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Atrophy of Anuran Tail Muscle During Metamorphosis.

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The total atrophy of the larval Anuran's tail constitutes one of the most striking changes evidenced during metamorphosis. The general concept held by many workers has been that the growth of the urostyle so impinges on the arteries supplying the tail that a condition of acidosis results in the latter structure due to inadequate circulation. This acidosis then results in the histolysis of the various tissues with resultant total atrophy. In a recent communication, Helff¹ has shown that the urostyle cannot be concerned since normal atrophy occurs following the removal of the larval urostyle before the latter undergoes growth. At the same time Lindeman² was able to show that tail integument underwent normal degeneration during metamorphosis when previously transplanted to the back of tadpoles. The present paper describes the similar transplantation of tail muscle to foreign regions to see whether or not normal atrophy would occur during metamorphosis.

All transplantations were made on large *Rana clamitans*' tadpoles. Four types of autoplasmic muscle transplants were made, *viz.*, tail muscle to the back, back muscle to the tail, tail muscle to another region on the tail, and back muscle to another region on the back. The technique for all these operations was briefly as follows: A small 2 mm. cube of muscle was first removed from the back or tail, as the case might be. A flap of integument was then laid back from the region to receive the transplant, and the transplant either laid on the muscle beneath or partially inserted in an incision made in the muscle. The flap of skin was then replaced and the grafts allowed

¹ Helff, O. M., *Anat. Rec.*, 1928, xli, 39.

² Lindeman, V. F., *Anat. Rec.*, 1928, xli, 39.

to heal for 2 or 3 days following which period the larvae were metamorphosed artificially with desiccated thyroid. The engrafted muscle was then examined at 10, 15 and 21 day intervals thereafter, and the normalcy or degree of atrophy recorded.

Two hundred and twenty successful transplantations were made which appeared firmly attached and normal within 3 days following transplantation. The average amount of atrophy of the various types of grafts is expressed in Table I.

TABLE I.

Type of Transplantation	Number of cases	Ave. reduction in volume due to atrophy		
		10 days	15 days	21 days
		%	%	%
Tail muscle to the back	130	58	86	(100 cases)—100
Back muscle to the tail	60	21	48	(30 cases)—54
Tail muscle to other side of tail	15	38	40	49
Back muscle to other side of back	15	27	38	38

The results as shown in the table throw light on several questions. It is evident that the musculature of the back undergoes a normal reduction in volume during metamorphosis while a still greater reduction is experienced when grafted to the tail. This latter result is to be expected in that the graft is surrounded by tail muscle undergoing rapid autolysis. The extremely rapid atrophy of tail muscle grafted to the back, resulting in total obliteration within 21 days cannot well be explained except by assuming that it is especially susceptible to autolysis and atrophy during metamorphosis. The results in this regard strongly indicate that normal autolysis of tail musculature of involuting frog larvae is the result of a specific reaction to blood changes or other metabolic disturbances developed at a certain stage of metamorphosis.