Developmental Physiology of Amphibian Pigmentation

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Project Number 146

Xenoplastic Exchange of Skin Between Pleurodeles waltlii and Ambystoma tigrinum melanosticum

It is known from some of our earlier work that newt xanthophores contain a yellow pigment which is a pteridine that we have designated, pleurodeles-blue (p.b.). This pteridine is not found in any other amphibian. As a result of some preliminary experiments we found that all indications are that there are two factors involved in the expression of this particular pigment. The first is that the xanthophore must have the appropriate enzymes to make p.b. The second factor seems to be an environmental factor, that is a factor present within the internal environment of the animal which turns on the genes responsible for the p.b. forming enzymes. In other words, in order for a newt to make p.b. it must first have the enzymes to make this compound and secondly, it must have the circulating environmental factors which turn on these genes. In an earlier publication we demonstrated that Pleurodeles neural crest cells will differentiate in an Ambystomid host, but that it will never form p.b. These same cells, however, will form p.b. when transplanted to another newt. In order to find out whether or not an Ambystomid will maintain p.b. once it is formed, I decided to transplant skin from the Algerian newt, Pleurodeles waltlii, to an Ambystomid host. Rationale for the experiment is as follows: The donor Pleurodeles skin already has p.b. in its xanthophores and if the Ambystomid can maintain this compound, p.b. should be retained in grafts that have been on Ambystomid hosts for quite some time. Accordingly, thirty-two larvae of Ambystoma tigrinum melanosticum received a graft of Pleurodeles skin. The graft was made on the right side of the head just behind the eye. The contralateral, ungrafted side served as a control. The grafts adhered remarkably well and healing took place quickly. The skin of the Pleurodeles donor is different from that of the Ambystoma host so the graft was always clearly identifiable. At given periods of time after the graft was made, ranging from five days to sixteen days, larvae were sacrificed and analyzed for the presence of p.b. by ascending paper chromatography. For each animal the skin from the graft side and from the control side was squashed on paper and the chromatograph was run. The presence of p.b. is determined by its characteristic fluorescence and R_f value. Briefly, p.b. was maintained in the graft for a short period of time; gradually it began to wane so that by the end of two weeks it was practically gone. It appears, therefore, that Ambystoma lacks the ability to maintain the expression of p.b. In similar skin grafts made between newts, p.b. is always maintained. This data supports the contention that expression of p.b. by newt xanthophores is dependent upon the substance from the host.

Ontogeny of Yellow Pigment

John Manice and I tested the skins of larvae of A.t. and Pseudacris nigrita for the presence of carotenoids. We found that carotenoids are not utilized as yellow pigments by Pseudacris until metamorphic climax. We found no carotenoids in the skin of A.t. in the larvae that we tested; whether or not carotenoids would appear later on in larval development is unknown. At any rate, larvae of 6 cm. in length and having five complete toes on the hind limb do not contain carotenoid pigments.

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Rust Fungi of the Western United States and Mexico

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During August, 1967 rust fungi were collected in Colorado, Wyoming, Montana and South Dakota. This field work is being done in connection with taxonomic studies and studies of host ranges and geographic distribution of North American rust fungi. The information obtained will be used in a proposed revision of Arthur's Manual of Rust Fungi.

During the period spent at the Jackson Hole Research Station, 119 specimens of rust fungi, representing 45 species in 10 genera, were collected in Teton County.

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