INHIBITION BY RESERPINE OF HISTOLOGICAL CHANGES INDUCED BY HYPERTONIC SALINE IN THE HYPOTHALAMIC NEUROSECRETORY SYSTEM OF THE MUSK SHREW, SUNCUS MURINUS L.

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It is well established that administration of hypertonic saline brings about characteristic histological changes in the hypothalamic neurosecretory system (HNS), which are regarded as morphological manifestations of augmented secretion of the antidiuretic hormone (ADH) (see Gabe, 1966). Reserpine is reported to stimulate (Chaudhury, Chaudhury & Lu, 1962; Guzek & Leśnik, 1968), inhibit (Moses, 1964; Bridges & Thorn, 1970), or to have no effect (Boris & Stevenson, 1967) on ADH secretion. The amount of neurosecretory material (NSM) after reserpine treatment has been found to be unchanged (Eränkö, Hopea, Kivalo & Telkkä, 1957) or diminished (e.g. Gabe, Tuchmann-Duplessis & Mercier-Parot, 1961). The present study reports the effect of reserpine on the histology of the HNS after treatment with hypertonic saline.

Animals were divided into six groups with 12 adults of either sex in each, and treated as follows: Group I: 3% NaCl solution (2 ml/day, i.p.) for 3–5 days (chronic dehydration); Group II: single i.p. injection of 2 ml 30% NaCl (severe dehydration), animals were killed 10–15 min after the injection; Group III: simultaneous treatment with reserpine (50 μg/day, i.m.) and 3% NaCl (2 ml/day, i.p.) for 3–5 days; Group IV: reserpine (50 μg/day, i.m.) for 5 days, 3 h after the last injection the animals were severely dehydrated by i.p. injection of 2 ml 30% NaCl; Group V: distilled water (2 ml/day, i.p.) for 3–5 days; Group VI: normal, untreated controls. Animals were killed by decapitation. The pituitary and adnexa were fixed in Bouin’s fluid, processed and sectioned at 10 μm in the sagittal plane, stained with Gomori’s aldehyde–fuchsin and counterstained with light green and orange G.

In Suncus, in contrast to nearly all other mammals, chronic dehydration (Group I) brought about profound changes in the cells of the paraventricular nucleus (PVN) (Plate, fig. 1) and only to a limited extent in those of the supraoptic nucleus (SON) (A. Kulshreshtha & C. J. Dominic, unpublished observations). The changes included enlargement of the cells and of cell nuclei, clumping of the intranuclear inclusions and depletion of NSM from the cytoplasm (Plate, fig. 1). The stalk median eminence (SME) and the neural lobe (NL) (Plate, fig. 2) were almost completely depleted of their NSM; Herring bodies were only rarely observed in the hypothalamus. The changes after acute dehydration (Group II) were similar to those following chronic dehydration except that the cells of the SON were also affected and there was no appreciable
depletion of NSM from the NL. Treatment with reserpine (Groups III & IV) completely inhibited the dehydration-induced changes (both chronic and acute) in the HNS (Plate, figs 3 & 4). The cytoplasm of the neurosecretory cells of the PVN and the SON contained much NSM and the cell nuclei appeared normal (Plate, fig. 3). The SME and the NL (Plate, fig. 4) showed no sign of depletion of NSM; Herring bodies were commonly observed in the hypothalamus. On the whole, the HNS of these animals (Groups III and IV) presented a picture which was comparable in all essential details to that of the HNS of controls (Groups V & VI) (Plate, figs 5 & 6).

Even though it is well established that the Gomori method stains only NSM and not ADH, the close relationship of these substances is indicated by the depletion of both after prolonged water deprivation or hypertonic saline treatment (see Gabe, 1966). Therefore, the histological changes in the HNS that follow hyperosmotic stimulation are regarded as morphological indications of increased secretion of ADH (Gabe, 1966). Hence, the inhibition, by reserpine, of these changes in the present experiments provides histological evidence in favour of the view (Moses, 1964; Bridges & Thorn, 1970) that reserpine significantly inhibits dehydration-induced antidiuresis. The mechanism by which reserpine blocks antidiuresis is not clearly understood, though it is is suggested that this is through a stimulatory action on the adrenal cortex (Moses, 1964).

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REFERENCES


DESCRIPTION OF PLATE

Staining: Gomori’s aldehyde-fuchsin, counterstained with light green and orange G; magnification: × 800.

Fig. 1. Cells of the paraventricular nucleus (PVN) of the musk shrew (Group I) after chronic dehydration. Note clumped intranuclear inclusions (arrows) and the cytoplasm depleted of neurosecretory material (NSM); cf. fig. 3.

Fig. 2. A portion of the neural lobe (NL) of the same animal. Note depletion of NSM; cf. fig. 4. PI, pars intermedia.

Fig. 3. Cells of the PVN (Group III) after reserpine treatment and chronic dehydration. Note absence of dehydration effects and the normal appearance of the cells; cf. fig. 5.

Fig. 4. A portion of the NL of the same animal. Note the absence of dehydration effects; cf. fig. 6.

Fig. 5. Cells of the PVN of a control animal (Group VI).

Fig. 6. Portion of the NL of the same animal.