Continuous Monitoring of Oxygen Consumption in Sheep Head and Estimation of Energy Expenditure from Oxygen Consumption

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Abstract

An experiment was conducted with two non-lactating and non-pregnant ewes to evaluate a new method of determining the energy expenditure of the head. The sheep were previously prepared with skin-covered loops and with ultrasonic blood flow probes around the carotid artery, and they were fed Italian ryegrass hay. After inserting the blood gas sensors into the carotid artery and jugular vein, the blood oxygen concentration, blood flow rate, and activity of the animals were continuously monitored. Oxygen consumption of the head was determined by multiplying the carotid blood flow rate and the difference in oxygen concentration between arterial and venous blood. The oxygen concentration of the carotid artery and jugular vein were relatively constant throughout a 3-day period; however, a rapid rise in the blood flow rate was observed. The rise in the blood flow rate was synchronized with the chewing activity of the sheep. Thus, the changes in the oxygen consumption of the head were associated with chewing. The calculated energy expenditure of the head was greater during eating and rumination than during resting. The rise in energy expenditure was greater during eating than that during rumination.

Keywords: Oxygen consumption, Blood flow rate, Chewing activity, Head, Sheep