorpion toxin LqhIT2 specifically targets a prey Nav through a conserved trapping apparatus comprising a three-residue-formed cavity and a structurally adjacent leucine. The cavity serves as a detector to recognize and bind a highly exposed channel residue conserved in insects and spiders, a major prey for scorpions; The leucine subsequently seizes the moving voltage sensor via hydrophobic interactions to reduce activation energy for channel opening, demonstrating its action in an enzyme-like manner. Based on the established toxin-channel interaction model in combination with a toxicity assay, we enlarged the toxic spectrum of LqhIT2 to spiders and other arthropods. Furthermore, we found that genetic background-dependent cavity shapes determine the species selectivity of LqhIT2-related toxins. The discovery of the trapping apparatus helps to clarify and understand the evolution and design principle of Nav-targeted toxins from a diversity of arthropod predators, which may facilitate and accelerate their uses in pest control.

Keyword: Novel pesticides; Scorpion toxins; Voltage-gated sodium channels; Electrophysiology.
Financial support: Not applicable.

ABSTRACT 71

AN OVERVIEW OF THE ANTIVENOM LANDSCAPE IN LATIN AMERICA: CURRENT SITUATION AND CHALLENGES

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Timely administration of safe and effective antivenoms is the cornerstone in the treatment of snakebite envenomings and a key component of the World Health Organization strategy to prevent and control these envenomings. There is a long-standing tradition on antivenom development and manufacture in Latin America, and a variety of products are currently manufactured in the region by a universe of public and private laboratories. The Latin American Network of Public Antivenom Production Laboratories (RELAPA) includes laboratories from public institutions in the region which, under the coordination of PANAFTOSA-Pan American Health Organization (PAHO), promotes the improvement of antivenom production and quality control. There are strengths and weaknesses, as well as a marked heterogeneity, in this regional landscape, which demand attention by public health authorities, research groups and manufacturers. A large body of information has been built on the preclinical assessment of antivenom efficacy, which allows a knowledge-based regional distribution of antivenoms. These studies have highlighted a high extent of cross-reactivity between bothropic antivenoms from different countries, and areas in need of improvement, particularly regarding antivenoms against coral snakes (*Micrurus* sp). There is a need to strengthen the clinical evaluation of antivenoms' safety and efficacy, as well as the national regulatory frameworks for these products. The growing body of information generated on snake venom composition, as well as various novel technological possibilities for improving antivenom quality, should be harnessed through partnerships between academic and manufacturing sectors. Likewise, renewed efforts should be implemented in antivenom distribution, particularly to remote rural settings of high incidence of snakebites, and on the correct diagnosis of envenomings and the clinical use of antivenoms. Such integrated efforts, encompassing research and development, manufacture, quality control, regulatory policies, evaluation of efficacy and safety, distribution policies and adequate clinical management, in the context of strong regional cooperation platforms, will contribute to the reduction in mortality and disabilities inflicted by snakebite envenomings in the region.

Keywords: Snakebite envenoming; Latin America; Antivenoms; Preclinical evaluation.
Financial support: Not applicable.

ABSTRACT 72

LOCATION-ALLOCATION OF HEALTH CARE FACILITIES IN AMAZONAS STATE, BRAZIL

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Access to health care services is crucial to patient outcome in time-dependent acute illness and injury. In snakebite envenoming (SBE), the patient's survival depends on the precociousness of the treatment, with time greater than 6 hours resulting in increased morbidity and mortality. Verifying what proportion of a given population is covered by health facilities can give scientific support to public health officials to allow optimization of existing resources. Several financial and ecological factors may act as barriers to access to health care services: as for example 1) the amount of health sites in the area (supply), 2) the population size in the same area (demand), and 3) the geographic barriers between supply and demand. There are existing methods that give information about the access to care, such as kernel density estimation, two-step floating catchment area, and service area. However, none of them are able to estimate the allocation or reallocation of resources. Location-allocation models require two elements: 1) facilities locations; and 2) the allocation of resources such as people and materials. These models involve objectives that often maximize access or attempt to minimize cost. The aim of this study was to verify through location-allocation models the minimum number of community health centers (CHC) required to provide≤6 hours travel time to the maximum number of people in the state of Amazonas, Brazil. We collected and mapped out the location of all hospitals and CHCs in Amazonas State in Brazil in 2021 from the National Registry of Health Facilities (Cadastro Nacional de Estabelecimentos de Saúde, CNES in Portuguese). We performed a network analysis using location-allocation to verify the maximum coverage of people by hospitals and CHCs (supply) and population (demand). The coverage was measured in percentage of population each time new 25 CHCs were included in the model. The analysis was performed on ArcGis Pro version 2.9. There were 41 hospitals and 606 CHCs located in Amazonas State. All hospitals together cover 62% of the population. Adding 25 CHCs the coverage increases to 73%, and the plateau is reached when 75 CHCs were included covering 76%, meaning that adding more CHCs would not substantially increase the coverage. In this study we verified the number of CHCs of the health care network in the state of Amazonas, Brazil, and observed that 75 CHCs would be the optimal number of facilities to cover the highest proportion of the population in the state. We expect this number could improve access and patient outcomes in SBE.

Keywords: Snakebite envenoming; Gis; Global health; Health systems; Data science.
Financial support: M.L., J.S., e W.M.M. receberam financiamento do CNPq, através de bolsas de produtividade. W.M. recebeu apoio da Fundação de Amparo à Pesquisa do Estado do Amazonas (PRÓ-ESTADO, 011/2021 – PCGP/FAPEAM, 010/2021- CT&I ÁREAS PRIORITÁRIAS, ePOSGRAD) e do Ministerio da Saúde, Brasil (No. 733781/19-035). C.J.G. recebe financiamento para esta pesquisa através do Fogarty International Center of the National Institutes of Health sob o No. R21TW011944.

