CHAPTER —

Progress in Megavitamin and Orthomolecular Science

Rims Ruling

During the first half of the 20th century, several fat-soluble and water-soluble vitamins were identified, isolated, and characterized and methods for their synthesis were developed. By 1943, the Recommended Dietary Allowances (RDAs)
were formulated and published by the Food and Nutrition Board of the U.S. National Academy of Sciences-National Research Council, which has revised its recommendations about every five years. The RDA's are defined in the following way: "Recommended Dietary Allowances (RDA) are the levels of intake of essential nutrients..."
considered, in the judgment of the Committee on Dietary Allowances of the Food and Nutrition Board on the basis of available scientific knowledge, to be adequate to meet the known nutritional needs of practically all healthy persons."

The Board states that the RDAs are intended to be met by a variety, rather than a wide variety, of foods rather than
by supplementation or by extensive fortification of
mingle foods, and that they apply to healthy
populations, not to those people with problems
such as premature birth, inherited metabolic
disorders, infections, chronic diseases, and the
use of medications requiring special dietary and
therapeutic measures.
During the second half of the 20th century it has been recognized that there is a fallacy in the definition of the RDAs. The fallacy lies in the last words of the definition, "...to meet the known nutritional needs of practically all healthy persons." Thus the "nutritional needs" are the amounts ingested by the control
A subpopulation of people in "ordinary good health".
Since the nutrient intake of these people is an average one, the definition of RDA leads to values of the TRDA equal to the amounts in the average diet.

With this definition, there is no possibility that the RDAs would be given values that would improve the health of all the people.
This fallacy is well known, even though the U.S. Food and Nutrition Board does not tell the American people about it. In their book Human Nutrition and Dietetics² the authors, Sir Stanley Davidson and P. Passmore, mention that different recommendations of the national committees of Britain and the USA are related to the customary diets of the two countries (p. 242). They
also say (p. 213) that the chief argument against recommending an intake of vitamin C that would lead to futher full saturation and improve the general health is that it would require a revolution in British rabbits to eat sufficient fruit and vegetables to provide the vitamin in this amount.
The value of megavitamins

The recognition of the value of an intake of vitamin larger than the intake that prevents manifestations of the corresponding deficiency disease has come mainly during the second half of the 20th century. In 1937 Albert Szent-Györgyi wrote that "Vitamins, if properly understood and applied, will help us to reduce human suffering to
on extent which the most fantastic mind would fail to imagine." In the period from 1940 on values of intake of vitamins somewhat larger than the RDAs were tested for prophylactic and therapeutic value. The amounts used were at first early investigators were conservative; for example, Cowan, Diehl, and Baker, who in 1942 reported that
in their double-blind study, 83-343 students who received vitamin C as a placebo, with 31% less respiratory illness in the vitamin C group than in the placebo group. Described the daily dose of 200 mg (four times the RDA) as a "massive" dose. A dose of 20,000 mg is now considered a massive dose. Megavitamin therapy was developed in 1952.
by A. Hofer and H. Raymond in Saskatoon, Saskatchewan, who reported they began the first double-blind study ever made in the field of psychiatry. In this study, 18 schizophrenic patients were compared with a placebo, nicotinic acid, and mecamylamine (each as an adjunct to standard schizophrenia treatment). The patients receiving vitamin
B3 (nicotinic acid or nicotinamide) fared better than those given a placebo.

A second double-blind study with 82 patients, follow-up studies since 1952, and clinical experience with on nearly 2,000 cases treated between 1952 and 1969 have clearly established for me that the treatment of choice for schizophrenia is a
combination of megavitaminic, tranquilizers, anti-depressants, and electroconvulsive therapy, combined with psychotherapy within the framework of the medical model. An example of independent collaboration is the work of Hawkins (Ref. 4, pp. 571-673). He and his clinic have treated over 4,000 cases, and the vast majority were restored to normality. This recent work may
be considered to be the logical consequence of earlier studies by many investigators of the value of this vitamin, which had been recognized in 1933 to the pellagra-preventing vitamin, in controlling the psychosis associated with pellagra and also in controlling depression and other psychotic states. The
Early studies are described by Hoffer's (Ref. 4, pp. 203-205). The RDA of vitamin B3 is 17 mg per day. In the early studies daily amounts from 500 mg to 1000 mg per day were used. Hoffer and Osmond, Hawkins, and 13 other psychiatrists prescribe 3,000 or more mg per day, usually together with an equal amount of ascorbic acid and often with other vitamins.

The biological importance
of vitamin B3 results from its involvement with enzymes.

Niacinamide is a constituent of the coenzymes

3-nicotinamide-adenine dinucleotide (NAD) and niacinamide-adenine dinucleotide phosphate (NADP), which serve as coenzymes in many enzyme systems.
Another early investigator in the megavitamin field was Fred P. Klenner. Following the 1935 report by Fungeblatt of the inactivation of poliomyelitis virus by ascorbate in 5, Klenner, before 1949 began the treatment of patients seriously ill with viral pneumonia, poliomyelitis, and other viral diseases by oral administration or venous infusion of ascorbate, often
in amounts as large as 1000 g per day. He recommended 10 to 20 g per day for prophylaxis. The biochemist Irwin Stone also played an important part in this development by marshalling the arguments about the optimum intake of vitamin C and advocating its therapeutic and prophylactic use in amounts far larger than the RDA.
Orthomolecular Substances and Orthomolecular Medicine

Most drugs have little physiological activity at doses far less than those at which they show pronounced activity, and the doses of drugs usually prescribed for the treatment of a serious illness are usually rather close to the lethal dose. In these respects the vitamins are much different. A daily intake
of 5 mg of nicotamide is enough to prevent pellagra from developing in most people, but 50 g, 10,000 times as much, can be taken without harm. Similarly, 5 mg of ascorbic acid per day is enough to prevent scurvy in most people, but 10,000 or even 50,000 times this amount can be taken without harm. No lethal dose is known for these vitamins as for
other — most of the others — it is estimated that a single dose of 10,000,000 I.U. of vitamin A might be lethal. 

Because the vitamins have physiological activity over a great range of tolerated intakes, an important question may be asked: what is the optimum intake?

For a vitamin the optimum intake may be
for greater than the TPDA.

Only during recent decades has there been serious interest in determining the optimum intakes.

In order to differentiate them from drugs, the vitamins and similar substances have
been given the name *orthomolecular substances.*

An orthomolecular substance is a substance that is normally present in the
human body and that serves some purpose. The vitamins, essential amino acids, essential fats, essential minerals, and various other constituents of foods are on the molecular substances, as are also various other substances, such as choline, $\alpha$-aminobenzoinic acid, the ubiquinones, and human proteins such as insulin and interferon.
Orthomolecular medicine is the achievement and preservation of the best of health and the prevention and treatment of disease by varying the concentrations of the orthomolecular substances in the human body. Reaching the goal may involve either increasing the concentration (e.g., for example, high-density lipoprotein in the blood) or decreasing the concentration (e.g., for example, low-density lipoprotein).