and the least one can say is that the burden of proof is likely to be a very heavy one. Nevertheless, these matters can be scientifically investigated, and perhaps the expression of unconvincing opinions may lead to fresh light and ultimately to some basis of general agreement.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

SOY-BEAN PASTE AS AN EMULSIFYING AGENT[1]

IN the United States the soy-bean (*Glycine hispida*) has been used chiefly for animal feeding and as a source of industrial products, but in the Orient it has long provided valuable staple foods for man. One property of importance in the preparation of foods and also for certain industrial processes is the stabilizing effect of soy-bean on oil-water emulsions. By substituting a cooked paste of soy-bean for eggs a salad dressing equal in quality to mayonnaise can be made.

Since lecithin occurs in soy-beans[2] we attempted to determine whether it contributed to their emulsifying action. Known additions of lecithin were made to other pastes of rather low original emulsifying power. The pastes were made by cooking corn starch, wheat starch or wheat flour with distilled water. Three samples of lecithin were used. Lecithins I and II were freshly prepared by extraction from egg yolk and soy-bean flour, respectively, while lecithin III was a commercial preparation of unknown age. The test consisted of preparing an emulsion under standardized conditions with each paste and noting the volume of oil which had been added when the emulsion began to "break." The experiment was then repeated with a duplicate sample of paste, into which lecithin had been dispersed before adding the oil. In a few cases the lecithin was dissolved in the oil itself. The amounts used, expressed as percentages of the weight of paste, were as follows: Lecithin I, 0.14 per cent. and 0.35 per cent.; lecithin II, 0.35 per cent.; lecithin III, 1.25 per cent., 2.5 per cent. and 5.0 per cent. In no case was there evidence that the lecithin greatly increased the emulsifying power of the paste; therefore the proteins of the soy-bean appear to be the chief stabilizing factor.

In preparing the mayonnaise-like salad dressing a paste was first made from sifted, finely ground flour, freshly milled from entire soy-beans of the Mammoth Yellow variety. The flour was mixed smoothly with five parts by weight of distilled water, boiled with stirring for two minutes over direct heat, cooked for fifteen minutes in a covered double boiler and cooled. Weighed portions of this paste were beaten in the usual way with a hand or electric rotary beater, while a moderate stream of oil was added. Water was added as needed for thinning, and lastly the requisite amounts of acid, dry seasonings and coloring were incorporated. Two parts of paste to twelve or fourteen of oil and three of additional liquid will yield a product of satisfactory flavor and texture, but this does not represent the maximum capacity for oil.

Soy-bean paste as emulsifying agent in salad dressing has several merits. Among these are: (1) low cost, (2) ease of shipping and storing the beans, (3) heat sterilization of paste immediately before use, (4) the incorporation of rather a large volume of liquid for a given viscosity. Emulsions made with soy-bean appear to be less sensitive to low temperature storage than those stabilized by egg, but to be more sensitive to excessive amounts of seasonings, particularly salt. Further work is required on both of these points, however, as our observations were not conclusive.

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[1] From the Laboratory of Home Economics, University of California at Los Angeles.

[2] Hugh MacLean, "Lecithin and Allied Substances," "The Lipins," new ed., Longmans, Green and Co., 1927.

CELLOPHANE FOR LANTERN SLIDES

REFERRING to the article, "A New Use for Cellophane," in the December 16 number of SCIENCE, page 573, I would like to add one suggestion regarding the making of charts and tables on cellophane for lantern slides. The carbon paper should be cut twice the width of the lantern slide and folded so that the cellophane can be placed between the two carbon surfaces. With hard finish typewriter carbon paper the results are much more satisfactory with the carbon deposit on both sides of the cellophane.

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THE RADIO-MAT

ALL who are interested in the convenient device described by Dr. Warren in SCIENCE, December 16, 1932, p. 573, may be concerned to know that a device of this kind ready prepared for making slides is marketed under the name of RadiO-Mat, manufactured by the RadiO-Mat Slide Company of New York, and is obtainable from photographic dealers generally. In this laboratory we have made a large number of slides

therewith. It is also possible to make legible projection material by simply typing the matter as one would a mimeograph stencil, on a blank piece of film. The ribbon can be left in, but it does not add greatly to the legibility and will smudge, as will a carbon under these conditions.