ABSTRACT 73

RELATIONSHIP BETWEEN DIET AND VENOM: CASE STUDIES ON SPIDERS AND SCORPIONS

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Spider and scorpions are known for possessing a potent venom which might be harmful for humans and has attributed a negative reputation to these groups. Because of their medical relevance, most studies have focused on analyzing the venom composition while ecological and evolutionary aspects remain unexplored for the majority of species. For example, the toxicity of some spiders and scorpions to humans has been traditionally explained as a defensive mechanism, despite venom in both groups being commonly used to subdue their prey. In this talk, I present the relationship between venom and prey capture using as a model one spider and scorpion species. In spiders, the toxicity against different prey types was evaluated and compared using as model the species *Phoneutria depilata (*Formerly *Phoneutria boliviensis*). To do this, the acceptance rate and immobilisation time were evaluated in vertebrate (frogs and lizards) and arthropod prey (spiders and cockroaches). In these experiments, both lizards and spiders were the most accepted prey, and spiders were paralyzed in similar times compared to lizards. Interestingly both, the prey acceptance and immobilisation time were similar in males and females of *P. depilata.* Once the most accepted prey for vertebrates and arthropods were identified, the median lethal dose was evaluated against these prey. After venom of both females and males of *P. depiltata* were injected to lizards and spiders, we observed that toxicity was signficantly higher in the former prey when compared to spiders, but toxicity was similar when compared between both sexes. These results suggest that toxicity on *P. depiltata,* against humans, might be a consequence of vertebrate consumption, just like it has been suggested for other groups such as *Latrodectus* spiders, which are medically important. These results are confirmed for a recent bibliographic review, where it is shown that several medically important spiders include vertebrates on their diet. In the case of scorpions a similar trend was evaluated, by comparing the toxicity against insects of medically and non-medically important species, using as a model species of the genus *Chactas* and *Centruroides* respectively. Once we observed that both species captured insects in similar times, median lethal dose was evaluated between both groups. Interestingly we found that toxicity against insects was similar for both groups, suggesting that other aspects could explain scorpion's toxicity against vertebrates. Further studies should explore for example the vertebrate consumption of scorpions, especially those of medical importance.

Keywords: Predation; Venom; Toxicity; Arthropods; Prey.
Financial support: Agencia Nacional de Investigación e Innovación (ANII), Comisión Sectorial de Investigación Científica (CSIC).

ABSTRACT 74

MECHANISMS OF THE SCORPION VENOM-INDUCED INFLAMMATORY RESPONSE

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Tityus serrulatus (Ts) sting induces various deaths every year. The clinical manifestations that lead death after scorpion envenomation are heart failure and pulmonary edema. To explore the mechanisms of the lung inflammation, heart dysfunctions and deaths induced by the Ts venom (TsV). TsV provokes inflammasome activation with IL-1ß production, which via IL-1R stimulates PGE_2 and LTB_4 release. The lipid mediator PGE_2, binding to EP2/4 receptors, increases IL-1ß generation and promotes acetylcholine discharge, lung edema, cardiac dysfunction and deaths. On contrary, LTB4-BLT1/2 signaling controls lung inflammation and death. Administration of LTB4, or treatment with COX-2 inhibitors, or corticoid, or IL-1R absence prevents TsV-induced lung edema, cardiac dysfunction and death. Ours results show that the PGE_2 is the key mediator in the scorpionism, since it regulates the IL-1ß and acetylcholine release and the consequences of the envenomation. Our results suggest the use of prostaglandin synthesis inhibitors, or the use of corticosteroids, as soon as possible after the scorpion sting and while the patient is waiting for the anti-scorpion serum, could be a strategy to minimize the consequences of the envenomation.

Keywords: Scorpions; Inflammation; Poisoning.
Financial support: FAPESP, CNPq, CAPES.

ABSTRACT 75

SNAKEBITE IN RORAIMA: CLINICAL ASPECTS AND PRESENTING EDUCATIONAL PROGRAM

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Snakebites are still an overlooked problem, despite the 2.7 million bites and about 130,000 deaths each year. In Brazil, snakebite is a medical emergency being responsible for ~30,000 accidents and affecting mainly the Amazon population. Roraima is the Brazil's Northernmost state located in Amazon rainforest and the state with highest snakebite incidence in Brazil, presenting ~65 snakebites per 100,000 population, besides underreported accidents. Roraima Snakebite issue is aggravated due to the scarcity of research investments, high number of indigenous, and the struggle of Venezuelan migrants. In addition, the state has the least developed economy in the country and a fragile health system, lacking doctors and medical supplies. The Snakebite Roraima research group has been working with different aspects of snakebite envenomings, covering studies in basic and clinical Toxinology, as well as an Educational and Training Snakebite Program. In this presentation, the snakebite neglected reality in Roraima will be exhibited, including the epidemiology, pathophysiology, singularity of local envenomings (*i.e.*, rare case reports), difficulties of access to treatment, and the physical/social damages. Moreover, an overview of the educational and training programs to overcome de drawbacks aiming to decrease the snakebite problem in the state will be presented.

Keyword: Snakebites; Antivenoms; Educational program; Envenomings.
Financial support: Not applicable.

ABSTRACT 76

PnPP-19, A SYNTHETIC AND NONTOXIC PEPTIDE DERIVED FROM A *Phoneutria nigriventer* TOXIN, IS A POTENTIAL DRUG TO TREAT ERECTILE DYSFUNCTION AND GLAUCOMA

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The venom of the *Phoneutria nigriventer* spider is highly neurotoxic and is the most studied among the venoms corresponding to other species of the genus Phoneutria. This venom is composed of a diversity of peptides, enzymes, and potent neurotoxins that interact with ion channels, among other pharmacological targets. Accidents by the "armed spider" *Phoneutria nigriventer* cause several toxic symptoms such as: cramps, tremors, tonic convulsions, spastic paralysis, sialorrhea, arrhythmias, visual disturbance, sudoresis and priapism (an involuntary and painful erection). Priapism is associated with two highly toxic peptides (PnTx2-5 and PnTx2-6) from the venom, which act on sodium channels (Navs). To try to obtain a less toxic compound active on erectile function, we have designed PnPP-19, a synthetic and non-toxic peptide with 19 aminoacid (aa) residues, which is a minimized version of the toxin PnTx2-6 (48 aa). Experiments in rodents, *in vivo* and *ex vivo,* have demonstrated that PnPP-19 in nanomolar range, potentiates erectile function in normotensive animals and restores erectile function in hypertensive and diabetic animals. The topical application of the peptide *in vivo* has shown a similar effect. The intravenous injection of the labelled peptide or its topical application have shown that it has a tropism to the cavernosal tissue. The PnPP-19 mechanism involves the cGMP/nitric oxide (NO) pathway, which activates nNOS and iNOS, and increases the expression of iNOS. On the other hand, NO has gained attention as a new target for the treatment of glaucoma, an eye disease characterized by an increased intraocular pressure (IOP). Therefore, we have tested the effects of PnPP-19 in a rat model of eye hypertension. PnPP-19 (80 µg/20 µl) significantly reduced IOP and increased NO release. Additionally, PnPP-19 exerted neuroprotective effects by avoiding the loss of retinal ganglionic cells in treated eyes. Currently, the company Biozeus Biopharmaceutical (Rio de Janeiro, Brazil) holds the technology involving PnPP-19 in pre-clinical studies and the clinical studies of phase 1 were recently approved by ANVISA, the regulatory agency in Brazil. Taken together, the results obtained with PnPP-19 suggest that it is a safe and promising potential molecule to treat erectile dysfunction and glaucoma, by topical application.

