

non-volatile acids after resolution into solids and liquids. In addition, it was found that methanolysis and ethanolysis resulted in a considerable lowering of the iodine values of the C_{18} , and especially the C_{20} , unsaturated acids.

Glyceride Structure.—Studies on glyceride structure have been confined to the determination of the amount of fully saturated glycerides by oxidation of the unsaturated glycerides with permanganate in acetone solution. A series of eight determinations yielded an average value of 39 mols. per cent. of fully saturated glycerides, the standard deviations being 1.9 mols. per cent. The fully saturated glyceride content of this butter exceeds the value expected from the saturated acid content by some three or four units. This may mean either that this butterfat has an unusual glyceride structure or a more complete recovery of the fully saturated glycerides than previously obtained by other workers.

Characterization of Acids of Butter Glycerides.—The assumption has generally been made that the monoethenoid C_{18} acids of butter are comprised solely of oleic acid. Preparation of pure monoethenoid C_{18} fractions of butterfat and of olive-oil by fractional crystallization at low temperatures from acetone and methyl alcohol showed that, while olive-oil readily yielded oleic acid (m.p., 12.8–12.9°), butterfat gave a fraction, which melted indefinitely some three or four units lower, indicating the probable presence of one or more isomers. The probable presence of one or more isomers of oleic acid in butter is of distinct interest in increasing the random distribution of the acids and providing a lower melting-point fat than would be the case if the monoethenoid C_{18} fraction were composed solely of oleic acid.

A concentrate of C_{20} unsaturated acids, which form a minor and little-known fraction of butterfat, was prepared by fractional distillation of the methyl esters. By spectroscopic isomerization it was found that approximately half the total fraction was monoethenoid, one-third diethenoid, and the remainder mainly tetraethenoid, the di- and tetraethenoid acids being mainly in a conjugated form prior to isomerization.

Phosphatides and Unsaponifiable Constituents.—Studies of the phosphatide fractions which separate with the serum during the dehydration of butter by centrifugal separation showed that the C_{18} and C_{20} unsaturated acids were much more highly unsaturated than those present in the whole butterfat. The phosphatides were also found to contain nearly seven times as much as C_{20} unsaturated acids as found in normal butterfat, from which it also differed in the absence of lower saturated fatty acids. The unsaponifiable constituents, including principally cholesterol, were found to be concentrated to the extent of 2.11 per cent. in the serum glycerides, as compared with 0.65 per cent. in the dried butterfat. Investigations on the nature of the unsaponifiable fractions is continuing.

FISH-OIL INVESTIGATIONS

Molecular Distillation.—During the course of the year, using fish-liver oil containing 34,000 I.U. per gram of vitamin A, some 77 lb. of distillates of average concentration of 200,000 I.U. per gram, but ranging up to over 300,000 I.U. per gram, were prepared using a still of novel design for which a patent has been applied. Arising from this work, vitamin A concentrates are now being produced commercially in New Zealand to meet the keen demand overseas for this product.

Eel-oil.—The results of a survey of fresh-water eels made in collaboration with the Marine Department during the war have now been assembled. It has been found that the oil content of both the long- and short-finned species increases with age up to as much as 23 per cent., the migrant eel containing as much oil as the largest size of immature eel. The oil content of the immature eel was found to be largely concentrated in the tail, while in the case of the migrant the oil was found to be much more uniformly distributed. The data thus collected has application, in connection with the eel-canning industry, which has already produced some 80 tons of canned product for UNRRA. It is hoped that this industry will continue and that the eel-oil-extraction plant at Lake Ellesmere will soon be in production. In regard to this project, technical advice has been provided.