



Can Rumen Protected Methionine Improve Reproduction in Dairy Cows?

Part 3: Transition Period – Decreased Embryonic Loss

Greater than 50% of embryonic deaths happen before d 28 after insemination. Prior to implantation (d 16-18), the free-floating embryo is dependent on uterine fluid for nutrition. Discover insights into how a targeted nutritional strategy can help improve embryo survival.

KEY TAKEAWAYS

Adequate uterine nutrition, including sufficient supply of methionine: 1) supports embryos with **higher nutrition concentration, particularly lipids, improving their chances of survival** during pre-implantation stage, and 2) promotes the development of a **large embryo leading to increased production of Interferon tau (Day 14 to 18)**, necessary for pregnancy recognition. Conversely, if nutrients are insufficient, the conceptus will die which is the definition of embryonic loss.

DELVING IN

Acosta et al. (2017) evaluated the impact of rumen-protected methionine (RP-Met) supplementation from -21 to 73 days relative to calving on the lipid accumulation of embryos pre-implantation stage (harvested on day 7 after insemination; 63 DIM). By the way, since pregnancies prior to implantation are very difficult to measure, most studies begin tracking embryonic development post-implantation, when the embryo can be identified through ultrasonography. In this study, embryos of cows fed RP-Met had greater concentrations of polyunsaturated fatty acids, resulting in lipid accumulation 3 times greater (6.74 vs. 3.60; $P < 0.001$) than control. A lipid profile study of the embryos revealed that diacylglycerol and ceramides – unsaturated and monounsaturated lipids – increased with RP-Met supplementation (Stella et al., 2024). The increase in these lipids provides essential nutrition for the embryo prior to implantation, thereby increasing survival rates of the free-floating embryo.

Toledo et al. (2017) tested the effect of RP-Met supplementation in a commercial dairy herd (control = 153 cows, RP-Met = 156 cows). Researchers observed a **13.5% reduction of pregnancy loss between days 28 and 61 after insemination in multiparous cows supplemented with RP-Met compared to control (6.1 vs. 19.6%, $P < 0.03$)**. The decrease in pregnancy loss was attributed to larger, healthier embryos with a uterine environment that fosters survivability. Additionally, Stangaferro et al. (2017) also observed a numeric decrease in embryonic loss between days 32 and 67 after AI in cows receiving RP-Met compared to the control (6.7 vs. 10.8 %, $P = 0.12$).



Interferon tau (IFNT) is a cytokine produced by the conceptus before and just after implantation. It serves as the pregnancy recognition signal in ruminants. Effective signaling through IFNT prevents regression of the corpus luteum, allowing the cow to maintain progesterone production, which in turn provides negative feedback to the hypothalamus to maintain pregnancy. The health of the conceptus directly impacts the amount of IFNT that is produced, increasing pregnancy recognition and, as a result increasing pregnancy rates.

**Methionine & Embryo =
Larger, healthier embryo =
Increased interferon tau production =
Increased recognition of pregnancy =
Less pregnancy loss**

PREGNANCY LOSS (%) IN MATURE COWS



*Pregnancy was diagnosed on day 28 after AI by PSPB; pregnancy-specific protein B, and on day 32 and 61 after AI by ultrasound
Toledo et al., 2017*

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