Keywords: PnPP-19; *Phoneutria nigriventer* peptides; Erectile function; Glaucoma.
Financial support: CAPES, CNPq and FAPEMIG.

ABSTRACT 77

FROM VENOM TO DRUGS: AN AMAZING TRIP!

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Venomous animals have always been feared for their he capability to kill, but in recent decades, researchers and pharma companies have begun to be interested in their toxins. These toxins act quickly and effectively on the victim's body, due to massive repertoire of molecules able to bind to specific targets. However, to bridge the gap between basic and applied sciences, to push forward disease research and therapeutics is fundamental. What categories of drug leads are truly "druggable", sit in "patented bioproduct space" and can be pushed towards clinical trials? Although animal toxins present excellent candidate molecules because they have high specificity for a cellular receptor without side effects, few drugs are approved for human use. We present two successful translational cases of bioproducts from laboratory bench to the bedside. Case 1: *Fibrin sealant derived from snake venom* □ Considering that infectious diseases could be transmitted via human blood, a new heterologous fibrin sealant (HFS) was proposed, whose components are a serine protease (a thrombin-like enzyme) extracted from South American rattlesnake (*Crotalus durissus terrificus*) venom and a fibrinogen-rich cryoprecipitate extracted from the blood of *Bubalus bubalis* buffaloes. This new bioproduct has been used as a coagulant, sealant, adhesive, drug delivery, and recently as a scaffold candidate for bone, nerve and cartilage repair associated with mesenchymal stem cells. Thus we show its pre-clinical applications aiming at accelerating the wound healing process and at repairing nervous system trauma, cartilage and bone regeneration. We have also finished an innovative safety trial phase I/II to treat chronic venous ulcers in 40 humans concluding that the product is safe and clinically promising for this purpose due to its preliminary effectiveness. We have observed a significant improvement in 72.1% of the cases studied in only three months of treatment. Case 2: *Africanized honeybee antivenom* □ Bees are economically beneficial insects to humans and have provided several products, such as honey, royal jelly, propolis, beeswax, and pollen. However, they represent a public health problem in the Americas with large colonies of Africanized honey bees causing thousands of accidents per year with dozens of deaths. Due to this problem, we have developed a new antivenom to treat multiple stings. One of the major challenges was the standardization of the product, because of the antigenic characteristics of the venom. The apilic antivenom (AA) was developed based on horse hyper-immunization using only main toxic compounds of the venom. Each milliliter of Fab2-AA neutralizes 1.25 mg of venom and 10 mL of antivenom can treat about 100 stings. A multicenter, non-randomized, open-label phase I/II clinical trial with 20 participants to assess safety, neutralizing ability and confirm the lowest effective dose together a specific drug protocol was designed. Its delivery route is intravenous and the administration follows a strict clinical protocol that aims to rapidly neutralize and eliminate the venom toxic effects. The antivenom was considered safe for clinical application and a phase III clinical study will be proposed to evaluate its effectiveness and to promote its registration in regulatory agencies. Toxinologists have the expertise to develop new drugs through translational research, applying modern biotechnology tools, and trying to solve health problems with bioproducts.

Key words: Bioproducts; Venoms; Toxins; Trials; Research and development.
Financial support: RSF Jr. is a CNPq PQ1C fellow researcher (303224/20185)

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FUNCTIONAL CHARACTERIZATION OF ION CHANNEL TOXINS FROM THE LONGEST ANIMAL ON EARTH

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Polypeptides from animal venoms have found important uses as drugs, pharmacological tools, and templates for biotechnological and agricultural applications. We here report a novel family of cystine knot peptides from nemertean worms, with potent activity on voltage-gated sodium (Nav) channels. These toxins, named the α-nemertides, were discovered in the epidermal mucus of *Lineus longissimus*, also known as the 'bootlace worm'. The most abundant peptide, the 31-residue long α-1, was isolated, synthesized, and its 3D NMR structure was determined. Transcriptome analysis including 17 species revealed eight α-nemertides, mainly distributed in the genus *Lineus*. α-1 caused paralysis and death in green crabs (*Carcinus maenas*) at 1 µg/kg (~300 pmol/kg). It showed a profound effect on invertebrate Nav channels expressed in *Xenopus laevis* oocytes (e.g. *Blattella germanica* Nav1) at low nanomolar concentrations. Six more nemertides were discovered by the mining of available nemertean transcriptomes. Nemertides α-2 to α-7 (2-7) were produced and their effect on insect and mammalian Nav channels was investigated using the two-electrode voltage-clamp technique. In addition, ion channel activities were matched to *in vivo* tests using an *Artemia* microwell assay. Although nemertides demonstrate high sequence similarity, they display variability in activity on the tested Navs. The nemertides are all highly toxic to *Artemia* and all manifest a preference for the insect BgNav1 channel. In-depth structure-activity relationship analysis of α-1 revealed the key residues for Nav-subtype selectivity. Combined with low EC50 values this underscores the potential utility of α-nemertides for rational optimization to improve selectivity. Moreover, the strong selectivity for insect over human Nav channels indicates that α-nemertides can be promising candidates for the development of bioinsecticides. Furthermore, we discuss the potential clinical application of nemertide α-1 in a severe case of cardiac sodium channelopathy with Brugada syndrome where nemertide α-1-dependent reduction of channel inactivation could restore the variant's loss-of-function effect.

Keywords: Toxins; Drugs; Bootlace worm; Nemertides.
Financial support: Not applicable.

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ENVENOMINGS BY AQUATIC ANIMALS

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The most injuries caused by aquatic animals are caused by sea urchins (approximately 50% in bathers), followed by occurrences caused by cnidarians - jellyfish and Portuguese man-o´war - (25%) and venomous fish (also 25%). Certain venomous fish such as catfish, stingrays, scorpionfish and toadfish can cause skin necrosis at the point of inoculation of their fin rays and adapted bone structures (fin rays and stingers). All these envenomations cause pain of varying intensity that na be associated with fever, malaise, adenopathy, nausea and vomiting, although most fish toxins have a local effect. The occurrences caused by animals in Brazilian rivers and lakes are almost entirely caused by fish similar to venomous marine species (catfish/mandis and freshwater stingrays). The therapeutic measures of first aid and late for the control of these accidents will be discussed during the presentation. Regarding the studies of the properties of these venoms, we see that several lines of research are developed in the country, such as studies with venoms from catfish, mandis, freshwater and marine stingrays, toadfish and scorpionfish. With these clinical and experimental advances, we believe that joint studies and comparisons between clinical signs and symptoms and laboratory studies complement each other, allowing the recognition and identification of therapeutic methods and the intensification of new research on this little-known chemical arsenal.

