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SERUM XANTHINE OXIDASE ACTIVITY
IN DOGS WITH ISCHAEMIC DISORDERS

A thesis presented in partial fulfilment of the requirements for
the degree of Master of Veterinary Science at Massey University

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1997
Abstract

This thesis has focused on the measurement of the serum xanthine oxidase activity in dogs with diseases which involve ischaemia-reperfusion injury. The pathophysiology of ischaemia-reperfusion injury, the production of oxygen derived free radicals (ODFRS), their deleterious effects, the endogenous protective mechanisms against ODFRS, and the structure, function, distribution and kinetics of xanthine oxidase, have been reviewed.

Xanthine oxidase activity in blood and tissues can be measured using a variety of assays of uric acid production over time. A spectrophotometric assay was developed for use with canine serum, and studies were undertaken to assess the linearity and reproducibility of the assay. The effect of storage temperature and duration on the activity of bovine milk xanthine oxidase in canine serum, was investigated. The serum xanthine oxidase activity was measured in “healthy” dogs, and in dogs presented to the veterinary clinic with diseases likely to involve ischaemia-reperfusion injury.

Xanthine oxidase activity followed zero order kinetics after a short burst phase. The intra-assay and inter-assay coefficients of variation were less than or equal to 5.5% and 12.8%, respectively. Bovine milk xanthine oxidase was stable in serum stored at -20°C or -80°C for 90 days. A wide range of serum xanthine oxidase activity were measured in clinically “healthy” dogs (0-363 mU/l) and values obtained did not assume a Gaussian distribution. Using nonparametric methods, a reference interval, containing 95% of the xanthine oxidase activities, was determined to be 0-204 mU/l. The serum xanthine oxidase activity was not dependent upon age or sex.

Compared with “healthy” dogs, the sick dogs had significantly higher serum xanthine oxidase activities. The serum xanthine oxidase activity was significantly higher following reperfusion (treatment with intravenous fluids), than prior to treatment. There was a statistically insignificant trend towards higher serum xanthine oxidase activities in dogs with more severe clinical signs relating to the cardiovascular system, but the serum xanthine oxidase activity did
not appear to be useful in predicting patient survival.

Circulating xanthine oxidase may be involved in the development of complications that are seen relatively frequently following ischaemia-reperfusion injury in dogs. Xanthine oxidase may react with purine substrates in the plasma, producing large amounts of ODFRS throughout the body, resulting in widespread capillary endothelial damage, and the attraction of inflammatory cells into organs some distance from the original site of ischaemia and reperfusion.
Acknowledgements

Funding was provided by the Massey University Veterinary Research Fund, and the Massey University Research Fund. I would like to thank the clients, students and staff members who allowed the collection of blood from their dogs, and the nursing staff, students and my colleagues for their assistance in blood collection, and care of the dogs during hospitalisation. I would also like to thank Mark Wiseman for his input into the development of the spectrophotometric assay, and Steve Haslett, who performed the statistical analysis in Chapters 3 and 4.

I am extremely grateful for the support, encouragement and wisdom provided by Grant Guilford, Boyd Jones and Hilary Burbidge during my residency. Thank you for sharing your enthusiasm for veterinary medicine, and for providing the inspiration and opportunity to learn. In particular, I thank Grant for the time and advice he has generously provided during the preparation of this thesis.
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