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PHYSIOLOGICAL RESPONSES TO SELECTION

FOR GREASY FLEECEWEIGHT

IN ROMNEY SHEEP

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

Carolyn Mary Clark

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ABSTRACT

The study was undertaken to identify physiological differences between the Control (C) and Fleeceweight-selected (FW) lines of Romney sheep at Massey University. These differences were examined with a view to determining the mechanisms by which sheep of high genetic merit attain their superior fleece production, and to identification of potential markers of genetic merit.

Three experiments were conducted using rams and ram hoggets from the selection lines. The first (E1) was a preliminary investigation in which 12 C and 12 FW rams (aged 14 months) were fed freshly cut pasture *ad libitum* and blood sampled by jugular venipuncture. In the second (E2) 9 ram hoggets from each line were fed a lucerne-based diet (at fixed intakes irrespective of liveweight) during a stabilisation period and a subsequent treatment period in which they received the basal diet plus one of 3 levels (0, 30, or 60g) of formaldehyde-protected casein. In the third experiment (E3) rams received an intravenous infusion of saline or saline plus 1.5g/day methionine in a switchback design. During this experiment rams were fed 110% maintenance (lucerne chaff) in a regimen designed to maintain steady state conditions.

In contrast to literature reports, no difference was found between the lines in plasma levels of either aspartate or alanine amino-transferase activities (E2). FW rams did maintain greater concentrations of reduced glutathione (GSH) in erythrocytes but differences were not significant. Concentrations of GSH were substantially increased by methionine infusion (E3).

In all three experiments, C rams maintained greater concentrations of urea in the plasma than FW rams (by approximately 1mM). Supplementation of the diet with protected casein increased plasma urea concentration but this effect was additive with that of selection line (E2). Methionine infusion did not affect plasma urea in FW rams but reduced that of C rams so that the between-line difference was reduced by 50%. Control rams were also observed to have greater creatinine concentrations than FW rams (E3) but these were not influenced by methionine infusion. The reduced plasma urea concentration of FW rams may be due both to their lower rates of amino acid deamination and to an increased glomerular filtration rate.

Fleeceweight rams also exhibited lower concentrations of thyroxine than C rams in the two experiments in which they were examined (E2, E3). This result is consistent with those from Australian Merino selection lines but the physiological basis for the difference is unknown.

It is concluded that, in view of their consistent association with genetic merit for fleece production, and their ease of measurement, plasma concentrations of urea, creatinine and thyroxine may prove to be useful predictors of genetic merit for wool production.

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LIST OF ABBREVIATIONS

cm	centimetres
°C	degrees celcius
d	day
d.f.	degrees of freedom
dl	decilitre
DM	dry matter
g	gram
h	hour
IU	international units
kg	kilogram
l	litre
ME	metabolisable energy
mg	milligram
MJ	megajoule
ml	millilitre
mm	millimetre
mM	millimolar
µg	microgram
S.E.	standard error
U.L. ⁻¹	units per litre

Levels of Significance

NS	.10 < P
†	.05 < P < .10
*	.01 < P < .05
**	.001 < P < .01
***	P < .001