Proc. Indian Acad. Sci., Vol 87 B (Animal Sciences), No. 3, March 1978, pp. 33–37,

Effect of osmotic stress on parsnervosa and median eminence of *Columba livia* (Gmelin)

S S HASAN and K CHANDRASEKHAR
Surgical Research Laboratory, Institute of Medical Sciences, Banaras Hindu University, Varanasi 221 005

MS received 22 September 1977

Abstract. The response made by parsnervosa and median eminence of pigeons to osmotic stresses created by sodium chloride and potassium iodide salt solutions have been studied. Parsnervosa of pigeons showed more drainage of AF-positive secretion in response to a higher concentration of saline solution (0·25M) whereas it became refractory to a lower dose of saline (0·15M). It was further observed that a 5 μg/ml dose of iodide affected the parsnervosa partly and while a 10 μg/ml dose failed to bring about any appreciable change. The amount of secretion contained in the median eminence underwent no essential change in response to osmotic stress.

Keywords. Parsnervosa; median eminence; neurosecretion; osmotic stress.

1. Introduction

Sodium chloride treatment brings about neurosecretory draining of parsnervosa, while the amount of secretion contained in the median eminence undergoes no essential changes (Oksche *et al* 1959, 1963, 1964). Kobayashi *et al* (1962) further observe that osmotic stress affects only the neurosecretion contained in parsnervosa and fails to influence the content in the median eminence. On the other hand Peczely (1966) reports the neurosecretory contents of median eminence to respond to hydration and dehydration (induced by NaCl treatment). Jasinski and Gorbman (1967) find only minimal but recognizable differences between the natural dehydrated and hydrated states with respect to stainable hypothalamic neurosecretion in *Scaphiophus hammondi.* In view of the existence of contradictory observations, the experimentation of studying the neurosecretory contents in the Parsnervosa and median eminence of pigeon under two different experimental conditions was undertaken.

2. Materials and methods

25 pigeons (*Columba livia*) formed the material for this experimentation. Birds were obtained from a nearby locality of Varanasi, which is their natural habitat and were acclimatised to the laboratory conditions for a fortnight. During this period and also throughout the duration of experimentation the birds were fed on sprouted gram and were housed under identical animal husbandry conditions. After acclimatisation the birds were divided into 5 equal groups, each containing 5 birds:

Group I: formed the control to all the experimental groups and were allowed tap water *ad-libitum.*

Group II: was fed 0·25 M NaCl solution.

Group III: was fed 0·15 M NaCl solution.

Group IV: was fed 10 μg potassium iodide/ml of water.

Group V: was fed 5 μg potassium iodide/ml of water.

Everyday fresh solutions of potassium iodide (BDH) and sodium chloride (BDH) salts were prepared in tap water and put in respective cages for drinking. In each group on an average each bird drank 17 ml of the solution per day. Birds were sacrificed by decapitation on the 20th day of administration of the salts and their brains were fixed in Bouin's fluid. Prior to fixing, the brains were decraniated. Serial paraffin sections of 10 μc thick were cut and stained in Gomori's aldehyde fuchsin according to Halmi's modification.

