To obtain a more profound understanding of polyamine changes, we planted wheat seeds in boxes and grew them in the greenhouse. In whole 1-month-old plants without roots, before earing, spermine increases, given as γ/unit of seed, about 8 times and spermidine about 5 times. The increase of these polyamines, observed in plants before earing, suggest that leaves are one site of biosynthesis. Besides, the data show that the spermine and spermidine content is greater in organs of higher biosynthesis of the wheat plant.

The relationship of spermine and spermidine to nucleic acid biosynthesis[6], amino acid rate of incorporation[7] and 1 C unit metabolism[8], shows the importance of their presence during wheat plant development.

Riassunto. Spermina e spermidina sono presenti in tutte le parti della pianta di frumento eccetto radici ed antere. Sono particolarmente abbondanti negli ovuli dove aumentano dopo la fecondazione. I risultati inoltre indicano che le foglie sono uno dei principali luoghi di biosintesi di queste sostanze.

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The Influence of the Experimental Conditions on the Renal Response to Angiotensin in the Rat

Although there is increasing evidence that the renin-angiotensin system is important in the control of sodium metabolism and arterial pressure, its exact role is far from clear. Studies on the effect of angiotensin on renal function have led to contradictory findings. Thus all previous investigators[1–4] have found that in the rat infusion of angiotensin increases urinary sodium excretion, and in this species angiotensin is thought to have the role of a sodium-excreting hormone. Since the rat is the common model for the study of hypertension as well as for micropuncture studies of sodium transport mechanisms, the action of angiotensin in this species is of critical importance. We have found that the effect of angiotensin on urinary sodium excretion in the rat is dependent on the experimental conditions. The same dose of angiotensin in the same animal is consistently natriuretic under one set of circumstances and antinatriuretic under another. This observation is of importance for the correct interpretation of the role of angiotensin, which in the rat appears to be that of a sodium-retaining hormone.

The experiments were performed on 7 young black-hooded rats weighing between 180 and 220 g. Under light ether anaesthesia catheters were inserted into a tail vein and, through a small suprapubic incision and cystotomy, into the bladder. The operative preparation took approximately 30 min, and the animals were then allowed to recover in special restraining cages.

The response to angiotensin was determined in the same animal at varying times after surgery, with and without anaesthesia, and in states of sodium loading and depletion. The protocol of each angiotensin infusion was identical under these different experimental conditions. For 1 h before and throughout each experiment the animal was infused continuously by means of a constant infusion pump at a rate of 0.37 ml/min. The infusate was half-strength Hartmann's solution, giving a sodium infusion rate of 24 μEq/min in all experiments except those performed during sodium depletion, when it was 2.5% dextrose. Urine was sampled at 10 min intervals and sodium concentration estimated by flame photometry. Following 2 stable control periods, angiotensin II (Ciba) dissolved in one of the above infusates was administered in doses of 0.00005–0.005 μg/kg/min for 12–32 min, the urine passed during the initial 2 min of the angiotensin infusion being discarded. In the following description, changes in urinary sodium excretion during angiotensin infusion less than 10% of control are considered insignificant.

Infusion of angiotensin in doses of 0.00005–0.005 μg/kg/min 2–6 h after operation, when the animal was fully conscious, had no consistent effect on urinary sodium excretion (Table). In separate experiments on 3 animals in whom anaesthesia after operation was maintained with i.v. nembutal 15–25 mg/kg, angiotensin in these doses never reduced sodium excretion and sometimes increased it.

After the acute post-operative infusion of angiotensin, the animal was placed on a high sodium intake by infusing approximately 0.5 mEq of sodium daily as quarter-strength Hartmann's solution and fed standard rat chow. In 3 animals the response to angiotensin was studied after only 1 or 2 days of post-operative sodium loading. Infusion of angiotensin at this time again had no consistent effect on sodium excretion. After 3–8 days of chronic sodium loading the response to angiotensin was again investigated. Doses of 0.0005–0.005 μg/kg/min now consistently reduced urinary sodium excretion in all 7 animals, and in 5 out of the 7 doses of 0.00005 μg/kg/min also reduced it (Table). Immediately after this study, the animal was anaesthetized with i.v. nembutal, 15–25 mg/kg, and the angiotensin infusion repeated in identical fashion. Doses of angiotensin which had been antinatriuretic in conscious animals immediately before anaesthesia, failed to affect

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Effect of angiotension on urinary sodium excretion in all experiments

