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2.1 ASSESSMENT OF VITAMIN ACTIVITY IN A FOOD COMMODITY OR DIET

2.1.1 Bioassays

In the context of human and animal nutrition, vitamins are physiologically active substances. To assess the nutritional value of a food commodity or diet with respect to a particular vitamin it is necessary to determine the vitamin's biological activity. Biological activity refers to the ability of a nutrient to fulfill a specific biological function or metabolic requirement. The only direct means of determining biological activity is a bioassay based on biological function. Such assays were the means by which the vitamins were originally recognized. They are still required today to measure the biopotency of new vitamin derivatives and food supplements, as well as validating new nonbiological assay methods.

For many bioassay procedures it is not practical or ethical to use human subjects, therefore animal models (mainly rats or chicks) are used instead. Although animal bioassays provide a measure of the available vitamin, they may not extrapolate to human nutrition. Aside from metabolic differences between animals and humans, animal bioassays require the use of vitamin-depleted animals and semi-purified basal rations. Growth assays use only immature animals. In addition, bioassays are subject to ambiguity because of the potential for altered biosynthesis or utilization of vitamins by intestinal microflora. Stimulation of the response of animals consuming test diets could occur if vitamins synthesized by the microflora were utilized, either by direct absorption in the lower intestinal tract or, in the case of rodents, indirectly by coprophagy.

The result obtained from a bioassay should ideally reflect the combined in vivo response to all vitamin-active compounds and vitamin precursors present in the test sample in relation to their biological activities. Such a result can only be achieved using a bioassay that measures a true biological response. This may be either the overall growth response or a specific physiological response such as calcification of bone induced by vitamin D. Bioassays based on biological function depend on a series of sequential physiological events: intestinal absorption, plasma transport, tissue uptake, metabolism and, ultimately, biological function at the