MELANIN FORMATION BY DEPLANTED FRAGMENTS OF THALAMUS IN AMPHIBIAN LARVAE.

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Melanin Formation by Deplanted Fragments of Thalamus in Amphibian Larvae.

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In the course of experiments on the functional deplantation of brain fragments into the dorsal fin of urodele amphibian larvae described in earlier communications,[1] a striking local pigmentation effect was observed, whenever thalamic grafts were used.

Donors and hosts were larvae of *Amblystoma tigrinum*, between 3 and 4 cm in length. The brain part which produced positive effects is shown as shaded area in Fig. 1. One-half of this portion, either with or without an adjacent slice of midbrain, was inserted into the gelatinous connective tissue of the fin. The grafts were positively free of hypophyseal and adjoining infundibular tissue.

Within a few weeks after the implantation, the vicinity of the grafts turned deep black (Fig. 2), indicating the deposition of vast amounts of newly formed melanin. The host chromatophores were not appreciably affected. Microscopically, the new pigment appears in two forms: (a) as granules inside of richly arborized cells, which

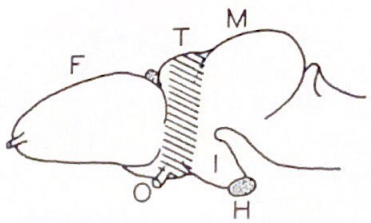

FIG. 1.

Left lateral aspect of the brain of *Amblystoma tigrinum*. F, Forebrain; T, Thalamus; M, Midbrain; I, Infundibulum; H, Hypophysis; O, Optic chiasma.

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1 Weiss, Paul, PROC. SOC. EXP. BIOL. AND MED., 1940, **44**, 350; 1941, **46**, 14.

give the appearance of hypertrophied chromatophores and which are found both in the interior and along the surface of the grafts; (b) as large compact clumps interspersed among the epidermis cells of the overlying skin (Fig. 4).

Whether the melanotic cells are all of metaplastic thalamic origin, or whether some surrounding host cells have likewise been induced to form pigment, has not yet been determined. However, the fact that deplants into animals which had been deprived of their hypophysis in the embryonic stage and were consequently very lightly pigmented, gave rise to local pigment clusters, points to the graft as the main source of the melanotic cells. Whether the large intercellular pigment clumps of the host epidermis arise as diffuse interstitial pigment deposits, or represent residues of degenerated chromatophores with excessive pigment content, remains to be seen.

Of 8 grafts containing larval thalamic tissue all produced the effect. Of 118 grafts taken from extra-thalamic portions of the central nervous system (forebrain, midbrain, medulla oblongata, spinal cord, spinal ganglia) not a single one has produced any pigmentation (Figs. 3, 5). The effect is, therefore, specific for *thalamus*. It seems to emanate from the thalamic floor, since roof fragments alone fail to produce it.

A continuation of the experiments in *Triturus torosus* larvae has produced similar results, although not wholly comparable because of differences in experimental procedure. In the Triturus series the thalamus was subdivided into 3 portions, (a) roof, (b) anterior (optic and preoptic) portion of the floor, (c) infundibulum, with or without attached hypophysis. Invariably, heavy pigmentation occurred around (c). In addition, however, both epidermal and dermal host chromatophores within a radius of a few millimeters from the grafts became maximally expanded and finally confluent. This local effect appeared within a week and remained localized. Infundibular fragments without hypophysis have produced it. If pituitary was included, the whole animal, in addition, darkened progressively.

A more detailed analysis, as well as the correlation of the results with those obtained in other forms and with different methods by other workers, is planned for some later date. In conclusion, the experiments indicate triple action on pigment formation by different portions of the diencephalic-hypophyseal complex in urodele amphibians: (1) stimulation of new pigment cell formation and melanin deposition (thalamic floor), (2) local chromatophore expansion (infundibulum), (3) local and diffuse chromatophore expansion

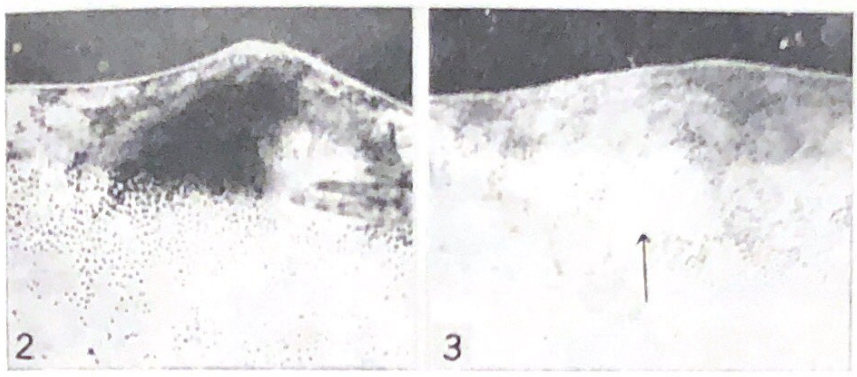
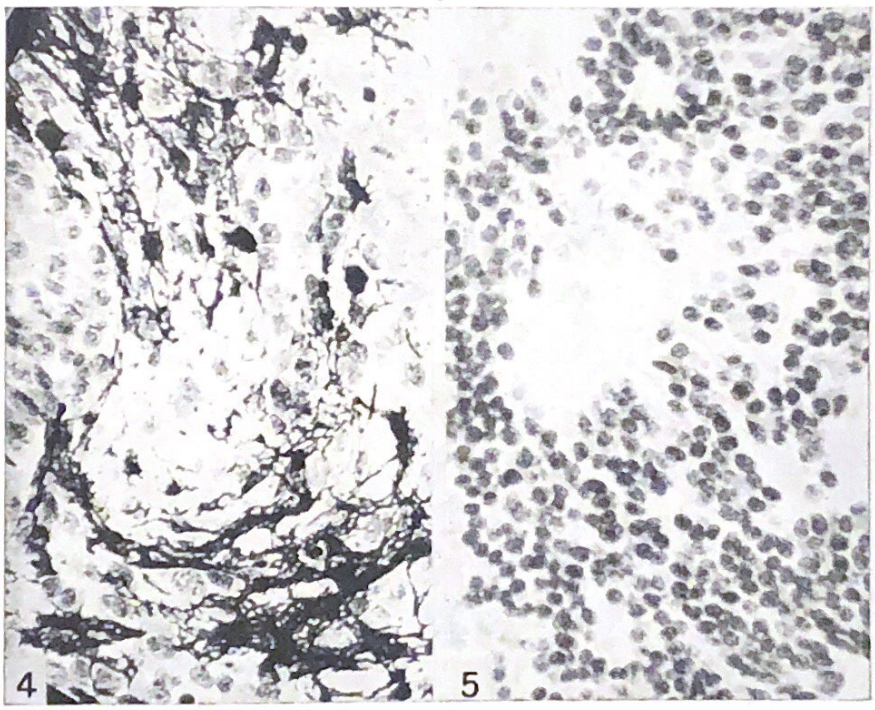


FIG. 2.
Lateral view of portion of dorsal fin containing grafted *thalamus*. Area over graft heavily pigmented. *cca.* 6 ×.

FIG. 3.
Lateral view of dorsal fin containing grafted *midbrain* (light area over arrow). No increase in pigmentation. *cca.* 6 ×.



FIGS. 4 AND 5.
Sections through a deplant consisting of both thalamus (Fig. 4) and midbrain (Fig. 5), 5 weeks after the operation. 220 ×. Masses of pigmented cells in the thalamic portion; no pigment in the midbrain region.

(pituitary); (2) and (3) apparently being followed by increase in total melanin content.