Effect of (±)-propranolol on the recovery of urinary concentration process after frusemide, in the rat

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Frusemide eliminates the intrarenal sodium concentration gradient. When its effect wears off, the recovery of urinary concentration process can be followed. In anaesthetized dogs, propranolol delays this recovery (Imbs, Schmidt, Belhadj-Mostefa & Schwartz, 1975). We have observed the effect of propranolol on the recovery of the sodium cortico-papillary gradient after frusemide, in conscious male Wistar rats. (a) Propranolol does not modify the diuretic action of frusemide but keeps urinary osmolality down: 579 ± 40 (s.e. mean, $n = 20$) instead of 901 ± 78 ($P < 0.001$), and 1236 ± 105 instead of 1671 ± 60 m osmol/kg ($P < 0.005$) respectively 4 h and 8 h after frusemide injection. (b) Papillary and cortical sodium concentrations were measured according to Atherton, Hai & Thomas (1968), 30 min, 1, 2, or 3 h after injecting 4 groups of 20 rats with frusemide (20 mg/kg). Half these rats had been treated with propranolol (6 mg/kg). Ratio of these two concentrations, obtained from dry tissue weight, served as an index to intrarenal sodium gradient.

Propranolol inhibits the recovery of intrarenal sodium concentration gradient (Figure 1). Cortical sodium concentration remained constant. Medullary hypertonicity remained lower much longer in propranolol-treated animals. Three hours after frusemide injection, the papillary Na-cortical Na ratio was 3.6 ± 0.2 ($n = 10$) instead of 4.4 ± 0.2 ($P < 0.05$) without propranolol.

Our grateful thanks to ICI for the (±)-propranolol hydrochloride.

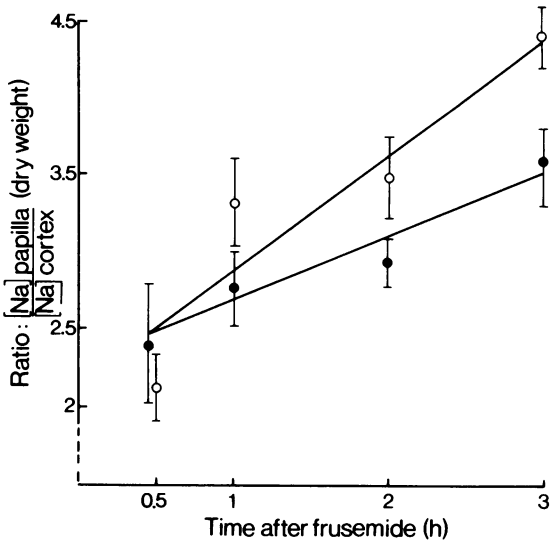

Figure 1 Regression curves for the papillary Na/cortical Na ratio expressed as a function of time between frusemide injection and kidneys removal. The equation for the curve is $Y = 0.797\ X + 2.039$ ($r = 0.6819$, $n = 40$) after frusemide (○), and $Y = 0.479\ X + 2.184$ ($r = 0.5233$, $n = 40$) after frusemide combined with propranolol (●). The slopes of these 2 curves are significantly different ($P < 0.05$). Points represent the mean of 10 measurements, vertical bars, s.e. mean.

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The role of potassium in the inhibition by cardiac glycosides of (Na^+-K^+)-ATPase prepared from human heart

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We have prepared an enriched fraction of human heart (Na^+-K^+)-ATPase from homogenates treated by NaI (De Pover & Godfraind, 1976). The activity of this preparation was equal to 10–15 μmol Pi mg protein^{-1} h^{-1} at 37°C in a medium containing (mM): NaCl 100, KCl 3, $MgCl_2$ 3, Tris-ATP 2.5, EGTA 1, Tris-maleate 20 (pH 7.4) (final volume 1 ml). The ATPase reaction was started by the addition of enzyme preparation (10 μg) and stopped by 0.1 ml of 50% trichloroacetic acid. The preparation contained 5% of residual Mg-ATPase.

The inhibition of (Na^+-K^+)-ATPase by digoxin, digitoxin, gitoxin and ouabain has been studied. The presence of the sugar chain and of the unsaturated lactone ring was required for full activity as reported