Keywords: Stingrays; Venom; Aquatic animals; Cnidarians.
Financial support: Not applicable.

ABSTRACT 80

ENVENOMINGS BY NON-USUAL ARTHROPODS

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Venomous and poisonous arthropods are common in the Nature. Some of them are known only through popular accounts and incomplete and vague descriptions. This review shows some of them, proven to be carriers of toxins capable of causing inflammation in human skin. Poisonings caused by Belastomatidae, Pentatomidae, Cerambycidae and *Fulgora* will be demonstrated. The author presents a review of human dermatitis caused by the Belastomatidae, Cerambycydae and Pentatomidae families. The review is based on previously published articles, with extensive iconographic documentation and clinical evidence of envenomations. Belastomatidae (giant water cockroaches), Cerambycidae (scorpion beetle) and Pentatomidae cause pain and inflammation at the point of the bite or sting. The *Fulgora* cicadas (jequitirinabóia) are harmless arthropods accused by the rural population of being extremely venomous animals.

Keywords: Venom; Arthropods; Poisoning.
Financial support: Not applicable.

ABSTRACT 81

MAPPING OF RESOURCES, SECTORS OF CARE AND DIMENSIONS OF ACCESS FOR THE TREATMENT OF SNAKE ENVENOMATION IN THE BRAZILIAN AMAZON

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Snakebite envenomings (SBEs) and other envenomings triggered by venomous animals (VAEs) represent a significant disease burden in Brazil, with 29,152 SBEs reported in 2021 alone with nearly half of those occurring in the remote Brazilian Amazon. In 2021, Brazil recorded 240,294 envenomings from snakes, scorpions, spiders, and caterpillars. Therefore, there is an unequal distribution of SBEs with high morbidity and mortality in the Brazilian Amazon. The severity of SBEs increases when patients require more than 6 h to access antivenom treatment, a common issue for the rural and indigenous populations. Understanding currently available resources and practices in Amazon remote areas of Brazil can serve to inform future interventions and guide health care policies. This study aims to develop a resource map of existing healthcare resources for the Brazilian Amazon's clinical management of VAEs with emphasis in SBEs, which will aid future strategic interventions. Data collection included a literature review, secondary data collected by government departments and organizational records, GIS mapping activities, and expert input. Our framework was guided by the three levels of healthcare service ecosystem analysis (macro, meso, and micro). Our resource map lays out a comprehensive overview of antivenom access, the distribution landscape, differences in patient transportation, and barriers to access healthcare that face populations in the Brazilian Amazon.

Keywords: Amazon; Snake bite; Poisoning; Brazil.
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ABSTRACT 82

Crotalus durissus ruruima VENOMICS: ADVANCES THROUGH A NOVEL MASS SPECTOMETRY METHOD

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In Brazil, rattlesnake bites represent 20 to 30% of registered snakebites, resulting in great concerns due to the lethality associated with the venom-induced acute kidney failure. Although there are 5 subspecies of rattlesnakes in Brazil, the subspecies *Crotalus durissus ruruima* (Cdc) has demonstrated great importance in the state of Roraima due to the toxicity of the envenomings and severity induced by them. Even though, the venom composition of this subspecies is still low explored, lacking venomic studies in the literature. The present study aims to evaluate the proteome of the yellow venom of the subspecies *Cdc*, assessing possible new biomolecules. This study is regularized by the *Sistema de Autorização e Informação da Biodiversidade* (SisBio n. 79102). To carry out this research, *Cdc* yellow venoms were collected and stored at -20 °C. Then, 10 µg of each venom were diluted in ultra-pure water and submitted to a reduction and alkylation followed by digestion with Trypsin, GluC and Chymotrypsin. The digested materials were injected on the Acquity M-Class UPLC, hyphenated to a Q Exactive (Thermo Scientific), in nanoelectrospray positive ion mode. Protein identification by automated *de novo* sequencing was performed using the software Peaks Studio X+, with database created by the deposits related to "Snake Venom" family in the UniProt repository, downloaded in June 2022 (75,818 sequences). Although the main crotalid toxins have already been reported in *Cdc* using proteomics, several other toxins had not been described in this subspecies, which may be important for the toxicity of envenomings in Roraima. Indeed, the present study identified novel compounds never such as phospholipase B, phosphodiesterase, cathepsin, hyaluronidase, growth factor, nucleotidases, and bradykinin potentiating peptide. This study demonstrates the importance of knowing more the local biodiversity of Roraima and deeply explore the venoms' protein cocktails of snakes to understand the severity of envenomings in the region as well as to search for potential pharmacological and biotechnological compounds.

Keywords: *Crotalus d. ruruima;* Venomics; Mass spectrometry; Proteomics.
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ABSTRACT 83

REVEALING THE DIFFERENCES OF THE *Crotalus durissus ruruima* WHITE AND YELLOW VENOMS: VENOM PROFILE AND BIOLOGICAL FUNCTIONS

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In Brazil, rattlesnakes are represented solely by the species *Crotalus durissus*, which is subdivided into five subspecies distributed in different regions of the country. Due to the distribution of the subspecies in the country, their venom compositions present variations leading to different manifestations and severities of the envenomings. Among the subspecies, *C. d. ruruima* (*Cdr*) inhabits exclusively Roraima state and can also present different types of venom: yellow and white. Rattlesnakes' venoms are major composed of phospholipases, serineproteases, metalloproteases, and crotoxins that denote the lethal neurotoxic character of the envenoming. However, little is known regarding the intraspecies venom variations (*i.e.*, white and yellow venoms). Thus, bioprospective and functional studies becomes very important to understand such differences. This study aimed to study the white and yellow venoms of the snake subspecies *Cdr*, analyzing intraspecific differences in these venoms, in addition to the search for new components. Venoms were collected from *Cdr* snakes from different regions of Roraima, and a pool of white and yellow venoms was stored. Crude venoms were centrifuged at low speed to remove cells and debris, lyophilized, and stored at -20 ºC. For the analyzes and evaluation of the venoms' profiles the Fast Protein Liquid Chromatography (FLPC) and TRICINE-SDS-PAGE methods were used. Also, we performed enzymatic analyses to evaluate activities of hyaluronidase, L- amino oxidase (LAAO), and Phosphodiesterase (PDE) and Caseinolytic. The presence of Vascular Endothelial Growth Factor (VEGF) was assessed through recognition by anti-VEGF antibodies. In addition, an *in vitro* immunomodulation assay using peripheral blood neutrophils was performed. Although the results are still preliminary, *Cdr* venoms demonstrated biochemical and function variations. Indeed, both yellow and white venoms were able to induce the formation of NETs (Neutrophil Extracellular Traps). This study highlights the need for further studies on *Cdr* venom to better understand the venom profile and role of NETs during crotalid envenomings. Moreover, individual variations studies may contribute to a better understanding of the clinical outcomes caused by these rattlesnakes in Roraima, which are usually followed by intense pain, bleeding, and high rates of deaths.

