HEMATOLOGY

Tracers for Blood Study

➤ RADIOACTIVE tracers are being used in Greece to increase medical knowledge of two hereditary blood diseases often fatal to children. Scientists hope radioisotope techniques will point the way to effective treatment methods.

The diseases are thalassemia, or Mediterranean anemia, and sickle cell anemia. Both are caused by inherited defects leading to abnormal production of hemoglobin, the oxygen-carrying pigment in the red blood cells.

In thalassemia, the fetal hemoglobin (hemoglobin F) present in unborn children persists after birth instead of being replaced normally by adult hemoglobin (hemoglobin A). In sickle cell anemia, an abnormal hemoglobin S is produced instead of the A type, and red blood cells change from their normal round shape to crescent or sickle shape, finally breaking down completely.

A recent survey in Greece showed that more than seven percent of the population carry the hereditary thalassemia trait. Sickle cell disease also is found in Mediterranean countries and in Asia, although it is more common in tropical Africa.

Work with the tracers, iron-59 and chromium-51, is being done on patients at the University of Athens' clinical therapeutics department, supported by an International Atomic Energy Agency research contract. Dr. E. H. Belcher of the Post-graduate Medical School, Hammersmith, London, reported on the project in the IAEA Bulletin, 3:20, 1961.

He points out that although blood transfusions may save the lives of some patients and removal of the spleen (an organ that disintegrates red blood cells and frees hemoglobin) may benefit others, no treatment is known to correct basic hemoglobin production defects. For research investigations, "radioactive tracer techniques have been found especially valuable."

Iron-59 is used to trace iron metabolism and hemoglobin production, which are closely related. Injected into a human vein, iron-59 is taken up by maturing red cells in the bone marrow and used to make hemoglobin. By taking frequent blood samples, researchers can follow the disappearance of the radioactive substance from the blood and its reappearance in red cells. Radiation counters placed over different body organs also follow changes. "Such measurements readily reveal any abnormality in hemoglobin synthesis and red cell production," Dr. Belcher said.

Chromium-51 is used to label red cells in a sample of the patient's blood, which is then reinjected. The progress of these cells also is followed through sampling and radiation counters.

Iron-59 studies of thalassemia patients have shown that a high number of red cells fail to mature in the bone marrow. Dr. Belcher said the marrow resembles "an assembly line working at a very high rejection rate." The findings, he said, suggest that treatment should be aimed at improving cell production in the marrow, rather than trying to improve cell survival in the circulation.

In sickle cell anemia, in marked contrast to thalassemia, iron-59 has shown that red cell production in the bone marrow is highly effective. Chromium-51 showed that the cells lived only a short time in circulation, however. In severe cases, a cell may change shape and die in a few days, compared to the normal red cell life span of about four months. Treatment of sickle cell disease, Dr. Belcher said, probably should be concentrated on ways of stopping the changing and destruction of red cells in the circulation, rather than trying to increase cell production in the bone marrow.

These types of congenital anemia may cause only mild illnesses when the disease trait is inherited from just one parent. But when two trait carriers marry, one in four of their children is likely to develop the most severe form of the dsease, and may not survive it.

Similar research is under way under IAEA contracts at the Republic Hospital, Baghdad, Iraq, and the University of Medical Sciences, Bangkok, Thailand.

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NATURAL RESOURCES

Underwater Drums Help Save Water

➤ A SPIKED DRUM rolling along a canal bottom and an invisible film coating reservoir surfaces are among the projects undertaken by the U. S. Bureau of Reclamation in its fight to save water.

Bureau of Reclamation scientists and engineers are now trying various methods to cut down the 25% to 50% water "loss" from reservoirs, streams and irrigation canals through seepage and other natural "drains." Scientists hope the studies will eventually cut the huge loss in half.

A drum that coats a canal bottom with asphalt to prevent seepage is now being developed, K. K. Young of the Bureau's general engineering department told SCIENCE SERVICE. Spikes or "feet" sticking out of the drum puncture the bottom, releasing liquid asphalt and filling the earth pores. The underwater roller is pulled by a truck riding along the canal's bank.

Surface reservoirs are also being coated with a one molecule thick chemical, hexadecanol, to prevent evaporation. Although preliminary studies on ponds and lakes show many millions of gallons of water could be saved, the thin film still tends to break apart on larger bodies of water.

Other reclamation projects include ridding streams in Western states of "trash" plants that use up too much water, and hydraulic studies of dams.

Bureau of Reclamation research and development work in coating irrigation canals alone saved Western water users $20,000,000 during the past 15 years.

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