

(figure 2 and 3). In the cytoplasm of detergent-treated and control cells, similar particles can also be seen in the contact with the ends or middle portions of CF, which are 30–90 Å in diameter. The morphology and contrasting capacities allow us to identify these particles as ribosomes. One can suggest that CF are engaged in the transport of so-called free ribosomes from the nuclear surface into definite areas of cytoplasm, where they function as the membrane-

free ribosomes. The failure to confirm the contact of CF with ribosomes in the similar experiments^{5,9}, is probably due to the destructive action of a relatively high concentrations of TX-100 applied in this work. The data on quite certain distribution of CF in the cytoplasm¹⁰, as well as the fact on the abundance of CF and free ribosomes in the malignant cells¹¹, correlate with the notion on transport function of these ultrastructures.

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Evidence of relationship between the dopaminergic neurotransmitters and the nuclei of the retinal cells

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Summary. Biochemical and quantitative autoradiographic methods indicated the accumulation of labelled dopamine inside the nuclei of retinal cells, and this decreased after treatment with 6 OH dopamine.

In previous papers^{1,2} we reported that, as a result of blocking the dopaminergic transmission in the retina, the neurotrophic false neurotransmitter 6 OH dopamine inhibited the generation of outer segments and the turnover of rhodopsin. Subsequent studies³ showed that the drug also affected the quantity of RNA in the retina. This led us to postulate that the dopaminergic neurotransmitter might be tied to the nucleic acid in some unknown manner. To pursue this interesting and important problem one step further, the answers to the following questions have to be sought. Firstly, is it possible that the dopaminergic transmitters enter into the nuclei of retinal cells? If so, will this entry be affected by such agents as 6 OH dopamine? Furthermore, since the retina consists of a heterogeneous population of neuronal cells, will the different nuclei of different cell types display variations in quantities of entry of dopaminergic transmitters?

Materials and methods. 40 neonatal albino rats (1-week-old, strain Simonsen) were used, of which two-thirds were for biochemical studies. The animals were divided into controls and experimentals. The latter were injected with 100 mg/kg 6 OH dopamine i.p. After 3 days, both the controls and experimentals in this group were sacrificed and the retinas dissected out and incubated with 0.005 mCi tritiated dopamine (New England Nuclear) in oxygenated TC199 medium at 37 °C for 45 min to 1 h. The retinas were then homogenized, and using a sucrose gradient method⁴, the nuclei were separated from the cytoplasm. The activities of both nuclei and cytoplasmic fractions were counted with a Liquid Scintillation Counter.

The remaining one-third of the rats were used in autoradiography. The retinas were again isolated and incubated with labelled dopamine. The retinas were then embedded in paraffin and sectioned. The sections were coated with Ilford emulsion and stored in the dark (4 °C) for 1.5 months. The emulsion was then developed and the sections stained with hematoxylin. The grains on the nuclei of the different layers of the retinas were counted.

Results. In the normal retina, the activity in the nuclei portion, as determined by the Liquid Scintillation Counter, was 551.8 ± 38.78 cpm/0.1 g tissue wet weight ($\bar{x} \pm SE$, $n=6$). The activity in the cytoplasmic portion was 15462.6 ± 1639.8 cpm/0.1 g tissue wet weight ($n=6$). In the nuclei portion of 6 OH dopamine-treated retinas, the activity was only 405.6 ± 26.72 cpm/0.1 g tissue net weight ($n=6$). The difference between this, and that of the controls, was statistically significant ($p < 0.05$).

Autoradiographic studies indicated that the number of grains on the nuclei of cells of the outer nuclear layer of the retina was 1.68 ± 0.43 ($n=30$), of the nuclei of the cells of the inner nuclear layer it was 1.20 ± 0.08 ($n=30$) and of the nuclei of the ganglion cell layer it was 4.32 ± 0.65 ($n=30$).

Discussion. Our results indicate firstly that labelled dopamine, a precursor of dopaminergic transmitters, enters the nuclei of cells of the retina. This strengthens our view that perhaps the dopaminergic transmitters do enter the nuclei. Secondly, the application of 6 OH dopamine will decrease the labelled dopamine entry into the nucleus. Furthermore, the entry of labelled dopamine into the different nuclei of the different cell types varies in quantity. The nuclei of the ganglion cells have the highest amount of labelled dopamine entry.

If our hypothesis on the entry of dopaminergic neurotransmitters into the nuclei is correct, then neurotransmitters which enter can either directly or indirectly moderate the DNA activities and cause changes in the RNA patterns, resulting in the manipulation of development and various metabolic activities.

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