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Reproduction Symposium: Advances and Applications of Assisted Reproductive Technologies in Dairy Cattle Breeding and Management

1430 Value of improving dairy cattle reproduction in the era of sexed and beef semen. A. De Vries*, *University of Florida, Gainesville, FL.*

Average reproductive performance has increased in the last decade, while the use of sexed dairy semen and beef semen has soared. The objective of this study was to evaluate the economic value of increasing reproduction efficiency when mating strategies include also sexed and beef semen. The method consisted of a herd budget model that mimics the economic consequences of mating strategies that include a combination of beef, conventional dairy, and sexed dairy semen in a herd of heifers and cows. A sufficient number of dairy heifer calves was kept to replace culled cows. Crossbred calves, dairy bull calves, and surplus dairy heifer calves were sold. Genetic variation across and within age of dams determined the economic value of kept dairy heifer calves. Semen types varied by price, fertility, and fraction of dairy heifer calves. Four mating strategies were evaluated that included conventional semen only, sexed and beef semen only based on the dam's age, or based on the dam's genetic merit. A fourth near optimal strategy was found using a nonlinear solver. Conception rates were varied for both heifers and cows, resulting in 21-d cow pregnancy rates (PR) that varied from approximately 18% to 31%. Genetic merit reliabilities were either traditional or based on genomic testing. Results showed that increased reproductive efficiency was worth more in sexed and beef semen mating strategies than when only conventional semen was used. Compared with the conventional semen strategy, the sexed and beef strategies were approximately $60/cow per yr more profitable around the 18% PR and $150 more profitable around the 31% PR. The use of beef semen based on the dam's genetic merit was slightly more profitable than the use of beef semen based on the dam's age. Genomic testing was generally profitable at greater PR but not at PR < 20%, depending on the strategy. The near optimal policy was not more profitable than the strategy where beef semen was based on the dam's genetic merit. In conclusion, the economic value of increased reproduction was greater in mating strategies that include sexed and beef semen than when only conventional semen was used.

Key Words: economics, beef-on-dairy, reproduction

1431 Applied use of embryo technologies in dairy cattle. R. Sartori*[1], N. P. Folchini[1], D. Demétrio[2], and P. S. Baruselli[3], [1]*Department of Animal Sciences, University of São Paulo, Piracicaba, São Paulo, Brazil,* [2]*RuAnn Genetics, Riverdale, CA,* [3]*Department of Animal Reproduction, University of São Paulo, São Paulo, São Paulo, Brazil.*

Despite great advances in knowledge of physiology, genetics, management, and technologies in the last 20 years, reproductive efficiency is still a challenge for dairy cattle. The applied use of embryo technologies has the potential not only to accelerate genetic gain, but also to improve reproductive efficiency, especially under challenging conditions, such as heat stress (HS). This abstract summarizes the state of the art for production of in vivo derived (IVD) and in vitro produced (IVP) embryos and their successful use in dairy cattle. Recently, we performed a study that evaluated FSH regimens for superovulation, as well as, the technology of sex-sorted semen (SexedULTRA 4M) of sires classified by field fertility, for embryo production (n = 131). Superstimulating cows with decreasing or constant doses of FSH induced similar embryo yields (4.1 ± 0.5 *vs*. 3.2 ± 0.3). Moreover, sires classified as high field fertility produced more transferable embryos (4.4 ± 0.5 *vs*. 2.6 ± 0.4), despite high variability among bulls. When data of IVP and embryo transfer in dairy cattle from RuAnn and Maddox Dairies (USA) were analyzed, many factors contributed to the production of a live calf from an embryo. Attention to details in every step of the process was crucial for success, such as quality of the oocyte at the start of IVP. Moreover, synchronization of follicular wave emergence and stimulation with one single treatment of FSH improved oocyte quality and embryo production. A good quality IVP embryo (grade 1), especially at the blastocyst stage, transferred by an experienced technician to well managed recipients on d 7 or 8 of the estrous cycle results in more pregnancies per ET, although high pregnancy losses may be an issue, especially with IVP embryos. Lactating dairy cows under HS, might have impaired oocyte and early embryo quality, and transfer of an embryo can help to reestablish fertility, surpassing AI results during warmer months. To optimize profitability, either IVD or IVP embryos should be produced using sex-sorted sperm and both can be transferred in cows under HS. In summary, embryo technologies can increase reproductive efficiency and production in dairy cattle. FAPESP Grant 2018/03798–7.

Key Words: dairy cow, embryo transfer, in vivo

1432 Dam and sire effects on early embryo survival. P Lonergan*, *University College Dublin, Dublin, Ireland.*

Pregnancy loss is recognized as a major cause of reproductive failure in cattle. In high-producing dairy cows, as many as 50% of embryos may no longer be viable by Day 7. A further proportion of loss occurs in the period of post-hatching conceptus elongation and interferon-tau (IFNT) production associated with lack of appropriate signaling to the uterus leading to failure of maternal recognition of pregnancy. The direct contribution of the sire to embryo loss is unclear but recent studies indicate an influence on embryo development, conceptus elongation and embryo-maternal signaling. Nonetheless, sire fertility is a major contributor to overall reproductive performance, particularly in the context of AI where, despite sperm quality being scrutinized, significant variation exists in field fertility. On the female side, oocyte quality can be impaired due to a variety of factors including lactation-induced metabolic stress. Progesterone plays a major role in regulating endometrial function including conceptus–maternal interaction, pregnancy recognition, and uterine receptivity. In particular, low progesterone has been implicated as a causative factor in low pregnancy rates observed in high-producing dairy cows, most likely through alterations in the endometrial transcriptome leading to impaired conceptus elongation and inadequate endometrial signaling. Indeed, the endometrium can act as a sensor of embryo quality with its transcriptome being reflective of the developmental competency of the conceptus. For example, the response of the uterus differs between conceptuses derived from AI vs cloning, conceptuses derived from in vivo vs in vitro derived blastocysts and age-matched short and long conceptuses. While the majority of these differences are associated with IFNT production, many of the altered genes are induced by conceptus-derived, but IFNT-independent, factors. Increased knowledge of the regulation of conceptus-endometrial interactions is necessary to understand and elucidate the causes of pregnancy loss and provide a basis for new strategies to improve pregnancy