

The activation of neurosecretory activity by gonadotrophic hormones. By
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The enzyme distribution as well as the enzyme activity of thiamine diphosphate phosphohydrolase (TPPase), a marker enzyme of the Golgi-complex, is a parameter for the neurosecretory activity of the supraoptic (SON) and paraventricular nucleus (PVN) in the rat (Jongkind & Swaab, 1967; Jongkind, 1969; Swaab & Jongkind, 1970).

Although the hypothalamo-neurohypophysial system (HNS) is not considered to be concerned in anterior lobe regulation, the neurosecretory activity, determined by means of these enzymic parameters, is increased after gonadectomy, during early oestrus and during light-induced persistent oestrus (Swaab & Jongkind, 1969, 1970). Since no direct anatomical connexion exists between the HNS and the anterior lobe-regulating-parvocellular system, the stimulus causing hyperactivity in the HNS after gonadectomy was supposed not to be neural, but probably hormonal in nature. However, the findings during the oestrous cycle and persistent oestrus showed no direct relationship between the blood-levels of sex hormones and the neurosecretory activity. On the other hand a close relationship was found between the gonadotrophic hormone levels and the neurosecretory activity during the experimental circumstances mentioned above. This relationship could not be explained by a stimulatory action of posterior lobe hormones on the release or production of gonadotrophic hormones. However, the increase in neurosecretory activity after ovariectomy was inhibited by oestrogens, while administration of gonadotrophic hormones (HMG, HCG, LH and FSH) reactivated the neurosecretory activity in these oestrogen-primed animals (D. F. Swaab & J. F. Jongkind, in preparation). Prolactin did not show any effect on the neurosecretory activity.

In order to investigate whether different cells might be activated by the different stimuli for neurosecretory activity, the amount of cells reacting during osmotic stress, lactation and gonadotrophic hormone administration was determined in the SON and PVN. As appeared from changes in the size of the Golgi-apparatus, 61-69% of the SON cells and 72-80% of the PVN cells were activated during osmotic stress as well as lactation and injection of LH or FSH. Consequently, activation of the magnocellular nuclei during the various experimental conditions is not caused by activation of different cells within these nuclei, but the same cells are activated irrespective of the kind of stimulus.

The factors influencing the HNS can be divided into neural stimuli, e.g. osmotic stress, parturition and lactation, and hormonal stimuli, e.g. gonadectomy, early oestrus and light-induced persistent oestrus. The activation by hormonal stimuli can be explained by the stimulatory effect of gonadotrophic hormones on the synthetic activity of the SON and PVN. The mechanism of this effect of gonadotrophic hormones on the neurosecretory nuclei is now under investigation.

The gonadotrophic hormones used in the present study (NIH-FSH-S7, NIH-LH-S15 and NIH-Prolactin-S9) were kindly provided by the Endocrinology Study Section, N.I.H.

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