

Blood Evaluation Of Cl and Na Concentration In Crioulo Breed Horses Using NAA: Comparison With Humans Levels

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Abstract. Neutron Activation Analysis was utilized for determining the concentration of chlorine and sodium in blood of Crioulo breed horses used for hyperimmune sera production (*Bothrops*, *Diphtheria* and *Tetanus*) at Butantan Institute (São Paulo city, Brasil). These data are an important support for a toxicological control of adverse reactions in patients who will receive the hyperimmune serum.

Keywords: horse, blood, antivenon, hyperimmune sera, NAA
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INTRODUCTION

During the last two years (2006-2008) the Crioulo breed, cheaper specie and very well adapted to the local climate, has been used for antivenom production at Butantan Institute (São Paulo, Brazil). In this study we intend to determine the concentration of Cl and Na in blood of this animal as well as in the hyperimmune sera (antivenom) and to compare with human been blood estimation. This investigation is important for a toxicological control of antivenom production of snakes (mainly the genus *Bothrops* that has high prevalence in Brazil) and toxins of infectious agents (as the causers of the diphtheria and tetanus) in order to diminish the possibility of adverse reactions in the patients who will receive the antivenom since Cl and Na are majority: in blood, in *Bothrops* venom, in the immunogenic mixture (dose of venoms mixture and Marcol Montanide adjuvant used for horses immunizations) and also in the final product (hyperimmune sera).

EXPERIMENTAL PROCEDURE

To perform these analyses whole blood samples came from 20 adult horses (Crioulo breed), with average mass 350 kg, without clinical signs of disease, 1-3 years old, kept on pasture in São Joaquim Farm at Instituto Butantan (São Paulo city). For sample preparation about 1 ml of whole blood was taken from jugular vein in vacuum plastic tube, without anticoagulants. Aliquots of 100 μ L (prepared in duplicate) were then transferred to the filter paper and dried for few minutes using an infrared lamp. The antivenom samples were prepared following the same procedure. After, each sample was irradiated for 5 minutes in the nuclear reactor at IPEN/SP (IEA-R1, 2-4MW, pool type). A HPGe detector connected to an ADCAM multichannel analyzer and to a PC computer was used to measure the induced gamma-ray activity. The concentration of each element was then obtained by using in-house software.

RESULTS AND DISCUSSION

The concentration of the Cl, K and Na in whole blood samples of horses are shown in Table I. The minimum and maximum values for human whole blood as well as the values for the antivenom (*Bothrops*^b, *Diphtheria*^d and *Tetanus*^h) were included for comparison.

TABLE I. Cl and Na contents in blood of Crioulo horses, gL⁻¹

Elements	Mean	SD (68%)	Min - Max
Cl	2.41	0.26	1.94 - 2.99
			1.92 - 3.40 ^h
			4.41 - 5.18 ^b
			4.88 - 5.10 ^d
			5.17 - 5.48 ^t
Na	1.96	0.24	1.56 - 2.41
			1.10 - 1.73 ^h
			2.60 - 3.72 ^b
			3.10 - 4.21 ^d
			2.99 - 3.43 ^t

^h human whole blood estimation [1]

CONCLUSION

The mean Cl and Na concentrations of Crioulo breed horses are in agreement with whole blood human estimation. However, the high concentration of these elements in *Bothrops*, *Diphtheria* and *Tetanus* antivenom suggesting the Cl and Na levels in patient's blood must be monitored during the treatment (ingestion of hyperimmune sera) to avoid toxicological reactions.

REFERENCE

1. L. C. Oliveira, C. B. Zamboni and J. Mesa, Quantitative estimation of Br, Cl, K and Na in sample blood by NAA. *Journal of Radioanalytical and Nuclear Chemistry*, 269, 3(2006)541.

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