FAST FACT

EVALUATION OF THE FERTILITY OF *IN VITRO*-PRODUCED EMBRYOS IN DAIRY HERDS

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SUMMARY

- *In vitro* embryo production can accelerate genetic gain by facilitating multiple matings between elite dams and sires
- *In vitro* produced embryos generated using slaughterhouse ovaries from beef dams as the source of oocytes could improve the beef merit and economic value of nonreplacement calves.

INTRODUCTION

In most dairy herds ≥60% of the calves born are destined for beef production. Many of these are male offspring of dairy sires and have low economic value. Many dairy producers are increasingly using sexed dairy semen to generate replacements, and mating dairy dams not required to generate replacements to beef sires. Assisted reproductive technologies, particularly *in vitro* embryo production (IVP) and embryo transfer (ET) can contribute to accelerating genetic gain in both dairy breeds and beef breeds suitable for mating with dairy cows by allowing an increased number of offspring to be produced from genetically elite dams. Using ovaries collected from beef dams post-slaughter to produce IVP beef embryos, it is also possible to transfer beef embryos into dairy cows that are not required to generate replacements, resulting in calves with 75–100% beef genetics coming from the dairy herd.

IVF-ET TRIAL MOOREPARK

In spring 2021, a large field trial was undertaken to evaluate the production and use of fresh and frozen IVP embryos and ET in a pasture-based, seasonal calving dairy system. Specially, the trial used commercial IVP practices to produce embryos with the following objectives:

- Evaluate the potential to accelerate genetic gain in dairy cattle (Economic Breeding Index; EBI) using live elite dairy dams as oocyte donors
- Evaluate the potential to accelerate genetic gain in a beef breed suitable for crossing on the dairy herd (Dairy Beef Index; DBI) using live elite beef dams as oocyte donors
- Evaluate the potential to impregnate dams that are not suitable for generating replacements with beef embryos (commercial beef).

The elite dairy and elite beef embryos were produced after collecting oocytes from 40 elite dairy dams (weekly for eight weeks) and 21 elite beef dams (weekly for eight weeks) using a technique called ultrasound-guided transvaginal ovum pick-up. To produce commercial beef embryos, ovaries were collected from 119 beef heifers post-slaughter (once), and oocytes were harvested. All oocytes were fertilised in vitro with sperm from high EBI bulls for the elite dairy embryos and with sperm from high DBI bulls for

both the elite beef and commercial beef embryos. After fertilization, the developing embryos were cultured in a lab incubator for seven days and either frozen or transferred fresh. 1,200 lactating dairy cows in nine herds were synchronized using a standard 10-day Progesterone-Ovsynch protocol. On the day of synchronised estrus, 20% of the cows were bred to AI (as normal). The remaining 80% of the cows were not bred, and instead assigned to receive embryo transfer seven days later. In seven of the herds, 40% of the cows were assigned to receive an elite dairy embryo (of which 50% were fresh and 50% were frozen) and 40% were assigned to receive an elite beef embryo (of which 50% were fresh and 50% were frozen). In the remaining two herds, 80% of the cows were assigned to receive a commercial beef embryo (of which 50% were fresh and 50% were frozen). Immediately before ET, cows were examined by ultrasound to determine suitability, after which 9.5% of cows were deemed unsuitable for ET. Pregnancy rates were determined on day 32 after synchronised estrus.

RESULTS

The provisional pregnancy rate results are presented in Table 1.

TABLE 1. PREGNANCY RATES DETERMINED ON DAY 32 AFTER SYNCHRONISED ESTRUS FOR COWS BRED USING AI OR ET

	AI	ET — DAIRY		ET — BEEF	
		FRESH	FROZEN	FRESH	FROZEN
% Preg., All Cows	47.7	61.1	40.1	51.7	41.2
% Preg., Elite Embryos	43.8	61.1	40.1	49.1	43.5
% Preg., Commercial Beef	54.2	-	-	55.8	35.0

Overall, there were no differences in pregnancy rate between cows bred using AI and ET, nor were there differences between dairy ET and beef ET. Of note, the pregnancy rate for fresh ET was better than frozen ET. The difference between fresh ET and frozen ET was more pronounced for dairy embryos than for beef embryos. Note that the values in Table 1 are only for cows bred, and does not adjust for cows that were synchronised but deemed unsuitable for ET.

CONCLUSIONS

The IVP method of producing embryos allows for oocytes to be collected multiple times between calving and the beginning of the breeding season and as such, fits well with a seasonal-calving, pasture-based production system. The results indicate that fresh embryos had better pregnancy rates than frozen, and achieved pregnancy rates comparable to AI. The calves will be monitored after birth to evaluate the rate of genetic gain and added value from elite dairy, beef and commercial beef embryos.