Studies on hemopoietic tissue of ribbed newt, Pleurodeles waltl after the flight on board Russian satellite “Foton- M2” in 2005


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The effect of 16-day spaceflight aboard the Foton-M2 satellite on the hematopoietic tissue of P. waltl newts was studied in flown intact animals (F-int) and in animals used in experiments on tail and lens regeneration under spaceflight conditions (F-reg). In addition to the flown animals, studies were performed on synchronous and aquarial controls in the case of non-operated animals, and on synchronous and basal controls in the case of operated newts. The main hematopoietic organs of urodelian species, are the liver, spleen, and peripheral blood. Therefore, we determined differential blood counts, estimated the weight of the liver and the content of its hematopoietic cells, and histologically assessed spleen and liver in the above experimental groups and the corresponding control groups of animals. No significant differences between these groups were revealed with respect to the structure of hematopoietic zones of the liver, the content of hematopoietic cells in the liver, and spleen morphology. However, liver weight in newts of the F-reg group was significantly greater than in the F-int group. In the peripheral blood, neutrophils, eosinophils, basophils, lymphocytes, and monocytes were found. Lymphocytes (L) and neutrophils (N) prevailed, accounting for about 50 and 38% of white blood cells, respectively. Among neutrophils, cells differing in the degree of maturity were distinguished: myelocytes (M), metamyelocytes (Mm), band (B) and segmented forms (S). For each group of animals, we determined the ratio of maturing (M + Mm + B) to mature (S) neutrophils and the relative L and N contents. The spaceflight had no apparent effect on the differential blood count in the F-int group: neither the L and N contents nor the (M + Mm + B) to S ratio differed from those in the control groups. This fact agrees with data obtained in our previous experiments aboard the Bion-11 biosatellite and indicates that the response of newts to spaceflight factors differs from the response of mammals, in which significant changes in the peripheral blood have been recorded. In the F-reg group, in which the hematopoietic tissue was exposed to a double impact (stimulation of regenerative potential upon lens or tail removal and the action of spaceflight factors), the content of L increased and that of N decreased, in contrast to the situation in the corresponding
control groups. Changes in the differential blood count of newts were also recorded in a similar experiment on regeneration aboard the Bion-10 biosatellite. A comparison of data obtained in the experiments aboard the Foton-M2, Bion-10, and Bion-11 satellites indicates that the response of peripheral blood to spaceflight factors may depend on the functional state of the hematopoietic tissue. Thus, additional influences on the hematopoietic tissue associated with injury (bleeding, inflammation, etc.) may modify its response to the spaceflight factors proper. Experiments with BrdU incorporation demonstrated labeled cells in the marginal, hemopoietic area of the liver as well as in blood and spleen. This observation gives evidence that the BrdU label can be used to study proliferation of hemopoietic cells.