STUDIES ON *EPERYTHROZOON OVIS* INFECTION IN SHEEP

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ABSTRACT

This thesis concerns the effect of Eperythrozoon ovis on its host, with particular emphasis on some of the haematological, pathological and biochemical changes which occur.

Haematological studies on experimentally infected sheep showed that both the maximum degree of anaemia and maximum degree of parasitaemia were similar in all groups and independent of the size of inoculating dose. The smaller the dose rate, however, the longer the prepatent period, so that at the lowest dose rate used (1×10^{-6} ml of infected blood intravenously injected) the peak of parasitaemia and peak of anaemia were synchronized. The time taken for anaemia to develop following inoculation was similar in all experimentally infected groups and independent of the time taken for parasitaemia development. It is suggested from these observations that the anaemia is at least partially associated with a host immune response against the parasite and involving the erythrocyte. In natural infection the severity of anaemia and parasitaemia was variable. It is postulated that in such infection the host immune response may be expressed before infection is fully developed. It was also shown that there was a significant ($p < 0.01$) correlation between the maximum degree of anaemia and maximum degree of parasitaemia for all infected (experimental and natural) sheep. For this reason the possibility of a direct effect by the parasite on the erythrocyte, contributing to the anaemia cannot be discounted.

All infected groups of sheep showed a slower rate of weight gain as compared with controls. In one experiment the difference between groups was significant ($p < 0.01$).

The main pathological changes in E. ovis infection were splenic enlargement and haemosiderosis of the liver and kidney cortex. These latter findings indicated that intravascular haemolysis is probably the predominant mode of erythrocyte destruction. Infection is accompanied by an increased intravascular clearance rate of carbon by the reticuloendothelial system. The possible role of the reticuloendothelial system in the host immune response and in erythrocyte destruction, along with the role of complement and the parasite in the pathogenesis of anaemia, is discussed.

Comparative glycolytic studies between E. ovis infected and control erythrocytes showed that infected erythrocytes utilized approximately 24 times as much glucose and produced 18 times as much lactic acid as the controls. Other findings included an egress of oxygen from infected erythrocytes, thought to result from a drop in intracellular pH and a reduction in the amount of glucose which could be accounted for as lactic acid, pyruvic acid and oxygen uptake. This latter finding was thought to be due to utilization of glucose by the parasite for synthetic purposes.

Changes in infected sheep which were considered to result from the increased glycolytic activity of erythrocytes were a fall in venous blood glucose levels (in some cases to negligible values) and a large increase in blood lactic acid levels. Acid-base studies showed that these changes were accompanied by significant ($p < 0.05$) falls in venous pH and standard bicarbonate. The fall in standard bicarbonate would be expected to result from the neutralization of lactic acid, but there was no apparent explanation for the increase in pCO_2 which also occurred. Such an increase is normally indicative of a respiratory acidosis. Apart from a period of inappetance during heavy parasitaemia, which may affect weight gain, no clinical effect due to the acidosis was noted.

The reductive potential, i.e., the ability of an erythrocyte to withstand oxidative damage was assessed

during an infection cycle by measuring erythrocyte reduced glutathione levels and blood methaemoglobin levels before and after incubation with acetylphenylhydrazine. It was concluded that an infected erythrocyte's ability to withstand oxidative challenge was severely affected as compared with control erythrocytes, and that haemolysis could be a likely result. Without such a challenge, however, an infected erythrocyte's reductive potential is not greatly affected. It is probable that such metabolic changes occurring in infected erythrocytes do not play a role in the pathogenesis of anaemia.

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