

## DIURNAL VARIATION IN OXYGEN UPTAKE BY THE PORTAL SYSTEM OF THE SHEEP

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The rate of appearance of nutrients in the portal blood of sheep provides a measure of uptake from portal-drained viscera (the gut) after the gut itself has utilised a portion of those nutrients absorbed (Tagari and Bergman 1978). We examined diurnal variation in portal blood flow and oxygen uptake. To adopt an unbiased sampling regime for future portal uptake studies, oxygen ( $O_2$ ) uptake was used as the criterion for nutrient uptake, since  $O_2$  uptake is a measure of respiratory metabolism and provides an indication of the energy cost of nutrient absorption (Huntington and Tyrrell 1985).

Three Merino wethers were surgically prepared with catheters in the portal vein and femoral artery and an ultrasonic blood flow probe (Transonic Systems Inc., New York) around the portal vein. These sheep were kept in metabolism crates in a continuously lit animal house and given daily 800g oaten chaff, 12g urea, 60g formaldehyde-treated casein and minerals at a constant rate. Portal blood flow was monitored continuously and integrated over 5-min intervals. Each hour, samples of arterial and portal vein blood were taken and  $O_2$  saturation and haemoglobin measured with a haemoximeter (OSM2, Radiometer, Copenhagen). These measurements were used to calculate  $O_2$  concentration (mM).

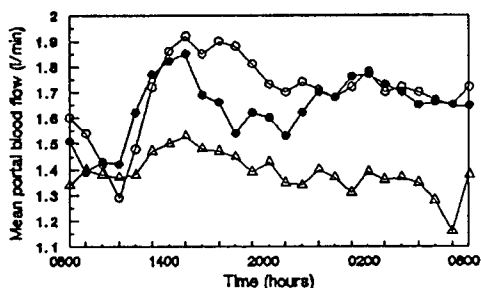


Fig. 1 Diurnal variation in portal blood flow

○ Sheep 12    ● Sheep 23    △ Sheep 58

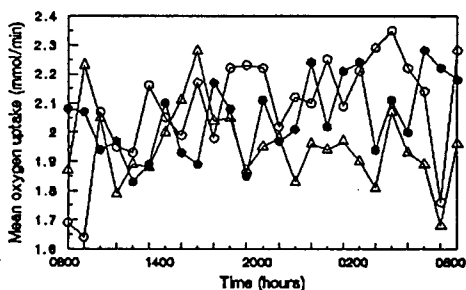


Fig. 2 Diurnal variation in portal oxygen uptake

○ Sheep 12    ● Sheep 23    △ Sheep 58

Mean portal blood flow from 0800 to 0800h (24h sampling period) and 0800 to 1500h (7h sampling period) was  $1.57 (\pm 0.018)$  and  $1.54 (\pm 0.050)$  l/min respectively. Mean portal  $O_2$  uptake for the same periods was  $2.03 (\pm 0.016)$  and  $1.96 (\pm 0.022)$  mmol/min respectively. Variation in arterio-venous  $O_2$  difference (mM) was slightly larger than for blood flow (CV = 8.0 and 7.0% respectively). Mean  $O_2$  uptake estimated from the shorter sampling period was 97% of that from the longer period. If  $O_2$  uptake is a useful criterion for nutrient uptake, selecting a 7h sampling "window" appears to be a satisfactory compromise between convenience and precision.

HUNTINGTON, G.B. and TYRRELL, H.F. (1985). *J. Dairy Sci.* 68: 2727.

TAGARI, H. and BERGMAN, E.N. (1978). *J. Nutr.* 108: 790.

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