DETERMINATION OF THE SPECTRUM OF NEUROSECRETION IN HISTOLOGICAL SECTIONS

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A method of qualitative and quantitative estimation of neuronal activity in the supraoptic and paraventricular nuclei of the hypothalamus is suggested, based on measurement of the absorption spectra of the neurosecretion. Accumulation of neurosecretion is accompanied by an increase in wavelengths in the green, blue, and violet regions of the spectrum.

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Increasing interest in hypothalamic neurosecretion and the associated extensive study of neurons of the supraoptic and paraventricular nuclei of the anterior hypothalamus has presented investigators with the problem of how to estimate qualitatively and quantitatively, with the highest degree of objectivity, the content of neurosecretory material in all parts of the hypothalamo-hypophyseal system, especially in the cytoplasm of its neurons. Qualitative estimation from the intensity of the PAS-reaction [6, 8], counting the number of secretory neurons in serial paraffin sections [7, 9], planimetry [4], photo- and densitometry [11], radioisotope recording [5, 10], biometry by the gravimetric method [3], and in particular, micrometry of neurons [1] are widely used to record the secretory activity of hypothalamic neurons.

To estimate the secretory activity of neurons in histological sections, in addition to micrometry of the cell bodies and nuclei, a method of qualitative investigation of the spectra with subsequent quantitative analysis by means of wavelength scales has been used. The hypothalamus from dogs in which reflexogenic hypertension had been produced was fixed in Bouin's fluid and stained by Maiorova's modification [2] of Gomori's method. Thin (4-5 μ) paraffin sections were used for spectral analysis. The boundaries of the regions of emission and absorption of light were determined with the Soviet SPO-1 spectral adapter. Daylight (spectrum with minimal absorption) and aldehyde-fuchsin (spectrum with maximal absorption) were used for reference. Hypothalamic neurons containing single small granules of neurosecretion in the prekaryon when stained with aldehyde-fuchsin were taken as normal. If neurosecretory material accumulated in the cytoplasm of the neurons, areas with the maximal content of neurosecretory granules were selected. The largest area of investigated surface of cytoplasm for spectroscopy did not exceed 9 μ^2. The results of the investigation are given in Table 1. They show that accumulation of neurosecretory material causes an appreciable increase in wavelength in the green, blue, and violet regions of the spectrum. This phenomenon disappears if appropriate filters are used. The use of spectrometry, provided that the methods of fixation and staining the neurosecretion are strictly standardized, can provide considerable help in determining the

TABLE 1

Color of spectrum	Wavelength (in μ)			
	daylight	neurosecretion		aldehyde-fuchsin
		normal	after accumulation in cell	
Red	0,75—0,66	0,75—0,66	0,75—0,64	0,75—0,65
Orange	0,66—0,58	0,66—0,63	0,64—0,62	0,65—0,63
Yellow	0,58—0,54	0,63—0,59	0,62—0,59	0,63—0,62
Green	0,54—0,49	0,59—0,51	0,59—0,55	0,62—0,59
Blue	0,49—0,47	0,51—0,49	0,55—0,50	0,59—0,56
Dark blue	0,47—0,44	0,49—0,47	0,50—0,48	0,56—0,53
Violet	0,44—0,40	0,47—0,40	0,48—0,40	0,53—0,40

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qualitative and quantitative characteristics of neurosecretory material contained in neurons of the supraoptic and paraventricular nuclei of the hypothalamus.

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