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Treatment of Hyponatraemia with Captopril

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Dear Sir,

I would like to describe correction of the serum sodium level with captopril as observed in 2 patients with marked hyponatraemia (104 and 108 mmol/L, respectively). In the 1st patient, this was associated with liver disease and the use of diuretics for mild congestive cardiac failure. The 2nd patient had biventricular cardiac failure and was also on diuretic therapy. In both patients, a very high serum aldosterone level was observed (1,140 and 2,303 pmol/L, respectively; fig. 1; normal range 30–350 pmol/L), and although there was a modest response in both patients to fluid restriction, a steady and sustained elevation in the serum sodium occurred only after treatment with captopril was commenced.

Marked hyponatraemia with normal or increased total exchangeable sodium can be a feature of liver disease and congestive cardiac failure. Hyperaldosteronism and increased plasma renin activity (PRA) is also described in these conditions. This high PRA may be responsible for hyponatraemia mainly through angiotensin II (A II) which, by virtue of its higher concentration in the kidney, decreases blood flow in the vasa recti, thereby trapping urea in the renal papilla. This results in greater medullary osmolality and thereby promotes water reabsorption with its consequent dilutional effect on the serum sodium [1]. A II can also stimulate the brain's thirst centre, promote antidiuretic hormone secretion (although hyponatraemia due to inappropriate antidiuretic hormone secretion is usually associated with low PRA) [1], promote or inhibit sodium excretion in the kidney directly [1], and cause pressure natriuresis [1] and even affect movement of sodium into or out of the vascular tree [2].

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Captopril 12.5 mg daily

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20 25 30 35 40 45

Time, days

Fig. 1. Steady and sustained rise in serum sodium together with fall in serum renin and aldosterone (case 1) and aldosterone alone (case 2) following administration of captopril. tds = Three times a day; bd = twice a day.

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Although the effect of A II on the blood flow in the vasa recti was the rationale for using angiotensin-converting enzyme inhibition in our patients, other mechanisms may be operable. These are: (1) potassium depletion which results in movement of sodium into the cells [3]; (2) use of diuretics, and (3) a shift of sodium from the extracellular fluid to the intracellular compartment which could be attributed to a circulating toxin suppressing cell membrane Na-K-ATPase activity [4–6]. Failure of Na-K-ATPase activity causes decreased sodium efflux from the cell due almost entirely to suppression of the ouabain-sensitive component of this pump. The stimulatory effect of aldosterone on Na-K-ATPase acts only on the ouabain-insensitive pathway and, therefore, should increase the sodium efflux constant [4].

It would appear then that AII was primarily responsible for producing hyponatraemia in these cases which occurred in the presence of an elevated aldosterone level and in whom serum sodium continued to rise despite falling aldosterone levels.

Captopril appears to be effective in raising serum sodium in patients in whom hyponatraemia occurs with a raised PRA and hyperaldosteronism.

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