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EVIDENCE FOR A SECOND THIAMIN

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In an earlier paper[1] the authors reported briefly the effect on the growth of *Phycomyces Blakesleeanus* of each of 36 pyrimidines when used in a nutrient solution with 4-methyl-5β hydroxyethyl thiazole, one of the two intermediates from which Williams and Cline synthesized thiamin (vitamin B_1). Thirty of these compounds had been tested by the writers and six of them by other investigators. At that time we were unable to determine the significance of the CH_3 group in the second position on the pyrimidine ring because suitable compounds were not available.

Through the courtesy of the I. G. Farbenindustrie Aktiengesellschaft, samples of 5-bromo-methyl-6-amino pyrimidine and 2-ethyl-5-bromo-methyl-6-amino pyrimidine were secured. The first of these compounds differs from the pyrimidine used by Williams and Cline in having hydrogen substituted for the methyl group in the second position; the second compound has the ethyl group for the methyl group.

When ten units of 5-bromo-methyl-6-amino pyrimidine were used with ten units of the vitamin thiazole in the nutrient solution previously described[1] no growth of *Phycomyces* occurred. The second compound used in the same way was as effective as the 2-methyl-5-bromo-methyl-6-amino pyrimidine. For both sets of experiments the solutions containing the supplements were sterilized by heating at 15 lb. pressure for 15 minutes.

We conclude that for *Phycomyces* the methyl group in the second position on the vitamin pyrimidine is important since the substitution of hydrogen for the methyl group eliminated the activity of the pyrimidine. However, the effectiveness of the compound is largely or entirely retained when the ethyl group replaces the methyl group in the second position.

This observation suggests that there may be more than one compound capable of functioning in the living organism as thiamin does; a methyl thiamin, the compound originally isolated and synthesized, and an ethyl thiamin differing from the former in having the CH_3 group in the second position on the pyrimidine ring replaced by the C_2H_5 radical.

In our experiments we have used the pyrimidine and thiazole compounds as such. From evidence presented previously[2] we believe, however, that the vitamin molecule (not the intermediates themselves) functions in facilitating the growth of *Phycomyces*. When a mixture of a particular pyrimidine and a particular thiazole is effective we conclude that the vitamin molecule or a substitute therefor is synthesized by the organism from the intermediates. It is on this basis that we suggest the existence of an ethyl thiamin.

There is of course the possibility that the fungus was able to substitute the methyl for the ethyl group and that the final effective product was identical with thiamin. We have no evidence on this point, though we are inclined to assume that this is not probable.

If there is an ethyl thiamin as we suggest there may also be other thiamins such as propyl and butyl. The investigation of this possibility must necessarily wait on the availability of suitable pyrimidines.

[1] William J. Robbins and Frederick Kavanagh, *Proc. Nat. Acad. Sci.*, **24**, 141–145 (1938).

[2] William J. Robbins and Frederick Kavanagh, *Ibid.*, **23**, 499–502 (1937).

AN ASTACENE-LIKE CAROTENOID FROM A PACIFIC COAST ANEMONE, EPIACTIS PROLIFERA

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While many fishes, mollusks, crustaceans, anemones and members of other phyla contain known carotenoids of recognized plant origin, including any or several carotenes and xanthophylls, contributions from various investigators during recent years have brought out the fact that numerous marine animals contain also previously undescribed carotenoids as well, resulting in a steady extension of our list of known lipochromes peculiar to animals. These animal lipochromes fall chiefly into the classes of acidic and xanthophyllic carotenoids. (See reference in Zechmeister, 1934, 1937; Lederer, 1933, 1935, 1938; Heilbron, Jackson and Jones, 1935.)

Heilbron and his co-workers (op. cit.) have given some attention to lipochromes of several species of sea anemones, and report, among other pigments, including new animal xanthophylls, a deep red, acidic carotenoid ester from *Actinoloba dianthus*, which, when hydrolyzed and crystallized in pure condition, showed a single absorption maximum in CS_2 at 495 mμ.