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ANALYSIS OF BRAZILIAN SNAKE VENOMS BY NEUTRON ACTIVATION ANALYSIS

H. Saiki, M. B. A. Vasconcellos, J. R. Rogero
Brazilian Nuclear Energy Commission -
Nuclear and Energy Research Institute (IPEN-CNEN/SP)
P.O. Box 11049, CEP 05499, São Paulo-Brazil

In Brazil accidents with snakes are still common in non-urban areas. An average of 70 000 accidents are estimated per year. Treatment still depends almost exclusively on injection of antivenim serum.

It has been shown that the hemorrhagic activity of snake venoms can be related to the presence of ions like Ca, Mg, and Zn. Friederich and Tu [1] analyzed by atomic absorption venoms from snakes of different geographical origins and found the metals Ca, Mg, Zn, Na and K in all of them.

Bjarnason and Fox [2] also pointed out that metals can play important roles in the venom protein structures stabilization.

The determination of inorganic components in snake venoms could be important from the point of view of the biochemical characterization of snake species and also as a contribution to the knowledge of the role of metals in the pharmacological action of the venoms.

Neutron activation analysis is highly suitable to be applied to this kind of study, but very few papers can be found in the literature about the use of this method in the characterization of snake venoms [3].

In the present paper, the method of instrumental neutron activation analysis (INAA) was applied to the determination of inorganic components in venoms from two different species of Brazilian snakes: Bothrops jararacussu and Crotalus durissus terrificus.

The procedure consisted of irradiating from 50 to 100 µg of crude and air dried venoms during different periods of irradiation, of 10 minutes under a thermal neutron flux of about 10^{11} n.cm⁻².s⁻¹ and of 8 hours under a thermal neutron flux of 10^{13} n.cm⁻².s⁻¹, in the IEA-R1 nuclear research reactor. During weighing, special care was taken not to breathe the venoms or allow them to be in contact with the skin.

Synthetic standards were prepared in the laboratory for the elements of interest and irradiated together with the venom samples. Suitable amounts of pure reagents containing these elements were dissolved and pipetted on pieces of Whatman n° 40 analytical filter paper.

After convenient delay times, samples and synthetic standards were measured in a gamma-ray spectrometer consisting of an ORTEC GEN 20190-P Germanium detector coupled to a 4096-channel Hewlett-Packard analyzer. The resolution of the detector was of 2.1 keV for the 1332.5 peak of ^{60}Co .

The analytical conditions used allowed the determination of the elements: Br, Ca, Cl, Co, Cs, K, Na, Rb, Sb, Se and Zn in the venoms, in concentrations ranging from μg (Na, K) to ppb (Co, Cs). The other elements were in the ppm range.

The elements: Hg, P, Al, La and Mn were also detected but not quantified yet.

The accuracy of the method was checked by analyzing the reference materials Bowen's Kale (IUPAC) and Bovine Liver (NBS SRM 1577a).

The main interference in the analysis of short-lived radioisotopes is the high activity of ^{214}Pb . Due to this fact, irradiations with cadmium filter are under investigation.

The elements Ca, Cl and Zn were also found in relatively high amount as noted by other authors.

Other venoms from different Brazilian snake species are intended to be analyzed by NAA to make a comparative study of their metal contents.

- [1] Friederich, C., Tu, A.T., *Biochemical Pharmacology*, 20 (1971) 1549-1556.
- [2] Bjarnason, J.B., Fox, J.W., *Journal of Toxicology-Toxin Reviews*, 7 (2) (1988-89) 171-209.
- [3] Hoav, B., Gitter, S., Wellwart, Y., Amiel, S., *Radiochemical Methods of Analysis, Proceedings of a Symposium, Salzburg, Austria, 1 (1964) 205-216.*