

opaque. Nevertheless they gave the same results in the conductance measurements, both showing low values of  $\Delta$  (maximum: .4%.)

These experiments show that polarization phenomena as observed in animal tissues can be imitated by lipoids. They show, furthermore, that the polarization, as measured by  $\Delta$ , depends on the degree of dispersion of the lipid in the membrane. Membranes containing the lipid in fine dispersion show high degree of polarization (high value of  $\Delta$ ) as do animal tissues, while membranes with lipoids in coarse dispersion show no or only minimal polarization.

This conclusion is corroborated by microscopical studies of the lipid membranes. The collodium-lecithin membranes are homogeneous, while the gelatin-lecithin membranes show doubly refracting lecithin lumps in irregular distribution.

The polarization of the lipid membranes (as expressed by  $\Delta$ ) was increased when the membranes were placed in .05 n HCl for 24 hours. It was diminished or destroyed by analogous treatment with .05 n NaOH or 95% alcohol. The change in the alcohol was irreversible due to the extraction of lecithin. The polarization of lecithin membranes treated with alkali could be restored by subsequent exposure to acid (.05 n HCl).

These experiments on membranes were followed by similar studies on brain tissue. According to Nernst<sup>4</sup> and others, excitation is supposed to be due to a change of ion concentration on semi-permeable membranes. Thus it seemed of interest to study agents that influence the convulsant reactivity in regard to their effect upon the polarization of brain tissue with this method. It was found on the cerebral hemispheres of cats and guinea pigs that  $\Delta$  diminishes under the influence of agents that produce a swelling of the tissue (hypotonic salt solutions, alkali). These studies are being continued with special reference to convulsive reactions.

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### Cause of Laxative Effect of Feeding Bran Pentosan and Cellulose to Man.

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Recent work suggests that the laxative effect of bran in animals and man is due to its fibre content. But in addition to fibre there

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<sup>4</sup> Nernst, W., *Pflügers Arch. f. Physiol.*, 1908, **122**, 275.

are large amounts of pentosan in bran. The purpose of this work was to compare the laxative properties of these 2 nondigestible carbohydrates, and also to determine whether the laxative effect was due entirely to the physical property of increasing the amount of unabsorbable matter and water content of the stool, or whether the metabolic products formed by the action of intestinal bacteria on them might be stimulating to the intestine. The volatile fatty acids are one of the principal split products of the action of bacteria on both digestible and nondigestible carbohydrates. We have already shown them to be greatly increased when assimilable carbohydrate predominates in the diet.<sup>1</sup>

The plan of the work was to use 2 human subjects whose colons appeared normal by X-ray studies. Four feeding periods each of 7 days. The first period consisted of feeding a nonresidue basal diet; in the second period the basal diet was supplemented with 35 gm. daily of a crude preparation of pentosan from bran which contained 40% pentosan by weight; in the third period the basal diet was supplemented with 35 gm. daily of a fraction of bran containing 50% crude fibre; and in the fourth period apples, apricots, and prunes were added to the basal diet.

The stools were weighed immediately and steam sterilized and sealed in fruit jars. They were analysed for pentose by determining the nonfermentable sugar after acid hydrolysis and precipitated by mercuric sulphate. The fibre was determined by the usual Weender method as outlined in official methods of Association of Agricultural Chemists. Volatile acids by our own method.<sup>2</sup>

Of the pentosan fed, only 17% in one subject and 6.5% in the other was recovered in the stools. In contrast to these results, 102% and 95% of the fibre fed was recovered. The marked destruction of pentosan did not increase either the volume of the stools or the output of volatile fatty acids. When, however, fibre was fed, the volume of the stools increased in one subject 100% and in the other 88%. The volatile fatty acids also increased 56% in one subject and 74% in the other. During the period when fruits were added to the basal diet there were definite increases in the stool volumes and amounts of volatile fatty acids.

*Conclusions.* The pentosans of bran are not laxative while bran fibre is definitely so. The volatile fatty acids parallel the volume of the stool and are not increased by the breakdown of pentosan.

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<sup>1</sup> Grove, E. W., Olmsted, W. H., Koenig, Karl, *J. Biol. Chem.*, 1929, **85**, 127.

<sup>2</sup> Olmsted, W. H., Duden, C. W., Whitaker, W. M., Parker, R. F., *J. Biol. Chem.*, 1929, **85**, 115.