Control of Farrowing

Generally, farrowing within a group of sows is spread over several days. Due to an increased focus on biosecurity and piglet health, there is renewed interest in batch farrowing and all-in-all-out production. Properly timed induction of farrowing increases the proportion of sows farrowing during normal working hours. It's important to note that successful induction requires treatment within two days of the expected normal farrowing date.

Available technologies for precise control of reproduction have been implemented in part or in whole by early adopters. These technologies are not therapies for reproductive problems the way antibiotics are for disease, but are designed to enhance production efficiency.

At present, the primary impediment to more universal application of these technologies is critical training of all personnel regarding the importance of proper and precise implementation. Careful timing of treatments and correct dosing of products are primary issues that limit the precision of these technologies. These are issues worth addressing, as pig reproduction is like proposing to your future spouse: There's no way around it, so you might as well do it right.

Part two: Application of sexed sperm in pig production

The use of sexed sperm has been primarily synonymous with cattle, but why should they have all the fun? Significant investment in research and development has made this technology available to other commodity groups including pigs. Commercial application of sexed sperm is expected to increase as the level of fertility approaches that of conventional AI and as the sorting capacity improves. So the timing was right for Kilby Willenburg of Fast Genetics to explain the processes of flow cytometric sperm sorting and how this technology can be applied to the swine industry.

Flow Sorting of X and Y Bearing Sperm

The effects of sorting, particularly on the sperm membrane, are well characterized and include several stressors and potential dangers to the gamete resulting in reduced viability, storage capacity and fertilization. Sperm are exposed to Hoechst staining, high dilution rates, laser exposure, high pressure, electrical charging, changes in media composition and centrifugation, which are collectively thought to reduce the lifespan of the sorted sperm.

Kilby Willenburg of Fast Genetics

Interestingly, inter and intra-boar variation exists for sperm to withstand flow cytometric sorting as it was reported that 15 per cent of boars did not exhibit a well-defined distinction between the X- and Y-bearing peaks in a histogram plot. Hence there is value in determining which boars can withstand the sorting process to ensure sufficient post-sort motility and viability to accommodate a greater distance between the sows and sorting lab.

Fertility of Sexed Sorted Sperm

The application of sexed sorted sperm in the swine industry must overcome some challenges before this technology can be used commercially. Flow cytometric sperm sorting speeds are a limitation, especially for an industry that inseminates 2.5-3.0 billion sperm in 75-100 mL of extender. Although sorting speeds have improved to around 20 million cells per hour, one A.I. dose would require about 100 hours of sorting time. To overcome this obstacle, new insemination techniques have been used to reduce the number of sperm and deposit the sperm closer to the site of fertilization.

One such technique is Laparoscopic insemination (LAI), which appears a plausible alternative to inseminate pigs from a sorting perspective. It could be a realistic model for sexed sperm on nucleus or multiplier herds since one gender is generally preferred and fertility could be reduced if additional animals from the desired gender are produced. This technique is still relatively new in terms of use with sexed sperm but has shown promising results.

Deep uterine insemination (DUI) is another option for inseminating reduced numbers of sexed sperm, particularly on a commercial farm. A DUI catheter longer than 1.5 m has to bypass the cervical folds and manipulate the length and coiled nature of the uterine horn prior to depositing cells in one of the horns.

Collectively, LAI and DUI enable the swine industry to reduce the number of sperm inseminated and further leverage a particular boar across multiple females, which is not realistic for inseminations that require billions of sperm per female.

For example, a boar that is used for cervical inseminations at 3 billion cells can produce almost 8,000 pigs a year, while that same boar can produce almost 8 million pigs when used in a laparoscopic model, assuming all sperm cells are used for insemination (and you thought you were overworked). A more realistic model for commercial farms would be an insemination dose of 500 million cells and 45,000 slaughter pigs produced per year.

At present it's unclear when sexed sperm will be ready for commercialization. Sorting speeds are a popular area of concern, especially for an industry that relies on billions of sperm for one insemination dose. Speeds have increased from 200-600 cells/second in the earlier years to 8,000-10,000 cells/second from improved digital technology and partial automation. For an industry that relies on 6-9 billion cells per breeding female, however, inseminating 50-500 million sperm might be a difficult transition. Sorting speeds will continue to improve but a reduction in sperm cells is needed for inseminations similar to what the dairy industry experienced in the earlier years of the implementation of sexed sperm.

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