The breakdown of the fat in the organism could be followed by deuterium analysis of the body fluids, since organic compounds containing deuterium, when burned, form an equivalent amount of heavy water. This is equally distributed in all body fluids. For example, after feeding mice for four days on a diet rich in carbohydrate with only 1 per cent. of fat, 60 per cent. of the absorbed fat could be recovered from the fat depots, and in the body fluids an amount of heavy water equivalent to 20 per cent. of the fat was found. In order to prevent an excessive storage of food material the total food intake was so limited that the animals lost weight during the feeding period.

The use of deuterium has made possible, for the first time, the recognition of cholestenone and coprostanone as intermediates in cholesterol metabolism. Earlier experiments with dogs have shown that administration of cholestenone gives rise to an excess excretion of either cholesterol or coprosterol, according to the nature of the basal diet. We have now found that ingested coprostanone is converted into coprosterol; after feeding coprostanone 4, 5–d_2 to a dog and to a human the coprosterol isolated from the stools contained large amounts of deuterium.

The number of possible applications of this method appears to be almost unlimited.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A BIOLOGICAL EFFECT OF IONIZED AIR

IN view of the contradictory results of certain experiments[1] designed to test the therapeutic and other biological value of ionized air, it has been thought desirable to try some simple experiment under well-controlled conditions which would give a definite answer to the question whether or not ionized air has any effect on living material. Accordingly, inbred cultures of wild-type *Drosophila melanogaster* have been grown in ionized air under various conditions.

In the first set of experiments ionized air was drawn through the culture bottle, which was closed by a rubber stopper. The air was ionized by a polonium source suspended in a glass tube, one end of which was closed with a wad of cotton, the other end leading without obstruction to the culture bottle. Since the source was never closer than 30 cm to the bottle, the weak gamma-radiation characteristic of polonium need not be considered. These experiments were performed in a damp, cool basement.

In a second series of experiments, performed in various rooms in another building, air was ionized in the culture bottles by means of a brush discharge between point and plane connected to a 5,000 volt transformer, each bottle being closed with a wad of cotton. In this case, as indeed in the previous one, the degree of ionization would vary at different points within the bottle, because of recombination of ions.

Each culture was started with flies from the inbred stock; neither these nor any of their ancestors had in any case been exposed in the experimental bottles, but exposure to highly ionized air was started within ten minutes after each culture was prepared. In the polonium experiments exposure was continuous, but in the second series exposure was stopped by turning off the current during about half of each day.

In both series of experiments a definite effect has been observed, consisting in the coloration and subsequent death of larvae. The coloration, reddish brown or rusty, appeared first at the posterior spiracles, and spread from this point through the larval body. The amount of coloration when death occurred was not uniform; the majority of affected larvae died when about half of the body was colored, although a few lived until coloration was practically complete, and many died with only a spot of color at the spiracles. Coloration did not advance after death.

Coloration never appeared in all larvae in a culture; it was not observed in larvae that remained in or upon the food medium at the bottom of the bottle, but only in those that crawled up the walls. Some larvae were colored in every bottle treated, and in several cases the majority of those on the walls. Once coloration set in, death of the affected larva followed within twelve to twenty-four hours. Within another day or two all larvae that could be seen in the bottle died. The adult flies remained alive, although in the second series, with the discharge, the adults showed an extreme debility, being scarcely able to crawl around after an exposure of two days or more.

That death of the larvae was not caused by a poisoning or other change in the food was proved in the following manner: A culture in which after exposure to ionized air all larvae that could be seen had died was allowed to stand filled with normal atmospheric air. Within two days larvae appeared, and seemed active and normal. None of these larvae were colored.

[1] Asperen, *Ann. Botany*, 44: 176, 989; Chouchak, *Rev. Gen. Bot.*, 41: 488, 465, 1929; Belak, Holik and St. Kelemen, *Zeitschr. Hyg. u. Infektionskrankh.*, 111: 5, 703, 1930. See also: Koller, *Jour. Franklin Inst.*, 214: 5, 543, 1932; Romanoff, SCIENCE, 81: 536, 1935.

