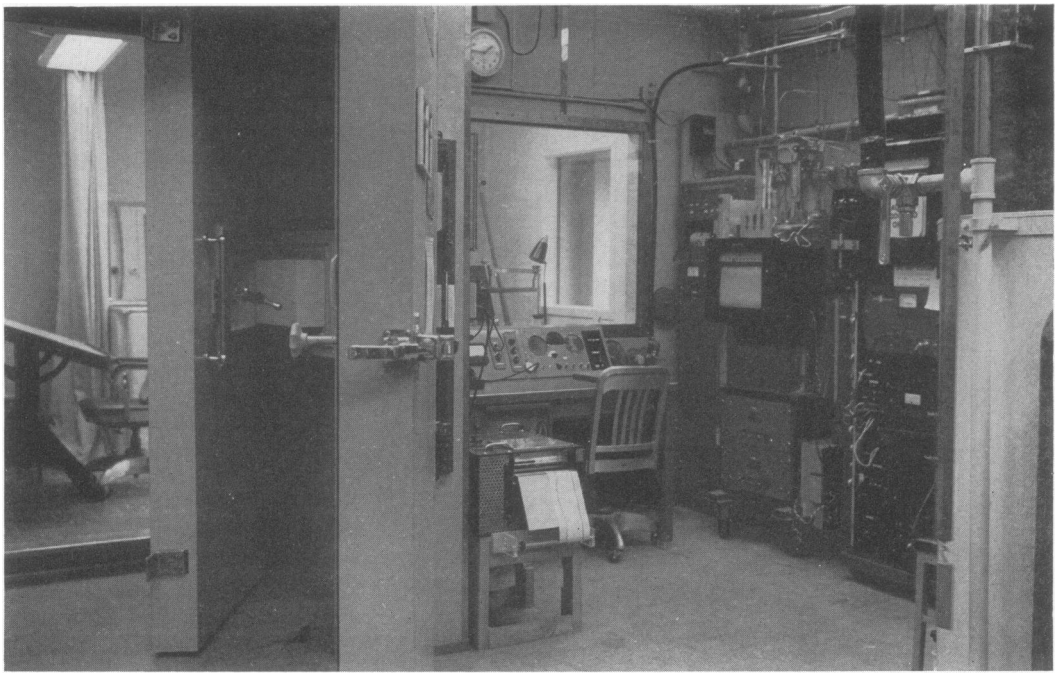
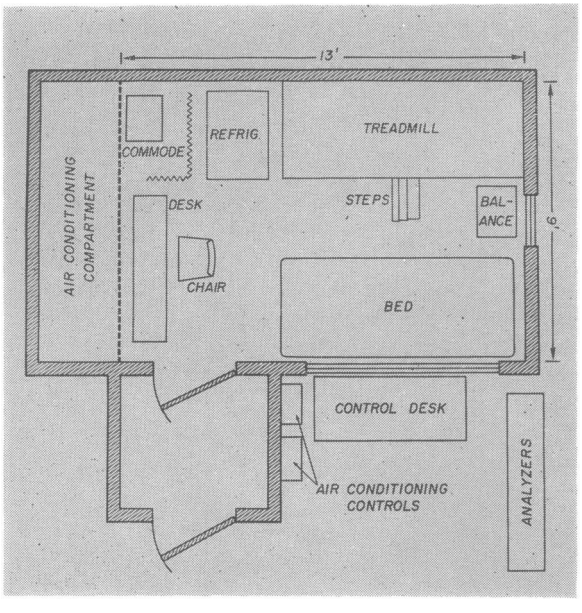


Metabolic Chamber



Long interest in the effects of activity and disease on human energy has led to the construction of a sealed chamber large enough to allow patients to carry on varied ambulatory activity during metabolic tests. At the National Institute of Arthritis and Metabolic Diseases, Public Health Service, where the project was developed, the person under test lives a relatively normal life for several days in the precisely controlled climate of the chamber, which is attached to a battery of recording and analyzing instruments. Physicians and scientists are thus able to discern new facts on the intimate process of human use of food for the building of tissues or for conversion to useful energy.

