

5'-Nucleotidase (5'NT) in Serum of some Animal Species in the Sudan.

Seri¹, H.I.; Barsham¹, M.A.; Idris², O.F.; A/Mageed²,
T.O.; Husna², M.El; Bashir² and Elsadiq², A.A.

(1)Department of Clinical studies, Faculty of Veterinary Science, University of
Nyala P.O. Box 155, Sudan. (2)Central Veterinary Research Laboratories. P.O.
Box 8067 Alamarat, Animal Resources Research Corporation, Khartoum,
Sudan.

ملخص البحث

في هذا البحث تم قياس المعدل الطبيعي لأنزيم نيوكليوتايديز (5-Nucleotidase) في أمصال الإبل، الأبقار، الماعز والضأن في السودان. ووجد انه يتراوح ما بين 2.2-13.3 وحدة/لتر باستخدام طقم محاليل سيجمما (Sigma) رقم 265. وقد أجريت هذه الدراسة في أمصال 22 رأس من الإبل و 25 من الأغنام و 17 من إناث الماعز و 15 بقرة.

Summary

The present investigation was carried out to determine the normal range of 5' Nucleotidase (5'NT) in sera of some animal species in the Sudan. Serum samples were collected once from 22 camels of both sexes, 25 sheep both sexes, 17 she goats and 10 cows. The normal range was found to be 2-13.3 U/L depending on estimation of 5' Nuclotidase activity using Sigma diagnostic kit, no. 265.

Introduction

The use of biochemical and haematological indices as a screening methods for physiological and diagnostic purposes has become a standard procedure in veterinary medical practice. It is thus, imperative that the physiological normals must be determined with certainty, since they are known to vary a great deal.

5'- Nucleotidase (5'NT; 3, 1, 1, 5, 5'- ribonucleotidase phosphohydrolase) denote a group of enzymes that specifically hydrolyse 5'-nucleotides, such as adenosine 5-monophosphate (5'-AMP) to adenosine and inorganic phosphorus. Adenosine 3-phosphate present in the yeast is not affected. Most of the enzyme is present in the posterior lobe of the pituitary gland, with relatively modest amounts in thyroid gland, testis and aorta, and smaller quantities in lungs, kidney medulla and liver (Varley *et al.*, 1980).

Belfield and Goldberg, (1969) have found that 5'-NT was only slightly activated by Mg₂ and strongly inactivated by Ni₂ and Zn₂ ions. A number of enzymes have been used to measure

obstructive processes in the hepatobiliary system of man; eg serum alkaline phosphatase (SAP), Gamma Glutamyltransferase (GGT), Leucine aminopeptidase (LAP) and 5'-NT. GGT, LAP and 5'-NT may have some distinct diagnostic advantage over serum SAP in that they may originate in hepatobiliary tissue and their activities may be normal or only minimally elevated in the serum of animals with bones disorders (Bodansky and schwartz, 1968; Cornelius, 1980).

In this study we endeavoured to determine the normal estimastes of 5'-NT in some animal species in Sudan.

Materials and Methods

Animals:

The following animal species were examined:

Camels:

Twenty-two (eleven females and eleven males) clinically healthy Sudanese arab camels (*Camelus dromedarius*) were used in this study.

Cattle:

Ten healthy cross bred cows (pure Friesian × local breeds).

Sheep:

Twenty-five (fifteen females and ten males) Sudanese desert sheep were also examined in this investigation.

Goats:

Seventeen female Sudanese Nubian goats.

Blood collection:

Blood was obtained by jugular venepuncture in plain vacutainer tubes. Serum was separated by centrifugation and stored at -20°C until enzyme activity was assessed.

5'-NT determination:

Procedure for assay of 5' NT is based on measuring either the nucleoside or the inorganic phosphorus produced by the hydrolytic action of the enzyme on nucleotide substrate. The procedure followed in this study measures the nucleoside employing an enzyme kinetic method (Arkesteijn, 1976). 5'-Nucleotidase activity was measured with an assay kit (Sigma diagnostic, U.K., Sigma -Aldrich company LTD. Procedure No. 265-UV).

Results and Discussion

The measurement of changes in the activity of enzymes in the serum or plasma of animals is a useful aid to diagnosis.

The interpretation of results is based on knowledge of the amount and distribution of enzyme in tissues, the degree and duration of tissue damage and the rate of removal of released enzyme from plasma (Ford and Evans, 1985). The method used in this study utilized the ability of 5'-NT to the hydrolize adenosine monophosphate (AMP) to adenosine and inorganic phosphorus (Pi). The auxiliary enzyme, deosine deaminase (ADA), deaminates adenosine producing inosine and ammonium ion (NH₄⁺). In a coupled reaction catalysed by L-glutamate dehydrogenase (GLDH), the NH₄ reacts with 2-oxoglutarate in the presence of reduced nicotinamide adenine dinucleotid (NADH) to form glutamate and NAD. The rate of NAD formation, which produces a decrease in absorbence at 340 nm, is directly proportional to the rate of adenosine formation and, hence, 5'-NT activity.

The mean values (M+S.E.M.) of 5'-NT in serum samples collected from the different animals are listed in Table (1). Normal values obtained from this study ranged between 2.2 and 13.3 U/L

Table 1: Mean values (M + S.E.M.) of 5'-NT in serum samples Collected from the different animals.

<i>Animal Sp.</i>	<i>Sex</i>	<i>No.</i>	<i>Mean + SD</i>	<i>Range</i>
Camel	Female	11	5.09±1.239	3.9-7.1
Camel	Male	11	5.35 ±0.95	3.9-7.1.
Caprine	Female	17	6.74±2.823	2.9-12.3
Ovine	Female	15	8.35± 2.420	5.2-13.3
Ovine	Male	10	7.64 ±1.408	4.7-9.5
Bovine	Female	10	6.85±2.279	2.2-10.3

The normal range for 5'-Nucleotidase is 2 to 15 U/L. The determination of 5'-NT had mostly been done in cases which had increased serum alkaline phosphatase. An increase roughly parallel to that accompanying a rise in serum alkaline phosphatase, is found in diseases of the liver and billiary tract. 5'-NT is therefore, at its highest concentration in post-hepatic obstructive jaundice when they may frequently exceed 50 U/L. Only slight increases are observed in hepatic jaundice for example in infective hepatitis and also in the later stages of liver cirrhosis. On the other hand, in bone diseases in which the alkaline phosphatase is increased such as Paget's disease, 5'-T usually remains within normal limits; even when there is any

increase, it is commonly slight. So the determination of 5' NT is used to help in distinguishing the source of an increase in serum alkaline phosphatase (Varley *et al.*, 1980).

References

- Arkesteijn, C.L.M. (1976). *J. Clin. Chem. Clin. Biochem.* **14**: 155.
- Belfied, A. and Goldberg, D.M. (1969). *J. Clin. Path.* **22**: 144-151.
- Bodansky, O. and Schwartz, M.K. (1968) In: O. Bodansky and C.P. Stewart Advances in clinical chemistry, Academic press, P. 278.
- Cornelius, C.E. (1980). Liver Function In: J. K. Jiro Clinical Biochemistry of domestic Animals., 3rd edition. Academic press, Inc. PP. 201-257.
- Ford, E.J. H. and Evans, J. (1985). *Res. Vet. Sci.* **39**: 103-109.
- Varley, H.; Gowenlock, A. H. and Bell, M. (1980). Practical Clinical Biochemistry, Vol. 1. 5th edition William Heinmann Medical Books Limited. London. P. 1277.