Histological examination has failed to show any significant difference between the colored and normal larvae. In every case control cultures were grown from the same stock and on food from the same supply, and none of the controls showed coloration or any other apparent deviation from normal.

Although the temperature in the discharge may have risen slightly, the temperature of the air throughout the bottle was not appreciably raised. In the polonium experiments no heating was possible. Also, while ozone and oxides of nitrogen are produced in a discharge, very little of either could have been present during the polonium experiments.

Flies from the same stock were treated by placing cultures in a drying oven at 33° C., and others in a desiccator containing calcium chloride. Although after several days all larvae in these cultures died, no coloration was apparent.

It would thus appear that ionized air is capable of producing an effect on living material.

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APPLICATIONS OF PERVAPORATION

PERVAPORATION was discovered by Kober[1] in 1917, to whom we owe most of the information regarding its usefulness. Holmes[2,3] briefly outlines the method and its uses. Outside of these references the method appears to have been practically entirely overlooked. Since it has proved so efficient in this laboratory, it was felt that this very useful procedure should be brought to the attention of other workers.

The apparatus used by the writer is illustrated in Fig. 1. The figure is self-explanatory. Cellophane casing is used instead of the collodion membrane described in the original paper; the fresh casing should be soaked in distilled water for a few hours before use.

The apparatus has been successfully employed by the writer for the concentration of very dilute protein solutions with the simultaneous removal of salts and for the concentration of aqueous and aqueous-glycerol solutions of enzymes. The rate of concentration of glycerol solutions is, however, considerably slower, and more frequent washing of the bag is necessary to remove the glycerol from the outside.

Large quantities of water can be evaporated in a relatively short time at room temperature or even slightly below this. For example, using a bag 18″ x 3″, approximately 1 liter of water per 24 hours was removed, the average temperature inside the bag being 20° C.

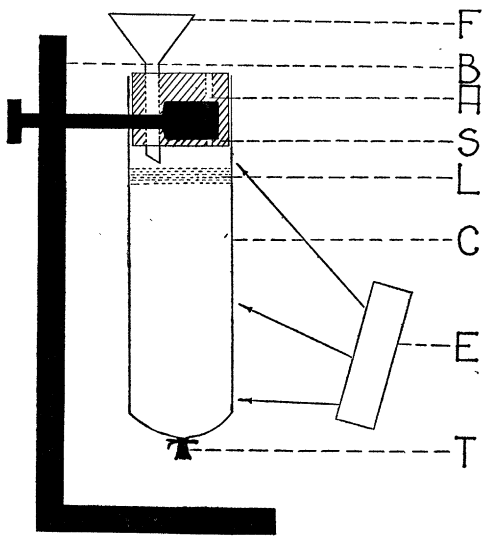

FIG. 1. Apparatus for Pervaporation. A, air vent; B, burette stand; C, Cellophane casing; E, electric fan; F, funnel; L, layer of toluene; S, rubber stopper; T, tied end of bag, dipped in paraffin.

The advantages of pervaporation are the simplicity of the necessary apparatus, the ease of manipulation and the little attention required during the operation. All that needs to be done is to refill the bag from time to time and to wash off its outside. In addition operations can be carried out under sterile conditions, and with a battery of pervaporators to take care of very large volumes of liquid.

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[1] Kober, *Jour. Am. Chem. Soc.*, 39: 944, 1917.
[2] Holmes, "Introductory Colloid Chemistry," 3rd Ed., p. 18, John Wiley and Sons, Inc., New York, 1934.
[3] Holmes, "Laboratory Manual of Colloid Chemistry," 2nd Ed., p. 30, John Wiley and Sons, Inc., New York, 1928.

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