

EFFECT OF EXPERIMENTAL RENAL HYPERTENSION  
ON THE COURSE OF PREGNANCY AND ON MORPHOLOGICAL  
CHANGES IN THE ORGANS OF PREGNANT ANIMALS  
AND THEIR FETUSES

M. I. Rudnev and T. D. Zadorozhnaya

UDC 618.3-06 : 616.12-008.  
331.1-092.9]-091

Investigations on rabbits and rats showed that renal hypertension is accompanied by premature birth, spontaneous abortion, and the appearance of dead and hypotrophic fetuses. In most cases focal circulatory disorders and degenerative changes in the internal organs were found in the pregnant animals and their fetuses.

A special place among the causes of intrauterine fetal death is occupied by hypertension during pregnancy.

Experimental facts concerning the course of pregnancy in experimental renal hypertension are very contradictory [4, 7].

The object of the investigation described below was to study the effect of experimental renal hypertension on the course of pregnancy and on morphological changes in the organs of pregnant animals and their fetuses.

EXPERIMENTAL METHOD

To produce hypertension in rabbits, loops measuring 0.8-0.9 mm were placed around the renal arteries, and in some rabbits and rats rubber bands were placed directly on the kidney.

Experiments were carried out on 33 rabbits and 65 rats. Renal hypertension was reproduced in 23 rabbits and 45 rats before pregnancy began. Ten rabbits and 20 rats acted as controls. The arterial pressure of the rabbits was recorded by Van Leersum's method.

The arterial pressure in the rats was recorded in the tail by means of a cuff and mercury-rubber detector fitted to the animal's tail.

The organs of 13 young and 10 adult rabbits and of 11 young and 28 adult rats (females with renal hypertension) were examined histologically. The controls consisted of 16 experimental animals and 8 fetuses (equal numbers of rabbits and rats).

Pieces of tissues from the heart, liver, kidneys, lungs, and placenta were fixed in 10% formalin solution and then embedded in paraffin wax. Sections were stained with hematoxylin-eosin and with picrofuchsin by Van Gieson's method.

---

Research Institute of Pediatrics, Obstetrics, and Gynecology. (Presented by Academician of the Academy of Medical Sciences of the USSR A. P. Nikolaev.) Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 72, No. 9, pp. 100-102, September, 1971. Original article submitted December 18, 1970.

© 1972 Consultants Bureau, a division of Plenum Publishing Corporation, 227 West 17th Street, New York, N. Y. 10011. All rights reserved. This article cannot be reproduced for any purpose whatsoever without permission of the publisher. A copy of this article is available from the publisher for \$15.00.

TABLE 1

| Animals              | Total number of animals | Number of pregnant animals | Births  |                   | Number of fetuses |                |               | Weight of fetus (in g) | Length of fetus (in mm) |
|----------------------|-------------------------|----------------------------|---------|-------------------|-------------------|----------------|---------------|------------------------|-------------------------|
|                      |                         |                            | at term | prema-<br>turally | total             | live           | dead          |                        |                         |
| Experimental rabbits | 23                      | 20                         | 18      | 2                 | 108               | 89<br>(82,5%)  | 19<br>(17,5%) | 44                     | 89                      |
| Control rabbits      | 10                      | 10                         | 10      | —                 | 84                | 82<br>(97,6%)  | 2<br>(2,4%)   | 52                     | 93                      |
| Experimental rats    | 45                      | 36                         | 32      | 4                 | 248               | 225<br>(89,8%) | 23<br>(10,2%) | 3,8                    | 51                      |
| Control rats         | 20                      | 19                         | 19      | —                 | 119               | 116            | 3             | 5,2                    | 53                      |

## EXPERIMENTAL RESULTS

The arterial pressure of the intact rabbits was 90–130 mm, and of the rabbits with renal hypertension 150–200 mm, with fluctuations not exceeding 10–15 mm. The same changes in arterial pressure as in the rabbits were found in rats with renal hypertension. Observations on the animals after the operation continued for 60–250 days.

Elevation of the arterial pressure was observed on the 7th–10th day after operation (up to 145–160 mm). During the last ten days the arterial pressure continued to rise to 180–200 mm, but it fell slightly (by 15–20 mm) before birth (both in the animals undergoing the operation and in the controls), and subsequently rose again in the postnatal period.

The results in Table 1 show that two rabbits and rats with experimental renal hypertension were similar to those described in the literature [3, 5–7].

The changes in the placentas of the rats and rabbits were identical. In most cases focal circulatory disturbances were found. The plasmodial tubes were often irregularly dilated, and in some places they were grossly dilated and congested, frequently with foci of hemorrhage, which infiltrated between and compressed the surrounding tissues. In three cases in 7 of the 13 young rabbits, considerable changes were found in nearly all internal groups, while in the other young rabbits the changes were ill-defined and focal in character or were absent altogether. Circulatory disturbances were found in the liver, kidneys, and myocardium of 7 rabbits. The circulatory disturbances were particularly marked in the liver (congestion of the central veins and irregularly hyperemia of the adjacent capillaries which, in some places, were grossly dilated and had areas of hemorrhages).

The liver of four rabbits contained more multinuclear giant cells than the liver of the control animals, bile pigment was present in the cytoplasm of the cells, and occasionally stasis of bile was present in the sinusoids. In nearly every case focal degenerative changes were found. The vessel walls in all the organs were without visible changes, but in the lungs (case No. 4) the vessel walls were slightly thickened and edematous and their endothelium was swollen.

Circulatory disturbances and degenerative changes were thus found in the liver, myocardium, and kidneys of the young experimental rabbits.

The changes observed in the placenta and internal organs of the young rabbits in the experimental group are comparable with those found in hypoxia [1, 2, 8, 9]. Marked focal disturbances of the circulation were found in the liver and myocardium of only two of the 11 young rats and no changes were found in the remainder.

Experimental renal hypertension thus disturbs the course of pregnancy and the state of the progeny in rabbits and rats, and it also gives rise to morphological changes in the organs of the pregnant females and their fetuses.

# LITERATURE CITED

1. V. I. Bodyazhina, Akush. i Gin., No. 1, 92 (1953).
2. N. L. Garmasheva, Vestn. Akad. Med. Nauk SSSR, No. 11, 19 (1962).
3. G. L. Derman, Vrach. Delo, No. 9, 775 (1949).
4. A. Kh. Kogan, Arkh. Pat., No. 6, 90 (1951).
5. A. U. Kaganskaya, Pathomorphological Changes in the Heart in Essential Hypertension (Clinical and Experimental Investigations). Candidate's Dissertation [in Russian], Khar'kov (1950).
6. Yu. V. Postnov, in: Hormones and Enzymes in Cardiology [in Russian], Moscow (1967), p. 180.
7. Yu. V. Postnov and N. T. Kovaleva, Arkh. Pat., No. 4, 60 (1969).
8. A. M. Charnyi, The Pathophysiology of Hypoxic States [in Russian], Moscow (1961).
9. E. Van Liere and C. Stickney, Hypoxia [Russian translation], Moscow (1967).