



— BIODIVERSITY

São Paulo in the Amazon region

Teams from São Paulo and Pará collaborate to prepare new researchers and studies on the poisonous species of the north

Marili Ribeiro



I remember well when I presented a study in 2005 here at the Butantan Institute, and a colleague remarked that if we are able to graduate a PhD candidate, our mission will have been accomplished.” Thus recalls Ana Moura da Silva, responsible for coordinating the Pará teams and researchers from the Butantan Institute’s National Institute of Science and Technology in Toxins (INCT-Tox), as well as the Amazon Region Actions Subprogram for the Butantan Institute’s Amazon region research program. “We’ve been able to train new researchers and are already prepared for much bigger challenges,” says Silva.

Considerable advances have taken place in the fields of biology, biochemistry and pharmacology. Among others, Silva points to: 1) the survey on snake and scorpion varieties in the Tapajós National Forest (Flona) near Santarém; 2) a revised and expanded classification of neotropic spiders of the *Haplogynae* variety; 3) a detailed study of the pharmacological effects of *Tityus paraensis* scorpion poison; 4) a study of plants – also regarded as basic inhibitors to animal toxins – that are used as antidotes against the venom of snake species in the Amazon region; and, in the medical field, 5) the expansion of knowledge about the symptoms of poisoning from animal toxins as well as the process involved through the use of reports and follow-up data on patients treated at the Santarém municipal hospital, as well as studies into the history of public health at Belterra, in Pará.

The effort achieved results that went beyond what was initially expected, largely owing to the support of experienced researchers from the Butantan Institute and experts who had previously

been dispersed throughout Pará’s research centers. Now working together, these researchers recall what Otávio Mercadante – the institute’s director and coordinator of the program at its inception – often said: “It wouldn’t have made any sense to do anything together if we didn’t draw on the local expertise.”

Before the first 2006 meeting of Butantan experts and specialists from institutions in the state of Pará that took place in Santarém, Mercadante had brought together the support of city and state governments, Pará and São Paulo foundations that finance research, and even the ministries of Education and Science and Technology to carry forward studies along three paths: the biodiversity of the Amazon region, the processes of animal toxins and the region’s public-health history. In addition, a study is underway with physicians and local health officials looking at treatment options in cases of accidents involving venomous animals. Furthermore, the Butantan team has put together and distributed a booklet on the region’s venomous animals.

The partnership that united the teams and the two states has proved to be a productive one. “This year, Hipócrates Chalkidis from the Goeldi Museum’s post-graduate program will have concluded his doctoral research, and Valéria Moura Mourão, from the post-graduate program in natural resources of the Amazon region at the Federal University of Pará (UFPA), will have completed her master’s. These are no small achievements,” says Ana Moura, who, in addition to her research work at Butantan, teaches in the post-graduate program in natural resources of the Amazon region at UFPA, in Santarém. There are another four master’s programs as well as three special-

Salamanta or red
boa constrictor
(*Epicrates
cenchria crassus*),
Amazonas, 1989

ization programs underway at the Butantan Institute, all attended by students from the state of Pará who can do part of their work in São Paulo before returning to complete their tasks in their own region.

“As of 2009,” says Moura, “meetings with community organizations and Pará-based institutions forged ahead with inflows of INCT-Tox and FAPESP funds targeted for research and scholarships for students from Santarém and São Paulo. We just approved two major phases with the Coordinating Agency for the Improvement of Higher Education Personnel (Capes) that involved over R\$ 7 million in financing for research projects and scholarships that will include the participation of research centers from Rio de Janeiro and Minas Gerais.”

Increasingly more inter-institutional and national in scope, even to the point of attracting the interest of biomedical research groups from abroad, the Butantan Institute’s Amazon region research program is currently comprised of more than 50 qualified professionals from at least 12 federal, state and local institutions concerned with the environment, science and public health.

Collaboration among the teams facilitates the search for new remedies from the plant and animal toxins from the Amazon region. It also puts to good use the investments already made in buildings, equipment and human resources in São Paulo. Some researchers work towards a better understanding of how

scorpion venom can affect humans, thereby developing new poison-control methods, while others attempt to develop biodegradable chemical compounds to use against scorpions where they tend to thrive in large numbers.

The researchers also extract venom from the snakes they collect in the Tapajós National Forest and they are learning more about its effects by conducting experiments on laboratory animals. One of the Butantan groups is currently examining the effectiveness of serums that the institute produces on a regular basis as remedies against snake bites, with particular attention on the coagulation of blood. “We’re delving deeper into studies about the changes in coagulation that are caused by animal toxins,” says Moura.

SNAKES AND SCORPIONS

Biologist and future PhD recipient Hipócrates Chalkidis began his trajectory through this project more than two years ago with frequent sojourns to the Tapajós National Forest to collect snakes with biology students from the Tapajós Integrated Colleges (FIT) where he is a

The effort to gather venom brought together the experts from São Paulo and the doctors from Pará

professor. The traps set for the snakes also captured scorpions and spiders that were then studied and used as raw material to expand understanding of the region’s biological diversity.

