

# Embryo quality and development in sub-fertile dairy cows

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## Introduction

Embryo Transfer (ET) is a valuable tool that producers can use to decrease the generation interval and/or quickly increase the genetic potential of the herd. Several factors affect the implantation and establishment of pregnancy with embryos such as fresh vs frozen, produced in vivo vs in vitro, and disease in the recipients. The objective of this study was to investigate the effect of embryo quality and subclinical endometritis (SCE) in Holstein Friesian recipient cows on early embryonic death (EED) between d 7 to d 16.

## Materials and Methods

The data, collected over 4 years, was compiled here. Cows (parity, 3 to 5; body condition score, 3 to 3.5 out of 5) with subclinical endometritis (n=180; SCE - >6% PMN on endometrial cytology) or without subclinical endometritis (n=180; No-SCE, ≤ 6% PMN) were selected. Cows in each group received a single, frozen-thawed embryo of quality 1 (n=60), 2 (n=60) or 3 (n=60) ([compact morula or early blastocyst], IETS manual, 4th ed) on d 7 post-estrus in the uterine horn ipsilateral to the ovary containing a corpus luteum using standard nonsurgical techniques by a single clinician. Only cows that expressed estrus (Select-Synch protocol) and with acceptable corpus luteum (progesterone >5 ng/mL at transfer) were implanted. Conceptuses were collected on d 16 from all recipient cows by standard nonsurgical uterine flushing technique, by the same clinician, using an 18-g embryo collection catheter with phosphate buffered saline (pH 7.4).

## Results

After collection, conceptuses were categorized as tubular (underdeveloped, 10 to 20 mm) or filamentous (normal, >25 mm; Betteridge et al, 1980; Ribeiro et al, 2016). Differences in proportion of cows that had conceptus recovered on

the d 16 flush between SCE or No-SCE groups and embryo quality groups was determined by logistic regression using the GLIMMIX procedure with a multinomial distribution and contrast statements. The total number of embryos recovered differed between SCE and No-SCE group ( $P<0.01$ ; 36.1 vs 48.9%). The total number of embryos recovered following transfer of grade 1 (53.3) and 2 (44.2%) embryos was higher ( $P<0.05$ ) compared with grade 3 embryos (29.2%). Within SCE group, the total number of embryos recovered differed between grade 1 and 3 ( $P<0.05$ ; 50.0 vs 23.3). Within No-SCE group, the total number of embryos recovered was higher ( $P<0.05$ ) for grade 1 (56.7%) and 2 (53.3%) compared with grade 3 (35.0%). The total number of filamentous embryos recovered was lower for SCE cows compared with No-SCE cows ( $P<0.01$ ; 30.0% vs 51.1), especially for grade 1 ( $P>0.05$ ; 43.3 vs 66.7%) and grade 2 ( $P>0.05$ ; 30.0 vs 56.7%). The total number of tubular embryos recovered did not differ between SCE and No-SCE cows ( $P>0.1$ ; 42.2% vs 45.6%). Within SCE group, the number of tubular and filamentous embryos recovered differed between grade 1 (56.7) and 3 (30.0) ( $P<0.05$ ). Within NoSCE group, the number of tubular embryos recovered did not differ among embryo grades, whereas filamentous embryos recovered for grade 3 (35.0%) were lower ( $P<0.05$ ) compared with grade 1 (56.7%) and 2 (53.3%) ( $P<0.05$ ).

## Significance

In conclusion, lower embryo quality and the presence of SCE negatively influenced early embryo development between d 7 and 16 of gestation. Although the proportion of underdeveloped tubular embryos recovered did not differ between SCE groups, more normal filamentous embryo development was observed in No-SCE groups that received embryo grade 1 and 2 compared with SCE cows that received embryo grade 1 and 2.