Negative results were obtained with colloidal gold, $BaCl_2.2H_2O$, $CaCl_2$, $Co(NO_3)_2.6H_2O$, $FeSO_4(NH_4)_2SO_4.6H_2O$, K_3AsO_4, $KAsO_2$, KCl, KCN, $K_2C_2O_4.H_2O$, K_2CrO_4, $K_4Fe(CN)_6.3H_2O$, $KHCO_3$, K_2HPO_4, KI, KIO_3, KNO_3, K_3PO_4, K_2SO_4, $K_2S_2O_8$, Li_2CO_3, Li_2SO_4, $MgCl_2.6H_2O$, $MgSO_4$, $MgSO_4.7H_2O$, $NaBO_2$, $Na_2B_4O_7.10H_2O$, NaF, $Na_2Fe(CN)_5NO.2H_2O$, $Na_2HPO_4.12H_2O$, $NaNO_2$, $Na_2S_2O_3.5H_2O$, $Na_2WO_4.2H_2O$, NH_4Br, $NH_4C_2H_3O_2$, NH_4Cl, $(NH_4)_2CO_3.H_2O$, $(NH_4)_2C_2O_4.H_2O$, NH_4NO_3, $(NH_4)_2SO_4$.

These observations may be of some interest possibly to students of toxicology, antisepsis, chemotherapy, permeability and allied basic problems.

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On the Almost Instantaneous Transport of Spermatozoa Through the Cervix and the Uterus in the Rat.

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(Introduced by Herbert M. Evans.)

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It is almost universally believed that spermatozoa owe their progression through the female genital tract to the lashing of their vibratile tails. Elaborate experiments have been made testing the rate of progression of spermatozoa in salt solution under the microscope, their chemotaxis towards uterine, tubal and ovarian tissue, their negative rheotropism towards a ciliary stream, the time elapsing between copulation and the appearance of sperms at the fimbriated end of the tube. (Bischoff.)*

Since the uterine horns of laboratory rodents as well as other mammals are filled to turgidity with fluid at the time of oestrus, it seemed logical to try to determine whether the uterine fluid also functioned as a readily miscible matrix for the rapid transport of the semen by uterine contraction.

Preliminary experiments were made by the senior writer in the

* The senior author (C. G. H.) questioned this view[1] He stated "that spermatozoa may reach the *os uteri* through the lateral vaginal canals almost instantly by simple peristalsis of the highly motile female organ—a passive transport in the liquid of the canal."

[1] Hartman, Carl G., *Anat. Rec.*, 1924, **27**, 293.

laboratory of Dr. Herbert M. Evans, which led to no definite conclusions because of the difficulty of determining the exact instant of ejaculation. In the same laboratory, the junior writer observed and learned to interpret the behavior of the male so as almost infallibly to diagnose the copulation that resulted in ejaculation, which made the present study possible. Thanks are due Dr. Evans for the use of the facilities of his rat colony and to Dr. R. R. Squier for assistance in the present series of experiments. The results are striking and at variance with the general notion, yet clear-cut and conclusive.†

A series of 3 rats was first taken. Two, 8 and 16 minutes respectively after the effective copulation the animals were killed, the body cavity opened and Bouin's fluid poured over the uterus. This was removed after fixation was well advanced. One minute elapsed before killing and opening the body cavity. All 3 specimens had masses of spermatozoa in the distal end of each horn. The result was surprising; yet the experiment was open to the objection that the *inside* of the uterus may not have been affected in time to stop the swimming spermatozoa.

The next 4 animals were studied in the living, the animal killed either instantly or after an interval following the effective coitus; the body cavity was quickly opened and a clamp placed on the uterine horns near the distal end, leaving a small portion at the extreme tubular end for testing.

Experiment 1. Killed one minute after copulation. At 2 minutes the uterine horns had been clamped near apex; at 2 minutes and 18 seconds, myriads of spermatozoa taken from the cornual apices were demonstrated under the microscope.

Experiment 2. Removed from cage the fifty-fifth second after ejaculation; killed the sixtieth second; left horn clamped at 100 seconds, right clamped at 116 seconds. Sperms had reached apex in left, about half way up in right horn.

† The ejaculatory sign in the rat must first be given. Although the copulatory behavior pattern in the rat has been fully described by Stone,[2] he interpreted the behavior accompanying ejaculation as a "minor irregularity". The rat copulates several times (5 to 20) before actually ejaculating, withdrawing suddenly and then usually licking the penis. When ejaculation occurs, however, the last of the four or five pelvic thrusts is deeper than usual and the male lies on the back of the female, withdrawing slowly only at the end of several seconds. The deep final thrust, then, followed by a period of inertia on the part of the male, lasting several seconds, constitutes the sign of ejaculation. It is practically infallible; nevertheless, to make even more certain that there be no mistake, the females were frequently examined to rule out any premature ejaculation.

[2] Stone, Calvin P., *J. Comp. Psych.*, 1922, **2**, 95.

Experiment 3. Killed 30 seconds after copulation. Left horn clamped 24 seconds later, the right 9 seconds after that. No sperms were found distal to the clamps, but plenty of them in the lower half of each uterine horn.

Experiment 4. Killed as quickly as possible after mating. Right horn clamped 54 seconds, left 63 seconds after coitus. Plug with active sperms in vagina, none in cervix or uterus.

From the last experiment one might conclude that something has to happen in the genital tract of the female within a few seconds of the effective coitus to effect the entrance of the semen into the cervix.‡ However, the experiments as a whole show conclusively that once the sperms enter the rat uterus they are rapidly carried, by contraction of the uterine wall itself, quite passively throughout the uterus to its distal end and the very portal of the fallopian tube. The transport of sperms, at least in the uterus of the rat, is a matter not of hours or of minutes, but of seconds. It is easy to observe contraction waves in the uterus at this period. Parker,[3] however, described the rabbit uterus as sluggish and concluded from his experiments that 2 hours was the time required for the journey covered in a half-minute in the rat.

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Implantation of Juvenile Testicular Tissue into the Hypertrophied Right Gonad of Ovariotomized Fowl.*

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In our early ovariotomy experiments[1] sex-inversion was incomplete owing to the fact that we failed to find spermatogenesis in the hypertrophied testis-like right gonad, though the individuals were otherwise equipped to function as males. In a subsequent series of experiments[2] in which the operations were performed at an earlier

‡ A similar observation was made by Parker[3] in the rabbit.

[3] Parker, G. H., PROC. SOC. EXP. BIOL. AND MED., 1930, **27**, 826.

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[1] Domm, L. V., PROC. SOC. EXP. BIOL. AND MED., 1924, **22**, 28; *J. Exp. Zool.*, 1927, **48**, 31.

[2] Domm, L. V., *W. Roux' Archiv. f. Entw. mechan.*, 1929, **119**, 171.