

dustry who wish to become better acquainted with plastics other than those with which they are thoroughly familiar.

L. M. DEBING

MANOMETRIC MEASURES

Manometric Methods. By MALCOLM DIXON. xiv + 155 pp., 20 figures. New York: The Macmillan Company. Cambridge: The University Press. Second edition. 1943. Price, \$1.75.

THE manometric method, as embodied in the familiar Warburg apparatus, has become increasingly valuable to the physiologist, biochemist and more recently to other classes of investigators, particularly food technologists who have been impressed with the versatility of the technique.

Manometric manipulations, though exacting, are regarded by many with undue awe. On the other hand, there are some who have used them without sufficient regard for the pitfalls which necessarily exist in a

method so delicate. This excellent little book, now in its second edition, should be most helpful to both types of investigators. The author's object—to provide a handbook for the laboratory, supplying in convenient form just that information which is likely to be required by research workers using the methods—has been fully realized.

Part I of the book comprises a discussion of principles and includes a satisfactory account of the theory involved in each of the methods described.

Part II contains a detailed description of the main methods now available: the direct and indirect method of Warburg, the first and second methods of Dickens and Simer and the method of Dixon and Keilin. A brief outline of the micro-technique is also given.

The book might have been improved by a presentation of the recent work on new applications and a description of the excellent new equipment now commercially available.

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SPECIAL ARTICLES

ESSENTIAL FATTY ACIDS AND LIPO-TROPIC ACTION OF INOSITOL

OVER a year ago the author became interested in the possible effect of essential fatty acids on the lipotropic action of choline. If choline lowers fat in the liver by virtue of its incorporation into the lecithin molecule, then essential fatty acids, which also constitute integral parts of this phospholipid, might similarly be required before choline can exert this effect. A preliminary experiment of three weeks' duration, using rats 100 to 125 grams in weight, suggested that the essential fatty acids were not required for the action of choline, although the results obtained did suggest that choline decreases liver fat to a greater extent when these metabolites are present. However, the difference found was of questionable statistical significance. It was realized that the three-week period would not have permitted a marked depletion of the animals' stores of essential fatty acids, and an experiment of longer duration was contemplated.

In the meantime Engel's paper¹ on the relation of the essential fatty acids to the lipotropic action of choline was published. In an experiment of eight weeks' duration performed on weanling rats, Engel found that pyridoxine was required for the full lipotropic action of choline. Because of the relationship of pyridoxine and essential fatty acids in the cure of rat acrodynia, Engel determined under similar conditions the effect of essential fatty acids on the lipotropic action of choline. He found that they also augmented the lipotropic action of this substance.

¹ R. W. Engel, *Jour. Nutrition*, 24: 175, 1942.

An experiment of eight weeks' duration was devised to test the effect of essential fatty acids upon the lipotropic action of choline and also of inositol since it, too, is a constituent of certain phospholipids and its influence might be similarly affected by essential fatty acids in the diet. The basal diet chosen for this experiment consisted of 8 per cent. casein, 12 per cent. casein, 12 per cent. gelatin (both extracted with 1:1 alcohol-ether), 73 per cent. sucrose, 5 per cent. salt mixture, 2 per cent. agar, 0.015 per cent. vitamins A and D concentrate (Ayerst, McKenna and Harrison, containing 500,000 I.U. of A per gram and 50,000 I.U. of D per gram). A mixture of the B vitamins in the following amounts was injected daily in 0.5 ml physiological saline: thiamine chloride, 50 α, riboflavin, 25 α, pyridoxine, 20 α, calcium pantothenate, 100 α, nicotinic acid, 100 α. Twenty weanling rats of the Wistar strain (23 to 35 days old) were used for each group and litters were divided as evenly as possible amongst the different groups.² The groups were also balanced with respect to weight and sex. After eight weeks on the diet, the rats were killed by a blow on the head. Individual liver fats were determined in the usual way by saponification, acidification and extraction of the fatty acids with petroleum ether. Table 1 shows the results obtained.

This result supports Engel's statement that the lipotropic action of choline is increased in the presence of Mazola oil presumably through the action of essential fatty acids¹. The lipotropic action of inositol on

² The mortality of the rats on the choline-free diets was quite high because of the development of hemorrhagic kidneys.