Bovine *in vitro* Production (IVP) through Ovum Pick UP (OPU) vs. Multiple Ovulation Embryo Transfer (MOET)

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There is an intensive increase in livestock breeding through production of embryos. Embryos can be produced *in vivo* or *in vitro*. Production of *in vivo* embryos can be achieved by the method Multiple Ovulation Embryo Transfer (MOET) often referred to as conventional embryo transfer, ET. The procedure requires a pre-treatment of the donor cow with gonadotrophic hormones resulting in multiple ovulations. Artificial insemination is then performed and 6-7 days after a number of in vivo embryos can be flushed from the uterus. Normally in the range from 3-20 embryos can be obtained and in average 12 embryos per session. This procedure can be done 2 months apart and only in cows responding well to the hormones. *In vitro* production (IVP) is a process of ultrasound guided ovum pick-up where oocytes are subsequently matured, fertilized and cultured *in vitro*. It is possible to achieve in average 8 oocytes per session, resulting in 4 embryos, however, the procedure can be performed as often as biweekly, though most common is bimonthly. The advantage of IVP vs MOET, besides producing 5- fold the number of embryos per year, is that it can be performed without hormone stimulation, as well as on pre-pubertal heifers and pregnant cows. For comparison over a 6 months period it is possible from one cow to produce 9 calves with the MOET method vs 52 calves with the OPU-IVP method. Embryos can, regardless of production method, be transferred to hormone synchronized recipient cows or cryopreserved through conventional freeze or vitrification, the latter becoming the more preferred method.

IVP has over the past years gained widespread implementation in cattle breeding particularly in South and North America but is increasing rapidly throughout the rest of the world. For the first time in history in 2017 the number of IVP embryos exceeded the number of *in vivo* produced embryos. In addition, North America became the largest producer of IVP embryos in the world, a position previously held through all embryo production years by South America. IVP is one of the most efficient ways to accelerate animal breeding, improve genetics and hence production of meat and milk, making it possible to rapidly multiply and breed genetically superior cattle. Furthermore, it reduces environmental impact from the increasing animal production requested by a growing world population particularly in developing countries. By genotyping embryos from a trophectoderm biopsy their genomic breeding values can be calculated and novel aspects such as feed-efficiency and reduced methane-production correlation can be estimated.

References

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United Nations Population Fund (UNFPA) http://www.unesco.org
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