CONCEPTION RATE AFTER UTERINE TRANSFER OF COW EGGS, IN RELATION TO SYNCHRONIZATION OF OESTRUS AND AGE OF EGGS

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In sheep, the transfer of two- to four-cell eggs from the oviduct of donors to the uterus of recipients results in a poor conception rate, while uterine transfers of Day-3 (eight-cell) eggs (Day 0 = day of oestrus) give a satisfactory conception rate (Averill & Rowson, 1958). Moore & Shelton (1964) found that transfers to the oviduct were more successful than those to the uterus, but Trounson & Moore (1974) found that the site of transfer of Day-3 eggs had no effect upon their subsequent survival. In sheep, most eggs are present in the uterus 66 hr after ovulation (Holst, 1974), whereas in the cow, which ovulates about 12 hr after the end of standing oestrus, Hamilton & Laing (1946) could find no eggs in the uterus before 96 hr after the end of oestrus. Thus, although the cleavage rates of eggs are approximately similar in relation to oestrus in both sheep and cow, sheep eggs are entering or are already present in the uterus on Day 3, but cow eggs of a comparable age remain in the oviduct for a further 24 hr.

In the present study, the conception rate after uterine transfer of cow eggs of different ages has been examined in relation to the degree of synchronization of the donor and recipient. Conception was assessed by rectal palpation 35 to 42 days after the oestrus before transfer. The eggs used for this purpose were collected and transferred as described by Rowson, Moor & Lawson (1969) or with minor modifications. The flushing and transfer medium was either TCM 199 or Dulbecco phosphate-buffered saline.

No pregnancies resulted from the transfer of twenty-two 2-day eggs to the uterus of recipients and these results were therefore excluded from the statistical analysis. The number of uterine transfers carried out on Days 3 to 7 to animals with synchronous oestrus or to recipients in which oestrus differed from the donors by +1 or –1 day, and the number of resulting pregnancies, are shown in Table 1. A weighted analysis of variance was carried out on the percentage conception rates of Table 1. There were significant differences in the success rates of eggs of different ages ($F = 44$). The mean rates and standard errors are plotted in Text-fig. 1.

Tests on each pair of egg stages showed significant differences between Days 3 and 4 ($t = 8.3$), between Days 3 and 5 ($t = 10.3$), between Days 3 and 6 ($t = 10.7$), between Days 3 and 7 ($t = 6.1$), and between Days 4 and 6 ($t = 4.0$). It is interesting that Day-4 eggs were more successful ($P < 0.01$) when transferred

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to a Day-3 uterus (-1 day asynchronous), than were Day-3 eggs transferred to a synchronized uterus (47% compared to 11.8%).

The highest pregnancy rate seemed to be achieved with Day-6 eggs, and transfer into a synchronized recipient was significantly more successful ($F = 5.6$) than transfer to recipients out of phase (Table 1).

Table 1. The number of cows becoming pregnant after transfer of eggs of different ages to the uteri of recipients synchronized or out of phase with respect to the time of oestrus

Stage of recipient (days)	Age of eggs transferred (days)					Mean % conception*
	3	4	5	6	7	
-1	1/15	9/19	2/3	3/3	1/1	55.4 ± 5.3
Synchronized	6/51	10/17	23/29	11/12	4/5	64.0 ± 3.4
$+1$	0/1	9/15	4/8	6/8	2/4	50.1 ± 5.2

* Means $\pm$ S.E.

TEXT-FIG. 1. Conception rate after transfer of cow eggs of different ages to uteri that were synchronous or out of phase by $+1$ or -1 day. The vertical bars represent $\pm$ S.E.

Thus, the stage of development of the transferred eggs is an important factor for success. The poor conception rate after the uterine transfer of Day-3 cow eggs is in marked contrast to results with sheep eggs of the same age, despite their morphological similarity. Moore & Shelton (1964), however, noted that the number of pregnancies in sheep increased significantly with the age of the eggs transferred when the eggs were harvested between 48 and 84 hr after the beginning of oestrus.

The significant difference in conception rate between Day-3 and Day-4 eggs transferred to a 3-day uterus indicates that at the Day-3 stage the cow egg is too immature to withstand the uterine environment.

It is possible that any increased rate of egg transport through the oviduct resulting in the premature arrival of Day-3 eggs in the uterus could adversely affect their subsequent development. These conditions may pertain in some animals in which superovulation is induced but those factors which increase the rate of transport through the oviducts probably also result in rapid expulsion of the egg from the uterus.

The present findings are of importance in the consideration of results of egg transfer since these might easily be biased by a disproportionate number of a particular egg stage in one or other experimental group.

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REFERENCES

- AVERILL, R. L. W. & ROWSON, L. E. A. (1958) Ovum transfer in the sheep. *J. Endocr.* **16**, 326–336.
HAMILTON, W. J. & LAING, J. A. (1946) Development of the egg of the cow up to the stage of blastocyst formation. *J. Anat.* **80**, 194–204.
HOLST, P. J. (1974) The time of entry of ova into the uterus of the ewe. *J. Reprod. Fert.* **36**, 427–428.
MOORE, N. W. & SHELTON, J. N. (1964) Egg transfer in sheep. *J. Reprod. Fert.* **7**, 145–152.
ROWSON, L. E. A., MOOR, R. M. & LAWSON, R. A. S. (1969) Fertility following egg transfer in the cow: effect of method, medium and synchronization of oestrus. *J. Reprod. Fert.* **18**, 517–523.
TROUNSON, A. O. & MOORE, N. W. (1974) The survival and development of sheep eggs following complete or partial removal of the zona pellucida. *J. Reprod. Fert.* **41**, 97–105.