TABLE 1

| Phospholipid | Phosphorus Per cent. | Nitrogen Per cent. | Ash Per cent. | Fatty acids Per cent. |
|---|---|---|---|---|
| Cottonseed (present investigation) ... | 2.9 | 1.2 | 10–11 | 48 |
| Cottonseed (Thurman[4]) ... | 2.6–2.9 | 0.96 | – | – |
| Cottonseed (Hilditch and Zaky[5]). | 2.8 | 1.6 | – | 48 |
| Soybean lipositol (Woolley[2]) ..... | 3.1 | 0.98 | 12.1 | 45 |
| Soybean (Hilditch and Pedelty[6]) | 3.7 | 1.4 | – | 70 |
| Wheat germ (Channon and Foster[7]) | 3.0 | 1.5 | 4.3 | 56 |
| Lecithin (theory[7]) . | 4.0 | 1.8 | none | 70 |

by Thurman.[8] The phospholipid contained 0.6 per cent. Mg, 0.3 per cent. Ca, and 0.03 per cent. K.[9]

Fifteen to 20 per cent. of the phospholipid could be dissolved by extracting with many changes of hot alcohol. This "lecithin" fraction contained 3.1 per cent. P, 1.5 per cent. N, and 2.5 per cent. ash.

After either acid or alkaline hydrolysis, 41 per cent. of the nitrogen was present in the form of amino nitrogen.

The phospholipid was readily soluble in water, and in ether and petroleum ether after the addition of small amounts of water. In 5 per cent. concentration, the solution in water was dark-colored with oil-like viscosity and wetting properties. It possessed antioxidant activity of a high order. When assayed in a preparation of ethyl esters of cottonseed oil fatty acids, 0.1 per cent. increased the induction period from 17 to 195 hours at 70°. The role of lipositols and metallic phosphatidates as antioxidants deserves further study.

The relatively low unsaturation (Iodine Number, 100) of the cottonseed phospholipid fatty acids is responsible, at least in part, for its stability.[10] This property and its availability make it a promising material for further investigation of the composition of plant phospholipids.

T. D. Fontaine supplied many analytical data in this study.

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# SCIENTIFIC APPARATUS AND LABORATORY METHODS

## PROPOSED USE OF STARCH SPONGES AS INTERNAL SURGICAL DRESSINGS ABSORBABLE BY THE BODY

AN absorbent dressing which, when saturated with a medicament and placed in an incision or a deep wound, would be slowly dissolved and absorbed by the body with gradual release of the medicament would be of considerable value. Sponges obtained by freezing starch pastes[1] have characteristics which suggest their use for such a purpose. As the authors have no facilities for experimentation with animals or for clinical studies, the preparation and characteristics of the starch sponges are described here, with the hope that others may be able to test the medical value of these materials.

Starch sponges are quickly and easily prepared. The following procedure is recommended: A 5 per cent. suspension of purified cornstarch is pasted by heating and then sterilized by heating in an autoclave for 15 to 20 minutes at 15 pounds per square inch gauge pressure. The autoclaved paste is placed in shallow pans or other containers as desired, and frozen slowly, preferably at a temperature just below 0° C. The higher the freezing temperature, the coarser and stronger the resulting sponge. When freezing is complete, the paste is removed from the freezer and allowed to thaw. The resulting spongy mass may be cut into pieces of the required size and shape. Sponges having different textures may be prepared by varying the pasting and freezing conditions, and the kind and concentration of starch used.

Sterile sponges can be prepared by autoclaving the paste and carrying out the rest of the preparation under aseptic conditions, or the final product can be simultaneously toughened and sterilized by immersion in 70 per cent. alcohol. Dried sponges can be sterilized by autoclaving, similarly to absorbent cotton.

Starch sponges are highly absorbent. They will take up 15 to 18 times their own weight of aqueous or alcoholic solutions. Unlike cotton, they are firm enough to retain the absorbed liquid during gentle handling.

