

On the occurrence of compensatory hypertrophy in the ovary / by E.S. Carmichael and F.H.A. Marshall.

Contributors

Carmichael, E. S.
Marshall, F. H. A. 1878-1949.
Royal College of Surgeons of England

Publication/Creation

[Place of publication not identified] : [publisher not identified], [1908]

Persistent URL

<https://wellcomecollection.org/works/mbgv83k7>

Provider

Royal College of Surgeons

License and attribution

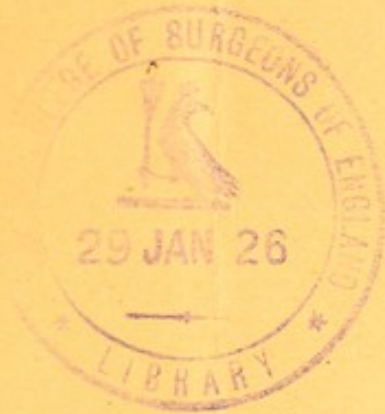
This material has been provided by This material has been provided by The Royal College of Surgeons of England. The original may be consulted at The Royal College of Surgeons of England. where the originals may be consulted. Conditions of use: it is possible this item is protected by copyright and/or related rights. You are free to use this item in any way that is permitted by the copyright and related rights legislation that applies to your use. For other uses you need to obtain permission from the rights-holder(s).

9.

ON THE OCCURRENCE OF COMPENSATORY HYPERTROPHY IN THE OVARY. By E. S. CARMICHAEL, M.B., F.R.C.S.E., AND F. H. A. MARSHALL, M.A., D.Sc.

Reprinted from the Journal of Physiology.

Vol. XXXVI. No. 6, February 28, 1908.

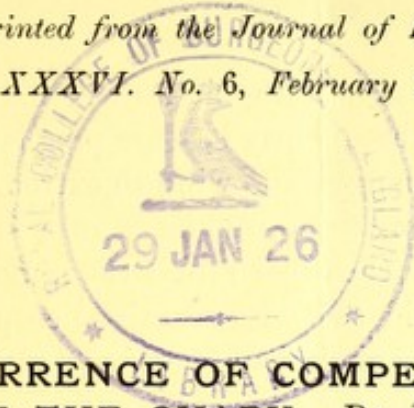




Digitized by the Internet Archive
in 2016

<https://archive.org/details/b22466514>

[Reprinted from the *Journal of Physiology*,
Vol. XXXVI. No. 6, February 28, 1908.]



ON THE OCCURRENCE OF COMPENSATORY HYPERTROPHY IN THE OVARY. BY E. S. CARMICHAEL, M.B., F.R.C.S.E., AND F. H. A. MARSHALL, M.A., D.Sc.

(From the *Physiological Laboratory, University of Edinburgh.*)

It has frequently been stated as a result of clinical and post-mortem observation that the kidney and other organs of excretion, when removed in part, have marked powers of compensatory growth, but there is little evidence that this is the case with the organs of internal secretion. Ribbert, however, has shown that the remaining testis is capable under certain circumstances of undergoing enlargement after one-sided castration. In the case of the ovary less has been done to test its power of compensation. Bond has recently published the results of some experiments performed by him and Horsley, in which it is shown that in rabbits compensatory hypertrophy of one ovary may occur when the other has been removed, and that this compensation is physiological as well as anatomical. Bond however asserts that this compensation only takes place if the animal is allowed to become pregnant or at least to have sexual intercourse, and he draws the conclusion that sexual intercourse acts as a stimulus to ovarian growth in adult life.

Our own experiments dealing with the question of the power of compensation possessed by the ovary may be arranged in four series.

1. A single ovary was removed in rabbits which were pregnant at the time of operation.

2. A single ovary was removed in rabbits non-pregnant at the time of operation.

3 and 4. One ovary, and half or more than half of the opposite ovary, were removed in animals pregnant or non-pregnant at the time of operation.

In the first series the operation was performed at various stages of pregnancy in three animals and therefore at a time when the organ was large and active.

