World Population Increase a Definite Challenge

Detailed structure of vitamin B_{12} elucidated, cobalt positions calculated, nitrogen distribution determined

NEW ORLEANS.—A definite challenge to agricultural and food processing industries is presented by the rapid increase in world population, trend toward urbanization, and universal demand for higher living standards. Chemistry helps meet this challenge by producing materials which in small concentrations

Francis W. Sherwood, North Carolina State College of Agriculture and Engineering, expresses his appreciation in receiving the Southern Chemist Award

improve, preserve, and extend the natural food supply. It can make food more healthful, nutritious, appetizing, convenient, and economical, said J. P. Kass, Atlas Powder Co., at the AMERICAN CHEMICAL SOCIETY Southwide Regional Conclave, Dec. 10 to 12.

Food processing industries use two general types of chemicals. Those adding essential nutrients to foods which may be below par in our diet are one class, such as vitamins for the enrichment of bread, milk, and margarine. Another type lends qualities demanded by the housewife for the sake of convenience and economy. Just to name a few, we have additives to preserve the eye appeal of canned or frozen fruits, vegetables, meats, and fish; additives to improve the texture of cakes, to prevent frying margarine from spattering, and to retard the spoilage of bread. Annual waste of bread through staling alone has been estimated sufficient to supply a city of 2 million people.

The chemical industry is spending vast sums of money to further research for better materials which can help food processing. A large part is devoted to testing the harmlessness of products. Synthetic chemicals used by the food industry are inherently no more harmful, and often less so, than foods to which they are added. Frequently they are identical with substances inefficiently produced by so-called natural means. Moreover, "unnatural" chemical products are usually produced from new foods upon cooking.

The very sound of the word "chemical" raises an emotional bias which can often be exploited by prejudiced or uninformed opinion for purposes of its own. This makes difficult the position of chemical and food industries and of such regulatory bodies as the Food and Drug Administration. Prejudice will inevitably discourage research and technological advances, with grave consequences to the welfare of the consuming public. Chemical and food industries should extend their efforts to present facts to the public by showing that use of harmless chemicals is simply another step forward in man's never ending battle to correct deficiencies of nature for his own benefit.

Vitamin B_{12}. A definitive allocation of the 13 nitrogen atoms of vitamin B_{12a} has been obtained, and by inference the 14 nitrogen atoms of vitamin B_{12}. Four researchers from Iowa State College, J. M. Brierly, R. R. Sealock, J. E. Ellingboe, and Harvey Diehl, performed an acid hydrolysis of the vitamin, followed by a Craig countercurrent distribution of the hydrolysate, and analysis of the various fractions for different types of nitrogen. Five atoms of nitrogen are found as ammonia in the hydrolysate, two atoms as 5,6-dimethylbenzimidazole, four as the red acid fragment, and two as 1-amino-2-propanol (or alternatively, one atom as 1-amino-2-propanol and one atom as a small, as yet undetected, nitrogen compound).

Attempts to elucidate the structure of vitamin B_{12} with x-ray analysis have been made by John G. White, Princeton University. A three-dimensional Patterson series and several three-dimensional electron density series have been calculated which give cobalt positions in the unit cell with certainty. They indicate, though do not definitely establish, the possible arrangements of groups coordinated to the cobalt atom.

Vitamin B_{12} is known to be an important nutrient for some species of a group of minute one-celled plants which occur in the sea. These plants, known as phytoflagellates or dinoflagellates, are second only to the diatoms in the production of organic food materials within the boundaries of the oceans. One of the phytoflagellates is responsible for causing red tide on the western coast of Florida, explained D. W. Hood and V. M. Doctor, Texas A & M. Many other species grow in great abundance at certain times of the year in parts of the Gulf of Mexico. Abundant growths, known as "blooms," occur only when the nutrient content, temperature, and salinity of the water

L. H. Greathouse, SRRL, discusses a pilot plant developed for treating cotton with volatile and toxic chemicals

reache optimum values. These values are not well understood. When more is learned about this phenomenon, it may be possible to set up conditions which will cause "blooms," either in artificial embayments or in the open sea, which can be harvested. Since these organisms are known to be about 50% protein, and also contain other nutrients, they can probably be utilized for animal feeds or direct human consumption.

Fertilizer. A phosphorus-nitrogen fertilizer extremely rich in plant food has been prepared on a small scale by a relatively simple process. TVA researchers, J. C. Driskell, F. A. Lenfesty, and Grady Tarbutton, burned phosphorus with dry air, and treated the hot phosphoric oxide with ammonia. Chemical tests show the solid product is essentially an equimolar mixture of ammonium metaphosphate and metaphosphimic acid. Further exposure to ammonia at lower temperature converts the metaphosphimic acid to ammonium metaphosphate. This compound has a theoretical composition of about 22% nitrogen and a phosphorus equivalent of about 74% P_4O_{10}.