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National Labeling Tritium Facility

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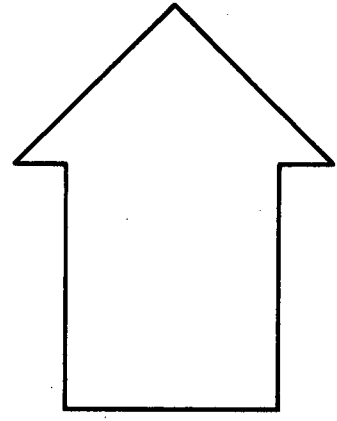
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National Tritium
Labeling Facility

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The National Tritium Labeling Facility
is a user facility, supported
by the Biotechnology Resources Program,
Division of Research Resources,
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Purpose

The National Tritium Labeling Facility (NTLF) was established on August 1, 1982 through the joint sponsorship of the National Institutes of Health and the Department of Energy. It functions as a national user facility under the Biotechnology Resources Program of the NIH Division of Research Resources.

The radioactive isotope of hydrogen, tritium, has become increasingly valuable to the nation's biomedical research programs. The new facility provides a laboratory where scientists can employ the latest techniques to "label" (i.e., incorporate tritium into) compounds that will then serve as valuable tracers in the scientist's home laboratory. The NTLF also serves as a research laboratory to increase our knowledge about the routes through which the tritium incorporations are achieved.

The principal activities of the NTLF are described below.

Core Research

This research effort is devoted to studies of the physico-chemical mechanisms involved when hydrogen atoms in an organic compound are replaced by atoms of tritium, the radioactive isotope of hydrogen. The principal reactions currently under study are excitation labeling (the replacement of H by T atoms derived from passing T_2 gas through a microwave discharge), catalytic tritio-hydrogenation, and the replacement of halogen atoms in organic compounds by tritium atoms. These studies are of fundamental interest in physical and organic chemistry and have the potential for increasing our understanding of the best ways to produce desired tritium-labeled compounds for the biomedical community.

Labeling Service

The NTLF is authorized to handle up to 15,000 curies of T_2 gas and 3,500 curies of T_2O . It provides a place where research scientists can achieve the synthesis of needed, commercially unavailable, high-specific-activity, radiopure T-labeled compounds. Use of the NTLF is open to all



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also has an instructional purpose, and investigators must come to the NTLF and carry out the proposed tritiation under the supervision of the facility's staff. The NTLF is also equipped with a radiopurification laboratory in which, by a variety of chromatographic procedures, tritium-labeled compounds may be brought to maximum radiopurity before being transported to the laboratories where the tracer investigations will be carried out.

Examples of important biomedical compounds that have been labeled (through March 1984) are endorphins, gibberelic acids, norepinephrine, prednisone, and psoralens.

Collaborative research

Several research projects are carried on in collaboration with outside investigators. These projects all involve the use of tritium to unravel the details of the movement of hydrogen atoms in a variety of reactions, including those of interest to biologists and physical chemists.

Training

Through the above activities graduate students, postdoctoral fellows, and research scientists are trained in the methods of handling tritium and the applications of tritium-labeled compounds. In all of these activities, there is emphasis on handling tritium in the safest possible way.

Facilities Available

(1) A glove box for excitation labeling. Two such procedures can be done simultaneously in this box.

(2) A glove box for catalytic tritiations, catalytic halogen displacements, tritiations by exchange with tritiated solvents, and other chemical tritiation procedures. Two such reactions can be carried out simultaneously.

(3) Two gloved work-up boxes for lyophilizations, crystallizations, and other simple procedures for the initial separation of tritiated products from unwanted side products.

(4) A radiopurification laboratory for the rigorous purification of labeled compounds.



Techniques include high-performance liquid chromatography and gas chromatography, both analytical and preparative. The instruments are equipped with devices for on-line measurement of the radioactivity of compounds emerging from the chromatographic columns.

(5) A 220-MHz NMR spectrophotometer equipped with a probe for determining the spectra of tritium-labeled compounds.

(6) Several tritium-detection instruments for the continuous monitoring of tritium levels in the glove boxes, laboratory atmosphere, and the NTLF's exhaust stack.

Funding, Direction, and Further Information

The NTLF is funded by the NIH Biotechnology Resources Program of the Division of Research Resources. The Department of Energy also makes significant contributions to the operation of the Facility. An outside advisory committee provides the NTLF's staff with continuing important direction; committee members during 1982-83 have been N. Castagnoli, E.E. Conn, A. Fry, A. Liebman, N.A. Matwiyoff, J.B. Neilands, and L.D. Spicer.

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