Keywords: Rattlesnakes; *Crotalus*; Envenoming; Venom; NETs.
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ABSTRACT 84

ANALGESIC AND ANTIBIOTIC THERAPY USED IN SNAKEBITE IN A REFERENCE HOSPITAL IN MANAUS

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Snakebite by *Bothrops atrox* causes local pain and edema that may extend to ecchymosis, blisters and bleeding at the site of the bite and in some cases compartment syndrome and necrosis. To describe the prevalence of analgesia and antibiotic therapy in the treatment of snakebite, correlating the two groups in a clinical trial of the use of local laser therapy, and to verify the drug therapy used in pre-existing comorbidities was the aim this project. This is a cross-sectional, retrospective study with a quantitative methodological approach, developed in Manaus at the Fundação de Medicina Tropical Doutor Heitor Vieira Dourado (FMT-HVD), where 60 patients victims of snakebite were included in a clinical trial were analyzed, then 30 patients were control and 30 who received laser therapy between 2020 to 2022. Dipyrone was the most used analgesic in the first 24h of hospitalization followed by tramadol (100 mg/intravenous), in relation to the 2nd and 3rd day of hospitalization by appointment, the prevalence of systemic use was 21.3%, while the use only if necessary totaled 71.7% in both groups. In comparison between the control and laser group, it was observed on day 2 and 3, that the patients who underwent laser therapy, used about 10% less systemic analgesics than the control group. Clindamycin (600mg/intravenous) was the drug most often used followed by ciprofloxacin and gentamicin in the treatment of secondary infections. Dipyrone prevailed in analgesia, in patients who developed secondary infection clindamycin was the most commonly used antibiotic, and patients in the group that received low-intensity laser used fewer analgesics.

Keywords: Snake bite; Snake Poisoning; Drug therapy; Laser therapy.
Financial support: Fundação de Amparo à Pesquisa do Estado do Amazonas – FAPEAM.

ABSTRACT 85

PERSPECTIVES ON SNAKEBITE EVENOMING CARE NEEDS ACROSS DIFFERENT SOCIOCULTURAL CONTEXTS AND HEALTH SYSTEMS: A COMPARATIVE QUALITATIVE ANALYSIS AMONG US AND BR HEALTH PROVIDERS

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With the advancements in therapeutics and available treatment options, almost all deaths and permanent disabilities from snakebite envenoming (SBE) are preventable. The challenges lies in implementing these evidence-based treatments and practices across different settings and populations. This study aims to compare data on provider perceptions of SBE care across health systems and cultural contexts to inform potential implementation science approaches. We hypothesize different health systems and cultural contexts will influence specific perceived needs to provide adequate snakebite care within central tenets of care delivery (e.g., cost, access, human resources). We previously conducted exploratory descriptive studies in the US and Brazil in order to understand the experience, knowledge, and perceptions of health professionals treating SBE. In the US, in-depth interviews were performed with emergency physicians from January 2020 to March 2020. In BR, focus group discussions were conducted with health professionals from community health centers at the end of June 2021. The focus group discussions (BR) were originally analyzed through an inductive thematic analysis approach. We conducted a secondary qualitative analysis in which this codebook was then applied to the interviews (US) in a deductive content analysis. The analysis concluded in August 2022. Brazil participants were physicians (5) or nurses (20) from three municipalities in the State of Amazonas with an average of three years of professional experience. USA participants were emergency physicians (16) with an average of 15 years of professional experience. Four main themes emerged: 1) barriers to adequate care on the patient and/or community side and 2) on the health system side, 3) perceived considerations for how to address SBE, and 4) identified needs for improving care. There were 25 subthemes within the four themes. These subthemes were largely the same across the Brazil and USA data, but the rationale and content within each shared subtheme varied significantly. For example, the subtheme "role of health professionals in improving care" extended across Brazil and the USA. Brazil emphasized the need for task-shifting and -sharing amongst health care disciplines, whereas the USA suggested specialized approaches geared toward increasing access to toxicologists and other referral resources. Despite similar core barriers to adequate snakebite envenoming care and factors to consider when trying to improve care delivery, health professionals in different health systems and sociocultural contexts identified different needs. Accounting for, and understanding, these differences is crucial to the success of initiatives intended to strengthen snakebite envenoming care. Implementation science efforts, with explicit health professional input, should be applied to develop new and/or adapt existing evidence-based treatments and practices for SBE.

Keywords: Implementation science; Snakebite envenoming; Care delivery.
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ABSTRACT 86

ACUTE MESENTERIC ISCHEMIA FOLLOWING LANCEHEAD SNAKEBITE: A RARE CASE REPORT IN BRAZILIAN AMAZON

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Snakebites in Brazil represents approximately 29,000 accidents per year characterizing an important public health problem, albeit neglected. The main snake genus responsible for snakebites in the country is *Bothrops*, which the venom can induce local manifestations (e.g., pain, edema, and necrosis) and systemic alterations (e.g., coagulopathies). This study presents a rare case report of a male indigenous patient from the Yanomami ethnicity, 33 years-old, envenomed by a *Bothrops* spp. (probably *B. atrox*), while hunting. The victim was admitted to the main hospital of Roraima (*Hospital Geral de Roraima Rubens de Sousa Bento)* for snakebite treatment approximately 3 days after the accident, presenting pain in the right iliac fossa, in addition to abdominal distension, edema, as well as intense pain in the right malleolar region (body segment bitten by the snake). On physical examination, the patient was in regular general condition, dehydrated, acyanotic, afebrile, with edema in the right ankle and pain on palpation of the abdomen. On admission, blood was also collected for laboratory tests. Laboratory results demonstrated some parameters outside the reference range (e.g., clotting time and lactate dehydrogenase). The patient received the antivenom specific therapy (12 ampoules of botropic antivenom). However, on the same day, the patient evolved with worsening pain, which started to affect the right flank, without irradiation to the back, but with signs of peritonitis. Two days after hospital admission, the patient underwent a computed tomography (CT) of the abdomen and pelvis. Imaging revealed small ascites (small amount of free fluid in the abdominal cavity), in addition to small to moderate distention of intestinal loops with fluid repletion and air-fluid level. Five days after admission, the patient underwent an exploratory laparotomy where, during the procedure, ischemia and necrosis of the proximal ileum were observed, and a segmental enterectomy was performed with subsequent side-to-side anastomosis. The patient was clinically followed up for 27 days in the infectiology department of the hospital and was finally discharged and refereed to the *Casa do Indio* (CASAI) to be monitored. After 13 days at CASAI, the patient returned to his isolated community (Waiamu community - Hakoma pole - demarcated by the Yanomami indigenous land). This clinical report demonstrates the impact of snakebites on Brazilian public health, besides evidence rare complications that venoms from Amazon region can induce. Moreover, the study shows that snakebite patients may need long periods of hospitalization and specialized services (e.g., surgical procedures), specially for indigenous people that reach the health services after long period of the bite, resulting in high costs for the Brazilian Minister of Health along to great psychosocial impact for the victim.

