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*Dear Reinhardt
file*

RADIOACTIVITY RESEARCH CENTER REPORT

January 1, 1962 to June 30, 1963

K. G. Scott, Ph.D., Director

I. Service

The use of radionuclides and the service offered by the Radioactivity Research Center continues to increase on this campus; 1,230 isotope shipments were received during the reporting period representing a two-fold increase over the previous eighteen months. This involved the handling of 18,005 Curies of labelled compounds and isotopes and 268.5 Curies of Tritium. This is a reduction from the total amount in curies received in the previous period and represents a trend toward more expensive and exotic radiochemicals ordered in smaller quantity, better delivery by manufacturers and less decay prior to use.

The isotopes mentioned above were used in research in 236 projects described in this report and as routine diagnostic tests and therapy. Such projects place a heavy demand upon the consultative time of the academic staff and upon the available equipment and technical staff. The work load upon the liquid scintillation and gamma ray spectrometers has been especially heavy and 101,305 samples were assayed for one or more radionuclides during the past eighteen months. Additional space and personnel are necessary if we are to continue to serve this campus adequately.

II Instruction in Bioradiology and Related Subjects

The teaching of medical students, residents and others, employs the combined facilities of the Radioactivity Research Center and Radiology and in some instances, also receives financial support from the School of Pharmacy and the Department of Emergency Medicine. Fifty freshmen medical students enrolled in Emergency Medicine 121-B and thirty six continued the course in the sophomore year to complete the laboratory exercises and qualify for certification. Twelve students, mostly at the graduate level in the basic sciences enrolled in Bioradiology 125. Three evening courses were offered through Continuing Education in order to offer to those in outlying areas, the opportunity to learn isotope technics. The first, a series of five 2-hour lectures had an enrollment of over one hundred and fifty. This was followed by a fall and spring laboratory work shop comprised of thirteen 2-hour sessions leading to Atomic Energy Commission or California State certification following a comprehensive examination. The course was over subscribed (40) with students coming from as far as Redding and Modesto.

A one month full time course in isotope fundamentals is also offered and is primarily taken by the resident staff but also by research fellows, visiting faculty and others enrolling in Continuing Education. A large number of these from foreign countries return to establish isotope research programs in their home land. Fifty six M.D.'s or Ph.D.'s and sixteen technicians took this course.

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INVESTIGATOR &
DEPARTMENT

Havel, R.J., M.D.
CVRI

ISOTOPE & PROJECT

¹⁴C Palmitic acid: This palmitic acid will be converted to the sodium salt by addition of an aqueous solution of sodium bicarbonate and the solution heat sterilized. The soap solution will be added to a quantity of sterile human serum albumin solution to yield a concentration of 1 to 2 moles fatty acid per mol of albumin. The resulting physiologic fatty acid-albumin complex will be injected intravenously in young labile diabetic subjects hospitalized on the metabolism ward of Moffitt Hospital on three occasions: during adequate chemical diabetic control; at the onset of ketosis after withdrawal of insulin; and during the presence of moderate ketosis prior to re-institution of insulin therapy. From appropriate analyses of serial blood samples, the turnover rate and miscible pool of unesterified fatty acids will be calculated during these periods. The data obtained will be correlated with quantitative analysis of plasma glucose, ketone, and lipo-protein concentrations during the periods of study. The blood samples will be processed at the Hooper Foundation and the radioactive assays will be performed at the Radioactivity Research Center. On the basis of a 24 hour half-life of the palmitic acid in the body, Dr. Kenneth Scott has calculated that total body radiation for the entire study would be 5-6 mr. per subject.

⁹⁰Sr: The isotope is contained in an ionization detector which forms a part of a gas-liquid chromatograph apparatus to be purchased from Research Specialties, Inc. The source for this detector has been shielded in accordance with AEC requirements. The ⁹⁰Sr is alloyed with gold and covered with gold foil and should represent no radiation hazard since it is a β emitter and is shielded by this equipment.

¹⁴C; ¹³¹I, ³H, ³²P: (1) Metabolic studies in rabbits, dogs, and possibly other animals. (2) Metabolic studies in tissue slices and homogenates. (3) Membrane transport studies.

³H: Isotopically labeled compound to be fed to animals in order to label chylomicron ester lipoproteins which will then be isolated and injected into recipient animals.

¹⁴C: Preliminary studies in subjects over 40 receiving constant intravenous infusions of palmitic acid-¹⁴C during exercise have shown that both influx and efflux of free fatty acids in the blood

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ISOTOPE & PROJECT

^{14}C contd. insufficient to account for the energy needs of these subjects as measured by oxygen consumption. It is considered that free fatty acid flux may limit the magnitude of exercise during non-steady state conditions. It is felt to be important to carry out similar studies during steady state exercise and in highly trained subjects who can carry out high work; such subjects are necessarily young. These studies require the use of 25 microcuries of ^{14}C because of the high turnover rate of free fatty acids.

^{14}C : The palmitic acid will be converted to the sodium salt by addition of an aqueous solution of sodium bicarbonate and the solution sterilized by heat. The soap solution will be added to a quantity of sterile human serum albumin solution to give a concentration of 1 to 2 moles fatty acid per mol albumin. The resulting complex will be injected intravenously in subjects hospitalized at Moffitt or San Francisco General. The conversion of the fatty acid to other circulating lipids, especially triglycerides, will be studied to derive information regarding pool sizes and turnover rates under varying conditions of diet and in certain hyperlipidemic states. Available evidence indicates that the biologic half-life of palmitic administered in this manner to humans is about 24 hours. For each study, the minimum quantity necessary to provide the required information will be used.

Titaniumtritide coated on 0.001" thick stainless steel foil: a sealed source--total activity not to exceed 250mc.

^{51}Cr : We use our own modification of Sterling & Gray's method for measurement of blood volume (Scand J. Clin. & Lab. Invest. 14:355, '62). Ten ml. of the patient's blood is tagged with ^{51}Cr using sterile precautions. A carefully measured volume of tagged cell suspension is given intravenously and a portion of suspension is reserved for use as a standard. Blood is taken from the patient at suitable intervals for determination of hematocrit and radioactivity. The latter is compared with the radioactivity of suitable dilutions of the tagged cell suspension. Patients are only those selected for special study because of advanced conditions associated with edema or abnormalities of serum protein. Plasma volumes are measured with T 1824. Volunteers will be limited to a few individuals with extreme abnormalities of body build.

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