IX. Blood, Bone Marrow and Whole Body Counting

Studies on Organ-distribution of Damaged Erythrocytes and Hemoglobin Using Several Radiosotopes

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This study was designed to investigate the disposal of damaged erythrocytes and hemoglobin in organs containing RES.

Method:

Adult male rats were used. Erythrocytes were labeled with ^{51}Cr, ^{59}Fe and ^{14}C-glycine, and treated with heat. All rats were sacrificed 1.4 and 12 hours after intra-venous administration and radioactivity in each organ was determined in a Well type or a liquid scintillation counter. Hemoglobin was similarly labeled and used.

Results:

1. Damaged erythrocytes

With ^{59}Fe-labeled erythrocytes, relative liver uptake was significantly increased over that with ^{14}C-erythrocytes. The activity in the liver and spleen after 4 hours was smaller than that after 1 hour, but the activity in the blood was increased markedly after 4 hours. At 12 hours the radioactivity was predominatly in the liver and spleen. This result suggests that part of ^{59}Fe-labeled erythrocytes detained by the liver and spleen in a short time after injection might be released in blood after about 4 hours. With ^{14}C-glycine-labeled erythrocytes, this relation with time after injection was about the same as that observed with ^{59}Fe-labeled erythrocytes. The organ-distribution in splenectomized rats after 4 hours studied with ^{59}Fe and ^{14}C-glycine-labeled erythrocytes showed that the amount or radioactivity expected to be taken up by the spleen was added to the hepatic uptake. The splenic uptake increased with minimal injury to erythrocytes while severely injured erythrocytes were predominantly taken up by the liver.

2. Hemoglobin

With ^{59}Fe-labeled hemoglobin more radioactivity was taken up by the liver as compared to other radioisotope labeled hemoglobin, and a rapid uptake by the liver parenchyma was suggested. With a large quantity (35 gm) of ^{51}Cr-hemoglobin, most of it was taken up by the kidney. It seems that it is excreated from the kidney and a fair amount of Cr is released from hemoglobin. Large quantities of ^{14}C-glycine-labeled hemoglobin injected resulted in a decreased radioactivity on the liver and spleen, and increased radioactivity in blood. The uptake by the kidney was smaller than that of ^{51}Cr-labeled hemoglobin.

Conclusion:

These three labeling methods for the study of the fate of injured erythrocytes and hemoglobin yield differing results probably due to different chemical incorporation of the isotopes and interpretation of such results must be made with caution.