NEW INSIGHTS INTO FETAL AND NEONATAL THERMOREGULATION

H.P. Laburn, A.S. Faurie, S. Madu and D. Mitchell, Brain Function Research Unit, University of the Witwatersrand, Johannesburg, South Africa.

Fetal animals appear to be thermally protected from heat and cold stress, by strategies employed by the pregnant animal during her own thermoregulatory responses, or by virtue of the fetus' thermal inertia. During experimental mild to moderate heat or cold exposure, or during exercise of the mother animal, the body temperature of fetal lambs, for instance, changes relatively less than does body temperature of the mother, with the feto-maternal thermal gradient being adjusted appropriately. What is not known, however, is whether fetal thermal protection is sustained in animals in natural conditions, where wide ambient temperature fluctuations, and variable solar radiation, wind and humidity occur. We have studied pregnant Angora goats (*Capra hircus*) in laboratory conditions as well as in their natural habitat, to examine the differences in fetal body temperature regulation. We used miniature dataloggers implanted intra-abdominally and under Fluothane (Halothane, Hoechst) anaesthesia, in mother and fetal animals for both laboratory and field experiments. Pregnant goats show greater variability of body temperature in natural as compared to laboratory conditions, but apparently continue, by physiological means, to reduce the corresponding variations in their fetuses. At birth, in natural conditions, body temperature of the delivered kid plummets more than in controlled laboratory conditions, and survival in this species is dependent on the prevailing environmental conditions, with the risk highest in conditions with low solar radiation. While abdominal temperature may be kept relatively constant in fetal animals, our measurements of brain temperature in fetuses using chronically implanted thermistors suggests that the temperature of the highly metabolic brain may vary in a fashion different to that of the rest of the body. These variations by have consequences for fetal development, and neuronal injury at birth. Maternal fever poses considerable thermal risk for the fetus (Laburn, *et al.*, 1992). We have shown that bacterial products present in the fetal lamb circulation, and particularly in the intra-uterine cavity of the sheep (*Ovis aries*) result in abortion in between 50-75% of pregnancies. Fetal lambs themselves apparently are not capable of generating febrile temperatures *in utero*, although serum iron concentrations of fetuses fall significantly after Gram-positive pyrogen injection into the fetal circulation. Fever in the newborn and young animal can be deleterious; we report that repeated febrile episodes in young guinea-pigs (*Cavia porcellus*) are associated with growth retardation, at least partly as a result of decreased food intake during the febrile period.

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057helen@chriron.wits.ac.za