LITERATURE CITED


CHANGES IN MONOAMINE CONTENT IN VARIOUS REGIONS OF THE HYPOTHALAMUS IN DIFFERENT STAGES OF THE ESTROUS CYCLE

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The role of the brain monoamines in the regulation of pituitary gonadotropic function is now firmly established. Much attention has been paid to this subject in the literature, but there is still no general agreement regarding the role and site of action of a concrete monoamine in this process. Some workers ascribe the leading role in the activation of the pituitary-gonadal system to dopamine [1-3], others to noradrenalin [4-5]. Some workers consider that serotonin plays an inhibitory role [2, 6]. Moreover, data on the role of the various monoamines are based on results obtained under conditions far from physiologically normal: either during continuous illumination, or after deafferentation of the mediobasal hypothalamus, which usually produced permanent estrus. Against this background, administration of various monoamines led to an increase or decrease in the blood level of luteinizing hormone (LH), from which the authors concerned deduced that the amine injected was associated with the regulation of the pituitary gonadotropic function [7].

The object of this investigation was to study the dynamics of the monoamine content in the hypothalamus during the estrous cycle. It was assumed for the investigation that there are two centers for the regulation of gonadotropic functions, tonic and cyclic. The question accordingly arose: is the cyclic character of the pituitary gonadotropic function due to one or several monoamines?

Fig. 1. Changes in monoamine content in different parts of hypothalamus and in LH level in pituitary (I) and blood plasma (II) at different stages of estrous cycle. ARC-ME) Region of arcuate nucleus and median eminence; PoA) preoptic region; PM-MM) region of posterior hypothalamus; SO-DM) mediobasal part of hypothalamus. DA) Dopamine, S) serotonin, NA) noradrenalin, A) adrenalin. A) Castrated females; B) intact males. D1, D2) Stages of diestrus, P) proestrus, E) estrus. Ordinate, content of monoamines in hypothalamus (in ug/mg tissue) or of LH in blood plasma (in ng/ml) and in pituitary (in ug/mg tissue); abscissa, time of day (15 = 3 p.m., 18 = 6 p.m.).

At the first stage of the investigation changes in the monoamine levels in the different parts of the hypothalamus were studied and an attempt was made to compare the dynamics of these changes with the LH levels in the pituitary and blood.

MATERIALS AND METHOD

Experiments were carried out on noninbred female rats weighing 200-220 g with a clear 4-day cycle, produced by keeping the animals under standard conditions (illumination from 5 a.m. to 7 p.m.). The animals were decapitated at different times of day: 10 a.m., 3 and 6 p.m. The concentrations of the monoamines — dopamine (DA), noradrenalin (NA), adrenalin (A), and serotonin (S) — were determined fluorometrically by the method of Welch and Welch [8] in different fragments of the hypothalamus: fragment 1 included the preoptic region, the anterior hypothalamic field, and the suprachiasmatic nucleus (PoA), the 2nd the region of the arcuate nucleus and the median eminence (ARC-ME), the 3rd the dorsal and ventromedial nuclei and the paraventricular nucleus (SO-DM), and the 4th the premammillary and mammillary bodies (PM-MM). Fragments from eight rats were pooled for each determination, except for determination of monoamines in the 3rd fragment, when the material was pooled from four rats. Altogether 336 determinations were made, on average six for each fragment of hypothalamus. All operations were carried out in the cold. Tissue of the hypothalamus was homogenized in 0.01 N HCl and frozen before determination. The concentration of LH in the blood plasma and pituitary of these rats also was determined by a radioimmunological method [9].

The content of monoamines in the various parts of the hypothalamus and of LH in the blood plasma and pituitary glands also was determined in ovariectomized females 3 weeks after castration and in intact males.

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