

## Brain Nucleic Acid Content During the Estrous Cycle in the Rat<sup>1</sup>

Pharmacologic<sup>2</sup> as well as cyclic endogenous levels<sup>3,4</sup> of estradiol influence the incorporation of amino acids into proteins of specific hypothalamic nuclei in the brain of the rat. Since alterations in the incorporation of amino acids into brain protein may reflect changes in the synthesis of RNA(s), it is significant that shifts in RNA base ratios have been reported for neurons of the supra-optic nucleus of the rat at different stages of the estrous cycle<sup>5</sup>, and in various brain areas of the rabbit following ovariectomy and ovarian steroid replacement<sup>6</sup>. Total RNA concentration, expressed in terms of wet weight, was also found to be significantly lower for the hypothalamus, amygdala and frontal cortex of the deermouse during diestrus than proestrus<sup>7</sup>. It was of interest to determine if a similar relationship existed for the total RNA content of various areas of the rat brain during different stages of the estrous cycle. However, since the water content of the hypothalamus, sensory-motor cortex and hippocampus of rat brain is significantly higher during diestrus than at proestrus or estrus<sup>8</sup>, nucleic acid data were expressed in terms of dry weight.

**Methods.** 11 rats/cycle stage (proestrus, estrus and diestrus) were selected by vaginal smears from cycling Sprague-Dawley rats (approximately 250 g) maintained on a 12/12 h light/dark schedule. After decapitation,

evident and is in agreement with the findings of others<sup>11</sup>. The validity of expressing neurochemical data in terms of dry weight is supported by the finding that dry weight expressed in terms of total DNA is constant throughout the estrous cycle for each selected brain region (Table).

It appears that changing titers of ovarian steroids during the estrous cycle of the rat are associated with alterations in RNA-base ratios of specific hypothalamic nuclei<sup>5</sup>, while the total RNA content of specific brain regions remains unchanged.

**Résumé.** Le contenu total du RNA, DNA et le poids sec de certaines parties prélevées au cerveau sont restés constants durant les différentes étapes du cycle oestral.

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Nucleic acid and dry weight concentration for selected regions of the rat brain during estrus

Tissue	$\mu\text{g RNA/mg dry wt.}$	$\mu\text{g DNA/mg dry wt.}$	$\mu\text{g dry wt./}\mu\text{g total DNA}$
Cerebellum (left lobe)	10.34 $\pm$ 0.67	20.18 $\pm$ 0.68	50 $\pm$ 2
Sensory-motor Cortex	15.04 $\pm$ 0.35	4.18 $\pm$ 0.29	249 $\pm$ 16
Hypothalamus	14.62 $\pm$ 0.47	4.81 $\pm$ 0.22	213 $\pm$ 10
Hippocampus	16.06 $\pm$ 0.34	4.29 $\pm$ 0.31	247 $\pm$ 20
Corpora quadrigemina	12.81 $\pm$ 0.44	5.32 $\pm$ 0.34	198 $\pm$ 11
Head of the caudate nucleus	13.78 $\pm$ 0.49	4.34 $\pm$ 0.17	234 $\pm$ 9
Olfactory bulbs	15.31 $\pm$ 0.54	14.04 $\pm$ 0.30	72 $\pm$ 2

Each value is the mean $\pm$ standard error of tissues from 11 rats. Values were not significantly different from those during proestrus or diestrus, and values for proestrus were not different from those of diestrus.

brain areas (Table) were rapidly removed, rinsed free of blood, weighed and frozen not longer than 2–3 h prior to analyses. RNA was determined by a modified orcinol and DNA by a modified diphenylamine reaction<sup>9</sup>. Both reactions were modified to allow duplicate analyses of the nucleic acids for each brain area from individual rats. Dry weights were calculated on the basis of the percentage of tissue water previously determined for each brain area listed in the Table<sup>8</sup>. Significance of differences was determined for each brain area between each stage of the cycle by the Student's *t*-test.  $P \leq 0.05$  was considered significant.

**Results and discussion.** There were no significant differences between the 3 stages of the estrous cycle in the RNA content for the 7 areas of the brain examined. Therefore, only data for the estrus stage of the cycle is arbitrarily presented in the Table. Since the DNA content of the rat brain remains constant after 14 days of age<sup>10</sup>, it is not surprising that differences were not found in DNA for the brain areas between the 3 stages of the cycle. The extremely high concentration of DNA in the cerebellum and olfactory lobes as compared to other regions is

<sup>1</sup> Supported by U.S. Public Health Service Grant No. AM-06603 and by Training Grant No. AM-05249. This research was conducted in the Developmental Neuroendocrinology Research Lab., V.A. Hospital, San Fernando, California.

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