



HAL
open science

RENAL FUNCTION AND MICTURITION IN FETAL LAMBS, AND THE EFFECTS OF HYPOXIA

D.W. Walker

► **To cite this version:**

D.W. Walker. RENAL FUNCTION AND MICTURITION IN FETAL LAMBS, AND THE EFFECTS OF HYPOXIA. *Annales de Recherches Vétérinaires*, 1977, 8 (4), pp.497-498. hal-00900971

HAL Id: hal-00900971

<https://hal.science/hal-00900971>

Submitted on 11 May 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

RENAL FUNCTION AND MICTURITION IN FETAL LAMBS, AND THE EFFECTS OF HYPOXIA

D.W. WALKER

Nuffield Institute for Medical Research, University of Oxford, England

The fetal kidney receives only 3% of cardiac output and forms a large volume of hypotonic urine. Renal blood flow falls during experimental hypoxia (Cohn *et al.*, 1974) but the effects on glomerular filtration rate (GFR), urine flow and urine composition are unknown.

In 6 chronically catheterized sheep, fetal urine was collected from a suprapubic bladder catheter; GFR was measured by infusion of ^{51}Cr -EDTA. During hypoxia (the ewe breathing 9% O_2 with 3% CO_2 in N_2 for 1 hour) the fetal femoral PaO_2 fell from 22.3 ± 1.5 to 13.8 ± 0.7 mmHg and arterial pressure increased from 49 ± 3.7 to 56 ± 5.9 mmHg. There was either no change or an increase in GFR; urine flow fell when GFR did not change, but otherwise did not alter or increased slightly. Urine pH, osmolality and excretion of Na and K increased. The clearance of solute-free water always fell and in some lambs there was re-absorption of solute-free water. After hypoxia GFR and urine flow always increased and urine pH remained high for 1-2 hours.

Infusion of adrenaline into a fetal tarsal vein ($1.3 \mu\text{g}\cdot\text{min}^{-1}$ for 1 hour) increased GFR from 3.1 ± 0.31 to 5.4 ± 0.15 $\text{ml}\cdot\text{min}^{-1}$ and urine flow from 0.45 ± 0.09 to 0.97 ± 0.17 $\text{ml}\cdot\text{min}^{-1}$. Initially arterial pressure increased. Urine osmolality fell from 180 ± 42 to 101 ± 18 $\text{mOsm}\cdot\text{kg}^{-1}$ H_2O and free water clearance increased from 0.21 ± 0.1 to 0.70 ± 0.05 $\text{ml}\cdot\text{min}^{-1}$. There was no change in urine pH or the excretion of Na and K. Infusion of arginine vasopressin (2.25 $\text{mU}\cdot\text{min}^{-1}$ for 1 hour) increased urine osmolality from 130 ± 6.9 to 322 ± 15.7 $\text{mOsm}\cdot\text{kg}^{-1}$ H_2O and reduced the clearance of solute free water; urine flow fell from 0.49 ± 0.06 to 0.32 ± 0.1 $\text{ml}\cdot\text{min}^{-1}$. Urine pH and the excretion of Na and K increased during and recovered 1-2 hours after the infusion of vasopressin.

The release of adrenaline and vasopressin during hypoxia (Jones and Robinson, 1975; Rurak, 1976) together can amount for the observed changes in urine flow and composition. The maintenance, or increase, of GFR during hypoxia was unexpected and requires further investigation in view of the reported decrease in renal blood flow. Acidification of urine did not occur during or after hypoxia, suggesting that renal mechanisms are not involved in correcting hypoxic acidemia.

Recording of pressures within the fetal bladder showed that contractions occurred 2-4 times per hour, usually in association with episodes of fetal breathing recorded from a catheter in the fetal trachea. However, there was no evidence of a diurnal rhythm. Similar pressures were recorded in the bladder of newborn lambs, where the passage of urine was observed.

References

- COHN H.E., SACKS E.J., HEYMANN M.A., RUDOLPH A.M., 1974. *Amer. J. Obstet. Gynec.* **120**, 817-824.
- JONES C.T., ROBINSON R.O., 1975. *J. Physiol. London* **248**, 15-23.
- RURAK D.W., 1976. *J. Physiol. London* **256**, 36-37P.