TABLE II.
Cross-reactions with Native and Benzoylated Protein "Carriers".

Group of rabbits sensitized to:	Unilateral ophthalmic allergy following intravenous injection with:		
	BEW	EW	BEW
BEW	++++	++++	—
EW	—	++++	0

The reactions recorded in this paper are all of them strictly unilateral ophthalmic responses. On repeated intravenous tests on the same rabbit, "sympathetic allergy" is eventually elicited in the non-sensitized or control eye. These bilateral responses were originally described by the Seegals[4] and are apparently non-specific in character.

7087 C

Internal Migration of Ova in the Cat.*

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During other investigations, we have had occasion to interrupt one uterine tube to study the changes which might occur during pregnancy in the occupied and unoccupied horns. This report deals with observations on the uterine horns of 7 cats in which the right uterine tube was interrupted in each case a number of weeks before the animal was bred.

In 3 animals, the operative procedure consisted merely of ligation (with silk thread) of the right uterine tube in 2 places and section between the ligatures. These animals were bred and were sacrificed in the 7th week of pregnancy. Fetuses were found in both horns in all 3 animals. We were unable to find any macroscopic evidence of regeneration of the uterine tubes and in 2 animals the silk ligatures were found encircling the cut ends. Further evidence of migration of the ova from the unoperated to the operated side was obtained by a study of serial sections of both fragments of the tube and the tubal end of the uterine horn from the operated side of one of the animals. No histological evidence of a reestablishment of the lumen was present.

[4] Seegal, B. C., Seegal, D., and Khorazo, D., *J. Immunol.*, 1933, **25**, 207.

* This study was conducted with the aid of a grant from the Sex Division of the National Research Council and of the Rockefeller Foundation Grant for Fluid Research in the Medical Sciences at Stanford University.

In order to test further the possibility of migration from one horn to the other, we transected the uterine tubes in a second series of cats. Here we sectioned the uterine tube midway between its 2 ends, cauterized the free end of the ovarian half and buried the free end of the uterine half in the muscle of the uterine horn. When these animals were sacrificed at different intervals during their pregnancies, there were fetuses in both horns of 3 of the 4 cats. In all of them, what had been the free end of the uterine half of the tube was still buried in the uterine musculature and the silk thread used to sew the tube into the uterine muscle was still in place.

In this series of 7 cats in which the right uterine tube had been sectioned, there were 21 fetuses with a distribution of 10 in the right horns and 11 in the left ones. The average litter was 3. In another series of 13 animals which had been subjected to another abdominal operation, there was an average litter of 4.7. This indicates that there was a reduction in the average number of fetuses in the litters following section of the right uterine tube. It also demonstrates a fairly equal distribution of fetuses in the 2 uterine horns.

There are only 2 ways in which transmigration of ova can occur. In species in which the ovarian bursa is incomplete, migration may occur across the peritoneal cavity, into and down the opposite uterine tube. Since the right uterine tube had been interrupted in these animals, ova could not possibly have gained entrance into the right uterine horn through the tube. Obviously, the ova passed down the tube and horn on the unoperated side to reach the rather long (2 to 3 cm.) common portion of the uterus, and then passed up the horn in the operated side. This brings up the question of how these ova were transported in their passage from one horn to the other. Although Parker[1] has shown that on the endometrium of mammals there is a narrow band of cilia that beat upwards, it does not seem probable that they could have carried the ova up the operated horn. Evidence of a reverse peristalsis during coitus has been presented by Evans[2] in the dog and by Hartman and Ball[3] in the rat. As far as we know, there are no observations which would support the occurrence of such a reverse peristalsis at the time of implantation as would be required to explain our observations. A third possible explanation occurs to us, namely that the uterine horns may contract alternately with sufficient force to drive the uterine

[1] Parker, G. H., *Phil. Trans. Roy. Soc. B.*, 1931, **219**, 381.

[2] Evans, E. I., *Am. J. Physiol.*, 1933, **105**, 287.

[3] Hartman, C. G., and Ball, J., PROC. SOC. EXP. BIOL. AND MED., 1930, **28**, 312.

contents from one horn to the other. If this were the case, ova might be carried from one horn to the other in those animals which possess a common portion of the uterus of adequate size. This hypothesis would involve the assumption that the cervix and the utero-tubal junctions were effectively closed. Although there is no data at present bearing on this point in the cat, Kelly[4] has shown that the utero-tubal junction is blocked in the guinea pig by a valve-like flap of tissue and Allen[5] mentions a similar fold in the mouse.