These sponges can be air-dried at temperatures up to 105° C., to light, rather brittle masses which return

[4] B. H. Thurman, U. S. Patent No. 2,201,061, 1940.
[5] T. P. Hilditch and Y. A. H. Zaky, *Biochem. Jour.*, 36: 815, 1942.
[6] T. P. Hilditch and W. H. Pedelty, *Biochem. Jour.*, 31: 1964, 1937.
[7] H. J. Channon and C. A. M. Foster, *Biochem. Jour.*, 28: 853, 1934.
[8] B. H. Thurman, U. S. Patent No. 2,150,732, 1939.
[9] Microchemical analyses by C. Tiedcke, New York, N. Y.
[1] The sponge-like character of frozen starch paste was reported by E. A. Scharling, *Ann.*, 49: 315, 1844.
[10] B. H. Thurman, U. S. Patents No. 2,182,767, 1939; 2,201,064, 1940.
[11] Present address: Western Regional Research Laboratory, Albany, Calif.

rapidly to their original soft state when remoistened. In water they are only moderately strong and disintegrate slowly if subjected to mechanical strain. In 70 per cent. alcohol, on the other hand, they remain soft and pliable, but become quite tough and retain their structure almost indefinitely.

There are several methods by which medicinals as, for example, penicillin, sulfathiazole, sulfapyridine or other drugs can be introduced into a starch sponge. The latter may be squeezed nearly dry and filled by dipping into solution. If desired, the sponge can be filled with medicament, dried and remoistened just prior to use. A medicament, such as sulfathiazole, incorporated in the paste prior to freezing, is retained almost completely in the sponge when excess water is expressed. That the sponge would be dissolved and absorbed in the body, with consequent slow release of the medicament, is suggested by the fact that 100 mg portions of dried sponge disperse in 4 to 7 hours at 37° C. in Seitz filter-sterilized beef serum buffered to pH 7.0 to 7.6.

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## MOLECULAR WEIGHT BY ISOTHERMIC DISTILLATION

THE previously described "parallel twin capillary" method of J. B. Niederl and A. M. Levy[1,2] for the determination of molecular weight by isothermic distillation has now been improved by reducing the time necessary for interpretable results to 2–3 days instead of weeks. This has been accomplished by placing the capillaries containing the solutions of the standard and the unknown, "opposite" (mouth-mouth) instead of "parallel." Thus the length of the vapor bridge is reduced to 6–8 millimeters.

As before and as illustrated in Fig. 1, the apparatus consists of a capillary desiccator tube (C) and two capillaries, each 25 mm long and 1.5 mm in inner diameter (A and B). Capillary (A) contains the standard solution, while a similar, but opposite capillary (B) contains the unknown. A cotton wad (D) keeps the capillaries in place. The sealed desiccator tube containing the filled capillaries is mounted, by means of a drop of water glass solution, on a microscope slide (E) provided with suitable reference lines (F).

Three trials are usually carried out simultaneously. The unknown is paired with (a) a higher molar, (b) an equimolar and (c) a lower molar standard solution, preferably 0.15, 0.1 and 0.05 molar solutions of azobenzene in acetone. The solutions of standard and unknown are thus placed in competition for solvent through a short vapor bridge in obedience to Raoult's law. Isomolarity between the unknowns and the standard results in no net change of solvent concentrations, and therefore no relative volume changes in the matched pair of capillaries containing equimolar

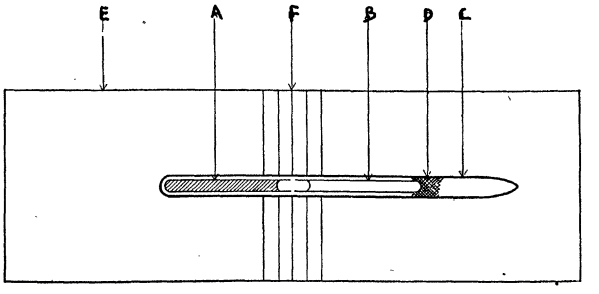


FIG. 1. Apparatus for isothermic distillation.

solutions. However, in the case of the higher molar standard solution the standard gains, while the unknown shows a corresponding loss. With the lower molar standard solution the reverse will be the case.

After an acclimatization period of 24 hours gain and loss of solvent are ascertained by observing the movement of the meniscuses of the solutions by means of a low-powered microscope, possessing a micrometer scale in the eye piece. Readings are taken every 24 hours. With acetone as the solvent two days of observation suffice. The readings are then plotted or tabulated and from these data the results are calculated as described before.[1,2]

The method requires only 25 cu mm of solution per trial, involving as little as 0.5 milligram of substance, which can be recovered. The apparatus consisting of three capillaries is of utmost simplicity.

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[1] J. B. Niederl and A. M. Levy, SCIENCE, 92: 225, 1940.
[2] J. B. Niederl and V. Niederl, "Micromethods of Quantitative Organic Analysis," 2nd ed., pp. 230–238, New York, N. Y.: J. Wiley and Sons, 1942.
[3] D. R. Kasanof, M.Sc. Thesis, New York University, Graduate School, April, 1944.

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