THE USE OF PULSE RATE MEASURED BY TELEMETRY AS AN INDICATOR OF OXYGEN CONSUMPTION IN CATTLE

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Much of the research on energy metabolism and metabolic rate in cattle has been conducted with animals restrained in metabolism cages or respiration chambers because measurement under field conditions is difficult. Furthermore, the act of collecting data from restrained cattle may alter their physiological state (Hahn *et al.* 1990). This study was undertaken to explore the relationship in cattle between pulse rate (measured by telemetry) and oxygen consumption when pulse rate was increased by exogenous adrenalin to simulate different levels of sympathetic stimulation.

Six 18 month old Hereford heifers were used. All heifers had been implanted with a pulse rate telemetry probe (Model HR 400 Telonics, Mesa, Arizona) 8 months prior to the study. A low quality roughage diet was available *ad libitum* except during the 12 hours prior to adrenalin treatment when all feed was removed. Water was available continuously. The adrenalin treatments were an intra muscular injection of sterile water (0), 2 mg adrenalin (2) or 4 mg adrenalin (4). All 6 heifers were subjected to all treatments. A randomised complete block design was used where the animals were blocks and 48 hours elapsed between treatment applications for each animal. Pulse rate was measured and recorded on a data logger every 2 seconds for 15 minutes following the injections. Rate of oxygen consumption was measured concurrently (15 minute periods) using a face mask and an open circuit respiratory analyser (Brosh *et al.* 1994). The results for pulse rate and oxygen consumption are shown in Table 1.

Table 1. Means (± SEM) for pulse rate (PR) and rate of oxygen consumption (OC) over a 15 minute period following exogenous adrenalin treatment

	Adrenalin level (mg)			
	0	2	4	SEM
PR (beats/minute)	63.2 (5.93)^{aA}	75.8 (5.93)^{ab}	85.5 (5.93)^{b}	3.53
OC (ml/minute)	1162.25 (111.55)	1393.96 (111.55)	1354.32 (111.55)	66.32

^{AB}Means within a row with different superscripts are significantly different (P<0.05).

Pulse rates were increased linearly by adrenalin. Pulse rate was significantly greater during the 15 minutes following the 4 mg injection than in the 15 minutes following the water injection. Oxygen consumption was not affected (P>0.05) by treatment. The relationship between pulse rate and oxygen consumption was found to be linear but not significant. The use of pulse rate as a stand alone indicator of metabolic rate is not supported by this study as claimed by others (Webster, 1967; Richards and Lawrence, 1984). The telemetry equipment proved to be an effective method of measuring pulse rate in cattle. Some problems were encountered with electrical interference which could mask transmission if the cattle were more than about 50 m from the radio receiver. Subsequent modifications to the pulse rate probe from an internal to an externally (surface) attached device allowed greater flexibility and reliability. The use of this type of monitoring equipment will lead to improvements in our ability to study parameters such as pulse rate in unrestrained animals.

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