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IVF Technology No Longer Just For Trendy

While the non-invasive technology that currently allows us to perform OPU (Ovum Pick Up) was first developed over 25 years ago, only recently has this process become commercialized, resulting in over 112,000 IVF (In Vitro Fertilization) embryos produced in North America last year. Numerous advancements in the OPU and IVF process have allowed the technology to evolve from only being performed on very valuable donors or in terminal situations, to a technology that is both efficient and affordable.

Arguably one of the most important areas of focus over the past 25 years has been donor preparation. Starting with good quality oocytes is key to creating embryos and ultimately pregnancies. While several different stimulation protocols exist, there is little doubt that super-stimulation results in a more homogeneous population of follicles, yielding more competent oocytes resulting in a greater number of transferrable embryos per donor.



However, one of the factors limiting OPU/IVF program adoption was that a highly skilled

veterinarian must perform the detailed and technical aspiration technique. This meant that fewer people were available to perform the OPU procedure, but, as the demand for this service has grown, more veterinarians have been trained to perform aspirations and are incorporating OPU/IVF services into their business plans. And, like conventional flushing, many dairymen and ranchers would prefer to have the veterinarian come to them, as opposed

to hauling their valuable animals to a separate location. Some vets have even responded to this demand by creating mobile labs allowing them to aspirate anywhere there is a heated collection room, and then process the oocytes on farm. This convenience allows more producers to use OPU/IVF services.

Not only do we now better understand donor management and have greater

access to skilled professionals that can perform OPU, but several advancements have also been made at satellite centers and regional IVF labs. Satellite OPU centers allow for

greater access to OPU technologies for producers throughout the U.S. and Canada, while the regional IVF lab offers benefits of concentration of resources and skilled personnel. The oocytes mature in shipment from the satellite center to the IVF lab, and are fertilized upon arrival. A misconception exists about the success of sexed frozen semen versus conventional semen to fertilize an oocyte. Yes, there are certainly differences in embryo yield

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+112,000

IVF Embryos Produced In North America In 2014

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when conventional embryo donors are bred with sexed semen, but with IVF at Boviteq, embryo yield between donors mated with conventional, sexed frozen or reverse sorted semen result in comparable rates.

After the oocytes are fertilized, they are moved to a different type of media to mature, known as culture media. Boviteq has developed its own proprietary culture media suite designed to mimic the uterus' chemical make-up. As Semex researchers more accurately characterize the uterus, improved culture media lead to a more suitable environment in which embryo development can occur. Improved culture conditions over the last five years have improved both embryo development rates and embryo quality.

Once the embryos have developed, they can either be shipped back to the farm for fresh embryo transfer or frozen for use at a later date. At Boviteq, we realized that with sub-optimal culture media, IVF embryos can be more sensitive than conventional in-vivo embryos when subjected to freezing. Therefore, several freezing techniques have been developed to increase post-thaw embryo survival.

An example is vitrification, a method in which an embryo is cryopreserved very quickly in a small amount of media, with an increased cryoprotectant concentration. This method works well in human IVF clinics, because in theory, it's gentler on the embryo. However, warming a vitrified embryo can be complicated and cause toxicity if left too long in the cryoprotectant. Plus, warming vitrified embryos requires a skilled technician and a microscope chute side.

Another method for freezing IVF embryos uses a glycerol solution. Again, the procedure is theoretically gentler for the embryo, but the thawing process is complex. Conventional freezing methods use ethylene glycol and result in direct transfer (DT) embryos. Used for many years with conventional flushed embryos, it is the preferred method in

terms of ease of use since the straws containing embryos are simply thawed in warm water, loaded into a warmed ET gun and transferred. At Boviteq, our unique culture media suite results in embryos that are frozen for direct transfer resulting in a pregnancy success rate between 55-65%.

Earlier IVF technologies were described as yielding calves that were different than those that resulted from the transfer of conventional flush embryos. One example of this is the 'large calf syndrome,' a problem that is much less prevalent today. Previously, IVF systems co-cultured embryos with cells from the oviduct, and added fetal calf serum to the media. This increased embryo development and growth and was scientifically proven to result in the differences seen between calves from IVF and conventional flushes.

Boviteq's current culture media suite does not use either of those additives, so the frequency of large calves is not higher than calves resulting from conventional embryos. In the 2014 calving season, large calves accounted for 0.6% of births in the Boviteq recipient herd.

Given that global IVF embryo production has consistently increased in the last 15 years, look for advances in research to continue propelling IVF embryo production numbers. And, as more markets open and allow IVF embryos to be imported, demand will drive technological advancements even further. Producers will challenge researchers to push the limits of physiology by using younger donors and bulls, and innovations in human fertility will continue benefiting dairymen and ranchers. Though OPU/IVF processes are still being improved, this assisted reproductive technology is no longer just trendy, but rather an important tool that will be used by many farmers in the future.

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