

Effects of Hypophysectomy and Urohypophysectomy on Fin Regeneration in (*Fundulus Heteroclitus*)¹

Richard A. Liversage
University of Toronto

Presence of the pituitary (presumably the pituitary-adrenal synergism or PAS) is essential for the initial stages of forelimb regeneration in the adult urodele *Triturus viridescens* Schotté et al. '55, '56, '57). Contrary to these findings, extirpation of the hypophysis in urodele larvae has no inhibitory effect whatever upon the various stages of forelimb regeneration (Schotté, '61; Liversage, '61).

Experiments were performed upon 149 killifish (*Fundulus heteroclitus*) followed by histological verification of the surgical procedures of hypophysectomy (Pickford & Atz, '57) and urohypophysectomy (a hypophysis-like endocrine gland in the tail - see Dahlgren, '14; Speidel, '19; '22; Enami, '59). In all cases de-differentiation and morphogenesis of the amputated left pectoral fin was studied.

The first group of experimental series involved: 1) simultaneous hypophysectomy and fin amputation; 2) hypophysectomy followed in 5 days (recuperation period) by fin amputation; and 3) fin amputation followed in 5 days by hypophysectomy.

The second experimental approach included: a) extirpation of the urohypophysis and hypophysis simultaneous with fin amputation; and b) urohypophysectomy followed in 5 days by fin amputation.

In these defect experiments hormonal imbalances were brought about; either by hypophysectomy resulting in an interruption of the pituitary-adrenal synergism and/or by a disturbance of osmoregulation through urohypophysectomy. However, normal fin regeneration ensued in all cases and appears to be completely independent of the hypophysis and urohypophysis and also independent of the combined influences of these endocrine organs.

1. This work was supported by a research grant from the National Research Council of Canada.

Interacting Flows in Diffusion Across the Cell Membrane of Sand Dollar Eggs

David B. Ludlum
New York University College of Medicine

Recent studies in freely diffusing systems by Gosting and coworkers have shown that interactions may occur between different solutes diffusing past an initially sharp boundary. The purpose of this investigation was to determine whether such effects are present in diffusion across biological membranes, and to determine their role in the interpretation of active transport.

Intact, unfertilized sand dollar eggs were chosen for this investigation. Although these eggs were found to be impermeable to many solutes including several amino acids, acetamide and propionamide penetrated freely. Some preliminary evidence was obtained for interaction between these two solutes in experiments where one solute was allowed to equilibrate between the eggs and external medium before the second solute was added. Theoretical equations were derived which indicate the reciprocal effects to be expected in the interaction of the solutes on each other. Further experimental work is planned on both fertilized and unfertilized eggs, as well as on individual cells from embryos dissociated in calcium-free media at the two and four cell stages.

Interacting Flows in Diffusion Across the Cell Membrane of Sand Dollar Eggs

David B. Ludlum
New York University School of Medicine

Additional data were obtained on the interactions between flows of solvent and one or more permeable solutes across the cell membrane of unfertilized sand dollar eggs. Measurements with an ocular micrometer were supplemented by photographic studies which permit more complete measurement of individual eggs and allow direct comparisons to be made among different eggs.

Definite solute-solvent interactions were demonstrated. Thus in one type of experiment, eggs equilibrated in sea water solutions were transferred to other solutions having the same freezing point, but having the impermeable salts replaced in part by a permeable solute, acetamide. The rate of water penetration accompanying the solute penetration was much greater than would be predicted from the osmotic imbalance resulting secondarily from the solute penetration. Some preliminary evidence for solute-solute interaction between different permeable solutes was also obtained.

Interacting Flows in Diffusion Across the Cell Membrane of Sand Dollar Eggs

David B. Ludlum, Lewis D. Fineman
New York University School of Medicine

Studies on interacting flows in diffusion across the cell membrane of unfertilized sand dollar eggs were extended to mixtures of sea water, ethylene glycol, and propylene glycol. These solutes are superior to acetamide and propionamide in their apparent lower toxicity to the eggs.

Experiments with ethylene glycol and propylene glycol separately showed marked solute-solvent interaction. The magnitude of this inter-