PRACTICE TIP

Cytoplasmic droplets on boar sperm cells

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Many veterinarians and AI stud managers have inquired about the significance of cytoplasmic droplets on boar sperm cells. I currently advocate using ejaculates for artificial insemination (AI) which have fewer than 20% morphologically abnormal sperm, with no more than 15% attributable to cytoplasmic droplets. There is, however, little published research on cytoplasmic droplets and their effect on fertility in any species. So what do we really know?

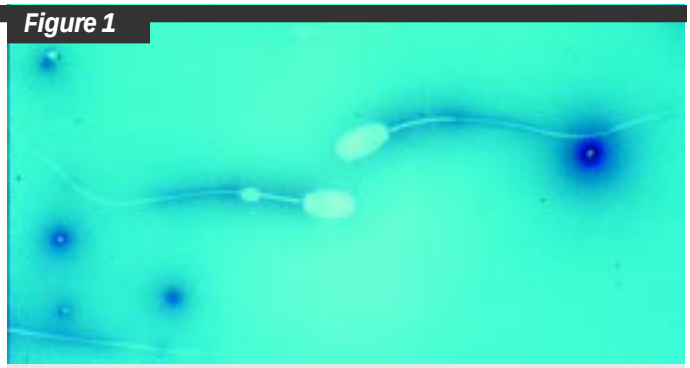
In males of both singlet (i.e., monotocous) and litter-bearing (i.e., polytocous) species, cytoplasmic droplets are usually found in one of two positions on the midpiece: at the terminal portion of the midpiece (distal; Figure 1), or surrounding the neck/upper midpiece region (proximal; Figure 2). In monotocous species (e.g., bovine, equine), distal droplets are considered a less serious problem than proximal droplets. Some have extrapolated this view to polytocous (e.g., swine) species. In general, fertility data collected from monotocous species does not necessarily correlate well with fertility data from polytocous species, because polytocous species manifest subfertility in both conception rate and litter size. One should, therefore, be cautious at extrapolating between the species types.

The work of Waberski et al.,[1] demonstrates that extended porcine semen exhibiting a high percentage of sperm with proximal and distal cytoplasmic droplets had a negative correlation to both pregnancy rate and litter size. This provides evidence supporting the possibility that the presence of cytoplasmic droplets on porcine sperm cells may compromise fertility. A review of the literature provides ample information to establish normal spermatologic values for boar semen in the general population.[2–8] Generally, adult boar ejaculates have greater than 80% morphologically normal sperm, with less than a 10%–15% prevalence of proximal and distal cytoplasmic droplets. Morphologically abnormal sperm are an indicator that a disruption in spermatogenesis, maturation, or semen handling has occurred. When an increased number of sperm in an ejaculate exhibit abnormal morphology, the vitality of the sperm that appears "normal" comes into question because both the normal and abnormal sperm present in a given ejaculate undergo spermatogenesis, maturation, and handling at approximately the same time. Sperm morphology estimation, therefore, should be used primarily as a quality control parameter for overall quality of the ejaculate.

In modern AI systems, it appears to be more cost effective to discard abnormal ejaculates than to use ejaculates that exhibit a high number of morphological abnormalities (e.g., cytoplasmic droplets) which are of a transient nature. Thus, boars that produce abnormal ejaculates should be excluded from the breeding program until they either produce normal ejaculates or until research demonstrates that the abnormality they exhibit represents normal variation for the species, with no effect on fertility. This issue is even more critical today because AI allows on average 8–15 times more services per boar than with a natural mating program. Additionally, definitive diagnosis of subfertility is difficult at best because most animals tend to not be permanently subfertile, and because a multitude of factors other than male subfertility can contribute to poor pregnancy rate and litter size.

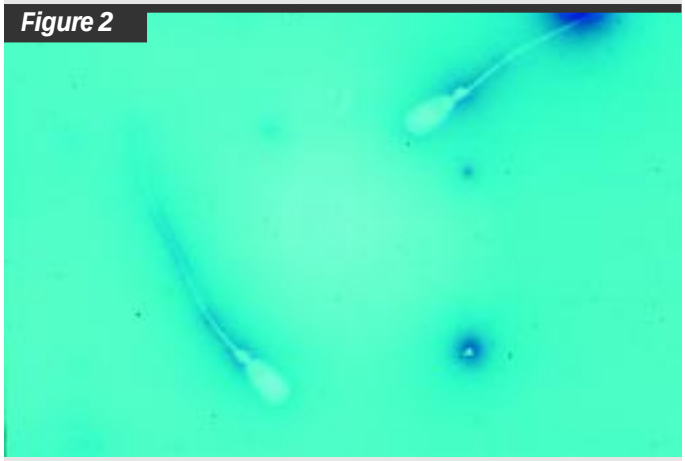
Given the aforementioned, I would recommend only using ejaculates for AI that exhibit < 20% morphologically abnormal sperm, with < 15% proximal and distal cytoplasmic droplets. Boars that produce unacceptable ejaculates should be collected on a weekly interval; if no improvement is seen in ejaculate quality over a 3-month period, the animal should then be culled from the breeding program.

Figure 1



A normal sperm (above) and a sperm with a distal cytoplasmic droplet (below).
×100; oil immersion

Figure 2



Two sperm with proximal cytoplasmic droplets.
×100; oil immersion

References

1. Waberski, et al. *Anim Reprod Sci.* 1994;36:145.
2. Althouse. *Comp Cont Ed Pract Vet.* 1996;19:30.
3. Bach, et al. *Monat Vet.* 1982;37:463.
4. Bonet. *Anim Reprod Sci.* 1990;22:67.
5. Borg, et al. *Biol Reprod.* 1993;49:515.
6. Larsson, et al. *Nord Vet Med.* 1980;32:533.
7. Smital. *Zivocisna Vyroba.* 1993;38:415.
8. McKenzie, et al. *Miss Ag Exp St Res Bul.* 1938;279.

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Practice tips are not refereed

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