the environment. Lansing has suggested that ageing is the inability of protoplasm to maintain itself by self-synthesis. The sequence of events in the regression phase of the regression-replacement cycle of the colonial hydroid Campanularia flexuosa can be regarded as true ageing and death on a rigid cyclic program. Crowell has found that at a temperature of 17°C to 18°C the Campanularia lived from 4 to 9 days with the arithmetic average at 6.8 days. During a study of metabolic inhibitors on the life cycle it was observed that sodium fluoride appeared to effect longevity of the hydranths. Campanularia were maintained in sea water according to the methods of Crowell and the temperature of the water was maintained at 15-17°C. Sodium fluoride in concentrations ranging from 10^{-3}M to 10^{-5}M was added to the sea water culture containing the Campanularia. Preliminary statistical analysis suggests that sodium fluoride 10^{-4}M increases the life span up to an arithmetic average of 8.3 days. The results of the Chi-square test substantially exceeded the 0.01 level of probability. The growth rate under these specific conditions increased by 2-3 fold. At a concentration of 10^{-3}M the sodium fluoride decreased the life span to 6.1 days. The average life span for controls at 15°C was 6.75 days.

It is difficult to interpret this possible increase in longevity. It appears from the increased growth rate it is not a simple case of inhibition of metabolic rate. It is known that sodium fluoride at 10^{-4}M will inhibit acid phosphatase activity, at 10^{-2}-10^{-3}M it will inhibit enolase, succinic dehydrogenase, myolinase, and enzymes containing Mg, Ca and other metals. Further investigation is in process to determine a possible enzyme target. The fact that sea water varies in many characteristics suggest caution in interpreting preliminary results using natural sea water as a solvent. Further work is in progress using larger sampling and artificial sea water.

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1964 #20

RESPIRATORY RATE AND SENESCENCE IN Campanularia flexuosa

E. E. Palincsar, Loyola University, Chicago, Ill.

The oxygen uptake of 100 - 200 Campanularia flexuosa hydranths at different stages in the regression-replacement cycle was measured using the Clark oxygen electrode and polarographic recording methods. Campanularia were cultured in sea water, using the technique of Crowell, and the temperature in the culture system and experimental vessels was maintained at 17-19°C. Respiratory rates of complete hydranths at four different ages were determined. There did not appear to be any significant differences in rate among complete hydranths 1, 2, 3 and 4 at the distal end. According to Crowell, position 1 is considered the youngest, and positions 3 and 4 the oldest. Preliminary determinations suggest that there may be a slight increase in respiratory rate at the onset of senility. This observation, however, needs further study since it is based on only 4 experiments utilizing only 500 individuals. The range of oxygen uptake for 100 hydranths in positions 1 - 4 was between 10.5×10^{-3} μM O_2/min/100 hydranths to 12.5×10^{-3} μM O_2/min/100 hydranths. Measurements of rate were determined for the first 15 minutes in the respiratory chamber. The data suggest that there is no decrease in respiratory rate during the complete hydranth stage. Regression appears to be a sudden climactic phenomenon, not preceded by a grad-

ual tapering off of oxygen consumption.

In the incomplete hydranths of the 1/2 and 3/4 stages, there was a significantly lower oxygen uptake (45 - 60% LESS). This was probably due to the relatively smaller amount of tissue in the developing hydranths as compared to the complete hydranth. No detectable oxygen uptake was observed in the terminal stages of regression. It appears that the aging complete hydranths of positions 1, 2, 3 and 4 continue all their normal feeding activities until the climactic onset of regression. The rate of aerobic respiration changes only after the onset of senility with its dramatic lysis of the hydranth.

1964 #21

In Vivo AND In Vitro STUDIES OF POTENTIAL DIFFERENCE OF THE VENTRICULAR FLUID OF ELASMOBRANCHII

C. S. Patlak, R. H. Adamson, W. W. Oppelt, and D. P. Rall, NIH, Bethesda, Md., and University of Florida, Gainesville, Fla.

An in vitro chamber system (Patlak, Fed. Proc., 1964, 23, 211) has been utilized to explore the fourth ventricle choroid plexus (CP) of the dogfish S. acanthias. The electrical potential difference (pd) in vitro was 2-4 mV, with ventricular fluid (VF) always positive in approximately 80 experiments. However, pd in in vivo experiments with dogfish (also lemon sharks, N. brevirostris and nurse sharks, G. cirratum) was 15-20 mV, VF negative (in agreement with results of Hogben, et al. (Am. J. Physiol., 1960, 199, 124). In vitro experiments with unmounted exposed fourth ventricle gave a VF pd that was negative with the electrode next to the brain (-5 mV) but positive with the electrode next to the CP (+2 mV).

Experiments utilizing the Ussing chamber with addition of 10^{-4} M ouabain to both sides or VF side caused a steady decrease so that the pd was less than 0.5 mV after 30 minutes. In contrast addition of ouabain to the extradural fluid side resulted in little or no change of the pd. Perfusion of ouabain (in from lateral ventricle to fourth ventricle) in an in vivo setup resulted in no change of the VF pd. Preliminary experiments changing pH in vitro resulting in little or no change of the VF pd whereas in vivo pH changes (acidosis 6.95) lowered the VF pd but the pd still remained negative. These experiments are not inconsistent with the hypothesis that the in vivo pd may arise predominantly from neural tissue.

1964 #22

DURATION OF STIMULUS AND LATENT PERIODS PRECEDING CLEAVAGE IN SAND DOLLAR EGGS

R. Rappaport, Union College, Schenectady, N. Y.

It now appears that the mitotic apparatus releases a stimulus that alters the surface so that it produces a furrow. After stimulation, the mitotic apparatus may be removed without affecting cytokinesis. To further characterize the cleavage stimulus I tried to measure the total time required for stimulus and response together and the time required for stimulus and response sepa-