REGULATION OF ERYTHROPOIESIS IN THE FETUS

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Cessation of erythropoietin production in pregnant rats (as a result of artificially produced polycythemia) had no effect on the red blood indices of the newborn rats. Polycythemia in lactating rats likewise has no effect on erythropoiesis in newborn rats.

Despite its undoubted interest, the regulation of embryonic hematopoiesis has received very little study. With the publication of works [1, 2] showing the inability of newborn puppies and rats to respond by increased erythropoiesis to hypoxia and blood loss, and also of studies [3, 4] showing increased erythropoietin production during pregnancy and lactation, it can be postulated that erythropoiesis in the fetus bears some relationship to the supply of maternal erythropoietin.

To test this hypothesis, polycythemic animals in which erythropoietin production has ceased were used.

EXPERIMENTAL METHOD

Polycythemia was produced in 10 rats weighing 200-250 g by a single intraperitoneal injection of a suspension of erythrocytes washed free from plasma (3-3.5% of the animal's body weight). The injection was given under sterile conditions on the 12th-14th day of pregnancy, which in rats lasts about 21 days. Polycythemia was reproduced in the same animals during the first day after birth of the young rats. To minimize undesirable stress reactions, the rats were gradually accustomed to the experimental conditions for 4-5 days.

EXPERIMENTAL RESULTS

Data showing the state of erythropoiesis in the pregnant rats are given in Table 1.

All the rats gave birth to healthy young weighing 4-6 g 6-7 days after the beginning of development of polycythemia. Each litter contained from 4 to 9 young rats, and the total number of young was 72. The number of erythrocytes (megalocytes) was between 2.8 and 3.4 (3.0±0.2) millions/mm^3, and the number of reticulocytes over 80%. The red blood indices in ten young control rats taken from three litters were the same. These results show that erythropoiesis in the fetus (at least in the last third of pregnancy) is independent of the presence or absence of maternal erythropoietin. This substance was absent from the polycythemic mothers.

TABLE 1. Erythropoiesis of Pregnant Rats before and after Intraperitoneal Injection of Erythrocytes

Index	Initial level	Time after injection of erythrocytes (in days)		
		2	4	6
Erythrocytes (in millions/mm^3) . . .	6,6±0,2	9,7±0,3	9,4±0,3	8,6±0,4
Reticulocytes (in % per thous.)	32,6±3,3	10,2±1,8	1,7±0,8	Single cells in film

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To rule out any possible effect of erythropoietin contained in normal maternal milk on erythropoiesis in newborn rats, polycythemia was again reproduced in the rats which had just started lactating. Under these conditions, maternal erythropoiesis was blocked for a further 9-10 days. The young rats feeding on the milk which did not contain erythropoietin were indistinguishable in their development from the controls.

These experiments show that erythropoiesis in the embryo, and also in the newborn rat, takes place independently of the maternal erythropoietin, However, the question of the ability of the fetus and newborn animals to produce its own erythropoietin requires further investigation, because the possibility cannot be ruled out that fetal hematopoiesis differs from adult hematopoiesis also by the fact that it takes place without erythropoietin.

LITERATURE CITED

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