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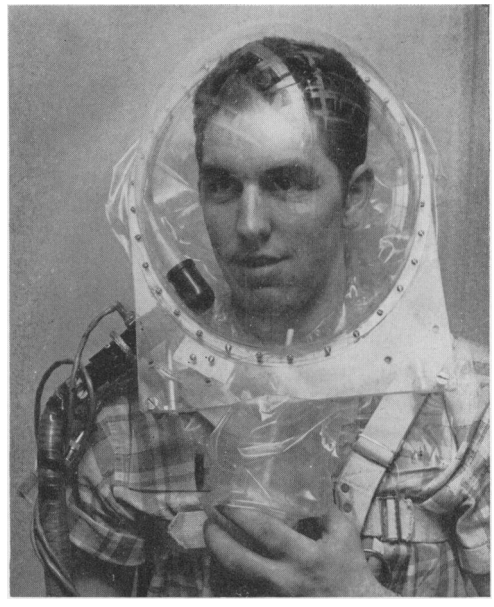
Flanking the double-doored entrance to the chamber (opposite page) are intricate analyzing and recording instruments, on the right, a control panel facing the picture window, and an electrocardiograph, lower center. A unique feature is the plastic helmet worn by test patients (right). Suction draws expired air through a plastic tube to electronic instruments. Fresh air enters under vinyl plastic apron, passes within the hood and around the subject's head. Through the "elephant's trunk," he may scratch his nose, shave, wash, and take liquids through a straw. In the chamber (below) he reads, works at the desk, or walks on the treadmill for exercise. The window shown here overlooks the countryside. Also in the room are a picture window facing the control room, a refrigerator, commode, and scale. The subject converses through a combined speaker and microphone in the helmet, part of a two-way communication system.



Over the years, scientific investigators have accumulated much information on the basal rate of metabolism of man in the resting state and some data on isolated aspects of metabolism for short periods of activity. Now, for the first time, they are able to obtain readings on the metabolism of man active for sustained periods of time.

A system of continuous collection of expired air coupled with the use of continuously recording stream gas analyzers indicate minute-to-minute patterns of variation in oxygen-carbon dioxide exchange. This feature permits close analysis of the characteristics of gas exchange in studies of the expenditure of exercise energy and of work efficiency. Also measured are changes in expired air gas concentrations over many hours or days, contributing to the study of the influence on total energy metabolism of a variety of environmental, hormonal, nutritional, and other factors.

The metabolic chamber is about 9 by 13 feet with an 8-foot ceiling. It is an open circuit, indirect calorimeter, conditioned for close control of temperatures ranging from 5° to 49° C. and relative humidities of 10 to 95 percent over most of the temperatures. Air recirculates through the chamber at a rate of 1,300 cubic feet per minute but air velocity is low, less than 50 feet per minute, attained through inlet ports over the entire ceiling and a large exhaust area over half of one wall.

Air flowing into a collection hood over the subject's head and shoulders is carried outside the chamber by a flexible tubing reinforced by steel spring wire along a main line through an air volume meter to a vacuum line. The flow rate is close to 100 liters per minute, about 10 times the volume an individual breathes in and out each minute while resting. Separate vacuum and pump systems pull air from the main line at constant rates of 50 and 100 cc. per minute. Periodically valves are switched so that analyzers tap fresh air directly from the chamber for reference or baseline. Before and after each test, the gas analyzers are calibrated by flowing into the empty hood known constant flow volumes of carbon dioxide from a calibrated spirometer. This volume mixes with the main flow of fresh air, supplying a known addition of CO_2 and a known reduction in oxygen concentration.

Data on relative humidity, oxygen, and carbon dioxide from the analyzers are fed to the multiple point Speedomax continuous recorder. Between events in the chamber and their record, there is a time lag of about 2 minutes, representing time required for air to flow to the analyzers and for the analyzers to state the concentrations faithfully. The project, according to scientists at the institute, is directed toward establishing a technique of total energy balance which may provide answers to fundamental physiological questions of energy metabolism.

The chamber was developed in the institute by Drs. G. Donald Whedon, chief, Metabolic Diseases Branch, and Russell M. Wilder, former director of the institute, now retired. They were assisted by Ernest E. Huber, Jr., a physicist, and Ronald H. Thompson, a physiologist.

Weekly Reports on Acute Respiratory Diseases

From information gathered during household interviews, the National Health Survey of the Public Health Service is issuing a series of weekly reports on the prevalence and incidence of acute respiratory diseases severe enough to cause bed disability.

Including figures for influenza, pneumonia, and similar conditions, the reports estimate the number of cases in continental United States during each week since mid-July 1957, and the average number of persons in bed each day as a result of the diseases. Estimates for the most recent week are provisional.

The first report, issued November 7, covered estimates through the week ending October 12 and included a description of methods used in compiling data, definitions of the disease group and of indexes, and a statement on the reliability of the data.

The weekly reports, Current Statistics on Respiratory Diseases, may be obtained from the National Health Survey, Public Health Service, Department of Health, Education, and Welfare, Washington 25, D. C.