

141 Diet supplementation alters oocyte lipid content and developmental competence in mares

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Abstract:

The equine oocyte is dense in lipids, which may serve as an energy source for oocyte maturation and later embryonic development. However, the association between lipid content and fertility remains to be determined, as does the extent that diet can modify oocyte lipids. We hypothesised that diet supplementation can alter the oocyte lipid profile and subsequent developmental potential. In Study 1, we examined if oocyte triglyceride (TG) relative abundance was affected by dietary supplementation. Mares (16–22 years, n=9) were fed grass/alfalfa hay and supplemented daily with a combination of commercially available feed additives designed to promote equine wellness and fertility [Equine GI™ (147g daily), Potency® (28g daily), Motility Plus® (23g daily), Healthy Weight Oil (60mL daily), Platinum Performance Inc.]. Oocytes were collected from the mares before (PRE) and after ≥8 weeks (POST) of supplementation during the natural breeding season. In Study 2, we compared oocyte developmental potential after injection of sperm into oocytes obtained from mares supplemented for ≥8 weeks with the same additives (ADD, 18–24 yr, n=5) or from a similar group of mares supplemented with a grain control diet (450g of grain mix and 60ml of corn oil daily, GRN, 19–23 years, n=5). Oocytes were collected from dominant follicles (≥35mm) during oestrus and at 20±2 h after induction of follicular maturation. In Study 1, oocytes were denuded of cumulus cells after collection, snap frozen, and assessed for TG composition by nontargeted liquid chromatography-mass spectrometry using an Acquity UPLC system (Waters). In Study 2, recovered oocytes were placed in maturation medium for 22±2h before being injected with sperm from one stallion, and blastocyst formation was assessed in 7 or 8 days. A total of 100 annotated TG species were identified. Normalized peak areas for PRE and POST oocyte TG were compared using two-tailed, paired t-tests. Blastocyst development rates were compared by Fisher's exact test. Relative abundance of 71 TG species differed ($P \leq 0.05$) between PRE and POST; all TG species as well as total relative abundance of TG were higher in oocytes from PRE compared with POST. Blastocyst rates per sperm-injected oocyte were greater ($P=0.03$) for ADD (40%, 6/15) than for GRN (5%, 1/19). Dietary supplementation of the complex mix of nutrients to middle-aged and older mares resulted in reduced relative abundance of TG in oocytes and improved developmental potential. We determined that oocyte lipid content can be modified through diet. The extent that diet supplementation improved oocyte competence by altering the lipid profile is still to be determined.

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