1962 #31

THE EFFECTS OF METABOLIC INHIBITORS ON THE REGRESSION-REPLACEMENT CYCLE OF Campanularia flexuosa

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The effects of certain metabolic poisons on the regression-replacement cycle of Campanularia were examined to gain some insight into the dynamics of the cyclic transformations. Campanularia were cultured (using Crowell's method) in aerated sea water containing chemicals at various concentrations. Temperature was constant and observations were recorded up to 15 days. Dinitrophenol, iodoacetic acid, sodium fluoride, colchicine, sodium bromide, and sodium iodide, in concentrations ranging from 10^{-5}M to 10^{-4}M were added to the sea water in which the cultures were grown. With dinitrophenol, an effect was noted after 9 days wherein the complete hydranths with a prolonged phase passed into the senile phase of the regression cycle. With iodoacetic acid, the complete hydranths regressed to the senile stage after two days. It appeared that regression was delayed in sodium fluoride and sodium bromide and that gonophore production was higher than for the controls. Sodium iodide showed growth stimulation up to the fifth day but gonophore production appeared to be retarded. By the eighth day the colony did not recover from the regression phase. Colchicine increased the growth rate for 5 days and then the growth rate returned to normal. The halogen salts had a stimulating effect on growth rate. Complete forms lasted 1-2 days longer than normal and their number was 3 times greater than controls. The number of gonophores increased threefold in five days. There was also a tendency toward the production of free stolons using sodium fluoride. In all cases the chemicals had their greatest effects on the complete hydranth. The ability of sodium fluoride to increase the production of gonophores is being further investigated.

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1962 #32

RESPIRATION IN FISH WITH SPECIAL ATTENTION TO ARTIFICIAL PERFUSION OF GILLS

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It was hoped that by using an artificial heart-lung for the perfusion of fish gills that some notion of maximum gas exchange possible in these structures might be obtained. This was the first year that we had worked in the Laboratory and many minor technical problems prevented our getting very far into the project.

The following were accomplished:

1. The dogfish was chosen as the experimental animal and the circulatory anatomy was reviewed and vinal injection preparations made through both the dorsal and ventral aortae. These injection preparations were studied in conjunction with sections provided by Dr. Sheldon made by conventional histologic techniques.
2. Using various concentrations of O_2-CO_2, charts were constructed showing the variations

of pH, pCO_2, and temperature. It was concluded that the extremely low pCO_2s found in dogfish would make it very difficult to measure maximum CO_2 exchange.

3. Perfusions were set up using a small membrane lung (Peirce) and trying quite a large number of cannulation techniques. O_2 exchange in the lung was measured by means of a small respirometer connected to the gas phase of the lung. It was found that it was almost impossible to set up a non-leaking perfusion preparation principally because of small branches of efferent gill arteries going to the head region. It is felt that it may actually be necessary to isolate gills so that perfusate coming from the gills may be collected more reliably.
4. Methods of deoxygenating sea water supplying gills were investigated, the idea being to measure the exchange of O_2 in gills in reverse direction on the assumption that deoxygenation in the gills would be equivalent to oxygenation since it is believed to be a passive physical process dependent on O_2 pressure differentials. This technique is necessary because no method of satisfactorily deoxygenating blood in an artificial lung is available. It was found that bubbling nitrogen through sea water and use of the enzyme Dee-O did not provide sufficiently low pO_2s in the sea water. It will probably be necessary to boil sea water and have it available in large quantities. It can be brought to the proper temperature for use by utilizing various small volume but efficient heat exchangers that are available and with which we have had experience.

Conclusion: It should be possible to set up a steady state perfusion incorporating an artificial membrane lung to provide oxygenation and gill units to provide deoxygenation. From experiments made with such a setup it should be possible to arrive at some estimate of maximum gill function as it relates to oxygenation.

1962 #33

UNILATERAL FURROWING IN THE EGGS OF *Hydractinia* AND *Echinorachnius*

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The geometrical relations of the cleavage stimulus and activities of the cleavage furrow were studied in the dividing egg of *H. echinata* which has a naturally unilateral furrow and in sand dollar eggs, manipulated to divide unilaterally. Results of preliminary operations upon cleaving *Hydractinia* eggs confirmed those obtained by Yatsu (1912) on Beroë. Experiments also showed that the furrow is not a restricted site of new surface formation. *Hydractinia* divides symmetrically if the distance from the mitotic apparatus to the periphery is equalized by amputating cytoplasm. Flattened *Echinorachnius* eggs divide unilaterally when the mitotic apparatus is mechanically displaced more than one spindle width from the egg center. When these eggs were subjected to the same operations as *Hydractinia*, responses were alike. Superficial differences between cleaving *Hydractinia* and *Echinorachnius* eggs are due to the difference in the geometric relation between mitotic apparatus and cell surface. Since the furrow in both forms can divide an unstimulated area, it appears that the base of the furrow is self-propagating and is the location of the mechanical forces which accomplish division. The geometrical relations between mitotic apparatus and cell periphery strongly suggest that the presumptive furrow region is

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