Two were not permitted coitus at any period after the operation and therefore did not subsequently become pregnant. In one of these animals, which became mangy and owing to extreme emaciation had to be killed, there was, if anything, evidence of a slight atrophy in the remaining ovary, while in the other rabbit the remaining ovary weighed the same as its fellow did (with its contained corpora lutea) 4 months previously, although the animal had been isolated for four months and therefore was not pregnant at the time of killing.

In the third animal, pregnancy occurred three times subsequent to the removal of the ovary, and the remaining ovary $4\frac{1}{2}$ months later weighed twice as much (.4 gm.) as the ovary previously removed (.2 gm.).

This result agrees entirely with those of Bond. It is interesting to note that the number of young born at each of the three pregnancies was seven, or somewhat more than half the number of a normal litter.

If we consider now our second series of experiments, we find that in three non-pregnant animals in which the ovary was removed, there was definite hypertrophy after 2 months, 4 months, and 5 months.

One animal was isolated and was never served with the buck. It had previously had several litters of young ones and therefore was a full-grown animal. The ovary was markedly hypertrophied after 4 months, showing a difference of from .12 gm. to .2 gm. in weight between the two ovaries.

This does not support Bond's contention that compensation depends on subsequent coitus and pregnancy.

The other animals showed marked compensation, but each had become pregnant on more than one occasion.

The actual weights were:—

(1) Right Ovary	= .1 gm.
Left Ovary (2 months later)	= .2 gm.
(2) Left Ovary	= .2 gm.
Right Ovary (5 months later)	= .3 gm.

The latter of these rabbits produced seven young two months after the removal of the left ovary.

The power of compensation was demonstrated even more strikingly in the third and fourth series of experiments.

In four animals more than one ovary was removed.

In one animal in which, as far as could be judged, about $\frac{1}{5}$ th only of an ovary was left behind, the weight of this part six months later was

.37 gm., or larger than the average weight of a whole ovary in an adult rabbit.

This animal became pregnant and five young ones were born. It is a striking example of the physiological and anatomical compensation that can take place.

In another rabbit six months after the removal of one ovary together with approximately half of the other, the remaining half weighed .35 gm. and appeared to be about the size of a normal ovary.

A similar result was obtained in a slightly less marked degree in the two other animals.

These latter experiments suggest that the power of compensatory growth possessed by the ovary is relatively greater the larger the amount of ovarian tissue which has been removed.

Further, that this power of compensation does not depend on the presence of the uterus is shown by the following experiment. The right ovary and uterus were removed from an adult rabbit, the ovary weighing .34 gm. Nine months later the left ovary was removed and was found to weigh as much as .75 gm.

REMARKS.

It cannot be contended that the observed compensatory hypertrophy on the part of the ovarian tissue left behind was merely normal growth, since the rabbits employed in our experiments were mature animals, and in nearly every case were known to have been previously pregnant. Moreover, it is equally certain that the differences between the weights of the two ovaries in each experiment had little or no relation to the periods of the year at which they were respectively removed, for the animals killed during the usual non-breeding season afforded as much evidence of ovarian hypertrophy as those which were killed during the usual breeding season.

Heape has shown that rabbits do not ovulate unless they are permitted to have sexual intercourse, and while Iwanoff's experiments seem to indicate that under certain circumstances ovulation may occur after artificial insemination, there can be little doubt that Heape's conclusion is in the main correct. This investigator states that if the doe rabbit is refused access to the buck the Graafian follicles, instead of discharging and becoming transformed into corpora lutea, undergo a process of degeneration and are converted into atretic follicles.

