An analysis of Selected Aspects of Sperm Quality in Fresh and Cooled-Storage Stallion Semen

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INTRODUCTION

Artificial insemination is used more and more in horse breeding, as it offers many advantages over natural breeding. The most important of these is the possibility of choosing the stud from the large number of stallions on offer, lowering the safety risk for both mares and stallions (Janett et al. 2003a) and reducing the risk of the transmission of infectious diseases and transport inconvenience (Janett et al. 2003a; Aurich, 2012). In addition, when compared with those from natural mating, pregnancy rates have been shown to be equal, or even higher, after artificial insemination with fresh, or cooled-storage semen (Janett et al. 2003a; Janett et al. 2003b).

Like many other mammals, Equidae directs their reproductive activity into a season, so that it is as advantageous as possible for their young. Seasonal changes in the length of the day are the main cause of the increase and decrease in the sexual activity of horses (Janett et al. 2003a; Gamboa et al. 2010). Horses are seasonal animals, with maximal reproductive activity in late spring and summer (Aurich, 2016). In order to achieve maximal reproductive performance in stallions, their normal sexual behaviour and libido must be maintained. This ensures that a high quality of ejaculate can be taken (Sieme et al. 2004), when the frequency of taking samples, and the intervals between them, are suitable.

How to evaluate the quality of stallion ejaculate?

The qualitative parameters of ejaculate include, without a doubt, the number of spermatozoa, sperm motility and the number of morphologically normal spermatozoa (Colenbrander et al. 2003; Love, 2011). These basic parameters usually uncover clear cases of lower fertility, or infertility, in a given individual (Rodriguez-Martinez, 1998). Other parameters, which also definitely belong among the qualitative indicators of ejaculate, are sperm chromatin integrity (Graham, 2001; Rečková et al. 2008;
Sudden changes in temperature can cause heat shocks, which lead to irreparable damage to the sperm (Samper et al. 2007). The diluent intended for diluting the selected ejaculate is always added gradually and is constantly mixed. The solvent used must be sterile and pre-heated to the same temperature as the diluted ejaculate (Ball and Peters, 2004).

The correct diluent must have the following characteristics: it must be a source of energy for the sperm, have good buffering abilities, contain a small quantity of electrolytes, ensure the required osmotic pressure, maintain a constant pH level (that corresponds to the requirements of the ejaculate), it cannot be toxic to sperm, and it must be sterile and economically accessible (Louda et al. 2001). The composition of each diluent significantly influences the lifespan and fertilization ability of the sperm in the insemination dose (Siddique et al. 2006). In practice, a whole range of mostly commercial diluents are used to dilute stallion ejaculates that are intended for the production of insemination doses. They are supplemented by various types and varying amounts of accessibility. Restrepo et al. (2012) and Janett et al. (2012) used Equipro (Minitube International), with the addition of DMF and egg yolk. Morillo Rodriguez et al. (2011) and Puglisi et al. (2016) used a commercial solvent, GENT (Minitube International), which contains yolk solvent, with glycerol and antibiotics.

Morillo Rodriguez et al. (2011) and Janett et al. (2012) used INRA 96 (IMV) diluent, with yolk and glycerol. Lorenzoni et al. (2011) and Janett et al. (2012) used INRA 82, with the addition of glycerol. In the last few years, studies have proved that it is possible to physically remove bacteria from the ejaculate, using the Single Layer Centrifugation method, without needing to use antibiotics (Morrell and Wallgren, 2011; Morrell et al. 2014). Morrell and Rodriguez-Martinez (2009) demonstrated an improvement in the quality of sperm could be achieved using the single layer centrifugation method on various types of animals, including stallions. If the ejaculate is kept for longer than 6 hours, it should be placed in cooling equipment, where a constant temperature of 5-8 °C is maintained, for a period of 48 hours (Samper, 2009), or 40 hours (Aurich, 2008).

The significance of cooling the ejaculate lies in the fact that the metabolism of the spermatozoa is significantly lowered. This lowers the number of metabolic products separated into the diluent in which the sperms are kept (Samper, 2009). Cooling the spermatozoa, from 18 °C to 8 °C, is a critical step and can cause specific damage to the sperm plasma membrane (Aurich, 2008). The individuality of the stallion, which greatly differs (Janett et al. 2003b) between stallions, has a crucial influence on the resulting quality of the cooled-storage insemination dose.

Diluting ejaculate and its later, cooled-stored semen

The actual dilution of ejaculate precedes its macroscopic and microscopic evaluation. The temperature of the diluent and the diluted ejaculate must be the same (±1 °C), so that cold shocks are avoided (Ball and Peters, 2004). According to Samper (2009), the percentage of motile spermatozoa is significantly influenced by temperature. It was proved that a temperature of just 22 °C can lower the progressive motility of sperm by 25% when compared with a temperature of 37 °C. Temperatures of more than 37 °C are also harmful to sperm motility, as temperature shocks can occur. During the collection of ejaculate, it is very important to ensure that the ejaculate, and also all the equipment which is in contact with it, is maintained at body temperature.
The correct collection and handling of the ejaculate are the keys to maintaining the quality of ejaculate during its processing and chilled storage. The collection of semen should occur after minimal sexual stimulation and ejaculation should occur during the first mounting. These conditions should lead to the collection of ejaculate that has a higher concentration of sperm, a lower percentage of semen plasma and minimal contamination by bacteria (Aurich, 2008). A higher percentage of semen plasma in the ejaculate has a negative influence on sperm motility (Janett et al. 2003b). The processing of stallion ejaculate is far from standardized between the individual AI centers (Heckenbichler et al. 2011).

CONCLUSION

The sperm quality parameters for stallions, and the subsequent production technology of cool-stored insemination doses, have not been totally specified. As for the issue of the quality assessment of stallion ejaculate and its processing and storage possibilities, so many questions remain to be answered. In this area, there is great scope for further development and research.

REFERENCES

Missouri, USA.