Communications

Big Business Takes Over Research

Recent years have witnessed the establishment of large and powerful institutes, both governmental and private, for the prosecution of research in chemistry and physics. These institutes possess the financial backing, the equipment, the highly trained scientists and the technicians to follow up any new lead in science and to carry this lead rapidly to a successful conclusion. The journals are then flooded with research papers.

On the contrary, the scientific worker who happens to be a teacher in a college or university must prosecute his research with the help of untrained, or partly trained men and often has to put up with unsatisfactory or insufficient equipment. He is obliged also to divide his time between teaching and research. Thus it is patent that the teacher cannot compete successfully with members of research institutes.

It appears to me that college researchers are being forced into the background by this big business of research and that this situation is altogether undesirable. I fully agree with Curt P. Richter [*Science* **118**, 91 (1953).] who states that the man should be supported rather than the design and that we should educate public agencies and legislators to see the importance of backing individuals.

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April 7, 1954.

Intestinal Absorption of Vitamin B_{12} in Man

It is common knowledge that only a small part of vitamin B_{12} ingested is absorbed in the intestine (*1–6*). The underlying principles of intestinal absorption of this vitamin are, however, poorly understood. Recently, we have used surface scintillation measurements of the uptake of radioactive vitamin B_{12} by the liver following parenteral and oral administration of this vitamin for the study of intestinal absorption of vitamin B_{12} in human beings (*7*). We measured the hepatic uptake of radioactivity in normal individuals (*8–10*) following the ingestion of a standard dose of 0.2–0.4 μc (microcuries) of Co^{60}-containing radioactive vitamin B_{12}, to which variable doses of crystalline nonradioactive vitamin B_{12} were added. The mean hepatic counts obtained were then compared with those observed following intramuscular administration of a similar dose of the radioactive vitamin B_{12}. This allowed one to calculate the parenteral equivalent of the oral dose of vitamin B_{12} ingested.

It became evident from these studies that there exists an inverse relationship between the radioactivity counts over the liver and the amounts of crystalline vitamin B_{12} added to the radioactive vitamin B_{12} ingested. In the same individual, the uptake of radioactivity by the liver decreases rapidly on increase of the total dose of vitamin B_{12} taken in, when calculated per 1 μc of radioactive Co^{60}-B_{12} ingested. This indicates an inverse relationship between the amount of vitamin B_{12} ingested and the efficiency of its absorption in the intestine (*11*). The parenteral equivalents of the dose of vitamin B_{12} taken by mouth show a steady decline and follow a hyperbolic regression curve. The oral dose of 0.5 μg B_{12} results in radioactivity counts over the liver equivalent to those observed after injection of 90.5 ± 5.8 percent of this dose; of 1.0 μg, to those observed after injection of 81.5 ± 11.4 percent of this dose; of 2.0 μg, to 40.0 ± 8.1 percent; of 5.0 μg, to 22.0 ± 3.3 percent; of 20 μg, to 6.0 ± 1.5 percent; finally, of 50 μg, to 3.0 ± 0.7 percent of parenteral dose only. The individual differences in absorption, however, may be considerable. The farther extrapolation of the curve shows that the efficiency of absorption of vitamin B_{12} in the intestine would decrease to less than 1 percent if the dose ingested were increased to 1000 μg or more. Because of the decrease in the efficiency of absorption on increase of the intake, the increment in the absolute amount of B_{12} absorbed on increase of the dose ingested from 0.5 to 50.0 μg is strikingly small and amounts only to about 1 μg.

The intestinal absorption of vitamin B_{12} under normal conditions is controlled apparently by the existence of a *partial mucosal block* which shows much similarity to that regulating the absorption of iron in intestine. We believe that it may require for absorption of vitamin B_{12} in addition to Castle's gastric intrinsic factor also an intramural *"intestinal B_{12}-acceptor,"* the role of which in metabolism of B_{12} would be similar to that of apoferritin in iron absorption. With increasing saturation of B_{12}-acceptor in the intestinal wall, the absorption of vitamin B_{12} in the intestine would be braked, and this might explain the regression of efficiency of absorption of vitamin B_{12} on increase of the dose. After B_{12} passes into the blood through the intestinal membrane and before it becomes anchored in the liver and hematopoietic tissues, it circulates in the blood where it probably becomes bound to one of the proteins of the serum (*3, 12*), which by analogy with the serum transferrin we might call *"B_{12}-transferrin."*

The partial mucosal block to intestinal absorption of B_{12} changes to a complete or almost complete block in sprue and in pernicious anemia. This is evidenced by no, or a negligible, hepatic uptake of orally administered vitamin B_{12} in these diseases (*8–10*). In sprue, the block cannot be corrected by the addition of gastric intrinsic factor (*8–10*), because the defect in this disease depends on a generalized and inherent defect in the absorption mechanism of the intestinal wall. In pernicious anemia, the block to absorption of vitamin B_{12} depends largely on the absence of Castle's gastric intrinsic factor and can be converted into a