

- July 18: Raymond Rappaport.**
 "Uptake of Water During Development of Amphibian Tissues".
- July 25: Margaret H. D. Smith.**
 "Some Bacteria which are Pathogenic to both Animals and Plants".
- August 4: William D. Blake.**
 "Neural Control of Renal Functions in the Dog".
- August 8: John V. Taggart**
 "Some Aspects of the Energetics of Transport".
- August 15: Solomon A. Kaplan.**
 "Control of Renal Excretion Solutes by the Autonomic Nervous System".
- August 22: Lot Page.**
 "Comments on the Effect of the Autonomic Nervous System on Electrolyte Excretion".
 "Urinary Concentration Mechanisms in the Dog and Seal".

Tissue Culture Seminars

Dr. Philip R. White

- July 9: "Historical Survey".**
- July 11: "General Methods. Plants and Animals".**
- July 15: "Nutrients of Natural Origin. Animal".**
- July 17: "Nutrients of Synthetic Origin. Plant and Animal".**
- July 22: "Problems and Results. Plant".**
- July 24: "Problems and Results. Animal".**

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Excretion in the Lobster, Homarus

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The extensive literature on nephridial function in the higher Crustacea has dealt largely with osmoregulation; little information exists on the handling of larger organic molecules. Difficulties in securing urine seem to have been an experiment-

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al stumbling block. P. R. Wilder, Atlantic Biological Laboratory, St. Andrews, N. B., showed us that by placing the hand over the carapace and then squeezing with the thumb placed between the bases of the walking legs, urine could be expressed at will. Assistance in various determinations by others is gratefully acknowledged, especially C. G. Zubrod (glucose), R. P. Forster (PAH), E. L. Becker (freezing points).

Reducing substance was present in lobster plasma, 24-40 mg. per cent., but absent in the urine. Exogenous injected glucose does not appear in the urine until the plasma concentrations are well over 100 mg. per cent.

PAH and phenol red are concentrated by the nephridium, with U/P ratios falling toward one with increased blood concentrations. Phenol red but not PAH is concentrated by the hepatopancreas and is secreted into the gut in concentrations higher than those of the urine. This hepatic secretion while appearing in the stomach is not normally voided through the mouth but rather seems to be reabsorbed and resecreted over and over again until the dye is lost slowly by the nephridia. Bromsulfalein is not markedly concentrated by the nephridia but is secreted into the gut in very high concentrations. The renal and hepatic handling of this dye is similar to that of the vertebrate. Exogenous injected sulphate (Na, Mg) is concentrated by the nephridia, the relative concentrations being greater at lower blood levels. The above dyes appear in the urine for weeks after a single injection, and sulphate while not followed for so long a time is lost slowly also. These data lead to the conclusion that the nephridia are the principal organs for the excretion of larger organic molecules and the divalent sulphate ion.

With lobsters placed in dilute sea water or injected with hypertonic NaCl, Na equilibration (Na measured with a flame photometer) between the blood and external water occurs and can not be accounted for by renal (or hepatic) excretion. Similarly the Br ion equilibrates. Presumably some monovalent ions and water equilibrate through extrarenal sources presumably the gills and/or body surface. Urine flow in 500 gr. untreated lobsters may vary from over 1 ml. per hour over 12 hour periods to 0 ml. for a two week period. Injected fluid, isotonic or not, tended to increase urine flow. Flows so induced were up to 4 ml per hour. Obviously the nephridia participate in fluid regulation.

The freezing point depression (measured by the Thermistor Method) was the same for cell free blood and urine; these fluids are isotonic or slightly hypertonic (never hypotonic) to sea water. The pH of the blood was in the 7.4 - 7.5

range; the urine pH was the same or slightly more acid.

No effort was made to study the mechanism of nephridial action, viz. filtration, secretion, etc. The evidence indicates that the lobster's nephridia act as a 'kidney' differentially conserving some substances (glucose) while concentrating others (dyes, sulphate). Certain monovalent ions are regulated largely extrarenally. The hepato-pancreas while capable of absorbing a variety of materials placed in the stomach, and capable of the differential secretion of substances into the gut is not an excretory organ in that its products do not directly reach the outside of the animal. Phenol red is not eliminated by the anus (or the gills). Since the lobster and marine fish are both complex animals living in the same environment, a comparison of methods of solution of their homeostatic problems is of interest. The lobster apparently has simplified his problems by using a slightly modified form of sea water for an internal fluid instead of a dilute saline solution.

A Study of Pulmonary Epithelium of the Tadpole (*Rana catesbiana*) in Tissue Culture

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One of the basic problems in cellular physiology is to determine how specific alterations in metabolic functions effect growth of cell types of the same and different species. The purpose of this study was to determine the relationship of one of these metabolic functions, respiration, to the cellular activity of one particular cell type, pulmonary epithelium.

All cultures were prepared from pulmonary tissues of tadpole specimens of *Rana catesbiana*. Each lung was cut into small fragments approximately 1 mm cubed. The fragments were explanted in roller tubes and Carrel flasks. The medium was composed of equal parts of embryonic extract from 7-day chicks and cockerel plasma in which 1000 units of penicillin G was incorporated. To each culture was added 1 cc of supernatant consisting of 40% human ascitic fluid, 40% Tyrode's solution, and 20% embryonic extract. The cultures were grown at 25° - 26° C.

The first step was to determine the control activity of the tadpole's lung in vitro. Cellular migration could be divided into five stages: (1) During the first 48 hours there was an initial migration of macrophages. (2) During the next 5 days there was extensive fibroblastic migration. (3) Between the