

that the pigment of these eyes undergoes a decided forward movement when the animals are transferred from darkness to light. In darkness most of the pigment is massed near the base of the epithelial cells, and only comparatively few needles extend into the protoplasmic processes between the visual cells. In light a decidedly greater amount of pigment moves toward the external limiting membrane so that the basal layer is thinner. Measurements of the distance from the external limiting membrane to the nearest pigment needle (or from the choroid edge of the epithelial cells to the farthest pigment needle) are practically the same in light and dark eyes, so that this kind of measurement gives no indication of the extent of movement of the pigment.

The cones in the light eye are $4.2\ \mu$ shorter than those in the dark eye, the total expanded length of the cones being $25\ \mu$. The rods seem to be longer in the light eyes than in the dark, but the increase is too slight to permit of satisfactory measurement.

Optic cups were transplanted at the tail bud stage to various parts of the body, where they developed to form more or less perfect eyes. The region of the auditory vesicle seemed to offer a particularly advantageous spot for the transplant. In the transplanted eyes the movement of the pigment is fully as great as in the normal eyes. The cones also contract in the light but only to the extent of about $2.5\ \mu$.

Pigment migration and cone contraction therefore do take place in a Urodele retina and can do so independently of the central nervous system.

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The alleged exhaustion of the epinephrin store in the adrenal by emotional disturbance.

By G. N. STEWART and J. M. ROGOFF.

[From the H. K. Cushing Laboratory of Experimental Medicine of Western Reserve University.]

1. It has been stated that a marked diminution in the store of epinephrin in the adrenal gland is associated with various kinds of emotional excitation. Thus Elliott¹ speaks of morphin-"fright" in cats causing exhaustion of a gland whose splanchnic nerve

¹ *Journal of Physiology*, 1912, 44, p. 374.

supply is intact, as compared with the other adrenal whose splanchnic supply has been previously severed. We can confirm his statement as to the difference in the content produced under the influence of morphin but we do not think that fright has anything to do with the result since it is also obtained in dogs where there are no signs of fright.

2. The signs of morphin-"fright" can all be elicited by administering morphin to a cat in which one adrenal has been removed and the splanchnic supply of the other cut and in which accordingly no demonstrable liberation of epinephrin through the splanchnics takes place. A cat in this condition behaves identically in the same way as a cat whose adrenal splanchnic supply has been cut on one side but left intact on the other. The pupils are widely dilated and there is the same characteristic restlessness and incessant movement. The content of epinephrin in the remaining adrenal of the first cat is found to be practically the same as that of the adrenal removed before the administration of morphin while the content of the adrenal with intact splanchnic supply in the second cat is definitely diminished.

3. When a cat with the splanchnic supply of one adrenal cut is frightened for many hours by a dog in which also the splanchnic supply of the adrenal has been divided on one side both animals undoubtedly experience emotions of great intensity. Nevertheless the content of epinephrin in the gland whose nerve supply is intact is not sensibly diminished as compared with the other.

4. We can confirm the statement that β -tetrahydronaphthylamine causes in cats extreme exhaustion of the epinephrin store of an adrenal whose nerve supply is intact as compared with its fellow whose nerve supply has been previously severed.¹ Elliott associates this with the emotional "alarm." We have attempted to test this interpretation by making observations on rabbits.²

¹ Elliott, loc. cit.

² Division of the nerves to one adrenal is complicated in the rabbit by the fact that the right adrenal seems to derive a portion of the nerve supply concerned in changes in the epinephrin store from the left splanchnic (Kahn, *Archiv für die gesammte Physiologie*, 1911, CXL, 209; Nishi, *Archiv für Exper. Path. u. Pharmacol.*, 1909, LXI, 401). We therefore tried to eliminate the nervous connections of the left adrenal by dividing all branches going to it from the celiac ganglion and in addition cutting any strands from the lumbar sympathetic and the sympathetic itself below the diaphragm.

We have not seen nearly as great a degree of exhaustion in this animal as in the cat. This might be interpreted as in favor of Elliott's view, since signs of "emotional" disturbance are also less marked in the rabbit, although great dilatation of the pupil, increased respiration and other symptoms are present, which, according to Mutch and Pembrey¹ "give the impression that the drug produces a state of increased psychic activity accompanied by muscular action appropriate to the emotions." It seems to us, however, more natural, considering our results with morphin and "frightening" without drugs to interpret the greater effect on the epinephrin content in the cat as due to some other action of the drug than the hypothetical emotional disturbance.

We determined the epinephrin content by the colorimetric method of Folin, Cannon and Denis, which we found to agree sufficiently well with blood pressure observations on the pithed cat.

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The liberation of epinephrin from the adrenals.

By G. N. STEWART and J. M. ROGOFF.

[From the H. K. Cushing Laboratory of Experimental Medicine,
Western Reserve University.]

The solution of the question of the liberation of epinephrin into the adrenal veins and the estimation of the amount so liberated in the absence of artificial stimulation of the splanchnics are complicated by the fact that after withdrawal of blood pressor substances are quickly developed in it, which give the same effect as epinephrin on such objects as the vessels of a frog's legs.² It is therefore desirable to demonstrate the fact of its liberation and to assay its amount without the necessity of withdrawing blood. We have done this (in the cat) by means of the denervated eye reactions (of Meltzer),³ and by the effect on the blood pressure curve.

¹ *J. of Physiology*, 1911, 43, p. 109.

² Cf. Trendelenburg, *Archiv f. Exper. Path. u. Pharmacol.*, 1915, 79, p. 154.

³ Experiments on the liberation of epinephrin by stimulation of the splanchnics, in which the eye reactions were used, have been described by us elsewhere, *Journal of Pharmacology and Experimental Therapeutics*, 1916, 8, p. 205.