

Numerous studies have found that fertilization occurs in over 80% of dairy cows every time that a cow is correctly found to be in estrous and inseminated. Since the best Conception Rates (CR) are around 40%, this suggests that embryonic death is responsible for 75% of all pregnancy failure or put another way, 30-35% of all AI services end in early embryonic death.

As understanding of two vs. three follicular waves has progressed, it became apparent that three wave cows have a fertility advantage over two wave cows. Trials have been conducted to coordinate Timed Artificial Insemination (TAI) protocols with the follicular waves. Maintenance of a dominant follicle by a CIDR or starting TAI after day 9 in the estrous period reduces CR when compared to cows started between days 6 and 8, when smaller and quick growing pre ovulatory follicles are recruited. **Double Ovsynch, Ovsynch G6G, and Presynch 11 or 12 are new TAI strategies** that coordinate follicular development to eliminate the difference between two and three wave cows and reduce EED.

Other work has shown that it is necessary to wait at least 5 days after estrus for new follicles to grow to be responsive to GnRH treatment which initiates LH surge and successful Ovsynch.

For a long time, it has been known that progesterone regulates the reproductive system, but it is still very controversial when low progesterone has the most effect on CR. Progesterone treatments after fertilization by progesterone releasing devices or hCG or GnRH have not given consistent positive results; whereas **using progesterone releasing devices before AI (as in heifer CIDR synch)** has been showing improved ovulation rates.

An area for further study will be **genome testing of bulls** for the interactions of their sperm cells with the egg activation process.

Poor transition cow management of high milk production cows has been described as a major factor in reduced fertility. The current evidence suggests that poorly transitioned cows are under negative energy for too long, which alters the immune cells of the uterus and lowers IGF and insulin which leads to lower fertility.

In a recent study by P Humblot, et al France, the behavioral signs of estrus used by the farmer to call the AI technician were related to EEM. When **secondary signs other than standing heat or mounting activity were used, there was a higher incidence of EEM**. In the same study, **when cows were bred early (<6 hrs) or late (after 24 hrs) after onset of estrous, EEM increased**. Also **restraint quality** was associated with EEM. Unfavorable restraint quality was defined as breeding a cow loose in a pen or inseminated in the milking parlor. Proper restraint was defined as in a proper head lock or tie stall. EEM dropped 25% for cows which were restrained properly while inseminated.

Two other obvious causes of lowered fertility are **heat stress and increased age**, which are mentioned only to complete the list of causes.