

CHANGES IN BONE MARROW HEMOPOIESIS AND IN CELL COMPOSITION
OF PERIPHERAL BLOOD OF DOGS AFTER PROLONGED ADMINISTRATION
OF CAFFEINE AND AMYTAL

I. Sh. Zedginidze, V. D. Kiknadze, G. E. Kevlishvili, and
T. A. Mekhuzla

The Mukhadze Blood Transfusion Institute (Director: Sh. V. Egnatashvili), Tbilisi.

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Although a number of papers devoted to the role of the central nervous system in hemopoietic processes have appeared during the last few years, there are still many problems in this field which are obscure or debatable. The present paper described the results of a study of changes in function of the bone marrow of dogs, and in the composition of their peripheral blood, following administration of drugs which act in different ways on the central nervous system.

Our experimental material consisted of 8 dogs, of which 3 (Nos. 153, 262, and 269) received amytal 3 (Nos. 163, 266, and 268) received caffeine, and 2 (Nos. 93 and 222) were given caffeine after a course of amytal.

Our experiments showed that, with daily intramuscular injections of 1 ml of 3% caffeine solution, the hemoglobin content and red cell count of the blood fall during the first 10 days, while the leucocyte count rises, with corresponding changes in the bone marrow, viz., fall in erythroblast count and in their maturation index, with enhanced activity of the hemopoietic function of the marrow. During the following days, and up to the end of the experiment (a month), there was a gradual rise in the hemoglobin content and red cell count of the peripheral blood, and a corresponding activation of the erythropoietic function of the bone marrow (increase in number of elements of the red cell line, with appearance of proerythroblasts, increase in the number of erythroblasts, and accelerated maturation). The leucocyte count of peripheral blood fell gradually, with a corresponding rise in the content of immature forms of neutrophils in the marrow and increase in the neutrophil index of the marrow, indicating delayed maturation (Fig. 1).

Daily injections of 5% amytal solutions, at a dosage of 0.8 ml per kg body weight caused a persistent anemia, with depression of the hemopoietic function of the bone marrow and retardation of the process of maturation of erythrocytes; at the same time we observed a rise in the leucocyte count of peripheral blood and in the neutrophil count of bone marrow, with depression of maturation (Fig. 2).

Daily administration of 5% amytal to 2 dogs (Nos. 93 and 222) for a month caused a progressive fall in hemoglobin content and red cell count of peripheral blood, and of erythroblast count of bone marrow, with retardation of their maturation. The leucopoietic function of the bone marrow was enhanced, but the bone marrow neutrophil index rose, and the peripheral leucocytosis was characterized by a marked shift to the left in the neutrophil nuclear picture, up to and including appearance of myelocytes.

