

EFFECT OF ADRENALINE ON URINE OUTPUT IN RATS*

By

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Adrenaline is known to cause a brief antidiuresis due to its effects on the renal haemodynamics. Dearborn and Lasagna (3) observed in dogs given adrenaline, brief antidiuresis associated with a fall in filtration rate and renal plasma flow. However, in some dogs, the antidiuresis persisted long after the renal haemodynamics had returned to normal. Antidiuresis did not occur following neurohypophysectomy. The workers concluded that the antidiuresis was due to antidiuretic hormone (ADH) release in response to the catecholamine. Eranko *et al* (5) observed that large doses of adrenaline cause release of ADH.

The present work was undertaken to examine whether adrenaline had an antidiuretic effect in rats and the possible role of ADH in mediating the effect.

MATERIALS AND METHODS

All experiments were made on male albino rats weighing 160-220 g. The rats were kept in metabolic cages in groups of four. The groups were so arranged that the total weight of one group (755-845 g) did not vary much from the other. The animals were starved for 15-17 hours before the experiment but were allowed water *ad lib*.

Group I served as control and received tap water 5 ml/100 g, administered through a stomach tube. Group II received 5 ml/100 g of 12% v/v ethanol administered through a stomach tube. Group III received 5 ml/100 g of 12% v/v ethanol through a stomach tube as in the case of group II but in addition received adrenaline tartrate in the dose of 16 µg/100g in a volume of 1 ml (made up by adding physiological saline if necessary) by intraperitoneal injection. Group IV received tap water as in group I (Control) and adrenaline as in group III. To maintain the constancy of injection trauma, groups I and II received 1 ml physiological saline by intraperitoneal route.

Urine was collected in glass cylinders. Urine volume was recorded every 15 min for 5 hr.

Rats used for one treatment were allowed rest for a week before being subjected to another treatment. All the groups received all four treatments in turn.

Time to excrete 50% of water load was determined by the method described by Burn (1).

* Received on 5-11-1969

RESULTS

TABLE I

*Effect of adrenaline on urine output in the various groups.
Mean urine volume in ml after 5 hr \pm S.E.*

I	II	III	IV
Control	Ethanol 12% v/v, 5 ml/100g	Ethanol (same as) (in II) and adrenaline (same as) (in IV)	Adrenaline 16 μ g/100g i.p.
36.25 \pm 1.46 (12)	57.25 \pm 3.79 (12)	43.33 \pm 3.05 (12)	27.83 \pm 1.86 (12)

Figures in parentheses indicate the number of observations.

It can be seen from Table I that adrenaline decreased urine volume significantly in 5 hr period ($p < 0.01$). Ethanol caused a significant diuresis ($p < 0.001$). Though the combined treatment resulted in a diuresis, the effect was not of the same degree as that caused by ethanol alone; however, the urine volume in this group was significantly more ($p < 0.001$) than in the group given adrenaline alone.

TABLE II

*Effect of adrenaline on the time to excrete water load.
Mean time in min. to excrete 50% water load \pm S.E.*

I	II	III	IV
Control	Ethanol 12% v/v, 5 ml/100g	Ethanol (same as) (in II) and adrenaline (same as) (in IV)	Adrenaline 16 μ g/100 i.p.
109.33 \pm 6.16 (12)	113.91 \pm 9.05 (12)	121 \pm 8.06 (12)	198.66 \pm 20.9 (12)

Figures in parentheses indicate the number of observations.

It is evident from Table II that adrenaline 16 μ g/100g i.p. delayed the time to excrete 50% water load significantly ($p < 0.001$). Combined treatment shortened the delay significantly ($p < 0.01$).

DISCUSSION

It is evident from the results that adrenaline has antidiuretic properties in the dosage used (16 μ g/100 g i.p.).

Alcohol is known to cause diuresis. Van Dyke and Ames (10) have shown that the alcohol induced diuresis could be due to inhibition of release of ADH. Dicker (4) in fact concluded that alcohol causes a functional hypophysectomy. Since then considerable evidence has been marshalled in favour of alcohol induced diuresis being mediated through inhibition of the supraoptico-hypophyseal system leading to decreased secretion of the ADH (7, 9).

Our results show that prior administration of alcohol significantly reduced antidiuresis due to adrenaline. This indicates that adrenaline antidiuresis is due to release of ADH.

The findings of the present study correlate well with the available literature. Dearborn and Lasagna(3) have shown in dogs that adrenaline can cause release of ADH. Carlsson *et al* (2) showed that the periventricular, paraventricular and especially the supraoptic nuclei were innervated by adrenergic nerves. Further, adrenergic blocking agents have been shown to block the release of ADH. (6, 8).

SUMMARY

Adrenaline was found to produce antidiuresis in rats. Prior administration of ethano abolished this antidiuretic effect of adrenaline. It is suggested that adrenaline brings about a release of ADH.

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