

dures does not impair the fall in urinary osmolality. It appears that the effects of the extracts on sodium and water excretion are, at least in part, at different sites in the nephron. Both these responses are similar to those seen in the kidney which has become resistant to the vasoconstrictive effect of intra-arterial infusion of angiotensin (Klein *et al.* 1971).

REFERENCES

- Bartter F C & Mills I H (1970) *J. Endocr.* 48, xii
 de Bono E, Mills I H & Wilson R J (1969) *J. Physiol. (Lond.)* 204, 32P
 Klein G L, Mills I H & Wilson R J (1971) *J. Physiol. (London.)* 215, 43P

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Maternal Water Metabolism in Pregnancy

In a normal pregnancy the average woman accumulates about 8.5 l. of water. Some 6 l. of that can be attributed to water contained in the product of conception, enlarged maternal organs such as uterus and breasts and the expanded maternal blood volume; the remaining 2.5 l. appears to be all in the maternal extracellular space (Hytten 1970). The added extracellular water is a little greater in women with lower limb oedema but considerably greater, averaging 5 l., in women with generalized oedema, although clinically this is almost always trivial and manifested as no more than a tight wedding ring (Hytten *et al.* 1966).

Some late pregnancy oedema is of the classical Starling type and may be attributable to the relatively high venous pressure in the lower limbs and the reduced colloid osmotic pressure of plasma (Robertson 1969). But most of the extracellular water is probably held in the connective tissue ground substance because of oestrogen-induced changes in the mucopolysaccharide component. Evidence for this is discussed by Hytten (1970). It seems likely every normal pregnant woman stores considerable amounts of water in her connective tissue ground substance and the wide differences in the manifestation of clinical oedema remain to be explained.

The excretion of water is also modified by pregnancy. Because of progesterone-induced overbreathing the pregnant woman reduces her

PCO₂, and plasma bicarbonate must be lowered to maintain pH. Sodium is excreted with bicarbonate, leading, with other changes, to a fall in plasma osmolality of about 10 mosmol/kg in the first few weeks which is maintained throughout pregnancy (Hytten 1968, Robertson 1969). Such a fall might be expected to lead to a diabetes-insipidus-like state and this may occur transiently in many women. However, subjects on salt-free diet, for example, can adjust to a slowly induced fall in osmolality and, while avoiding continuous diuresis, are able to produce only a small diuresis after a water load. The pregnant woman also avoids continuous diuresis but, by contrast, has an enormously enhanced ability to excrete water, up to 30 ml/min (Hytten & Klopper 1963). It seems likely that the osmoreceptors are reset in pregnancy to accept and preserve the new low level of osmolality in the same way that the respiratory centres are reset to accept and preserve the greatly reduced PCO₂ of pregnancy.

Lying supine in late pregnancy has long been known to reduce urine flow, sometimes but not necessarily associated with reduced renal plasma flow and glomerular filtration rate. Lindheimer & Weston (1969) have shown that when women in late pregnancy are given DOCA and infused with hypotonic saline, lying supine induces an immediate increase in sodium reabsorption in the proximal nephron; the 'third hormone' may be implicated.

REFERENCES

- Hytten F E (1968) *J. Obstet. Gynaec. Brit. Cwlth* 75, 1193
 (1970) *Int. J. Gynaec. Obstet.* 8, 343
 Hytten F E & Klopper A I (1963) *J. Obstet. Gynaec. Brit. Cwlth* 70, 811
 Hytten F E, Thomson A M & Taggart N (1966) *J. Obstet. Gynaec. Brit. Cwlth* 73, 553
 Lindheimer M D & Weston P V (1969) *J. clin. Invest.* 48, 947
 Robertson E G (1969) *J. Reprod. Fertil.* 9, Suppl. 27

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Neonatal and Infant Water Metabolism

As Du Pan has commented, the newborn infant is a dipsomaniac, since on a weight-for-weight basis his intake is equivalent to more than 12 litres per day in an adult. To analyse the background to water metabolism in the young, some of the limitations provided by renal structure and function in this age-group must be considered.

Following relative inactivity of the kidney *in utero*, renal function displays a transition period