Animal	Angiotensin dose μg/kg/min	Without previous sodium loading and 2 h after operation %	After sodium loading and 3–8 days after operation %	During anaesthesia %	After sodium depletion %	After sodium repletion %
1						
	0.00005	102	81	84	91	98
	0.0005	101	85	90	114	73
	0.005	86	75	91	117	67
2						
	0.00005	100	82			
	0.0005	100	88			
	0.005	97	76			
3						
	0.00005	103	88	104	97	
	0.0005	103	84	90	91	
	0.005	94	75	97	148	
4						
	0.00005	92	93			
	0.0005	90	75	66		
	0.005	94	62	59		
5						
	0.00005	90	77	83		
	0.0005	107	85	81	92	
	0.005	115	63	105	66	
6						
	0.00005	89	95	98		95
	0.0005	102	70	104	108	76
	0.005	78	79	103	91	70
7						
	0.00005	102	73		103	77
	0.0005	101	63		102	76
	0.005	78	61		117	72

Sodium excretion during the infusion of angiotensin is expressed as a % of mean sodium excretion in the control periods immediately before and after angiotensin.

sodium excretion in 7 out of 14 experiments under anaesthesia (Table).

Following the above study the animals were depleted of 1–3 mEq of sodium over a period of 2 days, by the administration of the diuretic frusemide (1 mg/kg) and a salt-free diet. In sodium-depleted animals, angiotensin in doses of 0.00005–0.0005 μg/kg/min had no effect on sodium excretion. Doses of 0.005 μg/kg/min reduced sodium excretion in 1 animal but increased it in 3 of 4 others (Table). Finally, the animal was repleted with sodium over 2 days by infusing the amount of sodium lost during the period of depletion. Infusion of angiotensin now again reduced urinary sodium excretion (Table). 1 animal was successfully depleted and repleted of sodium on 3 occasions. In each instance angiotensin in doses of 0.00005 to 0.005 μg/kg/min was either without effect or natriuretic when the animal was sodium depleted but antinatriuretic after sodium repletion.

A typical series of experiments in the same animal, illustrating the influence of different experimental conditions on the response of sodium excretion to angiotensin, is shown in Figure 1. The effect of angiotension on sodium excretion in all experiments is shown in the Table, and the influence of sodium status on the renal response to angiotensin in Figure 2.

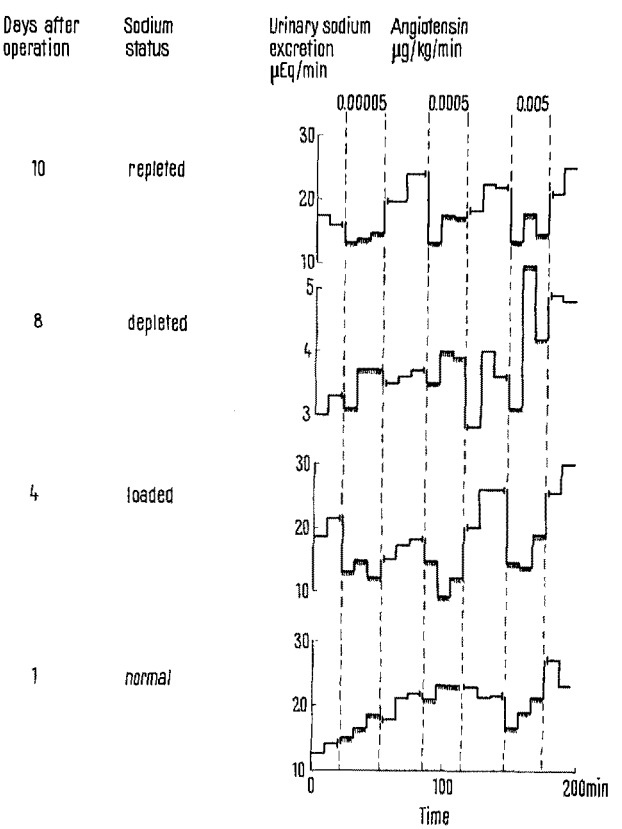

Fig. 1. The effect of different experimental conditions on the response of urinary sodium excretion to angiotensin in the same animal. Experiment performed (A) 2 h after surgery; (B) 4 days after surgery following sodium loading; (C) 8 days after surgery following sodium depletion; and (D) 10 days after surgery following sodium repletion.