Internal migration of ova has been studied in a number of different animals. Negative results were obtained in the rat by Doncaster and Marshall,[6] King,[7] Arai,[8] and Rathbone and McGuinness,[9] in the opossum by Hartman,[10] in the guinea pig by Asdell,[11] and Kelly,[12] and in the rabbit by Kinney.[13] Our observations give experimental proof in the cat for those which Corner[14] made on the domestic pig by comparing the number of corpora lutea in each ovary with the number of fetuses in the respective horns. It should be noted that both the cat and the domestic pig have rather a long common portion of the uterus.

The uterine horns of the one cat in which transmigration did not occur seem worthy of especial mention. There were 2 young in the left horn (3.57 and 3.59 gm.) and none in the right. The volume of the left horn (empty) was 12.5 cc., that of the right 6.0 cc. The volumes of the longitudinal muscle, circular muscle, endometrium, connective tissue (between the muscle layers) and the lumen were determined by a method which will be described in detail in a later publication. In the left horn, the longitudinal muscle made up 28% of the volume, the circular muscle 35%, the endometrium 19%, the lumen 6%, and the connective tissue 11%. In the right unoccupied horn, the longitudinal muscle made up 32% of the volume, the circular muscle 32%, the endometrium 16%, the lumen 2%, and the connective tissue 18%. It is self-evident

[4] Kelly, G. L., *Am. J. Anat.*, 1927, **40**, 373.

[5] Allen, E., *Am. J. Anat.*, 1922, **30**, 297.

[6] Doncaster, L., and Marshall, F. H. A., *J. Genetics*, 1910, **1**, 70.

[7] King, H. D., *J. Exp. Zool.*, 1911, **10**, 381.

[8] Arai, H., *Am. J. Anat.*, 1921, **28**, 59.

[9] Rathbone, R. H., and McGuinness, J. E., 1927, unpublished work from the Department of Anatomy, Stanford University.

[10] Hartman, C. G., *Am. J. Anat.*, 1923, **32**, 353.

[11] Asdell, S., *Brit. J. Exp. Biol.*, 1923, **1**, 473.

[12] Kelly, G. L., *Anat. Rec.*, 1928, **40**, 365.

[13] Kinney, P. B., *Am. J. Obst. and Gynec.*, 1924, **8**, 198.

[14] Corner, G. W., *Johns Hopkins Hosp. Bull.*, 1921, **32**, 78.

that there is a local factor that influences the growth of the uterine tissues during pregnancy in the cat. This local factor is of considerable consequence since it causes the occupied horn to grow to dimensions double that of the unoccupied one which is presumably subjected to the same hormonal changes. This growth is accomplished by an approximate relative increase in each of the component tissues of the uterine horns as is shown by the fact that the percentage content of the longitudinal and circular muscle layers, endometrium and connective tissue (between muscle layers) on the 2 sides shows only slight variations which are probably within the error of our method. The growth of the muscle at the implantation sites might be attributed to a work hypertrophy but this cannot explain the greater growth in the portions between the implantation sites of the left horn. This latter is easily seen by a comparison of microscopic cross sections of the right and left horns (between implantation sites) where the latter is considerably larger. This difference was further shown in our direct measurements. This local factor is being studied in greater detail in the rabbit.

7088 C

Pregnancy Following Bilateral Section of the Cervical Sympathetic Trunks in the Rabbit.*

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The ovulation which follows coitus is known to depend upon the activity of the anterior lobe of the hypophysis. This activity must depend upon the central nervous system. However, at the present time the efferent pathway to the anterior lobe of the hypophysis is only a matter of conjecture as to whether it is direct or indirect. The tractus supraoptico-hypophyseus passes from the nucleus supraopticus to the posterior lobe (Greving[1]). The only innervation which is known for the anterior lobe is from the carotid plexus. If the pathway from the central nervous system to the anterior lobe

* This investigation was conducted with the aid of the Rockefeller Foundation Grant for Fluid Research in the Medical Sciences at Stanford University and a grant from the Sex Division of the National Research Council.

[1] Greving, R., 1931, p. 188, in L. R. Müller's *Lebensnerven und Lebenstriebe*, 3rd Edition. Julius Springer, Berlin.