

This method is susceptible to as many variations in devices as was the stroboscopic principle applied to the measurement of pitch, depending upon the particular needs of the research.

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### SPECIAL ARTICLES

#### THE INFLUENCE OF MINUTE DOSES OF IODINE AND IRON ON GROWTH OF RATS FURNISHED VITAMIN A FREE DIET

IN a series of experiments recorded elsewhere, the writers have shown that while thyroid extract and iodine will produce rapid metabolism resulting in small animals, minute doses of the iodides or desiccated thyroid prove beneficial to rats on a normal diet and induce bone growth and increased weight. Certain preliminary experiments having shown slight beneficial results with sodium iodide on rats receiving vitamin A free diet, it was decided to combine minute quantities of iron with the iodine in an attempt to partially replace vitamin A.

The combination was chosen since the old-fashioned remedy, syrup of the iodide of iron, formerly so much used in anemia, has recently been displaced by the more fashionable although less esthetic *raw* and cooked liver. The peculiarity of the situation is that investigators have apparently given themselves over to a debauch in the field of vitamins and utterly forgotten that all important vitamin-containing foodstuffs are composed of combinations of chemicals. Analyses of the iron, sodium, calcium, phosphorus and manganese, and in some cases the copper of these "vitamin rich" substances, have been available for years.

The writers believe that the benefit ascribed to the "vitamins" is really due to minerals and that these minerals, acting as catalyzers, make available the proteids, carbohydrates and fats supplied with them.

One feature has been neglected in connection with discussions of the remarkable freedom from illness of those Greenland Eskimos subsisting entirely on a carnivorous diet.

The whales, seals, walrus and bears of the far north secure their food almost entirely from the water, devouring the fish which in turn depend upon minute organisms living on a diet rich in certain minerals.

The raw liver, flesh and oil of the mammals mentioned and of the codfish, which form a considerable part of the diet of the Eskimos, are rich in iodine, iron, manganese and minute quantities of other minerals such as zinc and copper. Recent investigations

by Miss Sommer and Dr. Lipman, of the University of California, indicate the significance to plants of as little as one part in two millions of either zinc or boron.

In a series of two experiments just completed (August 1) we have utilized fifty-seven rats, placing some of them at the age of one month on diets deficient in vitamin A and later using small quantities of iodide of iron to bring about a restoration to normal condition. In the first *preliminary* experiment, we used nineteen Albino rats from the original stock purchased at the Wistar Institute; in the second experiment we found it desirable to use thirty-eight Agouti rats developed from an extremely vigorous and resistant strain produced by our animal husbandry department.

In both experiments the rats were divided into four lots. The first lot received Sherman diet No. 380 plus cod-liver oil. The second lot received Sherman diet No. 380 plus 0.01 mgm of irradiated ergosterol daily. The third lot, also on Sherman diet No. 380, received in addition to 0.01 mgm of irradiated ergosterol 0.0003 grain of iodine and 0.0001 grain of iron in the form of dilute syrup of the iodide of iron. The fourth lot received Sherman diet No. 380, ergosterol to supply vitamin D and in addition a daily allowance of 0.0005 grain of iodine and 0.000165 grain of iron.

In the preliminary experiment it was noted that several rats on the deficient diet were benefited and in some cases permanently cured of their xerophthalmia. Complete growth was not resumed, however.

In the second experiment we were able to bring the deficient animals up to a point where they followed closely the average weight of the positive controls for a period of fourteen weeks.

For six weeks they remained at an average weight of twenty grams above the negative controls, fluctuating around the maximum for over three weeks. The experiment lasted twenty-four weeks.

In the absence of adequate proteid, carbohydrate and fat, we could not hope to find that minerals acting purely as catalyzers would be able to keep the animals up to normal growth. It is reasonable to suppose, however, that in the experiment that we are now running, in which we will add dextrose to the deficient diet, our minerals will show up to even greater advantage.

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