



Editorial

The Structure of Vitamin B₁₂

Announcement was recently made of the establishment of the structure of vitamin B₁₂. Two teams of investigators, a group at Oxford¹ (with an assist from U.C.L.A. and Princeton) and a group at Cambridge² both report the identical structure in the same issue of *Nature*. The former group based their studies largely on crystallography, whereas the latter emphasized biochemical reactions.

The complex structure has the formula C₆₃H₉₀O₁₄N₁₄PCo, and the configuration of the molecule is illustrated in the reports. Nutritional chemists may well be proud of this bilateral achievement, coming a short seven years after the isolation of this remarkably potent substance. To E. Lester Smith of the Glaxo Laboratories in England goes the distinction of being one of the two original isolators of vitamin B₁₂, and also one of a

group which has now defined its structure.² Nor should it go unnoticed that, as in the case of its isolation, the establishment of the structure of vitamin B₁₂ was achieved simultaneously by two groups working independently—a form of scientific competition which can only lead to greater advances at a more rapid pace.

—S. O. WAIFE, M.D.

REFERENCES

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2. BONNETT, R., CANNON, J. R., JOHNSON, A. W., SUTHERLAND, I., TODD, A. R., and SMITH, E. L.: The structure of vitamin B₁₂ and its hexacarboxylic acid degradation product. *Nature* 176: 328 (Aug. 20), 1955.

Vitamins—Foods or Drugs

From time to time the Food and Drug Administration is asked if vitamins are foods or drugs. As defined in the Food, Drug, and Cosmetic Act, the term "food" means (1) articles used for food or drink for man or other animals; (2) chewing gum; and (3) articles used for components of any such article. The term "drug" means (1) articles recognized in the official U. S. Pharmacopeia, official Homeopathic Pharmacopeia of the United States, or official National Formulary, or any supplement to any of them; and (2) articles intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease in man or other

animals; and (3) articles (other than food) intended to affect the structure or any function of the body of man or other animals; and (4) articles intended for use as a component of any articles specified in clause (1), (2), or (3); but does not include devices or their components, parts, or accessories.

These definitions do not classify vitamin preparations in one category or the other. Vitamins are, in fact, included in both, and the courts have held that the food sections of the Law and the drug sections are not mutually exclusive. If a product is found to be in violation of the Act, then the intended use

of the product determines whether the food chapter or the drug chapter is applicable. The intended use will determine whether there has been a violation of the food or drug section. The label may be important in determining intended use, but equally important are the oral representations of salesmen to purchasers, oral or written instructions or suggestions of salesmen, and the relaying of these instructions to the physician or retailer. Newspaper, radio, or television advertising are also factors in determining intended use.

Notwithstanding the innocuous labeling of the drug itself, the dosage form may, in some cases, be significant in this determination. An encapsulated vitamin in a therapeutic dose with or without the additional factors mentioned above may, in some cases, be enough to tip the scales in favor of a drug determination. Intent for use for the cure, mitigation, treatment or prevention of disease makes a preparation subject to the drug chapter of the Act. Preparations properly labeled to indicate that they are for the physician's use for the treatment of disease or injectable preparations obviously must be regarded as drugs. A product offered as a food supplement and supplying a vitamin or vitamins in amounts not greater than intended to meet daily needs is a "food for special dietary use," and not a drug.

But, you say, articles listed in the U. S. Pharmacopeia are drugs and there are about a dozen vitamin products in the U. S. Pharmacopeia. Even though the law recognizes articles in the U. S. Pharmacopeia as drugs, an exception is made in the case of foods for special dietary use, and this exception must be recognized. From the above it should be clear that there is no simple classification of vitamin preparations either as foods or drugs.

If we use Webster's International Dictionary as a guide, we come to the conclusion that vitamins may be regarded as foods when used as foods, and as medicines when they are used for that purpose. Food is defined as "nutritive material absorbed or taken into the body of an organism which serves for purposes of growth, work, or repair, and for the maintenance of vital processes." A drug is "any sub-

stance used as a medicine or in making medicines for internal or external use," and medicine is defined as "any substance or preparation used in treating disease." Preparations offered in amounts that will serve to supply the maintenance requirements of the body with respect to nutrition and not intended for use or offered for use other than as food supplements should therefore be regarded as foods.