In previous studies angiotensin has been infused in acute experiments without prior sodium loading into either untrained[2,4] or anaesthetized rats[1,3], conditions under which we have also failed to elicit an antinatriuretic effect. In habituated chronically sodium-loaded rats, on the other hand, a consistent antinatriuretic effect is readily demonstrated, but only with small doses (0.005 µg/kg/min and below). Large doses (0.05 µg/kg/min and above) increase sodium excretion. Thus, in the rat angiotensin has the dose-dependent opposite effects on sodium excretion observed in dog[5], rabbit[6], and man[7]. The physiological role of angiotensin in the rat, as in these other species, is more likely to resemble the effect of small rather than large doses and to be that of a sodium-retaining hormone.

The influence of the experimental conditions on the renal response to infused angiotensin may be mediated by their effect on local renal angiotensin concentration. Thus, with sodium depletion, endogenous angiotensin production is increased and may lead to a local renal concentration of the hormone which exerts its maximal antinatriuretic effect. Infusion of additional hormone will then either have no effect or, by summating with endogenous hormone, lead to excessively high levels which increase sodium excretion. Similarly, in acute experiments involving traumatic procedures on untrained animals, greater activity of the sympathetic nervous system may increase endogenous angiotensin production[8], so that infusion of exogenous hormone can only elicit a natriuretic response.

The opposite effect that angiotensin has on sodium excretion from the 2 kidneys in rats with unilateral renal ischaemia, further suggests that the concentration of endogenous angiotensin in the kidney may be crucial in determining the renal response to infused hormone. Thus, angiotensin reduces sodium excretion from the unclamped kidney, which has a subnormal renin content, but increases it from the clamped kidney, with a raised renin content[3,9].

These results indicate the importance of the experimental conditions in assessing the effect of angiotensin on renal function and have other important implications. Thus, micropuncture studies of sodium transport and glomerulo-tubular balance should be interpreted in the understanding that in such acute experiments on anaesthetized animals the renin-angiotensin system may well be operating at maximal activity, since, at least in the rat under these conditions, infused angiotensin is incapable of exerting any further antinatriuretic effect. This point is especially important in view of the likelihood that angiotensin plays a crucial role in the control of glomerular and tubular function.

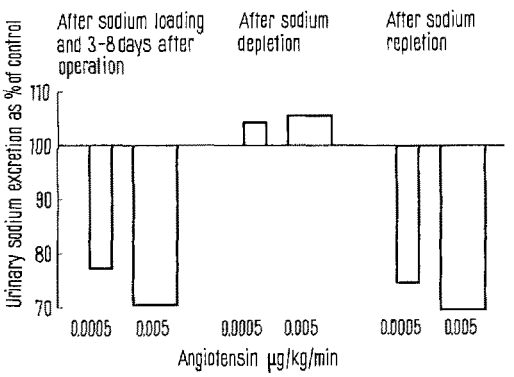

Fig. 2. The effect (A) of sodium loading; (B) sodium depletion; and (C) sodium repletion on the response of urinary sodium excretion to the same doses of angiotensin.

Mean urinary sodium excretion during angiotensin infusion is expressed as a % of the mean of the control periods immediately before and after its infusion. The average of all experiments is shown.

Résumé. Les conditions expérimentales déterminent la réponse rénale à l'angiotensine chez le rat. Antérieurement, on a seulement demontré une réponse natriurétique à cette hormone. Cependant, chez les rats chargés chroniquement de sodium, on a demontré que l'angiotensine en doses de 0,00005–0,005 µg/kg/min est toujours antinatriurétique. Après une opération récente, ou sous anesthésie ou en présence d'une déplétion de sodium, l'angiotensine à ces doses, chez les mêmes animaux, est soit sans effet ou même natriurétique.

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The Protective Effect of Small Amounts of Selenite in Sublimate Intoxication

The necrotizing effect of parenteral injection of small doses of cadmium cations on the testis[1,2] can be prevented by simultaneous injection of a small dose of selenium salts[3,4]; in our laboratory we were able to show a similar protective effect of salts of selenium[5,6] against the toxic effects of cadmium in other reproductive organs, i.e. in the non-ovulating ovaries of rats in permanent oestrus[5,7] and in the placentae[8,9]. In order to understand the mechanism of this protective effect of selenite and the nature of interaction between cadmium and selenium compounds, it was necessary to show how far the protective effect of selenite is specific for the effect of cadmium and its effect in reproductive organs only, or how far selenium compounds can act as a highly efficient protective agent in intoxication by toxic metals in general.

To test this possibility, we decided first to study the effect of simultaneous injection of selenite on the development of renal necrosis produced by sublimate intoxication. Male (50 rats) and female (24 rats) adult white rats (Wistar substrain Konárovice), kept on a standard laboratory diet and in standard laboratory conditions,