Trace Minerals in Food Production and Health

SCIENTISTS face no greater problem than that of assuring that the earth's rising population be adequately clothed, housed, and fed. Such assurance is essential if permanent world peace is to be attained. Achievement of this objective demands effort on many fronts: improved agricultural science, chemurgy, greater utilization of photosynthetic energy, novel foods and construction materials, the harnessing of microlife, and exploitation of marine resources. Among the possibilities is the increase of agricultural production and the nutritive value of foods by furnishing to deficient soils the minerals essential to high productivity and to the food quality upon which human health depends.

In addition to the major nutrients—nitrogen, phosphorus, and potassium—plants require small amounts of "trace minerals" such as copper, zinc, iron, manganese, and molybdenum. The animal body has similar requirements, since the trace minerals, among their other vital functions, are indispensable to the enzymatic control of plant and animal physiology. →

Severe deficiencies of trace minerals in the soil and diet produce a wide range of striking pathological conditions in plants, livestock, and man. More dangerous are the often unrecognized subclinical deficiencies, which prevent crops from attaining full productive potentialities, subtly restrain the growth of animals, and depress the general level of human health without inducing well-defined disease.

Trace-mineral deficiencies in soil, reflected in lowered essential mineral content of foods, are worldwide. Recent experience, especially in the United States, Great Britain, Australia, and New Zealand, has shown the important increases in crop production that are attainable by supplying small amounts of the trace minerals to soils that may not have been suspected of deficiency. There can be little doubt of the added benefit to human health.

The growing interest in trace minerals in plant and animal nutrition is seen in the growing number of programs on trace-mineral research at The Johns Hopkins University; MIT; Battelle Institute; the agricultural experiment stations of New Jersey, Missouri, Florida, Wisconsin, and California; the U. S. Soil, Plant, and Nutrition Laboratory; Rowett and Macaulay Institutes in Scotland; and others.

Although much remains to be learned of the fundamentals and applications of trace-mineral nutrition, the growing practical achievements of trace-mineral therapy have opened the way for widespread improvement in agricultural production and human health.

A bottleneck to research and practice in this field is the expensive equipment, skills, and resulting high cost of trace-mineral analyses of soils, crops, and foods, and of animal and human samples. This bottleneck could be broken by provision of a central analytical laboratory where the methods of the industrial production line could be used in complete and highly accurate analyses of hundreds of thousands of samples annually. The basic instrument would be the electronic recording spectrograph (quantometer), which has a theoretical capacity of a million samples of quantitative trace-mineral analyses per year, serving researchers, agriculturists, nutritionists, and medicine, internationally.

The laboratory would not interpret individual analyses; rather, it should supply new, needed data to aid diagnosis and treatment by specialists and practitioners in the fields served. The task of the laboratory we visualize extends beyond routine analyses. The data, if studied by competent investigators, would permit research by statistical methods, gradually clarifying the relationships between soil, agricultural production, and human health. In addition to revealing soil, food, and human deficiencies around the world, it would aid in the discovery of new mineral resources.

It can be predicted with confidence that the United States, as well as other countries, will some day have adequate analytical laboratories, and that their functioning will contribute notably to human well-being.

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