

Scientist Says Single Cell Protein May Become Important World Protein Source

Some three hundred years ago a Dutch naturalist, Leeuwenhoek, peered through his microscope at a shimmering drop of sunlit pond water and launched mankind into the great biological revolution that continues today. Leeuwenhoek had discovered the single celled organism, a simple yet complete living entity.

Today, A. E. Humphrey, a prominent chemical engineer from the University of Pennsylvania, prophesied that scientists may well turn to these single celled organisms to answer what may prove to be twentieth century man's most crucial problem: hunger.

Delivering the keynote address at the 18th Annual Pfizer Research Conference, sponsored by the firm's Agricultural Division, Dr. Humphrey stated that protein obtained from single cell organisms grown on cheap substrates, such as crude oil, is meeting with initial success in certain parts of the world.

"Used today to augment animal feeds," said Dr. Humphrey, "this protein, commonly referred to as 'Single Cell Protein' (SCP) is being developed by many scientists and companies in various parts of the world. Plants to produce up to 16,000 tons a year are presently being constructed and plans for plants with production capabilities of up to one million tons a year are being considered."

In addition, the scientist noted, SCP runs as high as 75% protein and has a "nutritionally attractive amino acid profile." Amino acids, found in all living cells and tissue,

are important as building blocks of proteins and synthesis of many key biological substances, including enzymes.

"Because of the high nutritional quality and the physical characteristics of SCP," said Dr. Humphrey, "some thought has been given about by-passing animals on the food chain and producing a protein food in a meat analog form for direct human consumption."

"Although SCP appears to have a bright future," he said, "it is not without its problems, toxicity being the most important. Preliminary evidence, however, indicates that toxicity will be overcome as the attendant technology advances."

"With such barriers overcome," concluded Dr. Humphrey, "single cell protein may eventually become an important world protein source, a source that could prove to be the decisive factor in tipping the scale of hunger in favor of man."

Director of the University of Pennsylvania's School of Chemical Engineering, Dr. Humphrey is a noted authority in the area of fermentation for production of biochemicals, pharmaceutical compounds and protein for human and animal consumption. He received his Ph.D. in chemical engineering from Columbia University in 1953 and has lectured extensively both in the United States and abroad. As author or co-author, Dr. Humphrey has published more than 60 papers and the book, *Biological Engineering*, a text used in many universities in the United States and abroad.

ABSTRACTS: FATTY ACID DERIVATIVES

(Continued from page 377A)

• Fatty Acid Derivatives

SYNTHESES AND POLYMERISATION OF METHYL 12- AND 18-VINYLOXYSTEARATES. G. N. Tewari, P. C. Chatterjee and J. S. Aggarwal. *Makromol. Chem.* 126, 173-6 (1969). Methyl 12- and 18-vinyloxystearates were prepared by vinyl trans-etherification with ethyl vinyl ether. Stannic chloride initiated cationic polymerisation of these monomers in cyclohexane to yield colourless viscous liquids having a degree of polymerisation of about 20. The ester groups in the polymers were hydrolysed to give the corresponding polyacids and were reduced to give the corresponding polyols. (World Surface Coat. Abs. No. 334)

FATTY ACIDS, PART 25; THIN LAYER AND GAS-LIQUID CHROMATOGRAPHIC PROPERTIES OF SOME DIUNSATURATED C₁₈-ESTERS. F. Gunstone and M. Lie Ken Jie (Dept. of Chem., The Univ. of St. Andrews, The Purdie Building, St. Andrews, Scotland). *Chem. Phys. Lipids* 4, 131-8 (1970). The chromatographic (GLC and silver ion TLC) properties of 13 octadecadienoic esters and the *cis,cis*- and *trans,trans*-dienoates derived from them are investigated. The possibility of predicting GLC behavior (ECL) is discussed.

PART 26; THIN LAYER AND GAS LIQUID CHROMATOGRAPHIC PROPERTIES OF SOME CIS-OCTADECENYL COMPOUNDS. *Ibid.*, 139-46. The methyl *cis*-octadec-2 to 17-enoates have been converted to the corresponding alcohols, acetates, trifluoroacetates, aldehydes and hydrocarbons for investigation of their chromatographic (GLC and silver ion TLC) properties.

RICINOLEATE AS OIL-WATER DEMULSIFIER. E. G. Foehr (Chevron Research Co.). *U.S.* 3,505,307. Monoricinoleate esters of di- and trihydroxy alkyl compounds are used as demulsifiers for lubricant oils contaminated with water.

• Biochemistry and Nutrition

AN ANALYSIS OF THE INTERACTION OF PROTEIN WITH LIPID MONOLAYERS AT THE AIR/WATER INTERFACE. P. J. Quinn and R. M. C. Dawson (Dept. of Biochem., Agr. Res. Council, Inst. of Animal Physiol., Babraham, Cambridge CB2 4AT, U.K.). *Biochem. J.* 116, 671-80 (1970). Measurements have been made of the interaction of cytochrome c, bovine serum

albumin and synthetic oxytocin with low-pressure (2 dyn/cm) monolayers of stearic acid, phosphatidylcholine and phosphatidylethanolamine. ¹⁴C-Carboxymethylation of the cytochrome c and albumin followed by surface-radioactivity determinations have shown that only a proportion of the protein added to the subphase is bound to the monolayers and that initially the degree of binding is dependent on the protein concentration. The binding is irreversible in the sense that the adsorbed protein cannot be removed by transferring the film containing the interacted protein to a fresh subphase containing no protein.

TURNOVER OF THE GLYCEROLIPIDS OF PUMPKIN LEAVES. P. G. Roughan (Plant Physiol. Div., Dept. of Sci. and Indust. Res., Palmerston, North, New Zealand). *Biochem. J.* 117, 1-8 (1970). Between 1 and 5% of the ¹⁴C recovered from pumpkin leaves within 15-60 min after pulse-labelling with ¹⁴CO₂ was in the lipids. The specific radioactivity of the phospholipids was higher than that of the glycolipids. Phosphatidylcholine had five times the specific radioactivity of monogalactosyl diglyceride, and the specific radioactivity of neither galactolipid changed significantly between 1 and 48 hr after labelling. It therefore seemed unlikely that the galactose moieties of the galactolipids were involved in the transport of assimilated compounds across the chloroplast membrane. Within 60 min of the application of acetate-1-¹⁴C to the surfaces of mature, intact, pumpkin leaves, 70% of the recovered ¹⁴C was in the lipid fraction. From a comparison of the changes with time of labelling of fatty acid fractions from phosphatidylcholine, phosphatidylethanolamine, phosphatidylglycerol and monogalactosyl diglyceride, it is suggested that the primary site of linolenic acid biosynthesis in leaf cells is within the phosphatidylcholine molecule.

EFFECT OF LOW DIETARY LEVELS OF GLUCOSE, FRUCTOSE AND SUCROSE ON RAT LIPID METABOLISM. S. Mukherjee, M. Basu and K. Trivedi (Dept. Applied Chem., Univ. Calcutta, Calcutta, India). *J. Atheroscler. Res.* 10, 261-72 (1969). The effects of dietary carbohydrates on lipid metabolism have been investigated in rats maintained on diets containing 12% glucose, fructose or sucrose and appreciable quantities of starch. The changes in hepatic rates of synthesis and catabolism of cholesterol and fatty acids as well as of triglycerides and phospholipids were studied to determine the relative influence of the three sugars on serum lipid concentrations. Marked increase in serum cholesterol results from feeding a sucrose diet, while elevation of serum neutral