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VITAMIN DEFICIENCY EXPERIMENTATION AS A RESEARCH METHOD IN BIOLOGY[1]

By Dr. S. BURT WOLBACH

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VITAMINS are organic substances, not related chemically to one another, indispensable to normal functioning of some one or more animal species. They are effective in small amounts, do not furnish energy, are not structural materials as the fats, carbohydrates and proteins, but are necessary for the chemistry of cells. Our knowledge of them came through discoveries that substances of plant origin—the vitamins or provitamins of to-day—are essential for the well-being of many animals. Species not requiring a given vitamin in their diet may have the power of synthesizing it from elementary compounds, as has been proved for the rat in the case of vitamin C. Absence of a vitamin results in the suspension, in all probability, of a single type of intracellular chemistry necessary for the tissue concerned, and indirectly, for the organism as a whole. One of the outstanding results of the attempts of Howe and myself to achieve morphological characterizations of the vitamin deficiencies was the discovery that cells deprived of a function essential for the organism as a whole may, nevertheless, survive and multiply.

We have endeavored to find the initial tissue or cellular responses to each vitamin deficiency with the belief that the cells first to exhibit changes would be those in which the vitamin was necessary for the performance of an essential chemical process. In some instances we have succeeded for the requirements of a morphological characterization, but with all members of the B group, B_1 and the B_2 components, we have failed, possibly because the chemistries involved are common to many tissues and concern energy processes.

[1] DeLamar Lecture, the Johns Hopkins University, School of Hygiene and Public Health, May 11, 1937.

cone was of such a size (No. 0 silk = 38 strands per inch) that the diatoms could pass freely through it, but copepods, etc., were stopped and swept off to one side.

Using one net (1 m diameter, 4 m long, No. 10 silk = 109 strands per inch) provided with a cone of this type, large quantities of diatoms were obtained on two occasions during September in Vineyard Sound. The net was towed at very slow speed, and at intervals of three minutes was hauled in and emptied. Each catch, which amounted to about six quarts of a thick suspension, was allowed to stand for two half-hour periods. At the end of each period the supernatant liquid, in which the diatoms remained suspended, was poured into a strainer, leaving in the bottom of each jar the heavier sand, detritus, and whatever zooplankton had accidentally entered. In the strainer (a bag of No. 20 silk) the material drained in the course of about half an hour to a sludge. For the first day's work, this sludge was spread out on towels to dry, and later transferred to a chemical hood heated to 40° C. On the second occasion the sludge was not dried but was shaken immediately with an equal volume of ether. As a result of a day's work we obtained on the first occasion about 200 grams of dry, flaky material, and on the second occasion about two quarts of sludge in ether.

A complete analysis of the plankton in a sample of sea water taken during the first operation, kindly carried out for me by Miss Lois Lillick, showed that the concentration of diatoms in this area was almost 200,000 cells per liter. This approaches the maximum richness observed for diatom flowerings. One species of diatom (*Rhizosolenia alata*) composed 85 per cent. of the count, another species (*Corethron hystrix*) formed 8 per cent., and seventeen other forms together amounted to less than 7 per cent. Examination of a sample of the sludge indicated that the detritus and the animal contaminants were as low as ever found in phytoplankton hauls, in this case being certainly less than 1 per cent. of the total volume. All the material has been turned over to Professor Hans T. Clarke, of the Department of Biological Chemistry at Columbia University, for chemical analysis.

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A COLOR TEST FOR THIAMIN (VITAMIN B_1)

A FEW milligrams of thiamin (crystalline, synthetic, Merck) and about five milligrams of p-dimethylaminobenzaldehyde are placed in a small crucible. 0.1 cc of glacial acetic acid is added and the mixture heated until all the acid is evaporated. After cooling, one drop of glacial acetic acid is added. An intense brick red color develops immediately.

The red compound is probably a Schiff's base, as most primary amines readily form colored condensation products with aldehydes.[1] Proteins and amino acids interfere.

HENRY TAUBER

THE MCLEOD INFIRMARY,
FLORENCE, S. C.

A METHOD FOR OBTAINING NEWLY HATCHED TADPOLES IN A CLEAN STATE

IN removing newly hatched tadpoles from their egg mass, especially when this has been procured outside the laboratory, some difficulty in obtaining them perfectly free from their "jelly" is often encountered. To overcome this the following procedure is suggested.

Place the material—the egg mass, if the larvae haven't hatched as yet, or the mixture of animals and debris—in as small a dish as convenient. Set this in a second container of sufficient size to enable water in it to more than cover the first vessel. Slowly fill the larger with clean water, being careful not to disturb the material in the smaller dish as the water overflows into it. Enough water to cover the dish by about three eighths of an inch should be added, and allowed to stand undisturbed. As soon as they are able, the tadpoles will rise and leave the smaller dish, entering the clean water surrounding it, from which they may be easily removed by means of a pipette.

ABRAHAM EDELMANN

THE JOHNS HOPKINS UNIVERSITY

[1] O. Frehden and L. Goldschmidt, *Mikrochim. Acta*, 1: 338, 1937.

BOOKS RECEIVED

KENOYER, LESLIE A. and HENRY N. GODDARD. *Laboratory Manual for General Biology.* Pp. 73. 27 plates. Harper.

Les Classiques de la Découverte Scientifique: J. B. DUMAS. *Leçons de Philosophie Chimique.* Pp. xxviii + 270. 2 plates. LAVOISIER. *Traité Elémentaire de Chimie.* Pp. xxxviii + 191. Illustrated. WÖHLER. *La Synthèse Totale en Chimie Organique.* Pp. viii + 143. 8 plates. Gauthier-Villars. 21 fr. each.

MAURAIN, CH. *Étude Pratique des Rayonnements. Solaire, Atmosphérique et Terrestre. (Méthodes et Résultats.)* Pp. 188. 18 figures. Gauthier-Villars. 80 fr.

Skrifter Om Svalbard Og Ishavet, 1937: No. 68, HANS FREBOLD and E. STOLL, *Das Festungsprofil Auf Spitzbergen, III.* Pp. 86. 1 plate. *No. 69,* HANS FREBOLD, *Das Festungsprofil Aug Spitzbergen, IV.* Pp. 94. 11 plates. *No. 70,* EILIF DAHL, B. LYNGE, and P. F. SCHOLANDER, *Lichens from Southeast Greenland.* Pp. 76. I. Kommisjon Hos Jacob Dybwad, Oslo.

TODD, T. WINGATE. *Atlas of Skeletal Maturation.* Pp. 202. Illustrated. Mosby. $7.50.

Transactions of the American Philosophical Society, September, 1937. The Mammalian Fauna of the White River Oligocene. Pp. 155–269. 70 figures. 33 plates. The Society, Philadelphia. $2.00.