HEMATOLOGY, CIRCULATION, AND BLOOD BIOCHEMISTRY

RADIOISOTOPES IN CLINICAL RESEARCH

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Iron and Red-Cell Kinetics in Man

During this 6-month period Fe^{59} was used to study 35 patients with a wide variety of blood disorders Red cell volume was determined with P^{32}. The production and destruction of red blood cells was localized by simultaneous serial measurements for two weeks of radioiron in plasma, red cells, spleen, liver, and bone marrow In some patients abnormal iron deposition in storage form was detected and quantitated These measurements were used to select appropriate therapy, which was successful in many cases.

Survival of Human Red Cells, White Cells and Platelets in Blood

Ten patients with anemia, leukopenia, or thrombycytopenia were studied with P^{32} diisopropylfluorophosphonate. This compound is particularly useful in the dosage used for it quickly labels all three elements of circulating blood without elution, relabelling, or detectable damage to these elements. The results of these studies were correlated with the clinical course, routine hematologic studies, and iron kinetic studies

Intermediary Metabolism of Glucose and Uric Acid

C^{14} glucose and C^{14}-uric acid were given intravenously in tracer amounts to nine normal subjects and patients Following injection serial measurements were made to determine specific activities of glucose of uric acid in the body and the specific activity of $C^{14}O_2$ in the expired breath In this way the size of the body pool turnover rate, and the rate of oxidation to carbon dioxide were determined Intermediary glucose metabolism was studied in normal subjects and diabetic patients. These subjects were studied under control conditions without administration of any drug Subsequently they were restudied after the administration of insulin or one of the new oral compounds that lower blood sugar such as orinase and DBI One patient was studied before and after irradiation hypophysectomy Preliminary results indicate that:

(a) Uric acid is not entirely and end product of metabolism, but approximately 10 to 15% of the compound is oxidized within the body to carbon dioxide.

(b) Orinase and DBI like insulin decrease endogenous hepatic release of glucose from glycogen but, unlike insulin do no appreciably increase glucose oxidation

Heart Function

Cardiac output and blood volume were measured with I^{131}-albumin in four patients with polycythemia or anemia A new method involving external measurements of heart radioactivity was compared with the established method of measuring radioactivity of blood obtained by arterial

cannulation. The heart outputs determined simultaneously and independently in this way were found to be in good agreement. Preliminary results indicate that cardiac output may be accurately determined by external measurement over the heart without arterial puncture. This new procedure may eventually become adapted for routine clinical use in hospitals as a bedside procedure.

Miscellaneous Clinical Research Studies

As a semiroutine aid to our clinical research in hematology, Co^{60}-vitamin B_{12} absorption tests were made in eight patients to aid in the differential diagnosis of pernicious anemia. Gastrointestinal bleeding was detected and quantitated in five patients by collection of stool specimens for a period of 4 weeks and measuring the amount of Fe^{59}-labeled red blood cells present. I^{131} thyroid uptake tests and body scans have been continued as a semiroutine study in 25 patients. This has complemented our other clinical research in these patients with thyroid and hematologic disorders, and in patients in whom radiation hypophysectomy is done (metastatic breast carcinoma, diabetic retinitis, etc.) Improvement of the scanning device has contipued concurrently with these studies.

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