Keywords: Snakebite envenoming; Lancehead; *Bothrops atrox*; Roraima; Necrosis; Ischemia.
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ABSTRACT 87

HEALTHCARE IN SNAKEBITE VICTIMS: A LOOKOUT ON A BIGGER SCENE

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In regards of the preventive model on public health proposed by Leavell and Clark, where primary prevention seeks to avoid the health aggravation, secondary prevention seeks to provide early diagnosis and proper treatment, tertiary prevention seeks to minimize damage and rehabilitation of those who are affected by the event, each degree of complexity is a strategy that allows the planning of health care providers. Nonetheless, two other degrees of prevention should find themselves on a proper spotlight, quaternary prevention which seeks the avoidance of excessive intervention and iatrogenic acts, and quinary prevention which seeks to dispel misinformation, and additional prevention level would be to provide care to the caretaker. Although there are other preventive models, such as the "Spectrum of Prevention" proposed by Larry Cohen in 1983, which focuses on individual measures and patient education, this article focuses on the model of Leavell and Clark for argument's sake. In order to identify the weak points on the chain of care provided by both the public and private health systems, it is imperative for one to understand how it works, evolves and connects itself to the other points of care, therefore allowing for a proper planning, which, in Brazil is executed under the care of the Basic Health Unit due to the Family Health Strategy. Educational measures are, by definition, an activity of primary prevention, seeking to avoid the health aggravation, yet being capable of changing the natural history of the event, preventing further damage and abbreviating the time before proper medical assistance and definitive treatment as long as the proper means are provided. In regards to secondary prevention, more specifically the chain of supply of the proper antivenom serum is a particularly fragile link, as it has to face both logistics of a continental country and the hardships of proper cooling and storage. Many solutions are proposed and are being studied, ranging from improvement on the supply chain and transport to more resilient serum, preferably those on the lyophilized presentation. On the other hand, when facing the step of the tertiary prevention, which mostly concerns physical sequelae, from amputation, limb necrosis with tissue retraction, and Post Traumatic Stress Disorder, the necessary approach must be individualized and therefore demands the availability of a well-structured and widely equipped multiprofissional team. Psychological morbidity has been explored as a recurring phenomenon due to a multitude of cultural, medical and economical factors that permeate the reality of many of the Yanomami communities in Brazil. Nonetheless, further studies and professional collaboration have brought up to light that the psychological morbidity resulting from physical damage and the traumatic event is a problem that affects not only indigenous populations from other ethnicities, but non-indigenous as well. The recent pandemic has brought to light the need of constant surveillance in order to guarantee that no excessive measures, nor those without proven benefits are taken, as well as guarantee the well-being of the care providers.

Keywords: Public Health; Envenomation; Preventive Medicine; Tropical Medicine; Snake bite.
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DISCOVERING MONOCLONAL ANTIBODY FRAGMENTS TARGETING METALLOPROTEASES FROM *Bothrops* SNAKE VENOMS

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Snakebites are categorized into the category A of the Neglected Tropical Diseases (NTDs) since 2017. This NTD affects more than 5 million people worldwide, which results in more than 100,000 deaths and around 300,000 amputations or other permanent disabilities. Pit vipers from *Bothrops* genus are responsible for causing 80-90% of snakebite envenomings in Brazil, due its distribution throughout the national territory. Their venoms are known to be haemorrhagic, proteolytic, and coagulant, characteristics that are responsible for many of their local and systemic manifestations, because they are mainly composed of metalloproteases (~30-70%), phospholipases (~7-40%), and serine proteases (~2-24%), varying quantitatively between them. The unique treatment for snakebite envenoming is the heterologous antivenom administration, which has several disadvantages regarding its use since they can trigger anaphylaxis and Serum Sickness. Thus, new technologies for antivenom development are still necessary, such as the phage display technique, which allows the selection of fully human antibodies against several antigens. Our study aimed the selection and production of fragments of human monoclonal antibodies (scFvs) against metalloproteinases from *Bothrops* snake venoms, through phage display. Our preliminary results show that the four panning rounds were sufficient and successful to phage-antibodies selection against jararhagin, demonstrated by a gamut of specific antibodies through ELISA. Monoclonal ELISA was performed to determine the clone that recognize jararhagin with the best affinity. This clone was used to produce the soluble scFvs through heterologous expression and purified by affinity chromatography. This study reports the selection and production of the first human fragment antibody against metalloproteases from *Bothrops* snakes, which will be tested in our next steps, and could be included in the formulation of a new generation of antibotropic serum.

Keywords: *Bothrops*; Phage display; scFv; Metalloprotease; Antivenom.
Financial support: We thank *Fundação de Amparo à Pesquisa do Estado de São Paulo* (FAPESP, São Paulo Research Foundation (scholarship to ISO No. 2020/13176-3).

