

# ACUTE LEUKEMIA IN GUINEA PIGS IN LATE PERIODS AFTER CHRONIC IRRADIATION

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Experimental leukemias developing in mice and rats under the influence of ionizing radiation have been described by many investigators [1, 2, 4-6]. Leukemias of radiation etiology in rodents such as guinea pigs have been less intensively studied [7].

In the investigation now described, the development of acute leukemia was studied in guinea pigs in late periods after chronic irradiation.

## EXPERIMENTAL METHOD

Experiments were carried out on 40 guinea pigs surviving after a course of chronic x-ray irradiation in a dose of 10 R daily, at a dose rate of 2-4 R/min, 6 times a week (total dose 600 R over 70 days; LD<sub>70/100</sub>). After the course of irradiation had ended, observations were maintained on the surviving animals for one year. The peripheral blood was investigated 10, 20, 30, 45, and 60 days after irradiation, and thereafter once every month. The sacrificed and dying animals were autopsied. Material was embedded in celloidin-paraffin wax and stained with hematoxylin-eosin by Van Gieson's method. Impressions of the bone marrow and spleen were stained by Pappenheim's method.

## EXPERIMENTAL RESULTS

During the 60 days after the end of irradiation the morphological indices of the peripheral blood of the irradiated animals returned to the control level. Four guinea pigs developed acute leukemia in the 6th month and one in the 7th month. The leukemia was of aleukemic type in all 5 animals.

The peripheral blood changes were characterized by a decrease in the leukocyte count, marked neutropenia, and by the appearance in 4 of the 5 guinea pigs of undifferentiated cells - reticular cells and hemocytoblasts, often with morphological signs of anaplasia, while in the fifth guinea pig no pathological cells could be found in the peripheral blood.

The course of the leukemia was very rapid, so that not all the animals developed anemia. The thrombocytopenia was well marked. The absolute lymphocyte count in the peripheral blood of most animals was considerably reduced.

The study of impressions of the hemopoietic organs showed an abundance of undifferentiated cells in the bone marrow, with the arresting of differentiation at the reticular cell - hemocytoblast stage. Practically no mature cells of the myeloid or erythroblastic series, and practically no megakaryocytes were seen. An increased number of basophilic and eosinophilic leukocytes was found in the bone marrow impressions of only one guinea pig.

The impressions of the spleen and liver contained many foci of proliferation of undifferentiated cells of the same type as in the bone marrow.

The results of the histological investigation confirmed the hematological findings and demonstrated the replacement of hemopoietic tissue in the bone marrow of the flat and long bones of the guinea pigs with leukemia by homogeneous large cells of hemocytoblast type with basophilic cytoplasm and large oval nuclei,

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with coarse chromatin granules and one or two nucleoli. Reticular cells were found in these cases as a rule in the peripheral areas of the bone marrow (bordering on the trabeculae). Foci of proliferation consisting of myeloblasts, hemocytoblasts, and reticular cells were localized in the red pulp of the spleen, in the central sinuses and medullary cords of the lymph glands, and also in the parenchyma of the liver.

In the control group (28 guinea pigs) and also among the 30 animals surviving after a single irradiation in doses of 250-300 R ( $LD_{50-70/30}$ ) no case of leukemia was observed throughout the same period of observation.

Comparison of these results with those reported in the literature [7] revealed a number of differences concerning the speed and frequency of development of leukemia in guinea pigs, and also the type of cells proliferating in the bone marrow and the extramedullary foci. The cases of acute leukemia observed by the authors caused death of the guinea pigs by the 9th-11th month of life, i.e., 5-7 months after irradiation. In the cases described in the literature [7], leukemia developed in irradiated guinea pigs much later (24-36 months) and it was of leukemic type. These differences may have been due to different conditions of irradiation. In this connection, it would be interesting to study the importance of the radiation dose and dose rate in leukemia formation.

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