treatment result in impaired function of these structures, then the endocrine function of the thymus gland as well as its role in providing circulating cells would be disturbed. The hormonal function of the thymus gland has been described by WHITE and GOLDSTEIN[14]. The thymic hormone, thymosin, is thought to be produced in the medulla, probably by the Hassal bodies.

The experiements provide a way of measuring the influence of a physical stress on the course of a viral disease. The stress is not an unusual one, nor would one have considered it to be especially severe. Since the stress is presistent and uniform with respect to duration and may be uniformly applied to animals, it offers a model for studying agents which may enhance the immune responses in stressed animals. Such agents may be useful in the treatment of acute or quiescent stages of viral diseases.

Table IV. Effect of stress on thymus

Groups	Body weight (g)	Thymus			
		Weight (mg)	DNA (μg)	RNA (μg)	Total Protein (mg)
Stressed	18.0	20.4	450	140	3.4
Control	18.0	36.6	914	291	5.7
P value	1.0	0.001	0.001	0.001	0.01

There were 10 mice per group. *P* value was calculated using the *t*-test. Stress produced a sharp and similar decrease in the DNA and RNA content of the thymus glands.

Riassunto. L'applicazione di un parziale bendaggio nei topi produce uno stato di fisiologica tensione caratterizzata, in parte, dall'involuzione della ghiandola del timo. Topi sottoposti a una tale tensione sono più suscettibili allo sviluppo dei tumori quando vengono inoculati con un oncogenico virus.

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Uptake of Dopamine by the Neural Lobe of the Pituitary Gland During Postnatal Development of the Rat

A relatively high monoamine oxidase (MAO) activity has been observed in the neural lobe of the pituitary gland of the rat, both in the neurosecretory axons and in the glial cells (pituicytes): so far the functional significance of this observation is conjectural[1]. Except for the noradrenaline containing sympathetic fibres innervating the blood vessels, the only monoamine-containing structures in the neural lobe are 1. the nerve plexus belonging to the tuberohypophyseal system, which contains mainly dopamine[2,3] and 2. a few mast cells containing serotonin[4]. One possible function of MAO would be inactivation of monoamines liberated from the nerves. Another possibility is that MAO would be needed to inactivate monoamines liberated from the median eminence, from which minor part of the portal vessels enters into the neural lobe[5]. In the portal blood, however, only minutely detectable amounts of monoamines have been found[6].

MAO activity increases in the brain tissue 8-fold from the first postnatal day to the adult age[7]. We have followed the uptake of dopamine into the neural lobe during this postnatal period.

Twenty-five female rats aged 1, 7, 14, 34 days and over 2 months old rats (5 in each age group) were injected i.p. with dopamine chloride (Orion, Helsinki), 100 mg/kg body weight, $^1/_2$ h before decapitation. The pituitary glands were processed for formaldehyde-induced fluorescence (FIF) according to the method described by ERÄNKÖ[8], and embedded in Epon resin; 2–5 μm thick sections were viewed and photographed with Leitz Ortholux fluorescence microscope fitted with an epi-illuminator[9] and with appropriate filter combinations. Subsequently the same or serial sections were stained with toluidine blue for light microscopy to identify the fluorescent structures. Some unstained sections were also examined with dark-field microscopy.

After the dopamine injection, a strong, green FIF developed in the neural lobe of the younger groups of the rats. The strongest fluorescence was observed in the neural lobes of 1-day-old rats. The intensity of the FIF decreased evenly with the age of the rats. At 2 months of age, the dopamine injection caused only a weak, just detectable fluorescence.

The FIF of young rats was distributed in the cytoplasm around the nuclei of the pituicytes, in the neurosecretory axons and in the processes of the pituicytes, where it was found to be granular. The intensity of the FIF faded only slowly. During the development the number of the nuclei of the pituicytes per unit area decreased. No uptake was observed in the cells of the pars intermedia and the pars distalis, as also reported by DAHSTRÖM and FUXE (1966)[10], when only dopamine was given. According