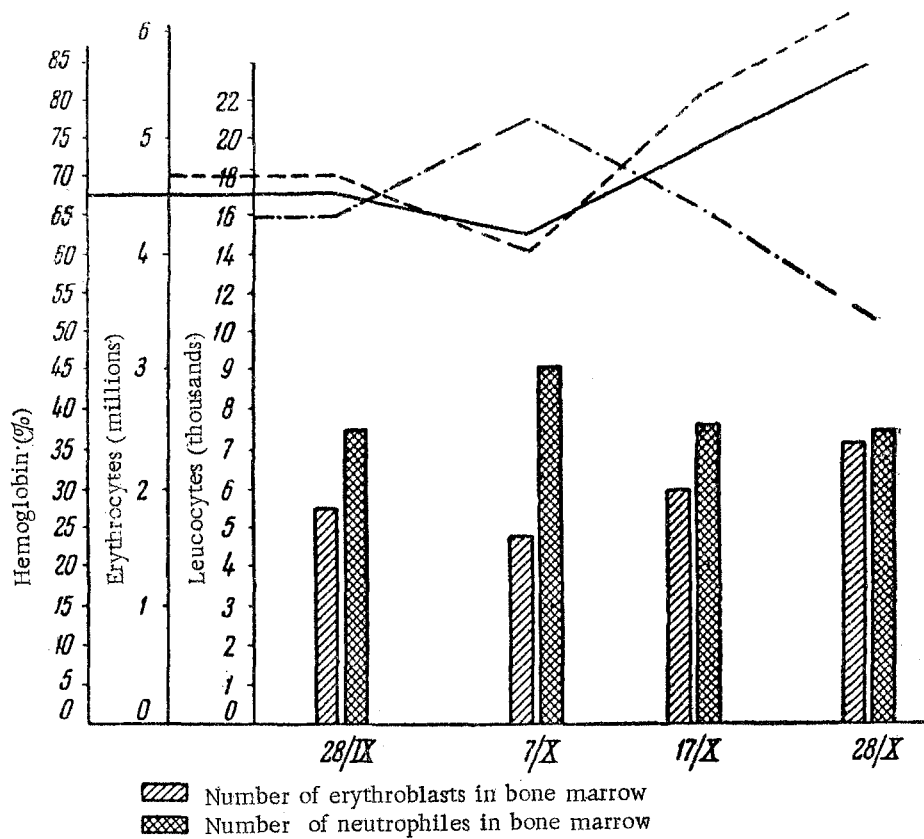


Fig. 1. Changes in bone marrow hemopoiesis and in cell composition of peripheral blood of Dog No. 266, receiving daily injections of 3% caffeine.

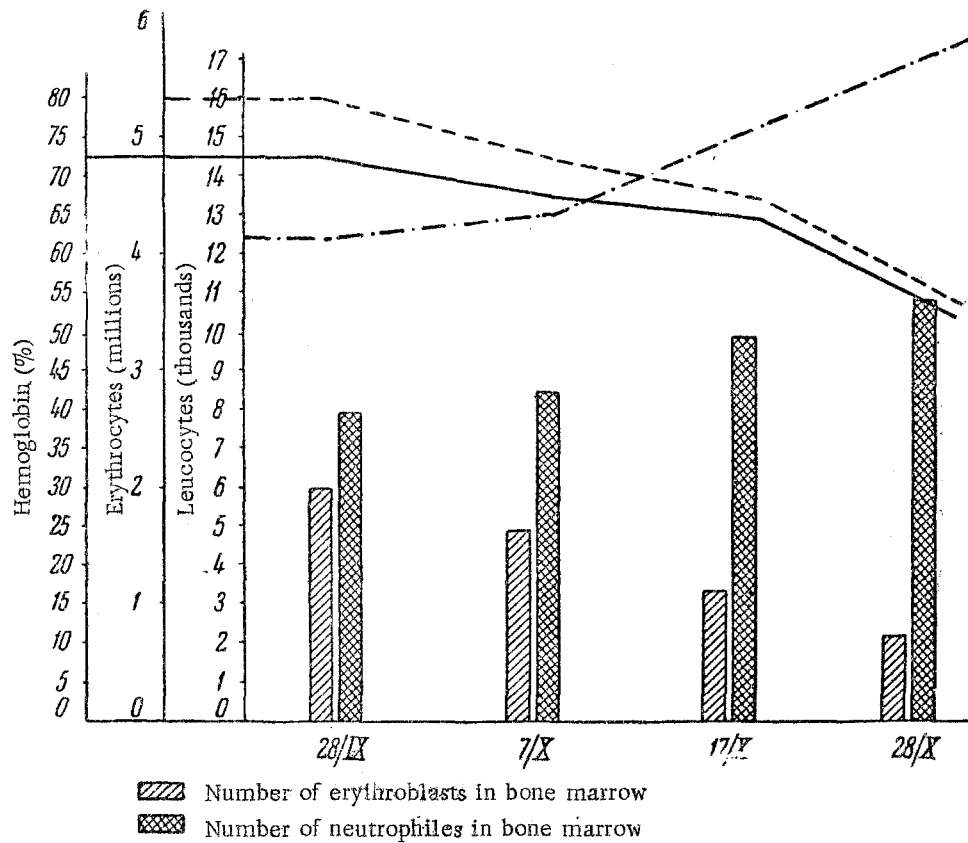


Fig. 2. Changes in bone marrow hemopoiesis and in cell composition of peripheral blood of Dog No. 262, receiving daily injections of 5% amytal.