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SPECIAL ARTICLES

SELECTION WITH THE MAGNET AND CULTIVATION OF "RETICULO-ENDOTHELIAL" CELLS

THE supposition that certain highly phagocytic cells situated along the sinuses of the liver, spleen, bone-marrow, lymph-nodes and other organs have activities in common besides phagocytosis and constitute a physiological system, the "reticulo-endothelial system," has led to much discussion and experimentation. A host of functions, among them those of forming antibodies and bile pigment, are attributed to the cells in question. These attributions have been the easier because only oblique methods of test for them have been available.

Von Kupffer, the discoverer of the cells in the liver now classed as "reticulo-endothelial," observed that after the cells have taken up particulate material from the blood flowing by them, a greater or less proportion lose their hold on the capillaries and come away into the stream, new ones being provided by a proliferation and differentiation of the vascular endothelium. This happens irrespective of the character of the material phagocyted. We have taken advantage of the phenomenon to procure and cultivate the Kupffer cells.

A suspension of highly magnetic iron particles (the gamma ferric oxide of Baudisch and Welo[1]) in 7 per cent. gum acacia solution is injected into the circulation of a rabbit (or dog) on several successive days; and after two or three further days have elapsed—to give time for the particles ingested by blood leukocytes to be deposited—the animal is anesthetized and fluid is run directly through the liver, at first under low pressure to wash away the blood, then under high, with intermittent obstruction of the outlet tube and kneading of the liver to loosen and flush out the Kupffer cells. Warm Tyrode solution with 1/8 per cent. of gelatin for protective purposes[2] has proved as satisfactory a fluid as homologous serum. The Kupffer cells containing iron are separated from other elements by means of an electromagnet, past which the suspension is slowly run, "washed" with gelatin-Tyrode solution while still held by the magnet, and plated in a culture medium consisting of this fluid, plasma and serum.

When first obtained in serum or Tyrode's solution and studied in the warm box the Kupffer cells have the general character of clasmatocytes, but they exhibit in addition special traits which distinguish them from those phagocytic elements of the spleen and of old inflammatory exudates which are supposed like them to be components of the "reticulo-endothelial system." It is plain that this "system" consists of elements differing from one another to no inconsiderable extent.

Kupffer cells proliferate *in vitro* despite an initial content of iron particles that is often large; and they retain their specialized character. Since this is the case experiments with cultures should throw light on the functions of the cells. Such experiments are under way.

It is obvious that the magnet can be utilized for the selective separation of the phagocytic cells of organs other than the liver.

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[1] Provided through the generosity of Dr. Oskar Baudisch.

[2] Peyton Rous and J. R. Turner, *Jour. Exp. Med.*, 23: 219, 1916.

RELATION BETWEEN OXYGEN TENSION AND PROTEIN SYNTHESIS IN CERTAIN TISSUE EXTRACTS

IN previous work[1] we showed that a marked decrease in oxygen tension below atmospheric tension under otherwise constant conditions of pH, temperature, concentration of substrate, etc., increases the degree and the rate of proteolysis in certain normal and malignant tissues. These results suggested experiments designed to show whether oxygenation of digests of tissues containing suitable protein split products would or would not result in enzymatic protein synthesis. Concentrated extracts of the following tissues in phosphate buffer (pH approximately 7.0) were used: Voluntary muscle of albino rats and rabbits, Jensen rat sarcoma and Walker rat carcinoma 256. The extracts were subjected to a preliminary period of digestion in an atmosphere of purified nitrogen, toluene being added to prevent bacterial growth. The digests were then treated with a current of purified oxygen from 2 to 4 hours. The mixtures were finally allowed to digest again in an atmosphere of nitrogen. The protein content was deter-

[1] Carl Voegtlin and M. E. Maver, Public Health Reports, 47: 711, 1932; M. E. Maver, J. M. Johnson and Carl Voegtlin, Public Health Reports, in press.