

# PLASMA VITAMIN C LEVELS IN DERMATOPHILOSIS INFECTED AND ON-INFECTED CATTLE

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## ABSTRACT

In two separate experiments, blood samples from dermatophilosis infected and non-infected cattle were analysed for their vitamin C content. In the first experiment using abattoir samples, streptothricosis infected animals showed significantly lower level ( $P < 0.01$ ) of ascorbic acid in mg per 100 ml of plasma (0.56) than non-infected ones (1.11). In the second experiment using samples from live animals, a non-significant decrease in the concentration of vitamin C was also observed in infected (0.94) compared with non-infected animals (1.03).

Key Words: Dermatophilosis, plasma vitamin C, cattle.

## INTRODUCTION

Lack of vitamin C or ascorbic acid, an antiscorbutic vitamin has been shown to cause deficiency symptoms in man and other animals such as monkeys, birds and guinea pigs (West *et al.* 1963). These animals lack the ability to synthesize Vitamin C. Mckee and Geiman (1946) noted a low level of vitamin C in the plasma of humans suffering from malaria and arteriosclerosis. On the other hand, Josephson *et al.* (1949) observed an increase in the adrenal concentration of vitamin C in avian malaria cases caused by *P. gallinareum*.

The study of changes in vitamin C level in plasma under dermatophilosis infection was motivated by the observation that the vitamin is closely associated with the normal production or maintenance of supporting tissues of mesenchymal origin such as osteoid,

dentin and collagen as well as contributing to the normal elaboration of intracellular cement or other related compounds (White *et al.*, 1978, West *et al.*, 1963). Pinkus (1953) also found that intracellular cement or tonofibrils allow the epidermis to combine a high degree of flexibility with considerable mechanical strength. It is known that this mechanical strength has to be comprised before streptothricosis infection can be established (Amakiri, 1973).

## MATERIALS AND METHODS

Blood samples were taken, first from 96 slaughtered cattle from the Bodija Municipal abattoir in Ibadan, out of which 48 were from infected and the rest 48 from non-infected animals. Thirteen (13) blood samples each from infected and non-infected live cattle kept at the Teaching and

Research Farm, University of Ibadan were also used. The animals samples were grouped into two, viz those manifesting streptothricosis in the form of massive lesions and those with no lesions. The samples were accordingly designated "infected" and "non-infected", and analysed for this and other biochemical parameters.

For vitamin C determination, 0.5ml of plasma was stabilized with 1.5ml of 5% TCA (in duplicate) and analysed on the same day using the method of Denson and Bowers (1961).

The stabilized plasma was centrifuged at 2,700 rpm in an MSE table centrifuge for about 10 min. and an aliquot of the supernatant 1.5ml pipetted into a test tube containing 0.5ml working 2,4-Dinitrophenyl hydrazine (DNPH) solution. The tubes containing the samples, standard and the blank were then incubated at 37°C for four hours. Thereafter 2.5ml of ice cold sulphuric acid (65%) was added slowly to each of the tubes placed in ice bath. The tubes were then removed from the ice bath and maintained at room temperature for about 30 minutes.

The optical density (O.D.) of the samples was read on SP-500 spectrophotometer at 520 nm.

The haemoglobin (Hb) concentration and packed cell volume (PCV) were also determined on the same blood samples.

## RESULTS

In the first experiment the level of plasma vitamin C ranged between 0.39 and 0.76 mg/100ml in the infected animals with the mean  $0.56 \pm 0.11$  mg/100ml. The vitamin C level in non-infected animals ranged between 0.70 and 2.08 mg/100ml, giving a mean of  $1.11 \pm 0.31$  mg/100ml (Table 1). In the second experiment, the level of plasma vitamin C in the infected group ranged between 0.54 and 1.50 mg/100ml giving a mean of  $0.95 \pm 0.33$  mg/100ml. For the non-infected animals the range was between 0.67–1.50 mg/100ml, giving an average of  $1.03 \pm 0.28$  mg/100ml (Table 1).

