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HEMOGLOBIN, GLUCOSE, OXYGEN AND WATER IN THE ERYTHROCYTE

A Concept of Biological Magnitudes, Based upon Molecular Dimensions

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THE purpose of this communication is to direct the attention of biological workers to the illumination which may be afforded in many problems by expressing, when possible, biochemical relationships on a molecular basis.

The use of empirical "units" in the literature of the vitamins and hormones is justified in the early stages of investigation before precise quantities can be employed. However, in many instances the usage of "units" of this or that has continued long after the chemistry of the therapeutic or prophylactic agent has been established. The persistence of such empiricism is not only irksome, but serves to obstruct quantitative thinking and often delays proper interpretation and formation of useful concepts. With the enlarging interest in the architectural chemistry of cells and the dynamics of cellular metabolism, the realization appears inevitable that quantitation even on such a basis as "gm or mg per 100 ml" may have but limited usefulness. This is more obvious in a consideration of the complex equilibria which are the chemical mechanisms of cellular work and energy supply.

My attention was drawn forcibly to the advantages and desirability of calculating the concentration of cellular elements in terms of molecular populations

wall just anterior to the liver, thus exposing the heart. This incision is then carried through into the sinus venosus. Since the circulation is not yet fully established the resulting hemorrhage soon subsides. The tissue to be implanted, having been previously secured and cached in a depression beside the prospective host, is then inserted into the open heart cavity. The incision closes rapidly and the retention of the implant is assured. The host can then be transferred to the container in which it is to be reared. After an appropriate interval the animal is sacrificed and the graft is recovered by sectioning the heart region.

The development of a number of embryonic tissues has been studied by this method, and it is felt that the encouraging results which have been obtained are in a large measure due to the adaptability of the transplantation site. The heart cavity is easily accessible and can accommodate fairly large pieces of tissue. Operations can therefore be performed rapidly and with little mechanical injury to the donor tissue. Since the incision closes rapidly it is possible to transfer the host without waiting for the implant itself to become fixed. The operation apparently causes no permanent damage to the host, and the mortality is negligible.

The blood plasma undoubtedly serves well to nourish the implant until vascularization has taken place. Thus a favorable environment is provided for the tissue during this critical period.

That a permanent attachment takes place very soon is indicated by the fact that the implants are not carried forward with the onset of circulation but can be recovered very near to their original site. When older hosts are used the implants often are carried as emboli which obstruct the blood supply to one or more gills, but this does not occur when tissues are implanted into the host before the onset of circulation.

The grafts survive in a very high percentage of cases. This indicates that physiologic conditions for the transplant are quickly restored and maintained in the heterotopic site.

Only the tissues of the blood vascular system are included in the environment. These factors are subject to little variation and probably act in a purely nutritive capacity. Thus a near approach to the controlled environment of the culture method is afforded.

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A MODIFICATION OF THE UREASE TEST FOR PROTEUS

THE ability of Proteus species to decompose urea[1] is considered an important identifying characteristic by Bergey,[2] and has recently been recommended by Ferguson *et al.*[3] as a routine differential test in enteric bacteriology.

In the test as employed by the above workers, inoculation of suspected organisms into a urea medium is followed by a twenty-four-hour incubation at 37° C. before results are obtained. Since the test is dependent upon the presence of the enzyme urease it seemed apparent that if a large amount of inoculum were employed in a small amount of urea medium decomposition could be quickly determined.

The medium used is that of Ferguson and Hook. It contains 2 per cent. urea (Baker's C.P.), 0.1 per cent. KH_2PO_4, 0.1 per cent. K_2HPO_4, 0.5 per cent. NaCl and 1.0 per cent. C_2H_5OH in distilled H_2O. The pH is adjusted to 7.0. A sufficient quantity of 0.2 per cent. aqueous Phenol Red is added to give a definite color. The medium is sterilized by Seitz filtration. Sterilization is not necessary, however, if the medium is stored in the refrigerator or made up in small amounts for relatively quick utilization.

In order to run the test a heavy inoculum scraped from an initial Kligler Iron slant or other solid medium is suspended in 0.1 ml of urea medium. The suspension is incubated at 37° C. and observed at five-minute intervals for a period of thirty minutes. A positive reaction, as indicated by a definite change of the indicator to pink, will usually occur in the first ten to fifteen minutes.

The test as described was run against a series of known Shigella, Proteus and Salmonella strains. During a five-month period the test has been routinely used in this laboratory[4] with biochemical and serological checks. No false positives have been observed.

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[1] Robert Rustigan and C. G. Stuart, *Proc. Soc. Exp. Biol. and Med.*, 47: 108–112, 1941.

[2] "Bergey's Manual of Determinative Bacteriology," 1939, 5th edition, Williams and Wilkins Co., Baltimore, Md.

[3] W. W. Ferguson and A. E. Hook, *Jour. Lab. Clin. Med.*, 28: 1715–1720, 1943.

[4] Fourth Service Command Laboratory, Fort McPherson, Georgia.

BOOKS RECEIVED

BAITSELL, GEORGE A., Editor. *Science in Progress: Fourth Series, National Lectureships, 1943 and 1944 of the Society of the Sigma Xi.* Illustrated. Pp. xvi + 331. Yale University Press. $3.00. 1945.

MAINLAND, DONALD. *Anatomy as a Basis for Medical and Dental Practice.* Illustrated. Pp. xvii + 863. Paul B. Hoeber, Inc. $7.50. 1945.

POLLACK, PHILIP. *Careers in Science.* Illustrated. Pp. 222. E. P. Dutton & Company, Inc. $2.75. 1945.

RATCLIFF, JOHN D., Editor. *Science Year Book of 1945.* Pp. xxviii + 224. Doubleday, Doran & Company. $2.50. 1945.

SCHWARTZ, CHARLES W. *The Ecology of the Prairie Chicken in Missouri.* University of Missouri Studies, Vol. XX, No. 1. Illustrated. Pp. 99. $1.50. 1945.