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NUTRIENT UTILISATION BY SKELETAL MUSCLE OF FASTED SHEEP

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Jarrett et al. (1976) have reported the utilisation of nutrients by the skeletal muscle of starved sheep at rest. This study however did not measure the true rate of non esterified fatty acid (NEFA) uptake by skeletal muscle. No studies have been made of nutrient utilisation by skeletal muscle in starved sheep during exercise. This study reports the nutrient utilisation of sketeltal muscle in starved sheep at rest and during exercise.

Ten non pregnant non lactating merino ewes with mean body weight of 38.6 kg were starved for 4 days. On the fourth day of starvation ewes were infused with (1-^{14}C) Oleic acid for 5 hours (5 sheep, experiments at rest) or 2 hours (2 sheep, experiments during exercise). Three sheep were exercised without receiving an infusion. During the experiments 8 - 12 simultaneous pairs of blood samples were taken from indwelling cannulae placed into the carotid arterial and lateral saphenous circulations (Domanski et al. 1974). Specific radioactivity of plasma NEFA and the concentration in blood of other metabolits were measured. Experiments with exercising sheep involved walking on a treadmill (not inclined) at 4.5 km/hour for 2 hours. Results are shown in Table 1.

Table 1. Arterial Concentration ([A], mM) and Arterio-Muscle Venous difference ([A-V], mM) of metabolites in the bloood of fasted sheep at rest and during excercise.

Metabolite		Rest	Excerciseϕ
Glucose	[A]	2.172 ± 0.127 (5)*	3.572 ± 0.139 (5)
	[A-V]†	0.106 ± 0.019 (5)	0.209 ± 0.015 (5)
Ketone	[A]	0.831 ± 0.055 (5)	0.789 ± 0.010 (5)
Bodies	[A-V]	0.102 ± 0.010 (5)	0.051 ± 0.005 (5)
NEFA	[A]	0.739 ± 0.053 (5)	1.146 ± 0.012 (4)
	[A-V]	0.051 ± 0.006 (5)	0.083 (2)
Oxygen	[A-V]	2.140 ± 0.094 (5)	4.321 ± 0.052 (5)

* No. animals
† Corrected for lactate and pyruvate release
ϕ Values represent the mean of a 2 hour exercise period

The results establish NEFA as a significant feul for skeletal muscle accounting for 57% and 46% of the oxygen consumed at rest and during exercise respectively. Glucose is potentially the next most important metabolite. Assuming complete oxidation glucose could account for 30% and 29% of the oxygen consumed by muscle at rest and during exercise respectively.

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