Oocyte Transfer as a Clinical Procedure in the Mare

Katrin Hinrichs, DVM, PhD; Gloria L. Matthews, DVM; Douglas A. Freeman, DVM, PhD; and Elizabeth M. Torello, BS

A pregnancy rate of 6/8 (75%) was achieved after the transfer of single oocytes to the oviducts of inseminated recipient mares. Oocyte transfer may offer a viable clinical alternative to embryo transfer in mares that cannot provide embryos. Authors' addresses: Dept. of Veterinary and Animal Science, University of Massachusetts, Amherst, MA 01003 (Freeman) and Tufts University School of Veterinary Medicine, 200 Westboro Rd., North Grafton, MA 01536 (all other authors).

1. Introduction

Embryo transfer is a useful clinical tool for obtaining foals from mares that cannot carry their own foal to term. However, some mares are not able to conceive or support embryo growth because of uterine or cervical trauma or chronic uterine infection, and therefore cannot provide embryos for transfer. These mares may still produce normal oocytes, which could possibly be transferred to a recipient mare for fertilization. Oocyte transfer has not been used clinically, however, because early studies demonstrated low pregnancy rates per oocyte transferred (8–13%). In these studies, oocytes were collected just before ovulation (or ~35 h after hCG administration) and were transferred within an hour to the oviducts of recipient mares. More recently, researchers in Wisconsin performed five transfers, of up to four oocytes each, and achieved a high pregnancy rate (~10/12; 83%). In that study, oocytes were collected 24 h after hCG administration and were cultured in vitro for 16–20 h prior to transfer. The maturation time for oocytes before transfer was therefore longer in the Wisconsin study (40–44 h total after hCG) than in the previous studies (~36 h after hCG).

We wished to determine whether oocyte transfer would offer a repeatable method for embryo production in a clinical situation, in which one oocyte was transferred at a time. In addition, we evaluated whether the duration of oocyte maturation after hCG administration influenced the pregnancy rate after transfer.

2. Materials and Methods

The study was conducted from June through September, using seven pony mares, aged 4–14 years with unknown reproductive histories. Estrus synchronization was aided by the administration of prostaglandin. On the first day of estrus, mares were randomly assigned to 36-h or 48-h oocyte maturation groups. When the dominant preovulatory follicle was 27 mm or greater, mares were given hCG to stimulate final follicle maturation. The follicle was aspirated 24 h after hCG administration by holding the ovary per rectum and puncturing the follicle with a needle placed through the lateral abdominal wall. Recov-
ered oocytes were incubated in medium 199 with 10% fetal bovine serum for 12 or 18 h, according to the donor mare’s group (total of 36 or 42 h from hCG administration, respectively), in a humidified atmosphere of 5% CO2 at 39 °C. After incubation, oocytes were either transferred back to the oviduct of the same mare (n = 3) or, if two mares provided oocytes on the same day, to the oviduct of the other oocyte donor (n = 5). The transfer of oocytes directly into the oviductal ampulla was accomplished by standing flank laparotomy. The recipient mares were inseminated twice, once the day before transfer and again 1-4 h after transfer. Pregnancy and embryonic growth rate was determined on days 11-14 by ultrasonography per rectum. Mares were then given prostaglandin F2α for luteolysis and were crossed over to the other oocyte culture time group for a second cycle.

3. Results
The oocyte recovery rate from mature follicles 24 h after hCG was 10/15 (66%). Of the recovered oocytes, five were transferred following 12-h culture (total 36-h maturation), and three were transferred following 18-h culture (total 42-h maturation). The pregnancy rates were 4/5 for the 36-h group and 2/3 for the 42-h group. Three of the pregnancies resulted from mares that received their own oocyte, and three resulted from mares that received another mare’s oocyte. Size and growth of embryonic vesicles was normal from 11 to 14 days after transfer. In one case, the recipient mare ovulated a second follicle the day after oocyte transfer; in this mare, two embryonic vesicles were later seen on ultrasound examination. In the two transfers that did not result in pregnancy, the oocyte was not expelled from the transfer pipette on the first cannulation of the oviduct.

4. Discussion
The overall pregnancy rate of 6/8 (75%) achieved in this study indicates that this technique offers a repeatable method for successful transfer of single oocytes in the mare. An increase in maturation time from 36 to 42 h after hCG administration does not appear to be the factor associated with the high pregnancy rate achieved by using this technique. Factors affecting the per-cycle success rate of the technique when used clinically may include (a) tight synchronization of follicle growth between donor and recipient; (b) recovery of the oocyte from both donor and recipient follicles (to prevent inadvertent fertilization of the recipient mare’s oocyte); and (c) smooth, rapid transfer of the oocyte to the recipient oviduct.

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References