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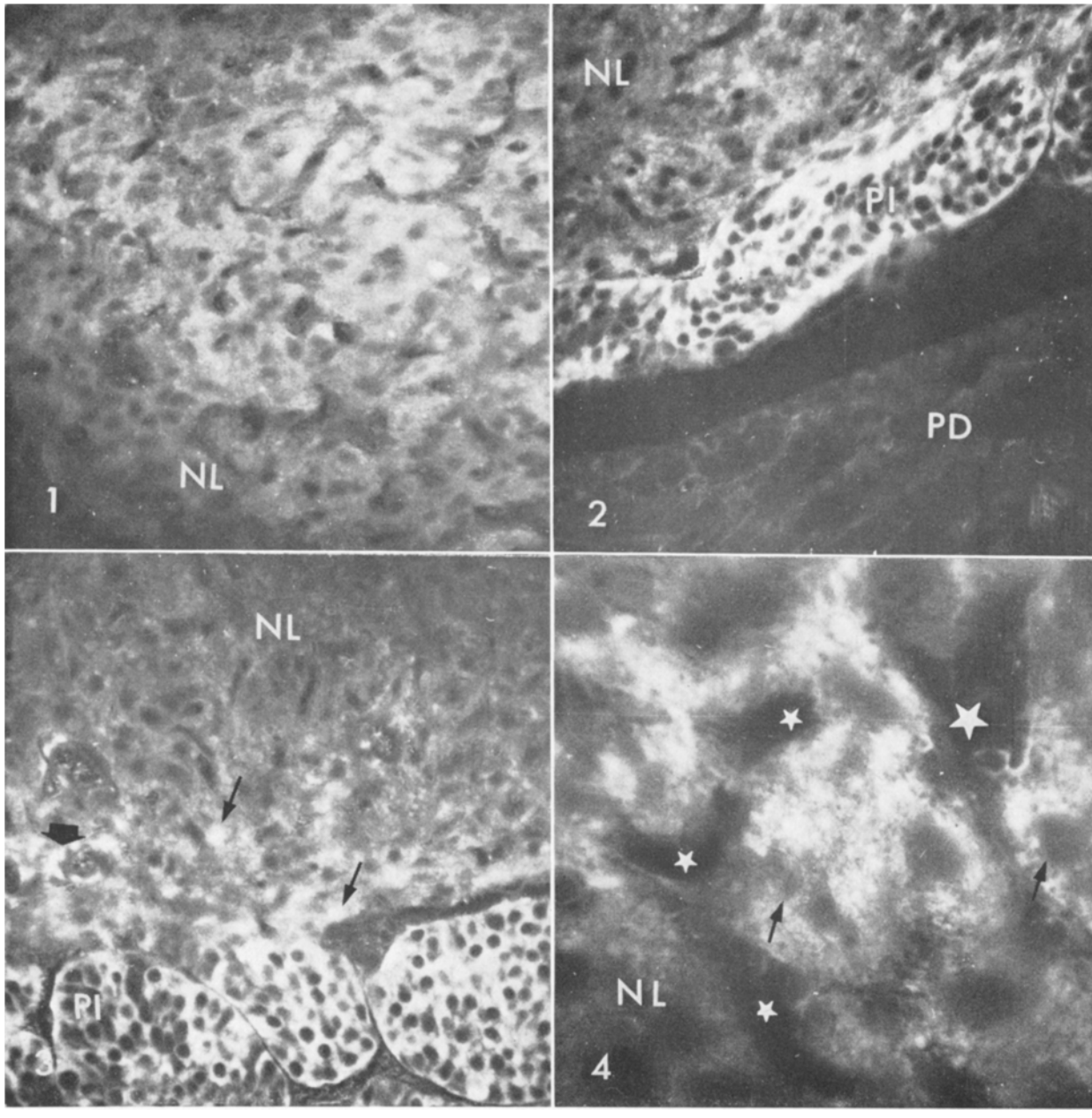

Figures 1–4 are fluorescence microscopical views of the hypophyses of the rats after 100 mg/kg dopamine injection. NL, neural lobe; PI, pars intermedia; PD, pars distalis.

Fig. 1. Neural lobe of 7-day-old rat. ×275.

Fig. 2. Neural lobe, pars intermedia and pars distalis of 21-day-old rat. Note the absence of FIF in the pars distalis. The fluorescence of pars intermedia is yellow and differs clearly from the FIF of the neural lobe. ×275.

Fig. 3. Neural lobe and pars intermedia of 34-day-old rat. Thin arrows point to the nerve fibres and thick arrows to the sympathetic fibres surrounding a capillary. Note the decrease of the intensity of FIF in the neural lobe. ×275.