The mean levels of Hb and PCV in both infected and non-infected animals are given in detail (Table 2). Both the levels of Hb and PCV in non-infected animals showed non-significant higher values as compared to their infected counterparts.

**Table 1**  
**Plasma Vitamin C levels (mg/100ml)**

### Experiment I (Samples from abattoir *slaughtered* cattle)

	Infected	Non-Infected
Range	0.39 – 0.76	0.70 – 2.08
Mean	$0.56 \pm 0.11^{**}$	$1.11 \pm 0.31^{**}$
**	Significant at $P < 0.01$	

### Experiment II (Samples from *live* animals)

	Infected	Non-Infected
Range	0.54 – 1.50	0.67 – 1.50
Mean	$0.94 \pm 0.33$	$1.03 \pm 0.28$

**Table 2**  
**Hb (gm/%) and PCV (%) in dermatophilosis infected and non-infected cattle**

Experiment I (Samples from abattoir *slaughtered* cattle)

1. PCV (%)

	Infected	Non-Infected
Range	25.4 – 25	31 – 36
Mean	24.71 ± 0.45**	33.33 ± 1.82
*	Significant at P < 0.05	

2. Hb (gm/5)

	Infected	Non-Infected
Range	6.00 – 6.80	7.00 – 7.80
Mean	6.20 ± 0.20	7.33 ± 0.39

Experiment II (Samples from *live* animals)

1. PCV (%)

	Infected	Non-Infected
Range	21 – 36	22 – 35
Mean	28.50 ± 4.02	28.76 ± 3.69

2. Hb (gm/%)

	Infected	Non-Infected
Range	6.26 – 10.67	8.46 – 12.12
Mean	8.33 ± 1.33	9.63 ± 1.20

## DISCUSSION

Data on blood levels of ascorbic acid in domestic animals are rare. This apathy may be due to the fact that vitamin C is synthesized by all species, except primate and is therefore not an essential dietary factor in the domestic animals. Nevertheless, Scott (1981) observed a dermatosis of young calves which was associated with low concentration of plasma vitamin C and which responded to a single injection of 3gm of ascorbic acid.

According to Schenk and Kolb (1980) plasma level of vitamin C can temporarily rise as high as 1.4 mg/100ml in humans after a heavy intake of ascorbic acid but which decreased below 0.4 mg/100ml during deficiency states. The result of our first ex-

periment showed a significant decrease ( $P < 0.01$ ) in the plasma concentration of vitamin C in animals suffering from *D. congolensis* infection. Although there was an overlap in the range of value but the fall in level from 1.11mg to 0.56 mg/100ml is attributable to the effect of dermatophilosis. Values obtained from the second experiment using live animals did not show a significant change in the level of vitamin C earlier observed between infected animals and those not infected. However a decreasing tendency in the level of plasma vitamin C was registered in infected animals even in the second experiment.

The "normal values" obtained in this study for cattle seem to correlate well with the values given for humans (Schenk and

Kolb, 1980). It would however seem that even in a diseased state, cattle is able to maintain a higher plasma level of vitamin C than humans. The decrease in the value of this vitamin in infected cattle in our opinion is closely related to the degree of biochemical stress to which the host animals are exposed as a result of the *D. congolensis* infection.

Ascorbic acid is known to aid erythropoiesis indirectly by helping in the absorption of iron used for red blood cell synthesis (Moore and Dubachi, 1957; William, 1957; Bonnet *et. al.*, 1960) or by aiding the incorporation of iron into tissue ferritin (White *et. al.*, 1978). A fall in the concentration of vitamin C will therefore affect the formation of red blood cell and consequently, the activities of related enzymes. The later reason may account for the reduced haematologic picture especially the PCV which showed a significant ( $P < 0.05$ ) decline on infection in the first experiment (Table 2). Lund and Crandon (1941) also observed that vitamin C acts jointly with zinc and copper to preserve epithelial tissues and heals wound and that its deficiency can result in chronic ulcers.

Although the mechanism by which vitamin C interacts in biochemical processes in health and disease as in streptothricosis is not yet well known, it appears that this vitamin is probably more versatile in its involvement and effect on body metabolism than is hitherto known.

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