The work of collecting poisons for research into new toxins brought together specialists from São Paulo’s scientific center and physicians from Pará. Chalkidis and his team were able to capture specimens of the Pará black scorpion, *Tityus obscurus*, the species responsible for the majority of reported scorpion bites in Brazil’s Northern region. With these creatures in hand, the Butantan team increased the amount of information available about antidotes to their venoms.

Pedro Pardal of the Federal University of Pará (UFPA) in Belém is conducting a parallel research effort into the biodiversity of the Amazon region. Pardal began studying the black scorpion to determine what made it genetically unique, largely because the species shows varying degrees of venom lethality from one region of the state of Pará to another.

SPIDERS

In contrast to the scorpions and snakes that are so prevalent in the region, spiders have taken a longer time to enter the scope of the project on toxins in the Amazon region owing to insufficient availability of live specimens to supply venom for effective studies. Then things began to change. Butantan Institute biologist Antonio Brescovit, who began exploring the forests of the Northern region 20 years ago when the trip from Santarém to Belém could only be ac-

1. Surucucu (*Lachesis muta*)
2. New bird-spider species (*Acanthoscurria geniculata*)





Pará black scorpion (*Tityus obscurus*)

The tarantula is practically innocuous when compared to the brown spider

complished by a week-long boat trip, is now conducting intensive studies on spiders of the *Haplogyne* variety throughout South America as part of a project approved last year.

“My team and I intend to deepen the understanding of these more primitive spiders, including the brown spider that can cause people serious problems, even death,” says Brescovit. “They are rare creatures that are difficult to capture and hard to work with because we examine the most minuscule genitalia to determine the differences among the species. As a matter of fact, there are very few studies about this variety of spiders in South America, as well as many gaps in our knowledge about the species of the Northern region,” he adds.

Research usually focuses on the most attractive spider species, especially those that spin webs, and generally ignores smaller varieties like the brown spider. To Brescovit, this practice is “a mistake, especially since this species can be dangerous.” He points to a paradox with the claim that “most people are afraid of ta-

rantulas, but their poison is weak and practically innocuous compared to that of brown spiders.” The latter variety comprises 11 species that are found in Brazil, and the Butantan team has yet to describe another 14 or 15 new varieties.

Some of the team’s efforts involve acquiring knowledge of the spider species that inhabit Pará. The researchers have already identified a new species of tarantula in the Amazon region of the genus *Acanthoscurria* that can measure up to 30 mm and will likely be named after the town where it was found - Belterra – and where Butantan will house an advanced research center and laboratories open to students and teachers.

The Butantan Institute has had contact with the animals of the Amazon rainforest for a long time. Due to the difficulty in communication and transportation, the region remained isolated from other areas of Brazil until the early twentieth century. However, according to a survey by Maria de Fátima Furtado and Myriam Calleffo published *Cadernos de História da Ciência*, Emília Sneathlage, then director of the Goeldi Museum in Belém, managed to send a collection of snakes from Pará to the Butantan Institute in 1914 for classification and safekeeping. This practice has continued without interruption, and the São Paulo institute is today home to 6,625 varieties from 213 locations in the Amazon region.

In 1924, Vital Brazil Mineiro da Campanha, the institute’s first director, hired

the physician Jean Vellard to assist with the identification of venomous spiders. Vellard and Campanha collaborated on the development of a serum against the venom of the wolf spider, the *Lycosa raptoria*, studied the toxicity of other spiders, identified new species and conducted numerous expeditions to the Amazon region to collect animals.

Today, the entire Amazon region is undergoing intense deforestation that is supposedly changing the dynamic between animals and the environment. To understand what is actually taking place, Lisle Gibbs, professor of molecular ecology at the Ohio State University, visited Santarém in March to take part in field work, lecture, and talk with the researchers from Pará and São Paulo who continue their work together. “Among other things,” says Moura, “we want to understand the type of genetic variation taking place in that area that has been undergoing intense deforestation for the past 30 years, and how this process affects the species.” ■

PROJECTS

1. Amazon region actions subprogram – No. 2008/57898-0 (2009-2014)
2. The nature of neotropical spiders of the Haplogynae variety (Arachnida, Araneae) No. 2011/50689-0 (2011-2016)

GRANT MECHANISM

1. and 2. Thematic project

COORDINATORS

1. Ana Moura da Silva – Butantan Institute
2. Antonio Domingos Brescovit – Butantan Institute

INVESTMENT

1. R\$ 345,000.00
2. R\$ 814,653.03

SCIENTIFIC ARTICLES

1. CALVETE, J. J. *et al.* Snake population venomics and antivenomics of *Bothrops atrox*: pedomorphism along its transamazonian dispersal and implications of geographic venom variability on snakebite management. *Journal of Proteomics*. v. 74, n. 4, p. 510-27, 2011.
2. LUCAS, S. M. *et al.* Redescription and new distribution records of *Acanthoscurria natalensis* (Araneae: Mygalomorphae: Theraphosidae). *Zoologia*. v. 28, n.4, p. 525–30, 2011.

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