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## Progesterone on Blood and Tissue Iron in Albino Rats. (31207)

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Estrogen causes severe anemia in both male and female animals(1,2,3,4). Dutta and Mukherjee(5) have recently observed that natural and synthetic estrogen reduced blood iron levels and increased iron content in the kidney. Nigst(6) has noted a stimulating effect of estradiol benzoate on the blood forming tissues. It has also been observed(7) that administration of either progesterone or testosterone increased blood iron. Estrogen being the dominating gonadal hormone in the female apparently has a tendency to produce an anemic state which is probably balanced by progesterone. From these observations the possible controlling role of progesterone on the mobilization of iron has been sought in albino rats.

*Materials and methods.* Healthy albino rats, laboratory inbred of both sexes, weighing 180 ± 20 g were selected for this experiment. The animals were placed in individual cages and were pair-fed a diet consisting of germinated Bengal gram *(Cicer arietinum)* and loaf. Water was supplemented *ad libitum*. Average food consumption per day per rat was estimated at 25 ± 2 g.

Animals were divided into 3 groups, each group consisting of 24 rats—12 males and 12 females. One group of animals was treated for 3 days and another group for 10 days with progesterone (2 mg/rat/day). Remaining animals served as controls. Progesterone-treated rats were sacrificed 24 hours after the last injection. From the control group of rats 6 males and 6 females were sacrificed at the end of 3 days and 10 days, respectively, along with 2 different experimental groups of rats. Blood and tissues were collected from each animal for hematological examination and iron estimation. Blood was collected by cardiac puncture in mixed oxalated tubes for hematological examination as well as for total blood iron, hemoglobin(8) tissue iron(9) and plasma iron(10). Total erythrocytes and leucocytes were counted employing standard pipettes and a Neubauer's counting chamber. Differential counts were done on dried smears.

*Results and discussion.* Progesterone treatment (2 mg/rat/day) for 3 and 10 consecutive days in both male and female rats increased total blood iron level and plasma iron level with a decrease in tissue iron content of bone marrow and liver. Change in the spleen iron content was apparent only in male rats and no alternation in the iron content of kidneys was observed either in male or female rats. No change was observed in total cell count or differential count in the blood from progesterone-treated rats. It has been noted (5) that both natural and synthetic estrogen causes a significant lowering of blood iron level, a rise in iron content of liver and kidney and a fall in spleen and bone marrow iron content. Thus the actions of estrogen and progesterone on iron level maintenance and regulation are almost opposite. The lowering of tissue iron content by progesterone may be the result of tissue iron release which apparently is enhanced by progesterone. This is further corroborated by an increase in transportable iron in the plasma. Progesterone neither stimulated nor depressed the hematological activity as the peripheral blood

TABLE I. Effect of Progesterone for 3 Days and 10 Days Consecutively on Blood and Tissue Iron in Albino Rats.

| | Male | | | Female | | |
|---|---|---|---|---|---|---|
| | Control (12 rats) | Progesterone, 2 mg/day (24 rats) | | Control (12 rats) | Progesterone, 2 mg/day (24 rats) | |
| | | 3 days | 10 days | | 3 days | 10 days |
| Blood iron, mg % | 48.5 ± 2.4 | 50.4 ± 2.6 | *54.9 ± 3.9 | 46.9 ± 2.7 | 48.9 ± 2.3 | *49.9 ± 1.4 |
| Plasma iron, μg % | 145 ± 9.6 | *195 ±14.8 | *184 ±18.6 | 169 ±15.3 | *184 ±13.6 | *197 ±15.2 |
| Hemoglobin, g % | 14.1 ± .7 | *14.7 ± .8 | *16.1 ± 1.1 | 13.7 ± .6 | *14.3 ± .8 | *14.6 ± .5 |
| Bone marrow iron, mg % | 66.0 ± 4.7 | *58.9 ± 7.6 | *54.3 ± 5.8 | 67.6 ± 4.5 | *62.1 ± 6.9 | *54.0 ± 4.3 |
| Liver iron, mg % | 25.1 ± 3.6 | *19.8 ± 6.4 | *19.7 ± 2.5 | 25.8 ± 2.7 | *19.5 ± 2.2 | *17.8 ± 2.3 |
| Spleen iron, mg % | 125.9 ± 7.3 | *117.6 ±11.9 | *117.3 ±11.2 | 118.4 ± 4.2 | 114.0 ± 8.7 | 114.3 ±14.3 |
| Kidney iron, mg % | 9.6 ± 1.3 | 10.0 ± 1.2 | 9.7 ± 1.3 | 10.1 ± 1.6 | 9.8 ± 1.8 | 9.6 ± .8 |

* "t" value significant at 2% level.

picture was not influenced. The rise in blood iron and hemoglobin level in absence of increased erythropoiesis may suggest that the high plasma iron level and raised hemoglobin are due to the hyperchromic erythrocytes in the blood, associated with release of iron from bone marrow. Antagonizing action of estrogen by progesterone maintains the normal iron level of blood in female rats. Action of estrogen with natural tendency to produce anemia is counterbalanced by the natural progesterone. Estrogen administration produces blood iron changes both in male and female rats(5). From the observations made, a similar role for progesterone in both the sexes is suggested. The counterbalancing and antagonizing action of progesterone in male rats is significant since the amount of circulating estrogen is thought to be less in male than in female rats. Diverse action of progesterone on splenic iron content in male and female rats suggests speculative possibilities. Further investigations may clarify this.

*Summary.* Administration of progesterone (2 mg/rat/day) stimulated iron metabolism but had no action on hemopoiesis in male and female rats. Variation in the stimulating action of progesterone on iron mobilization is observed in male and female rats. Iron mobilization from bone marrow, liver and spleen to blood in rats after progesterone administration shows a uniform decrease and there is a significant increase in blood and plasma iron level. It is tentatively suggested that progesterone plays a regulating or supporting role in mobilization of iron from different tissues to blood.

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