THE EFFECTS OF BREEDING STIMULI ON THE RATE OF SPERM TRANSPORT IN RABBITS

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Sperm transport through the female reproductive tract in mammals has been studied by several investigators. The results from these studies have shown that in the mouse (Lewis & Wright, 1935), the rat (Blandau & Money, 1944), the hamster (Yamanaka & Soderwall, 1960), the cow (VanDemark & Hays, 1951; Hays & VanDemark, 1952), and the ewe (Mattner & Braden, 1963), spermatozoa are present in the oviducts within minutes of mating or insemination. A rapid transport of spermatozoa to the rabbit oviduct has not previously been reported. The interval between mating and the finding of spermatozoa in the oviducts has ranged from 1 hr (Chang, 1952) to 3 to 4 hr (Braden, 1953) and, for sufficient spermatozoa to fertilize all of the eggs, to as much as 5 to 6 hr (Adams, 1956; Greenwald, 1956). The early literature has been more completely reviewed by Fitzpatrick (1966).

This paper presents the results from a study comparing the effect of natural mating and artificial insemination on the rate of sperm transport in the rabbit.

Twenty-nine sexually mature New Zealand White female rabbits were used in the study. Sixteen females were naturally mated with fertile males and thirteen were artificially inseminated into the anterior vagina with semen collected from the same fertile males. Does were mated with from one to three different males or inseminated with the total ejaculate from a single male. The does were killed with an intravenous injection of Nembutal from 5 to 120 min after mating or artificial insemination. Clamps were immediately placed on the reproductive tract, dividing it into three regions—the anterior half of the vagina, the uterine horns and the oviduct. The vagina and uterine horn portions were each flushed with 3 ml physiological saline into centrifuge tubes. The flushings were centrifuged for 10 min at 3000 rev/min, and most of the supernatant was carefully removed by pipette. The sperm pellet was resuspended in the remaining supernatant and haemocytometer counts were made or aliquots were transferred to microscope slides and the presence of spermatozoa determined with the aid of a light microscope. Each portion of the oviduct was flushed with 0.25 ml saline directly onto microscope slides and the flushings were examined for sperm cells at a $\times 200$ magnification.

The results from naturally mated does (Table 1) show that 120 min after mating eight of ten oviducts contained spermatozoa and all of the uteri and vaginae contained spermatozoa. The two oviducts not containing spermatozoa

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were from the same doe. Spermatozoa were not found in the eight oviducts from does killed 60 min after mating but all uteri and vaginae contained spermatozoa. Spermatozoa were found in the oviducts as well as in the vagina and uterine horns of the doe killed 75 min after mating.

Spermatozoa were observed in all portions of the reproductive tract of animals killed 30 to 60 min after artificial insemination (Table 1). Six of the eight oviducts and uterine horns from animals killed 15 min after insemination contained spermatozoa. Spermatozoa were found in only one of four uterine horns and in none of four oviducts 5 min after insemination.

TABLE 1
THE RATE OF SPERM TRANSPORT IN RABBITS AT VARYING TIMES
AFTER NATURAL MATING AND ARTIFICIAL INSEMINATION

Breeding stimulus	No. of females	Time after insemination (min)	No. of tract portions containing sperm.				
			Oviduct		Uterus		Vagina
			Left	Right	Left	Right	
Natural mating	5	120	4	4	5	5	5
	6	90	5	4	5	5	6
	6	75	5	4	5	5	6
	4	60	0	0	4	4	4
Artificial insemination	3	60	3	3	3	3	3
	4	30	4	4	4	4	4
	4	15	3	3	3	3	4
	2	5	0	0	0	1	2

These results show a different response in the rate of sperm transport following natural mating and artificial insemination in female rabbits. The slow transport following natural mating is in agreement with the reported literature and the rapid transport following insemination is similar to the findings for other species following either natural mating or insemination. It is believed, as reported by Hays & VanDemark (1953) and VanDemark & Hays (1951, 1954) for the cow, that oxytocin released during natural mating or insemination stimulates uterine muscle contractions resulting in rapid transport of spermatozoa through the female reproductive tract. The data reported here for the rabbit suggest that oxytocin is not released during natural mating but is released at the time of artificial insemination. The former part of this hypothesis is supported by the findings of Sharma & Chaudhury (1970) who found that there was no release of oxytocin in the rabbit following successful mating.

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