Fig. 4. Neural lobe of 7-day-old rat with higher magnification. Note the coarse granular appearance of the FIF. Arrows point to the nuclei, asterixes to the capillaries. ×975.

to them, with MAO inhibitor pretreatment DA caused a small increase in the number of fluorescent cells also in these parts of the pituitary gland. Our study of the neural lobe after dopamine injections combined with various drug pretreatments is in progress. It seems that the uptake of dopamine in the neural lobe is specific for the cells and processes originating from the basal hypothalamus.

The decrease of the intensity of the FIF with the age of the rat coincides with simultaneous increase in the MAO activity. However, the decrease in the uptake of dopamine with age may represent a change in the membrane permeability: many embryonal cells are capable of taking up substances which they cannot take up at an adult age. In the neural lobe, there are no ordinary synapses between monoamine-nerves and neurosecretory axons and pituicytes[4]. It is possible that dopamine can be taken up by the neurosecretory axons and pituicyte membranes. This would explain the universally distributed fluorescence after dopamine injection.

Zusammenfassung. Die Aufnahme von injiziertem Dopamin wurde mit Hilfe der Fluorescenzmikroskopie in der neurosecretorischen Axone und in den Pituizyten des Hypophysenhinterlappens der Ratte nachgewiesen. Die Intensität der Fluorescenz nahm während der postnatalischen Entwicklung ab. Mögliche Erklärungen über diese Erscheinung wurden diskutiert.

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Intrapulmonary Neuro-Epithelial Bodies: Hypoxia-Sensitive Neuro(Chemo-)Receptors

The possibility that intrapulmonary air chemoreceptors, in addition to the well established central and peripheral chemoreceptors, play a role in the regulation of the lungs has been a fundamental but unanswered problem for the past 20 years[1-3]. They had not been identified histologically by 1971[4], even though physiologic evidence of their presence was available[5]. It was indeed well established that hypoxia causes a pulmonary vasoconstriction with the aid of an intrapulmonary receptor[6]. A major influence of the central nervous system (CNS), the arterial pH and lactic acid on this system was excluded[7], while serotonin could be mediating it[8].

We have recently identified[9,10], the locus, architecture and basic structure of so-called neuro-epithelial bodies (NEBs) within the bronchial, bronchiolar and even alveolar epithelial lining cells of the mammalian lung (including man). They are located near fenestrated bronchial capillaries. We postulated them to be intrapulmonary chemo-, stretch-, baro- or tactile neuroreceptor organs modulated by the central nervous system which exhibit local secretory activities. We proved indeed by electron microscopic cytochemistry and microspectrography that these corpuscles contained serotonin amongst other substances[10].

In this report we demonstrate that the neuro-epithelial bodies of the intrapulmonary lining epithelium of rabbits secrete their dense-cored, serotonin-containing vesicles (DCV's) at their basal vascular pole after exposure to hypoxia. We propose that amongst their various possible neuroreceptor functions the NEBs provide an intrapulmonary, hypoxia-sensitive chemoreceptor system in addition to the well-established central and peripheral (e.g. carotid body) chemoreceptors. They secrete serotonin

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Number	O_2 (%)	Duration (min)
2	5	2
2	5	10
2	5	20
2	10	2
2	10	10
2	10	20
2	15	2
2	15	10
2	15	20

Number of neonatal rabbits submitted to various degrees of hypoxia during different periods of time.

→

Fig. 1. All figures illustrate various stages of the exocytosis cycle of DCVs of the granulated cells of the NEBs under hypoxic conditions; they illustrate in each substance a part of the basal area of the granulated cell cytoplasm (c), their basement membrane (bm) and the immediately adjoining subepithelial extracellular space. A) Exocytosis (arrow) of a DCV which still contains small fragments of its dense core; e, empty DCV; other DCVs are in the basal cell cytoplasm; neonatal rabbit; glut. fix. with postosmification; uranyl acetate and lead citrate staining; 10 min hypoxia with 10% O_2. ×64,638. B) DCV (x) contacting and fusing with the basal cell membrane; exocytosis of a DCV still containing some fragments of its dense core (arrow); same methods as in 1.A); ×48,988. C) Before extruding their contents DCVs, sometimes fuse (arrow); DCV (x) making contact with the basal cell membrane; e, empty DCV; same methods as in 1. A). ×76,608. D) Remarkably undulating basal cell membrane due to the exocytosis in the extracellular space of several DCVs, which are already empty; this is seen after a short hypoxia; same fixation and staining methods as in 1. A); 2 min hypoxia with 10% O_2. ×47,082.