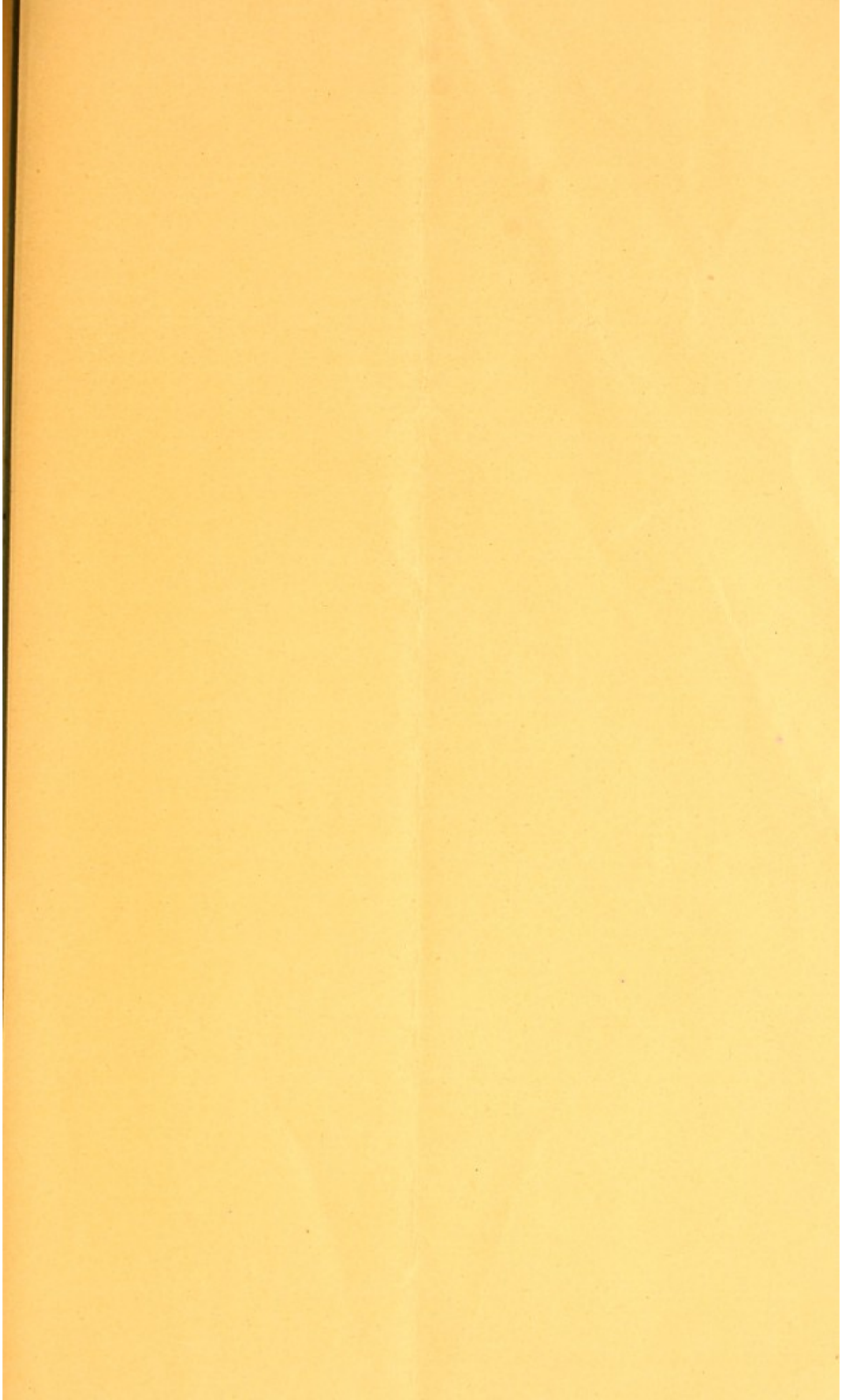
It would appear therefore as a result of our experiments that not

only is sexual intercourse unnecessary for the purpose of inducing compensatory hypertrophy in the ovary, but that ovulation is also not essential for the occurrence of that process.

In conclusion, attention may be directed to the fact observed by us, that if one ovary be removed at a very early stage of pregnancy (series 1) abortion does not necessarily follow, the remaining ovary being apparently sufficient for the continuance of the pregnancy until full time. Such experiments therefore may be regarded as controls to those in which both ovaries were removed in early pregnancy and in which abortion followed in accordance with Fraenkel's theory.

REFERENCES.

- Bond. *Brit. Med. Jour.* July 21st, 1906.
Fraenkel. *Arch. f. Gynäk.* LXVIII. 1903.
Iwanoff. *Jour. de Physiol. et de Path. gén.* II. p. 95. 1900.
Heape. *Proc. Roy. Soc. B.* LXXVI. p. 260. 1905.
Ribbert. *Arch. f. Entwickl.-Mechanik*, I. 1894.



29 APR 1908