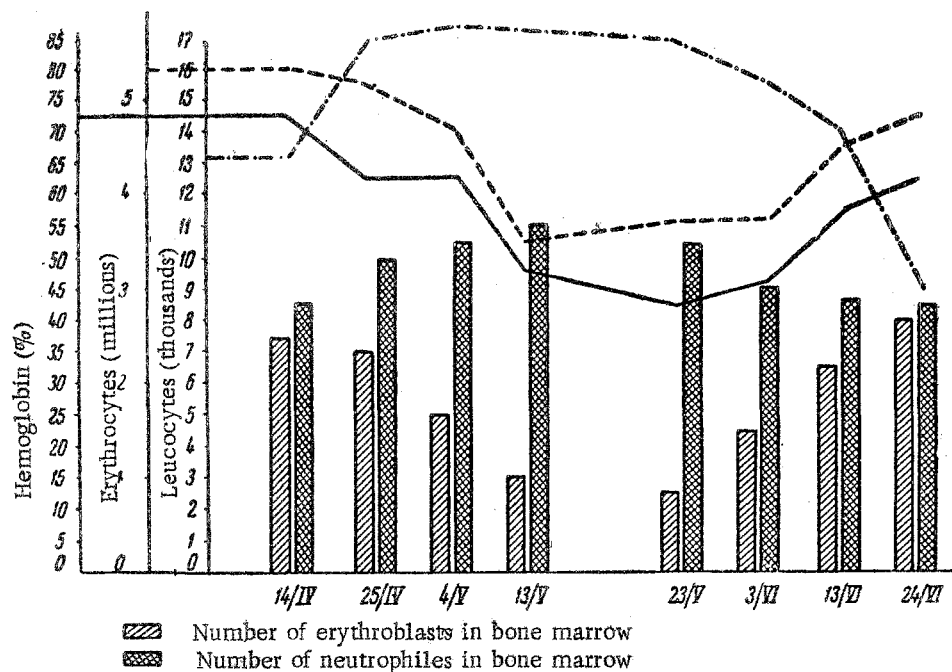


Fig. 3. Changes in bone marrow hemopoiesis and in cell composition of peripheral blood of Dog No. 93, receiving daily injections of 5% amytal, followed by injections of 3% caffeine.

Subsequent daily injection of 3% caffeine for a month caused almost complete restoration of the normal peripheral blood picture with increase in the erythroblast count of the marrow, and reversion to an average value of the erythroblast maturation index, with, however, a relatively low acidophile erythroblast count, with a corresponding rise in peripheral reticulocyte count (Fig. 3).

The neutrophile content of bone marrow gradually fell, and the process of their maturation was considerably depressed. Leucocytosis accordingly fell in the peripheral blood, to values below the initial ones, and the shift to the left of the nuclear index of the neutrophils became smaller.

Appearance in peripheral blood of reticulocytes only, but not of proerythroblasts and normoblasts, observed during the first weeks of caffeine administration, is evidence that release to peripheral blood of immature erythroblasts is considerably retarded.

Daily parenteral administration of 1 ml of 3% caffeine to dogs causes, after a transient anemia, an activation of erythropoiesis in the bone marrow. As a result of the regenerative process, the red cell count is not only restored to normal, but it often exceeds the initial value. After a transient rise during the stage of anemia, the leucocyte count falls below the initial value.

Daily administration of 5% amytal solution causes progressive anemia, due to depression of the erythropoietic function of the bone marrow, with retardation of the maturation process and with increased release to the periphery of reticulocytes. At the same time we observed activation of leucopoiesis, with retardation of maturation of neutrophils and release to the blood of immature forms, including myelocytes. This effect of amytal may be abolished by subsequent prolonged administration of caffeine.

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