

## Ovarian Transplantations in the House Mouse.

G. G. ROBERTSON. (Introduced by J. S. Nicholas.)

*From Osborn Zoological Laboratory, Yale University, New Haven, Conn.*

There have been many attempts to obtain offspring from homo-plastic transplants of ovaries in vertebrates. Of these attempts, the most important are those of Magnus<sup>1</sup> on rabbits, Guthrie<sup>2</sup> on hens, and Castle and Phillips<sup>3-5</sup> on guinea pigs and rabbits. The results of Magnus and Guthrie are uncertain, however, due to the possibility of the regeneration<sup>6, 7</sup> of host ovarian tissue. Castle and Phillips grafted ovaries into 141 guinea pigs which differed from the donors in a single genetic character, and, of these, 3 produced young having the genetic characters of the donor animals. The present work deals with the results obtained from ovarian transplantations in the house mouse.

Three groups of experiments were carried out on mice 6-8 weeks old. These are: Group I. A single ovary was transplanted from an animal of one inbred line into an animal of a different inbred line. Group II. A single ovary was transplanted from an animal of an inbred line into an animal differing in a single genetic character but belonging to the same inbred strain as the donor animal. Group III. As in Group II but in which the remaining host ovary was completely removed.

The transplantations were carried out as follows: The ovary of the host animal was exposed by a dorso-lateral incision in the abdominal body wall. A small incision was made in the ovarian capsule as far distant from the Fallopian tube as possible, and the ovary removed. The donor ovary was then pushed through the slit into the host ovarian capsule. No sutures were needed except for closing the incision in the abdominal wall.

Group I. Ovaries from yellow and agouti mice of an inbred line were grafted into 36 female albino mice of 2 different inbred lines.

---

<sup>1</sup> Magnus, V., *Norsk Mag. for Laegevidensk.*, 1907, 5R, 5, 1057.

<sup>2</sup> Guthrie, C. C., *J. Exp. Zool.*, 1907-08, 5, 563.

<sup>3</sup> Castle, W. E., and Phillips, J. C., *Science*, N. S., 1909, 30, 312.

<sup>4</sup> Castle, W. E., and Phillips, J. C., *Carnegie Institution of Washington*, 1911, Publ. No. 144.

<sup>5</sup> Castle, W. E., and Phillips, J. C., *Science*, N. S., 1913, 38, 783.

<sup>6</sup> Davenport, C. B., *J. Exp. Zool.*, 1925, 42, 1.

<sup>7</sup> Haterius, H. O., *Physiol. Zool.*, 1928, 1, 45.

The host albino females were test mated with albino males and all of the offspring obtained were albino, indicating that none of the ovarian grafts were successful. This is in agreement with the work on tissue transplantation by Loeb<sup>8</sup> and Loeb and Wright<sup>9</sup> on normal tissues of guinea pigs, and by Loeb and King<sup>10</sup> on normal tissues of rats. They found that tissues transplanted between 2 different inbred lines almost invariably degenerate, and few, if any, successful grafts are obtained.

Group II. Ovaries from yellow mice were transplanted into agouti litter mates in 11 cases. The yellow allele is dominant to the recessive agouti allele and there should be some yellow offspring resulting from the mating of the host agouti females to agouti males if the ovarian grafts are successful. However, all of the 30 young obtained in the resulting 5 litters were agouti, showing that the grafts were again unsuccessful.

Group III. Successful ovarian grafts were obtained, however, when one agouti host ovary was completely removed, and, a week to 10 days later, an ovary from a yellow litter mate was grafted into the opposite side of the agouti host. Thus, the agouti host contained one ovary from a yellow litter mate and neither of its own ovaries. Eight such operations have been completed. Of these 8 agouti females 4 have given no litters (indicating either sterility or failure of the graft to take), and four have given a total of 9 yellow and 9 agouti offspring after matings with agouti males. These transplantations were successful, and the young produced are according to genetic expectation. Thus:

$$\begin{array}{ccc}
 A^Y a & \times & aa \\
 \text{agouti host} & & \text{agouti test} \\
 \text{with yellow} & & \text{male} \\
 \text{ovary} & & \\
 \downarrow & & \\
 1 A^Y a & : & 1 aa
 \end{array}$$

In second matings, in which the 4 agouti females containing the successful ovarian grafts were mated with yellow males (for genetic purposes), 3 of the 4 animals have given a total of 8 yellow and 3 agouti offspring. This also is according to genetic expectation, showing that the transplanted ovaries have continued to function. In all of the litter-bearing females in this group the ovarian graft was

<sup>8</sup> Loeb, L., *Physiol. Rev.*, 1930, **10**, 547.

<sup>9</sup> Loeb, L., and Wright, S., *Am. J. Pathol.*, 1927, **3**, 251.

<sup>10</sup> Loeb, L., and King, H. D., *Am. Nat.*, 1935, **69**, 5.

successful, and the remainder of the experimental females gave no litters. This shows that there was no regeneration of functional host ovarian tissue. In the animals of Group II, however, the grafts were unsuccessful in all 5 of the females which gave litters. This, according to the results in Group III, is not due to regeneration of host ovarian tissue at the site of the operation, but is probably due to a physiological block between the host ovary of one side and the grafted ovary, since such a high percentage of successful grafts are obtained when the remaining ovary is completely removed. Thus, it seems evident that the presence in the host of one of its own ovaries changes some reaction which is necessary for graft maintenance.

Since the host agouti females of Group III were first mated approximately 10-15 days after the operations, and since 3 have given second litters, it is quite certain that the ovulations in the successfully grafted ovaries were not due simply to the mechanical stimulation of the operation. Additional experiments of this type are being done at the present time, and it is hoped that the high percentage of successful ovarian grafts can be equalled or increased. This type of operation should be of importance as an aid to the solution of problems in developmental genetics of mammals.

### 11439 P

#### Effect of Anterior Chordotomy on Essential Hypertension.

OLAN R. HYNDMAN, JULIUS WOLKIN AND W. D. PAUL.

*From the Department of Surgery, Neuro Surgical Service, and Department of Internal Medicine, State University of Iowa College of Medicine, Iowa City, Iowa.*

Within the past 10 years there have been many reports concerning the surgical treatment of essential hypertension.<sup>1, 2</sup> The methods used both in experimental animals and in man may be classified into 4 different groups:<sup>3</sup> (1) Interrupting sympathetic outflow by cutting anterior nerve roots from T<sub>6</sub> to L<sub>2</sub>,<sup>4</sup> (2) dividing the splanchnic and the sympathetic chain above the diaphragm,<sup>5</sup> (3) dividing the

<sup>1</sup> Braden, S., and Kahn, E. A., *Yale J. Biol. Med.*, 1939, **11**, 449.

<sup>2</sup> Craig, W. M., *Surgery*, 1938, **4**, 502.

<sup>3</sup> Ascroft, P. B., *Lancet*, 1939, **2**, 113.

<sup>4</sup> Page, I. H., and Heuer, G. J., *Am. J. Med. Sc.*, 1937, **193**, 820.

<sup>5</sup> Freyberg, R. H., and Peet, M. M., *J. Clin. Invest.*, 1937, **16**, 49.