ABSTRACT 89

PIONEERING ISOLATION AND FUNCTIONAL CHARACTERIZATION OF A VASCULAR ENDOTHELIAL GROWTH FACTOR FROM *Crotalus durissus terrificus* SNAKE VENOM

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Snake venoms are rich sources of components with important pharmacological effects. However, many components have not been isolated yet. Vascular endothelial growth factors (VEGFs) are non-enzymatic homodimers of 20-30 kDa with angiogenic properties. Although VEGF have already been identified by omics analysis in the *Crotalus durissus terrificus* (*Cdt*) venom, it was not isolated so far and its role in the envenoming pathophysiology remains unknown. In the present study, a new VEGF from *Cdt* venom (*Cdt*VEGF) was isolated. *Cdt* venom was fractionated by reversed phase chromatography, using a C-18 column, and all the fractions collected (30) were submitted to an ELISA assay for VEGF identification. Positive fraction for VEGF was submitted to an anion exchange chromatography for *Cdt*VEGF purification. Isolated *Cdt*VEGF was analyzed by mass spectrometry and was identified as a homodimeric protein with molecular weight around 25 kDa for the dimer and 13 kDa for the monomer. Afterwards, it was successfully chemically modified with a mPEG-maleimide molecule of 5 kDa. *Cdt*VEGF and PEG-*Cdt*VEGF were able to induce migration of human vascular endothelial cells (HUVECs) through *in vitro* scratch assay, with 81% and 63.3% of wound closure in 24 hours. Also, they were analyzed regarding their ability to promote leucocyte recruitment to the peritoneal area and vascular permeability in C57Bl/6 mice (approved by CEUA - 21.1.611.60.6), using three concentrations (0.01, 1, and 5 nM). Leucocyte recruitment was minimal for all tested concentrations of PEG-*Cdt*VEGF, when compared to the native form, which showed a dose-dependent increase. The vascular permeability was determined by the quantification of proteins in peritoneal exudates. The native *Cdt*VEGF groups showed a dose-dependent increase in protein when compared to the negative control group, while for PEG-*Cdt*VEGF groups the protein quantification was similar to negative control, showing that the chemical modification of the molecule was able to reduce the vascular permeability that *Cdt*VEGF induces. This work is pioneer on the isolation and characterization of VEGF from *Cdt* venom with enlightening results about the roles of VEGFs from snake venoms.

Keywords: Vascular permeability; Snake; Snake venom; VEGF.
Financial support: CAPES (scholarship financial code 001), FAPESP (2019/10173-6).

ABSTRACT 90

CURRENT KNOWLEDGE ON THE KAMBÔ (*Phyllomedusa bicolor*): A MEDICALLY IMPORTANT AND EMBLEMATIC TREEFROG FROM AMAZONIA

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The giant leaf frog, *Phyllomedusa bicolor* (Phyllomedusidae), is an iconic and widely distributed tree frog from the Amazonian biome that has high relevance for some of the indigenous communities that live in this region. This species' skin secretion is a white-colored poison rich in bioactive peptides used by the indigenous populations in healing and purification rituals, to bring luck to hunters, and to increase stamina. Studies with indigenous communities observing the biological effects of this ritual self-envenomation have fascinated researchers for decades. The giant leaf frog venom has been studied to detail the chemical composition and the potential pharmacological applications of its constituents. Since the first peptide was isolated and characterized in 1966, more than 277 new active peptides with unique sequences from frogs' skin secretion of this genus have been discovered. Therefore, it is a pharmacologically important taxon because it is considered a rich source of biologically active peptides, many of which have already been identified or characterized although it is estimated that there are numerous compounds yet to be discovered. During the Kambô ritual, the Shaman healer makes burns in the form of points with a thin vine and applies the *P. bicolor* secretion to the wound. The reaction is induced within minutes, after the application of a dose-dependent, often strong including tachycardia, sweating, and severe vomiting, which subside in about 60 minutes, followed by a state of apathy and sleep, lasting one to several minutes, or days. Currently, the use of Kambô has spread to large urban centers, especially in clinics that use it as an alternative therapy and for religious purposes, still with the original objectives of prevention and treatment of a series of illnesses and traditional syndromes. The expansion of the use of Kambô has raised concerns about biopiracy, with reports of use in European countries and the United States. Despite this, the main application centers are located outside the distribution area of the species, and there is no information on how individuals and secretions reach these sites since the exact origin and taxonomic accuracy of the sampled individuals are rarely mentioned at the application centers. Given this fact, indigenous communities and health agents fear the misuse of Kambô, or that inappropriate species are used, which can result in critically-ill envenomation or even death of users. There are no management protocols for these cases of envenomations, and supportive care has been adopted in the few reports found in the literature. The richness of bioactive peptides with different biological activities is responsible both for the signs and symptoms of their popular use and for the envenomations. Several studies, especially *in vitro*, have been carried out to better understand the chemical nature of these peptides and their biological effects.

Keywords: Bicoloured tree-frog; Giant leaf frog; Kampô; Vacina do sapo; Frog vaccine.
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ABSTRACT 91

THE PLACE OF SNAKE ENVENOMING A RIVERSIDE COMMUNITY IN THE BRAZILIAN AMAZON: A QUALITATIVE STUDY

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In the Amazonas state (AM) in Brazil the incidence of snakebite envenoming reaches 200 cases by every 100.000 inhabitants in some areas, being considered one of the highest rates of snakebite envenoming in the world. Due to the territorial extension and plurality of peoples that inhabit the region, it is essential that field research is carried out to understand the grievance and perceptions that surround it, to develop effective health care strategies in the future. The objective of this study was to describe the perceptions of the riverine people in the Brazilian amazon about snakebite envenomation. This is a field study, carried out in a community located in the municipality of Tabatinga, in the interior of the state of AM. In which in-depth interviews (IDIs), focus groups (FGs) and participant observations were carried out. Rapid qualitative research analysis was adopted to obtain the results. The study was submitted to the Ethics Committee on Research Involving Human Subjects of the Fundação de Medicina Tropical Dr. Heitor Vieira Dourado (FMT-HDV) an approved (CAEE: 40850020.1.0000.0005). The presence of venomous snakes in the vicinity of houses is considered common by riverine people, in this context most men report not being afraid because it is something that "will never end, on the other hand, women report feeing afraid and turn to a man to solve the problem. There are several beliefs about the accident and the animal, such as: birth of children immune to envenomation, pregnant women cannot look at the injured person, use of a tourniquet to prevent the circulation of venom, incisions, plasters and that snakes are enchanted beings. They understand the accident as a serious health problem that requires medical assistance. Despite frequent contact with snakes, accidents are rare, as most use boots as protective equipment in agriculture and fishing activities. According to the participants, above snake envenomation, there is a list of the most common accidents with venomous animals, they are: accidents with scorpions, spiders, stingrays, bees, spur fish, ants, caterpillars, and centipedes. They report that the type of accident depends on seasonal changes, for example: scorpion, centipede and spider are common in the flood season, while spur fish, stingrays, caterpillars, bees and ants, in the drought season. Snakebite envenomation is a serious health problem, the rates are significant, however it is not the only problem related to venomous animals that occur in the region, according to the participants. For this reason, field studies are needed to understand the plurality of peoples that exist in the Amazon and the health problems that surround them.

Keywords: Snakebite Envenomation; Riverine; Field research; Qualitative research.
Financial support: Approved resources from the Programa de Apoio à Consolidação das Instituições Estaduais de Ensino e/ou Pesquisa – PRÓ-ESTADO from the Fundação de Amparo à Pesquisa do Estado do Amazonas (FAPEAM).

