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Use of seminal plasma shows promise for fertility of

Adding 10 per cent seminal plasma has been shown to reduce injury to sperm in lab tests. Now the hope is that adding 50 per cent will improve sow fertility in the field

Maximizing herd health and reproductive efficiency requires requires wider use of cryopreserved (frozen) sperm. From a biosecurity standpoint, cryopreserved sperm is a better option than using fresh semen because the latter increases the risk of disseminating pathogens transmissible via semen, such as viruses causing Porcine Reproductive and Respiratory Syndrome, Porcine Circovirus Associated Disease and classical swine fever.

Using cryopreserved sperm allows the sire line to be "quarantined in a liquid nitrogen tank" for a predetermined time before insemination, enabling health concerns to be identified before the semen is used. Moreover, unlike fresh semen, cryopreserved sperm does not have to be used within 72 hours of collection.

Where cryopreserved sperm does not yet deliver, however, is in terms of fertility. The use of cryopreserved sperm in swine breeding is presently associated with major reductions in farrowing rates and litter sizes. At present, using cryopreserved sperm in swine breeding leads to major reductions in farrowing rates and litter sizes This is because the sperm are injured during the freezing and thawing processes. The ability to limit and possibly reverse this effect in laboratory tests using 10 per cent seminal plasma has been well documented, but, so far, the same results have not emerged in field tests. However, it has recently been suggested that a higher inclusion level will improve sow fertility.

"If we can determine an appropriate inclusion level of seminal plasma," says Roy Kirkwood, Associate Professor in the Department of Large Animal Clinical Sciences at Michigan State University, "the use of cryopreserved sperm can be advocated with swine. Further, once a beneficial effect of seminal plasma on actual fertility in live sows is documented, research can be directed towards finding the active principle(s) involved, so that the need for seminal plasma can be eliminated."

Kirkwood adds: "Interestingly, we have recently shown that, compared to a 10 per cent inclusion level, 50 per cent seminal plasma will improve the quality of thawed sperm in vitro."

In January, Kirkwood began a further study to demonstrate that inclusion of 50 per cent seminal plasma in the semen extender will repair sperm injury and allow normal sow fertility following insemination of cryopreserved boar sperm. "Prior to

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in improving cryopreserved sperm

these studies, we accumulated a pool of seminal plasma from boars housed at a commercial boar stud facility," says Kirkwood "and purchased both cryopreserved and fresh semen doses from three boars."

At weaning, 90 sows received injections to induce estrus and ovulation. Only sows exhibiting estrous behaviour in the presence of a boar at their designated time of breeding were assigned by parity to be artificially inseminated. "Positive" control sows received live fresh sperm via a single intra-uterine artificial insemination, "negative" control sows received live thawed sperm, and "treatment" sows received live thawed sperm in 50 per cent seminal plasma.

Thawing of seminal plasma was done in water heated to 37 C; then it was added to the extender prior to thawing of the sperm to allow immediate contact between the sperm and seminal plasma. All doses of fresh and thawed sperm were extended to a total volume of 60 millilitres and 3 x 10^9 live sperm and were deposited trans-cervically in the presence of a boar. Sows are being allowed to go to term to permit determination of farrowing rates and litter sizes.

Data to be recorded include pre-treatment litter size suckled, lactation length, wean-estrus interval, whether or not the sow farrowed to the first service, and subsequent litter size. The data will then be analyzed using appropriate statistical methods.

In terms of results, Kirkwood says: "We expect that sow fertility will be, as a minimum, maintained at current levels in the positive control group, but farrowing rate and litter size reduced by 35 to 50 per cent and two to three piglets, respectively, in the negative control group."

Furthermore, he says, "we anticipate that inclusion of seminal plasma at 50 per cent in extended cryopreserved sperm will reverse the capacitation-like effect and other freezing-related cryoinjuries, and so allow optimal sow fertility from insemination of cryopreserved sperm."

Once a field test (in vivo effect) on sow fertility is demonstrated, it will provide the impetus to further examine seminal plasma with a view to discovering the active principles involved.

"The potential impact of being able to fully utilize cryopreserved boar sperm is incalculable," says Kirkwood. "Its value to herd health indisputable, as evidenced by widespread disease outbreaks attributable to contaminated fresh-extended boar semen. The long-term goal is to determine the proteins involved in the effect and being able to eliminate the need for seminal plasma. This would be the subject of future experiments."

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