Since a food serves the purpose of providing the needs for growth, work and maintenance, and life cannot be maintained in the absence of vitamins, we must regard vitamins as food. However, when administered in suitable amounts, a vitamin may bring about the disappearance of symptoms of serious disease and restore health. The vitamin is then serving the function of a medicine.

This classification does not satisfy those who consider as medicines pills and capsules or solutions to be taken by the drop or teaspoonful. These are the forms in which drugs are usually administered, and are indicative of items obtained from a drug store. Fifty years ago this would have been a valid position, but scientific developments have brought forth some new facts that call for further consideration.

The dual role of vitamins as foods and drugs no doubt stems from the small quantities needed to perform a useful function and the ease with which potent pharmaceutical preparations can be manufactured. We express ourselves in milligrams and micrograms in speaking of a day's requirement of the vitamins and trace minerals, and in grams and kilograms in expressing the quantity of food that will supply the day's need for proteins and energy-yielding food. Congress recognized this unique position of the vitamins and minerals in a special section of the Food, Drug, and Cosmetic Act, and provided for labeling requirements for foods "for special dietary use" represented to have "vitamin, mineral, or other dietary properties."

A vitamin performs an inherent function that cannot be performed by anything else, and it does not promote science to try to define that function as one characteristic of foods or of drugs. There are legal situations



in which such a definition is required. For this purpose *the intended use* is the best basis for such differentiation. In those instances where it becomes important or necessary to reach a decision with respect to the kind of products that should be considered as drugs or foods (such as for control of representations or for tax purposes), the authority for such

purpose could so define the subject to be covered that no controversy should arise.

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Letter to the Editor

PERSONAL EXPERIENCE WITH PAROTID ENLARGEMENT

Dear Sir:

The report of Sandstead, Koehn, and Sesoms regarding enlargement of the parotid gland in malnutrition (AM. J. CLIN. NUTRITION 3: 198, 1955) suggested that some details concerning my personal experience with this disorder may be of interest. Various results of Dr. A. J. Carlson's experiments on my food restriction and fasting were previously described,^{1,2,3} but the development of parotid enlargement was not mentioned. In brief, "asymptomatic" bilateral parotid enlargement began to develop in 1908 when I ate freely after a period of about six months during which I restricted my food intake and, particularly, my protein intake.

The value of protein restriction at that time seemed to be supported by the findings in the studies made by Chittenden.⁴ Although no evidence of parotid enlargement was noted while my total calorie intake was considerably restricted (the food I ate consisted largely of fruit and sugar), I found evidence of excessive water retention.^{2,3} At that time this was assumed to indicate "autointoxication," but between 1917 and 1919 it became evident that the water retention was nutritional edema promoted by semistarvation, and particularly by protein starvation, with the inclusion of some salt in my diet. My food intake was increased in 1908, largely through the addition of potatoes, bread, and cabbage (sauerkraut). This,

incidentally, increased the salt intake considerably and a rapid increase in nutritional edema occurred. My entire body seemed to swell or become bloated and the swelling in the parotid region merely seemed to be the most prominent evidence of this general swelling. I looked as if I had the mumps but the swelling on the right side was somewhat greater than on the left. I also became mentally and physically very sluggish and this suggested in 1909 that I was afflicted with myxedema.

As the increase in my food intake appeared to be responsible for the generalized swelling or assumed increase in autointoxication, I restricted my food intake again and more drastically than before. I believed that fasting would serve best to reduce the swelling, but at that time fasting seemed to be too great an ordeal to be practical. Hence, I tried eating only enough citrus fruit to mitigate hunger. During 17 days in which I ate only oranges and a few lemons, the generalized as well as the local (parotid) swelling disappeared almost completely. Incidentally, I also became more alert mentally.

As a result of a fall I came under the care of a physician who prescribed a liberal diet "with plenty of vegetables like turnips." The generalized and mumps-like swelling consequently became greater than before within

