

Adrenocortical Stress Hormones and the Development of Adipose and Lean Tissue.

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Dip AppSc, Grad Dip

A thesis submitted in fulfilment of the requirement for the
degree of Master of Rural Science

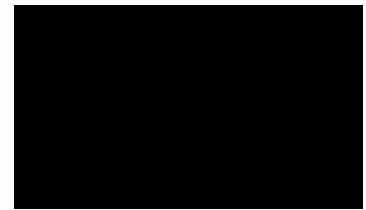
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August 1995

Preface

I certify that the substance of this thesis has not already been submitted for any other degree and is not being submitted currently for any other degree.

I certify that the work for this study was carried out solely by the candidate. All assistance received in the preparation of the thesis and all the sources used have been acknowledged herein.



David R Paul
August 1995

Acknowledgements

I wish to thank my supervisor in CSIRO, Dr Ron Hoskinson, who encouraged me to undertake this research project and who has been very supportive over our long association from the early trials into the development of Fecundin. It has been my good fortune to work with a scientist who has a broad understanding of science and is generous in sharing his knowledge.

I also wish to give special acknowledgement to my supervisors, Dr John Thompson from the University of New England and Dr Peter Wynn from the University of Sydney who have assisted enormously with their critical comments and constructive suggestions. I would like to thank them for their patience and helpful advice throughout the course of this degree. I am most grateful for the time they have given to me in the preparation of this thesis.

I am very grateful for the assistance provided by Ms Jenny Trenear and Mr Scott Pattison in carrying out the ACTH antibody titre and the plasma cortisol assays.

I also acknowledge the support of the CSIRO Division of Animal Production as this work was conducted on a part-time basis whilst I was employed in the division.

Abstract

This thesis describes the role of the Hypothalamo-Pituitary-Adrenal Axis in the role of controlling fat deposition and partitioning and muscle degradation in the mammal. The adrenal stress hormones (glucocorticoids) are also implicated in the function of the immune system and could be considered to be limiting animal production when they are significantly elevated.

A review of past and present techniques for the measurement of body and carcass composition is included in order to justify the use of techniques in the experiments carried out in this study. An attempt to validate long standing techniques carried out on the carcass at slaughter and measurements on the live animal using image analysis derived from CAT scans is made with strong correlations.

The series of experiments in this study attempt to improve the growth of lambs, reduce fat deposition per se, increase skeletal muscle mass and to improve the components of immune function by reducing stress induced elevated plasma glucocorticoid levels.

The active immunization of lambs against ACTH reduced plasma cortisol for a period of 100 days but failed to maintain low cortisol levels for the duration of the experiment. The immunized lambs undergoing stress had the highest plasma cortisol at the time of slaughter and contained 11.3% more fat in the carcass ($P < 0.05$) than the non immunized lambs. The average muscle pH was significantly higher in M.supraspinatus than M.semimembranosus ($P < 0.05$) in the carcass.

A double immunization procedure of lambs, firstly against ACTH to lower cortisol, followed by a second immunogen against GnRH was effective in lowering plasma cortisol but did not have any significant effect on the antibody titre levels produced to the second immunogen (GnRH). These antibody titre observations were supported by the bioassay for testis size, with no improvement over the single immunization against GnRH.

The final experiment examined changes to the conjugation chemistry to the ACTH immunogen and to immunization against the terminal segment of the ACTH molecule, in order to maintain lowered plasma cortisol levels for the duration of the trial. Lowered cortisol was achieved, but the ACTH immunization failed to alter physiological responsiveness of the target tissues.

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