EFFECT OF EXERCISE ON MATERNAL, FETAL AND UTEROPLACENTAL GLUCOSE METABOLISM IN PREGNANT EWES

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Moderate exercise in late-pregnant ewes causes maternal and fetal hyperglycaemia (Chandler and Bell 1981). However, it is not known whether these changes are associated with increases in maternal and/or fetal glucose utilisation. The present study was designed to extend these observations by measuring, simultaneously, maternal glucose turnover and net uterine, fetal and uteroplacental glucose uptakes in resting and exercising ewes during late pregnancy.

Eight well-fed, single-pregnant Merino ewes were used. At 101-121 d gestation, catheters were surgically implanted in the following blood vessels: maternal abdominal aorta, an external jugular vein, uterine vein draining the pregnant horn of the uterus, fetal abdominal aorta, common umbilical vein and fetal posterior vena cava. At least 7 d later, [2-^{3}H] glucose was infused into the maternal jugular vein and antipyrine into the fetal vena cava to measure maternal glucose turnover-rate, and umbilical and uterine blood flows, respectively. Blood samples were taken while the ewe stood at rest and then while it walked on a moving-belt treadmill at 0.7 m/s, 10^{o} slope.

Effect of exercise on blood glucose concentration, maternal glucose turnover, and net uterine, fetal and uteroplacental uptake of glucose (Means ± SEM; n=5)

	Arterial glucose concentration (mmol/L)		Maternal glucose turnover (μmol/min)	Net glucose uptake (μmol/min)		
	Ewe	Fetus		Uterine	Fetal	Uteroplacental
Rest	2.61±0.15	0.73±0.07	565±69	275±51	92±23	184±30
Exercise	3.42±0.52	1.05±0.16	1269±114	376±86	109±20	267±89

The following conclusions appear justified. (1) Maternal hyperglycaemia caused by exercise is due to an increased rate of entry of glucose into the bloodstream, as indicated by the increase in maternal glucose turnover. (2) The relative partitioning of maternal glucose turnover to the gravid uterus decreased from 50% at rest to 30% during exercise, despite a 37% increase in net uterine uptake of glucose. (3) Approximately 80% of the increase in net uterine uptake of glucose went to uteroplacental tissues and 20% to the fetus, indicating the apparent sensitivity of placental metabolism to changes in maternal glucose supply. (4) Although there was a relatively small increase in net fetal glucose uptake during exercise, it is not clear whether this is more than partly responsible for the observed fetal hyperglycaemia or whether changes in fetal glucose metabolism are also involved.

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