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STUDIES OF TESTICULAR AND REPRODUCTIVE ENDOCRINE  
PARAMETERS IN THE RAM WITH PARTICULAR  
REFERENCE TO SEXUAL MATURATION

A thesis presented in partial fulfilment of  
the requirements for the  
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Peter Raymond Wilson

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by PETER RAYMOND WILSON

Experiments in this thesis were designed to establish short-term and longitudinal patterns of secretion of LH, testosterone and prolactin, responses to GnRH administration, testicular and reproductive endocrine changes associated with sexual maturation in the ram, and to study endocrine factors which may influence reproductive development.

24 hour hormonal secretion profile studies employing 20 min sample collection intervals in 9 adult rams, and 8 h secretion profile studies in eight prepubertal, pubertal and early post-pubertal rams confirmed that LH was secreted in a pulsatile manner. Testosterone was secreted quantitatively following each episodic LH elevation in pubertal and older rams, but a consistent qualitative and quantitative secretory response was not observed in prepubertal rams. Plasma prolactin levels were stable and high during the summer, but low basal levels interspersed with pulsatile fluctuations occurred in winter sampling periods. Prolactin secretion profiles of prepubertal and sexually maturing rams were similar, and levels fluctuated markedly at each stage of development.

No circadian rhythms of LH, testosterone or prolactin secretion were evident in adult or sexually developing rams, but data was produced which supported the existence of a sampling-induced elevation of LH and prolactin in young rams: higher levels of both hormones were observed in early samples of sequential sampling studies employing venepuncture techniques.

Study of hormone levels of ram lambs bled each two weeks from birth to approximately 8 months of age showed that plasma LH content was low at birth, rose to a peak at approximately 6 weeks of age, and

declined during the period of major testicular development (10 - 18 weeks); plasma testosterone concentrations were low at birth and increased steadily throughout the period of study; while prolactin levels were low at birth, increased rapidly to reach a plateau from approximately 6 to 20 weeks, then gradually decreased to low levels by 32 weeks.

Testicular and epididymal development, seminiferous and epididymal tubule growth, and the onset of spermatogenesis during puberty followed patterns similar to those reported by previous authors. Regression analyses failed to distinguish major correlations between these developmental parameters and endocrine changes associated with sexual maturation.

Responses to intravenous GnRH injection and infusion to adult rams showed that LH output occurred in a dose-dependent manner but subsequent testosterone elevations were not significantly different. The LH responses of prepubertal rams to intravenous injections of GnRH (1  $\mu$ g/Kg) were high, but progressively decreased at consecutive four-weekly injection and sampling routines from 6 to 32 weeks of age. Peak LH responses were progressively delayed during this period. Testosterone output following GnRH-induced LH elevations were low in prepubertal rams and increased progressively during sexual maturation. Maximal responses to repeated GnRH injections were observed in pubertal (14 week old) rams.

Weekly treatment of ram lambs with GnRH failed to alter any of the testicular or endocrine parameters assessed during sexual development whereas weekly androgen treatment depressed mean testis and epididymal weights, seminiferous and epididymal tubular diameters and epididymal spermatozoal reserves, as well as basal and GnRH-stimulated testosterone output.

Prenatal androgenization of female lambs resulted in masculinization of external genitalia. Postnatal basal levels of LH were depressed in both males and females from androgenized ewes, while LH responses to GnRH were unaltered. It was concluded that prenatal androgenization depressed hypothalamic hypophysiotrophic function.

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