

## **Importance of advanced biotechnologies supply for Czech Holstein farmers: a highlight**

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Genomic selection in Holstein breeding is the positive and negative selection of animals based on their genomic profile expressed as a genomic breeding value. Due to its sophisticated mapping technology and precise database of genotyped animals, this estimated breeding value is constantly improving. Utilizing this method accelerates the genetic progress of herds and population. The genetic material market, which includes semen, embryos and animals, is also rapidly and positively influenced by the above-mentioned factors. Genomic selection also creates a greater interest in genetically determined traits like the absence of horns in animals.

Consequently, the genomic age is leading in developed countries and is related to the growing demand for more intensive reproductive biotechnology utilization. Farmers more than ever intend to produce top genetic material from their herds faster, more intensively and with a higher effect. Commercially provided genotypization at a herd level is currently used not only for production of bull mothers and young sires but also for herd breeding programs. The primary goal of such a herd program is to obtain more offsprings from genetically superior donors for the purpose of sales and increasing genetic progress in one's own herd; this is typically done by implanting embryos in genetically inferior recipient females.

A possible approach to accelerating genetic progress could be the utilization of reproductive biotechnologies. Reproductive biotechnologies, which include hormonal stimulation and synchronization, embryo transfer (ET), ovum pick-up (OPU) and *in vitro* fertilization (IVF), are able to increase reproduction efficiency and the utilization of female reproductive abilities. Compared with ET, the OPU procedure, based on repeated oocyte transvaginal aspiration from the ovaries during the ovarian cycle, offers as much as a 3 fold offspring yield per cow per year. Moreover, the use of *in vitro* fertilization is an effective way to eliminate the

disadvantages of sexed semen in artificial insemination, e.g., decreased pregnancy rate etc. In countries with advanced breeding practices, the benefits of OPU/IVF are amplified, especially by genomic selection of heifers.

Genotyping heifers, as a first step, provides a more accurate selection of potential donors. As second step, reproductive biotechnologies such as OPU promise to obtain oocytes from young heifers. The third step is IVF using top genomic young or proven sires, wherein oocytes of a single donor can be fertilized by sperm from different sires. A potential fourth step is to biopsy and genotype embryos before implantation or freezing.

The above described procedure combining genetic selection and reproductive biotechnologies at the farm level is rapidly growing in the USA. We can find a majority of EU countries, including the Czech Republic, that have similar trends only with respect to utilizing genomic selection; however, the supply of commercial OPU/IVF at the farm level is not routine practice.

Although implementation of genomic selection in the Czech Republic is already commercially possible and extensively done through genotyping top domestic animals through international programs (North America, Eurogenomics), planned domestic estimation of genomic breeding values should provide more accurate selection means for the majority of domestic herds in the near future. Therefore, it is extremely important to offer advanced reproductive biotechnologies for farm breeding programs as soon as possible. Utilizing OPU/IVF at the farm level can offer Czech farmers the opportunity to enter markets with top EU Holstein genetic material. This will also help Czech farmers obtain returns on their long term investments in top genetics, technologies and management. Moreover, further delays in biotechnology progress would result in a loss of competitiveness within the EU.

Key words: genomic selection, ovum pick-up, *in vitro* fertilization, genetic progress.