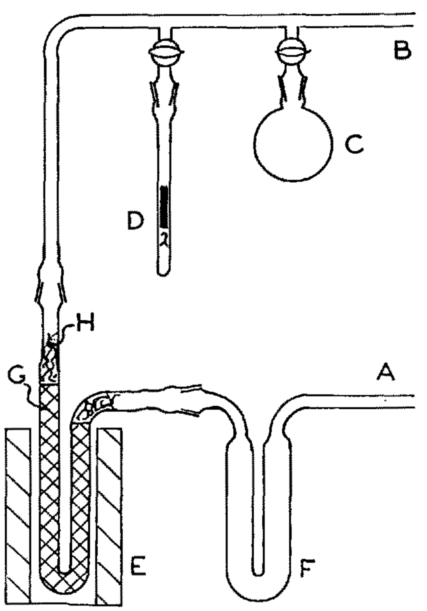
PRO LABORATORIO

Preparation of Radioactive Water

Because of the relatively low cost of hydrogen-3 (tritium) this radioactive isotope is being used in increasing amounts as a tracer. Water is one of the most useful compounds containing this element, not only for biological experimentation but also for chemical syntheses of other compounds. We present a method used for the preparation of tritiated water in our Laboratory in connection with our investigations of organic reactions by means of the isotope effect[1]. This method gives good yields based on radioactivity, is adaptable to any quantity of tritium, requires little special equipment, and is free of hazards. Other methods for the preparation of tritiated water from tritium gas have been reported[2], but these have disadvantages which are not shown by the method presented here. We do not claim that this method is original with us, but we feel that its publication will be helpful to others who wish to prepare tritiated water.



Apparatus for the preparation of tritiated water. *A*, intake of Toeppler pump; *B*, outlet of Toeppler pump; *C*, flask containing 1-3 ml of ordinary water; *D*, ampoule holding tritium, and a magnet; *E*, furnace; *F*, cold-trap; *G*, copper-oxide wire; *H*, glass wool.

Experimental.—A diagram of the apparatus used is shown in the Figure. The essential parts of the apparatus are: a container holding 1–3 ml of water (*C*), an ampoule containing tritium gas (*D*) to which has been added a cylindrical magnet, a heater (*E*) capable of reaching 300–350°, containing a U-tube packed with copper oxide wire which is held in place with glass wool, and a U-tube (*F*) which can be cooled to – 80° for the condensation of water. The apparatus is connected to a Toeppler pump for the circulation of hydrogen through the apparatus from *B* to *A*.

After the apparatus is evacuated and free of leaks, the furnace containing copper oxide wire is heated to 300°, the trap is cooled with solid carbon dioxide or nitrogen-toluene mush, and the bulb of the Toeppler pump is filled with hydrogen at a pressure of one-half an atmosphere. To start the reaction, the break-off seal on the ampoule of tritium is broken by means of the magnet, allowing tritium to expand into the evacuated space. The action of the Toeppler pump is started, diluting the tritium with hydrogen gas and pushing it through the heated copper oxide. The circulating action of the Toeppler pump is continued until the pressure in the apparatus drops to a few microns of mercury, indicating complete transformation of the tritium-hydrogen mixture to water. The Toeppler bulb may be filled again with hydrogen and this allowed to react as before. The furnace is allowed to cool and the stopcock on the container of water is opened. 1–3 ml of water is distilled through the line and furnace, in order to displace radioactive water which has been adsorbed on the walls. This part of the procedure is very important in getting good activity yields as all of the radioactive water might be lost by adherence to the solid surfaces.

In one experiment tritium gas from an ampoule thought to contain 100 mc was mixed with hydrogen and oxidized with copper oxide to water which was further diluted. The final weight of the water was 14·44 g with an activity of 7·13 mc/g, or a total radioactivity yield of 103 mc. Evidently the activity of the starting material was more than 100 mc; however all runs have shown consistently good yields, averaging about 70% based on starting activity. The resulting water can be obtained at very high specific activities by using less water for transference and dilution.

E. M. HODNETT, CH. F. FELDMAN, and J. J. FLYNN, Jr.

Department of Chemistry, Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma, October 30,1956.

Zusammenfassung

Radioaktives Wasser wird mit Sicherheit und mit guter Ausbeute dargestellt, indem man über Kupferoxyd bei 300–350° eine Tritium-Wasserstoffmischung streichen lässt.

[1] This work is supported by the United States Atomic Energy Commission under Contract No. AT(11-1)-71, Project No. 5, and is being done in the Radioisotopes and Radiations Laboratory, Research Foundation, Oklahoma A. and M. College.

[2] R. F. GLASCOCK, *Isotopic Gas Analysis for Biochemists* (Academic Press Inc., New York 1954), p. 203.

NOVA

Journal of Insect Physiology

The aim of the journal is to bring together in one place the best contributions on insect physiology from all parts of the world. It will be concerned also with the physiology of other groups of arthropods, especially of terrestrial forms. Original work on biochemistry, toxicology, and the functional aspects of morphology, as well as papers on new techniques and methods, will be published if it contributes to the solution of physiological problems. Preference will be given to papers that contribute to an understanding of the general principles underlying the physiology of insects.

Papers in English, French or German should be submitted to the appropriate editor: Prof. V. G. DETHIER, Department of Biology, The John Hopkins University, Baltimore, Maryland, USA.; Dr. H. E. HINTON, Department of Zoology, University of Bristol, Bristol, England; Prof. M. LÜSCHER, Zoologisches Institut der Universität Bern, Bern, Switzerland.