FATS AND PROTEINS
RESEARCH FOUNDATION, INC.
3150 DES PLAINES AVENUE • DES PLAINES, ILLINOIS 60018
(5 MINUTES FROM CHICAGO'S O'HARE AIRPORT)
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"THE DIRECTOR'S DIGEST"
D. M. Doty
Technical Director

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Preliminary results of the project "Microbial Modification of Saturated Fatty Acids and Tallow" look quite promising. Jules D. Porsche and Associates started work on this study in December, 1964. Nineteen selected bacterial cultures have been grown under aerobic conditions in a culture medium containing stearic acid as the sole source of energy for the bacteria. One of the organisms has the ability to convert stearic acid, a saturated acid, into oleic acid, an unsaturated acid containing the same number of carbon atoms. Under some cultural conditions quite large quantities of palmitic acid accumulate. This fatty acid is a saturated acid containing sixteen carbon atoms - two less than the stearic acid used as the starting material. Also some palmitoleic acid is formed; this is an unsaturated fatty acid containing sixteen carbon atoms.

The "bug" that has yielded these interesting results appears to be quite unique. It apparently doesn't want to chew up the saturated fatty acid completely, but uses only a small amount of the fatty acid chain (two carbon atoms out of eighteen) to obtain energy for growth. Also its growth pattern (metabolism) appears to be quite susceptible to changes in the cultural medium and possibly to changes in conditions under which it is grown. The effects of these changes on the nature and yield of end products are now being investigated.

What do these results mean from a practical standpoint? If an unsaturated fat or fatty acid can be produced from the saturated components of animal fat, this offers a fine starting material for many chemical reactions to produce useful organic compounds. Also "desaturation" of animal fat would change its physical characteristics and make it easier to handle and more competitive with vegetable oils for some uses. Consequently we hope that the results of this project continue to show promise.

Another FPRF-supported project that shows encouraging preliminary results is the study on "Use of Inedible Animal Fats in Portland Cement". This project is under a contract with R. L. Johnson at Madison, Wisconsin. The following statements are from the summary of the first detailed report on this research:

> "The work thus far has proven that there is improvement in strength at all ages up to 28 days when an emulsion containing fats is added to Portland cement compositions. Percentages of fat used in various tests have ranged from 1.1% to 5% by weight to the cement weight. There does not appear to be any loss of strength up to 5%. In fact, it may prove that strength increases with increase in fat content. This could be brought about by a number of reasons: improved bonding of cement particles, increased rate of hydration of the cement, or the fat may impart some degree of flexural improvement.
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> Workability is improved from the standpoint of plasticity. The plastic nature is better than controls, as evidenced by the manner in which the samples containing emulsions are smoothed down in the molds. The surfaces are smooth and glossy while control samples are dull and grainy.
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> Costs of adding emulsions appear reasonable and the system is easy to handle."

It is interesting that in some respects the lower grades of animal fat appear to be somewhat superior to higher grades for use in concrete. Also animal fats seem to be slightly better than soybean oil.

In connection with this project, Mr. Johnson is working with some concrete block and pre-cast concrete plants. Also we have visited with technical staff members of the Portland Cement Association. These people are all interested in the project and feel that the results obtained indicate that fat may impart some very desirable characteristics to concrete and be economically feasible to use.