Nucleic Acid Synthesis in Bone Marrow Cells of Various Hematological Disorders

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DNA synthetic rate in the normal human bone marrow cells determined by measuring the amounts of tritium labelled thymidine incorporated into DNA during one hour incubation at 37°C was 13.0 ± 0.92 $\mu\mu$ moles per hour for 10^6 immature cells. The DNA synthetic rate in the bone marrow cells was reduced in iron deficiency anemia, pernicious anemia and in acute and chronic myelogenous leukemia. The decreased DNA synthetic rate in iron deficiency anemia was recovered by incubating the iron deficient bone marrow cells in the normal plasma or in the plasma of iron deficiency anemia containing 100 μg/dl of iron, indicating a necessity of iron for the normal DNA synthetic activity of human bone marrow cells.

In 5 cases of aplastic anemia, DNA synthetic rate was within normal limit when it was measured on the basis of immature bone marrow cell count.

Incorporation of ^{3}H-thymidine into DNA was influenced by the changes in de novo pathway of thymidine monophosphate as well as by the changes in intracellular thymidine pool size. Thus, disturbance of the formation of thymidine monophosphate from deoxyuridine monophosphate by 5-fluorouracil or methotrexate markedly increased the incorporation of ^{3}H-thymidine into DNA. Increase in thymidine pool size brought about by adding unlabelled thymidine into incubation medium also caused an increase in the incorporation parallel to the amount of thymidine added. These factors modifying the incorporation of ^{3}H-thymidine into DNA should be considered in determining the DNA synthetic rate by measuring the amount of ^{3}H-thymidine incorporated.

RNA synthetic rate measured by an incorporation of ^{3}H-uridine into RNA was markedly affected by the maturity of bone marrow cells. It was considered very difficult, therefore, to give pathophysiological meanings on the RNA synthetic rate of bone marrow cells.

Pathophysiology of Bone Marrow as viewed from Lipid Metabolism

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The present study contains the Lipids metabolism of bone marrow cells in some blood discrasias, a part of that have already reported in the last Annual Meeting of this Society.

In considering Lipids accumulation in the bone marrow of hypoplastic anemia, metabolic disorder of lipid may have an important relation to blood cell production, directly or indirectly.

Bone marrow cell has an ability to incorporate ^{14}C-acetate into long chain fatty acids or cholesterol and esterify the newly synthesized fatty acids to lipids; free fatty acids, phospho-lipids, glyceride and esterified cholesterol, in vitro. Then, I studied lipid metabolism of bone marrow cells incubated in vitro in some cases of blood disorders.

^{14}C incorporations into total lipids per 10^7 nucleated cells were recovered almost equally in controls (5 male adults) hypoplastic anemia (4 cases) iron deficiency anemia (2