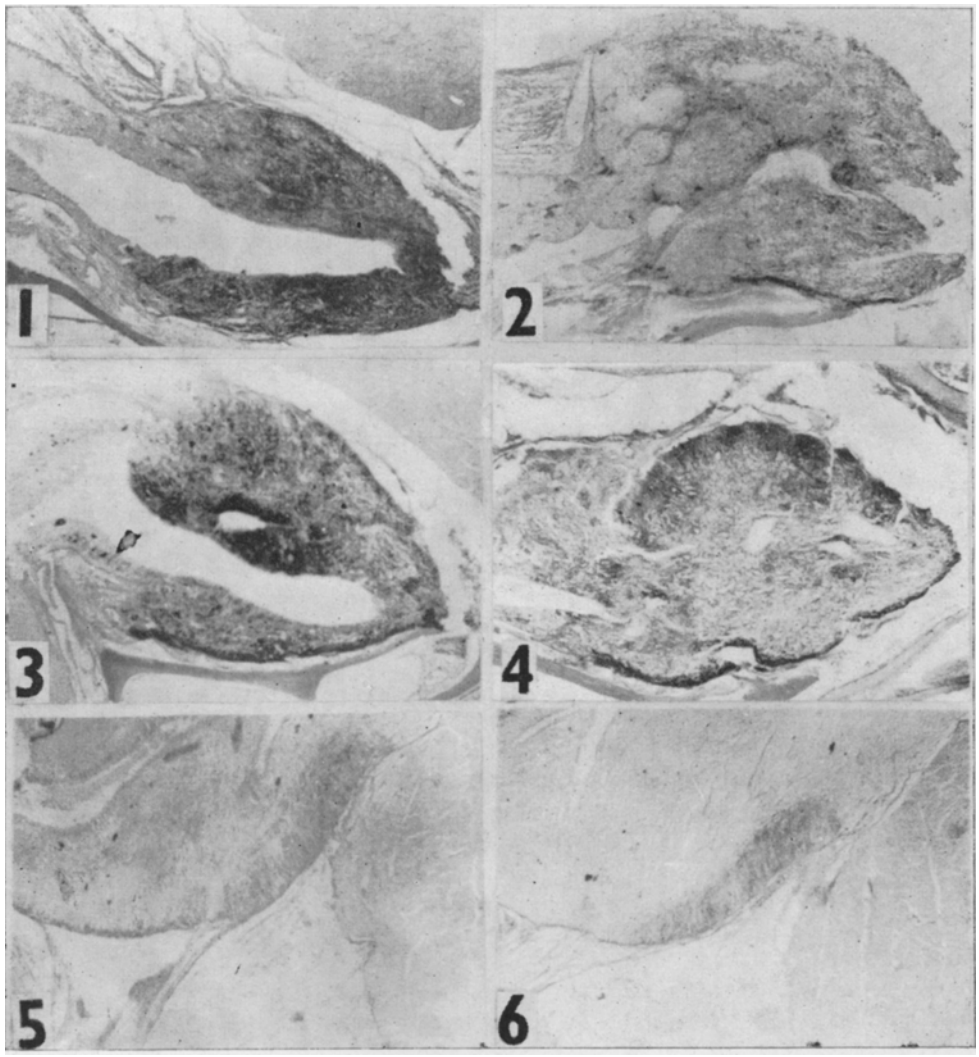
3. Results and discussion

In the control pigeons the parsnervosa (PN) was found loaded with dark AF positive substance (figure 1) whereas in 0·25 M saline administered pigeons the PN showed the depletion of AF positive material (figure 2). It was further observed that the PN of the pigeons treated with 0·15 M saline had appreciable amount of Gomori-positive material (figure 3). Thus, this study clearly demonstrates that PN of the pigeons make a definite response to a concentration of 0·25 M saline solution, whereas it fails to be influenced by a lower concentration of 0·15 M saline. This further points to the fact that PN may only respond to a high degree of osmotic stress as created by 0·25 M saline. This response of PN to NaCl treatment substantiates fully the findings of previous workers (Oksche *et al* 1959, 1963, 1964, Kobayashi *et al* 1962, Peezely 1966).

Potassium iodide treatment in a dose of 5 μg/ml of water elicited 50% neurosecretory material from the parsnervosa (figure 4) whereas a higher dose of iodide (10 μg/ml of water) failed to educe the material. This is presumably because the excess iodide is excreted and not checked by the posterior pituitary hormones and hence the PN remains undisturbed. Further work could reveal as to why a lower dose of iodide (5 μg) affects to some extent the PN whereas a higher dose (10 μg/ml) fails to do so. It is further adduced that iodide treatment does not cause much osmotic stress as compared to 0·25 M saline fed pigeons, so far as the removal of AF-positive material from the PN is concerned.

A distinct difference in the depth of staining between the AF-positive material of median eminence and the parsnervosa was discernible in the pigeon. Further, the neurosecretory material of the parsnervosa depleted readily in response to osmotic stress, while the granules in the median eminence, either did not or depleted only tardily (figures 5 and 6). These observations are in complete agreement with those of Oksche *et al* (1959, 1963, 1964) and Kobayashi *et al* (1962) but do not agree with those of Peczely (1966) who recorded a perceptible change in median eminence after dehydration (induced by NaCl treatment) and hydration (by excessive water loading) of *Columba livia* domestica-L.

The observed effect of NaCl treatment admits of the conclusion that parsnervosa of the pigeons respond to intense osmotic stress (0·25 M NaCl) by discharge of Gomori



Figures 1-4. S.S. of brain of pigeon passing through the parsnervosa, (× 280). **1.** control showing the AF-positive granules in the parsnervosa, **2.** 0·25 M saline administered, showing the depletion of neurosecretory substance from the parsnervosa **3.** 0·15 M saline administered showing the presence of AF-positive materials **4.** 5 μg iodide/ml water administered, showing the partial depletion of neusecretory materials. **Figures 5-6.** S.S. of brain of pigeon passing through median eminence, AF (× 280). **5.** control showing the scanty AF-positive material in the median eminence, **6.** 0·25 M saline administered showing lightly stained AF-positive substance in the median eminence.

positive neurosecretion. On the other hand, a low dose of iodide can only influence the parsnervosa. It further suggests that saline solution causes very strong osmotic stress in comparison to iodide.

Acknowledgements

Authors are grateful to Prof. K N Udupa, for providing the necessary facilities. One of the authors is grateful to CSIR, India for the award of a fellowship and a liberal contingent grant.

References

Jasinski A and Gorbman A 1967 Hypothalamic neurosecretion in the spadefoot toad, *Scaphiopus hammondi*, under different environmental conditions; *Copeia* **2** 271

Kobayashi H, Oota Y and Hirano T 1962 Acid phosphatase activity of the hypothalamo-hypophyseal system of dehydrated rats and pigeons in relation to neurosecretion; *Gen. Comp. Endocrinol.* **2** 495

Oksche A, Laws D F, Komemoto F J and Farner D S 1959 The hypothalamo-hypophyseal neurosecretory system of the white crowned sparrow (*Zonotrichia leucophrys gambellii*); *Z. Zellforsch.* **51** 1

Oksche *et al* 1963 The Hypothalamo-hypophyseal neurosecretory system of the Zebra Finch *Taenopyga castanotis; Z. Zellforsch.* **58** 846

Oksche A, Wilson W O and Farner D S 1964 The hypothalamic neurosecretory system of *Coturnix joponica; Z. Zellsforsch.* **61** 688

Peczely P 1966 Effect of thirst and water load on the hypothalamic regulation of the adrenal in the pigeon (*Columba livia domestica* L); *Acta Morph. Acad. Sci. Hung.* **14** 227