Ascorbic acid levels in the proglottides of cestode parasite Avitellina lahorea (Woodland, 1972) and host serum (sheep) in relation to their sexual maturity

K. Ramalingam, V. Vijayalakshmi and V.A. Satyaprema
P.G and Research Department of Zoology, Govt. Arts College, Madras University Constituent, Nandanam, Chennai – 600 035, India.

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Abstract: The ascorbic acid level was highest in immature proglottides and lowest in gravid proglottides of Avitellina lahorea, the gut parasite of sheep. The ascorbic acid content in all the regions of the parasite viz., immature, mature and gravid taken together remained higher to the value of the host serum. The above gradient between the parasite and the host serum interface suggested its active uptake on the part of the parasite.

Key words: Ascorbic acid, Avitellina lahorea, Immature, Mature, Gravid proglottides, Immunity.

Introduction
In the parasitological studies, apart from the role of metabolites and enzymes in their growth and differentiation, other factors may also be of interest both from the parasitological point of view and also from the physiological point of view. Towards this line, the important vitamins, their requirements for parasites and their implications over the host are to be understood clearly. In cestodes, the pathological implications of the absorption of vitamins from the host’s intestinal mucosa have been well-documented (Addis and Chandler, 1944; 1946). The vitamin requirements of parasites have been investigated by several workers (Addis and Chandler, 1944, 1946; Gould, 1958; Pantelouris and Hale, 1962, Gameel, 1982; Tandon and Gupta, 1988).

Vitamin C has been reported in many parasites eg., Fasciola hepatica, Paramphistomum cervi, Ascaridia galli, T.saginata and H.diminuta (Holz, 1961 and Gameel, 1982). The ascorbic acid levels in relation to maturity and growth of cestode parasites of birds and mammals were determined (Tandon and Gupta, 1988). They found that ascorbic acid levels were closely related to different stages of growth and maturity of A.centripunctata, M.expansa and S.globipunctata from goats and sheep and R.echinobothridia from fowl. Though the presence of vitamin C has been reported in many parasites, the role of the above vitamin on the maturity and growth of the parasite as well as its implications over the host organism is poorly understood. As ascorbic acid could be ascribed to the immune potential of the host organism, to what extent the selective absorption of this vitamin can bring the ill effects to the host animals, is pertinent to study. The present study was aimed to determine the ascorbic acid level in relation to maturity and growth of cestode parasite of sheep.

As, development and growth of parasites depend upon not only its morphological and physiological adaptations, to derive the nutrients from the lumen of host intestine but also from the host tissues, the need for the parallel analysis of various components of the host also seem to be important. In this context, the host serum represents the interfacial tissue compartment between the parasite and the host (Goodchild and Kagan, 1961; Markkanen and Vuopala, 1965; Fukushima et al., 1988; Haque et al., 1990). Hence the serum component was also included in the present investigation to correlate the parasite development and maturity, with reference to the vitamin C.

Materials and Methods
The tapeworm Avitellina lahorea (Woodland, 1927) were collected from the intestine of naturally infected sheep autopsied in the slaughterhouse at Perambur, Chennai. Then the worms were washed in distilled water to render them free from intestinal contents and rinsed quickly 3-4 times in normal saline. Proglottides of different regions and stages of growth (immature, mature and gravid) were selected from the same parasite. The host blood was collected and serum was separated for analysis. Ascorbic acid were determined according to the method of Sadasivam and Manickam (1996). A graph of ascorbic acid concentration versus absorbance was plotted and ascorbic acid contents in the sample were calculated. Analysis of variance (ANOVA) and F-test were performed for comparison of data (Zar, 1974).

Results and Discussion
Vitamin C (ascorbic acid) concentrations in the different strobilar regions of A.lahorea and host serum were given in Table 1. Vitamin C level was found to be highest in immature region and lowest in gravid region. A steady and significant decrease in the content of vitamin C was observed in the anterior-posterior direction, which was found to be statistically significant. The vitamin C level of host serum was found to be similar to that of immature region.

In the present study, the immature proglottides had the highest level of ascorbic acid. Cestodes are physiologically most active at the neck, the region of development of new segments where maximum transportation occur (Phifer, 1960). The total vitamin C (ascorbic acid) content in all the regions viz.,
immature, mature and gravid taken together remained higher to the value of host serum. The above gradient between the parasite and the host suggests its active uptake on the part of the parasite. Moreover, vitamin C being part of the ruminant diet, its uptake from the luminal content of the host may also be excluded. Hence, it may be premature to conclude that its presence in higher concentrations may affect the host body. However, considering the parasite’s load belonging to different group of cestodes, in the host lumen, the group effect of parasites over vitamin C deficiency to the host may not also be unexpected. The parasite acquires the ascorbic acid both from host as well as from the luminal content or gut flora, and stores it in all proglottides to be utilized for various metabolic functions such as carbohydrate metabolism and iron binding capacity (Horowitz and King, 1953; Gameel, 1982), formation of intercellular cement, collagens in fibrous tissue synthesis etc. (Horowitz and King, 1953; Gameel, 1982), formation of such as carbohydrate metabolism and iron binding capacity it in all proglottides to be utilized for various metabolic functions in the parasite. Moreover, vitamin C being part of the ruminant parasite and the host suggests its active uptake on the part of the parasite. 

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Parasite</th>
<th>Host serum</th>
<th>F-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin C</td>
<td>Immature</td>
<td>Mature</td>
<td>Gravid</td>
<td></td>
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<tr>
<td></td>
<td>2.60 ± 0.042.07</td>
<td>2.07 ± 0.01</td>
<td>1.92 ± 0.03</td>
<td>2.50 ± 0.04</td>
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</tbody>
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Each value represents mean ± S.E of six observations
** denote significant at 1% level

References

Correspondence to:
Dr. K. Ramalingam
PG and Research Department of Zoology
Government Arts college, Nandanam
Chennai – 600 056 (TN), India
E-mail: drkimmunotoxicol@yahoo.co.in
Tel.: +91-44-25391326