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REVEALING A NOVEL ACTIVITY OF 3-ALKYLPYRIDINIUM COMPOUNDS FROM THE SPONGE, *Haliclona (Rhizoniera) sarai,* ON VOLTAGE-GATED POTASSIUM CHANNELS

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Over the years, the plethora of marine bioactive molecules targeting many ion channels, including voltage-gated potassium channels, became a hot topic. In this context, sea sponges are known to be one of the richest sources of bioactive compounds. Among the six hundred species classified so far, *Haliclona (Rhizoniera) sarai* is native to the Mediterranean and the Adriatic Sea. Included in its bioactive compounds are polymeric 3-alkylpyridinium salts (poly-APS), formerly known as acetylcholine receptor (AChR) inhibitors. Using *Xenopus laevis* oocytes and the two-electrode voltage-clamp technique, here we demonstrate the novel activity of three different poly-APS compounds (APS7-2, APS8-2, and APS12-3) on human voltage-gated potassium channels (hKvs). From the eleven potential targets, comprising eight homomeric Kvs and two voltage-gated sodium channels, hKv1.1 and hKv1.6 were inhibited by nanomolar concentrations of APS7-2 and APS12-3. Furthermore, the heteromeric assembly combinations of hKv1.1-1.2 and hKv1.2-1.6 were assessed and indicated that the positioning and ratios of these related α-subunits influence the biophysical and pharmacological properties of these polymeric ligands. Poly-APS are now part of a select group of homomeric hKv1.1, hKv1.6, and heteromeric hKv1.1-1.2 and hKv1.1-Kv1.6 inhibitors, targets that play a crucial role in diseases striking the CNS and the heart.

Keywords: Sea sponges; Voltage-gated potassium channels; *Haliclona (Rhizoniera) sarai*.
Financial support: Not applicable.

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THE PROFESSIONAL SECTOR OF HEALTH CARE FOR INDIGENOUS PEOPLES AFFECTED BY SNAKEBITE ENVENOMING'S IN BRAZILIAN AMAZONIA: AN ANALYSIS THE HEALTH PROVIDER'S PERSPECTIVE

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Cultural aspects associated with the precariousness of transport logistic and limited access to health system, especially in indigenous communities, are decisive in the evolution of patients affected by snakebites. Thus, studies that assess the perception of the population affected by snakebites and the health professional who serve this population can provide important information for understanding the positive and negative factors that affect the outcome of snakebite. Understand the perception of professionals and describe barriers to access to health services by indigenous peoples. This is an exploratory qualitative study and the analytical framework used was inductive thematic analysis. The study was carried out in Manaus and Boa Vista, where discussion was held in 4 focus groups with the participations of 27 health professionals (Boa vista) and 29 (Manaus). Data were collected on knowledge and experiences with the snakebites in the exercise of the profession. The thematic analysis of the focus groups allowed the identification of 4 main themes: 1) Challenges for indigenous medical care: Health professionals described the precariousness of the infrastructure for medical care for indigenous people, difficulties in communication between Heath units and lack of inputs. 2) Hazard and challenges faced during medical work: Professionals report occupational hazards that put their lives at risk, such as plane crashes, territorial conflicts and snakebites. 3) Cultural aspects and communication between professionals and patients: Difficulties were reported in offering care to indigenous people. When there is a need for removal due to refusal of the same due to their beliefs. 4) Optimal working conditions: It was reported that in order to provide optimal care to indigenous people in the area, inputs are needed, such an antivenom and the availability of various antibiotics needed to assist them in the treatment of patients and avoid possible complications, reducing the need to remove patients for hospitals. The perception of health professionals who work with this population is important for the maintenance of a permanent intercultural dialogue and should be evaluated and considered in disease control programs.

Keywords: Snakebite; Indigenous; Health professionals; Perception; Qualitative research.
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ASSESSMENT OF ANTIVENOM ADMINISTRATION IN BRAZIL

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Snakebites envenoming (SBE) is considered a neglected tropical disease, responsible for high morbidity and mortality rates worldwide. In Brazil, as in another countries, SBE affects mainly poor populations and remote areas residents, which health and education access are limited. People in productive age are more vulnerable and impact family income when affected by SBE. The snake venom is composed by biochemical components that results in clinical characteristics like pain, oedema, myonecrosis, blistering, hemorrhage, renal failure, shock, compartment syndrome and, in some cases, amputations. The Ministry of Health recommended treatment is the antivenom (AV) administration, most effective when used properly and quickly. Clinical and epidemiological information about SBE occurred in Brazil are stored in 'Notifiable Diseases Information System' (Sistema de Informação de Agravos de Notificação - SINAN). Through this tool it's possible to easily obtain open data for multiple purposes and research. Epidemiological studies involving this theme are important because it offers an overview of SBE and guarantee strategies to improve treatment conditions to the victims. In this way, the objective of this study is to assess the quality of AV administration in SBE notified in Brazil between 2007 and 2020. For this, SINAN's open databases were obtained, extracted and unified through RStudio 4.2 software. A total of 2,422,825 accidents by venomous animals were identified and, after filtering it, 400,848 snakebites cases were found. It was observed that the majority of SBE were bothropic (287,353/400,848; 71.69%), followed by ignored notification (46,878/400,848; 11.69%), crotalus (31,290/400,848;7.81%), non-venomous (21,359/400,848; 5.32%), laquetic (10,677/400,848; 2.66%) and elapid (3,291/400,848; 0.82%). The administration of AV in underdoses were higher in laquetic (7,146/10,092; 71%), in highest proportion in Southeastern region (13/13;100%), followed by elapid (1,895/3,030; 63%) in South (169/237;71%), crotalus (13,312/29,596;45%) in North (1,571/2,581;61%), and bothropic (37,173/272,388;14%) in Northeast (10,001/56,722;18%). High dosages were predominantly in bothropic (47,989/272,388;18%), mainly in Northeast (13,022/56,722; 23%) and South (6,390/28,271;23%) regions; and in crotalus (3,815/29,596;13%) and elapid (71/3,030;2.3%), both with more occurrences in Northeast (1,604/10,866; 15%;62/1,584;3.9%). There wasn't high dosages in laquetic treatment. With those informations, its possible to identify therapeutic failures in AV administration. Underdosage may occur by AV shortages at access points, and both inadequacies could also be related to lack of trained professionals, mainly where SBE are frequently and there's no health care. The results presented by this research may allow the search for intervention strategies in SBE management and treatment in Brazil, according to each region needs.

Keywords: Antivenom; Snakebites envenoming; Brazil; SINAN.
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