LONG-TERM LIQUID BOAR SEMEN PRESERVATION – COMPARISON OF THE EXTENDERS

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Abstract

The beginnings of artificial insemination of pigs date back to the 1930s. The physiological specifics of pig reproduction certainly have not done anything to facilitate the development of insemination. The pig is one of only a few species of domesticated animals in which cryopreservation has so far not been successfully mastered. Diluting and preserving of boar semen for its use in artificial insemination is a key element of the technology for inseminating sows which has direct impact on the effectiveness on this method of reproduction in pigs. Modern extenders that extend the useful life of doses to approximately one week and up to ten days. For standard insemination, extenders which keep a dose viable for about 5 days are wholly satisfactory for the time being.

Key Words: Boar, semen, extender, survival rate

The beginnings of artificial insemination of pigs date back to the 1930s. In the 1931, the procedure was developed at Russian state farms where 160 sows were inseminated with various amounts of semen and 31 % of them were successfully fertilized (RODIN and LIPATOV; 1935). In the same year, MCKENZIE (1931) describes the first collecting receptacle for boar semen. We must not also forget of the Japanese great pioneering achievements on the field of how to apply artificial insemination in practice. They began the artificial insemination of sows as early as in the 1931. They described an artificial vagina for the collection of boar semen of their own design, a dummy mount and an insemination apparatus (NIWA; 1958). Following the vanguard of Soviet, American and Japanese experimentations with artificial insemination (with renewed vigor after World War II), other nations also began to look for a solution of the problems, beginning with the Swedes in 1950 (BANE; 1959).

Artificial insemination may well be called the most momentous change in pig-breeding since the beginnings of the domestication of the pig 7-9000 years ago. It was the introduction of artificial insemination which allowed not only a substantial intensification of the breeding process, but above all triggered the rise of large-scale industrial pig farming and thus a major drop in the price of pork. However, the physiological specifics of pig reproduction certainly have not done anything to facilitate the development of insemination. The pig is one of only a few species of domesticated animals in which cryopreservation has so far not been successfully mastered. The further development of these methods is closely linked to the economics of breeding and the economic pressure on the development of insemination methods has historically been headed primarily towards bringing down the price of production, distribution and use of insemination doses (ID) as much as possible.

Now, the prices for boars and the fast progress in quality breeding have shifted the need for long-term preservationprimarily into the area of preserving genetic heritage (i.e., creating a library of genetic resources) and maybe into the area of the specific needs to raise exporting and importing insemination doses. Though, it is more or less already covered in the case of pigs, thanks to the availability of modern extenders that extend the useful life of doses to approx. one week and up to ten days. For standard insemination, extenders which keep a dose viable for about 5 days are wholly satisfactory for the time being. In terms of the historical development, the creation of the short-term extenders currently in use can be dated back to the beginning of the 1970s and that of the long-term extenders to the 1990s. Compared to the current development of technology in all fields of human activity, progress in this particular area is rather slow but the existing extenders appear to satisfy the needs of breeders and ID producers.

Diluting and preserving of boar semen for its use in artificial insemination is a key element of the technology for inseminating sows which has direct impact on the effectiveness on this method of reproduction in pigs. For the time being, the short-term preservation of boar semen in its liquid state remains the most widespread method for preparing insemination doses. On a global scale, 99 % of sows are being inseminated with boar semen which was preserved in its liquid state and preserved at temperatures of 15 to 20 °C, only 1 % of all inseminations is being performed using thawed doses of sperm which was preserved by freezing. What keeps this method of preservation from entering the mainstream are the technological demands, the higher costs and unfortunately also the significantly poorer results of insemination with sperm thus treated for long-term preservation (JOHNSON et al. 2000, GERRITS et al. 2005). These poor results

have caused researchers to primarily seek improvements of short-term and mid-term preservation techniques for liquid insemination doses, which are used to inseminate breeding sows within a few days from collection of the semen. Credit for having moved forward in resolving this issue is due to the working team of Professor WEITZE K. F. (1990), which used a fraction of bovine serum albumin to perfect the preservation of sperm, as an ingredient of the extender which is sold under the trade name ANDROHEP and which is still in widespread use in the Czech Republic.

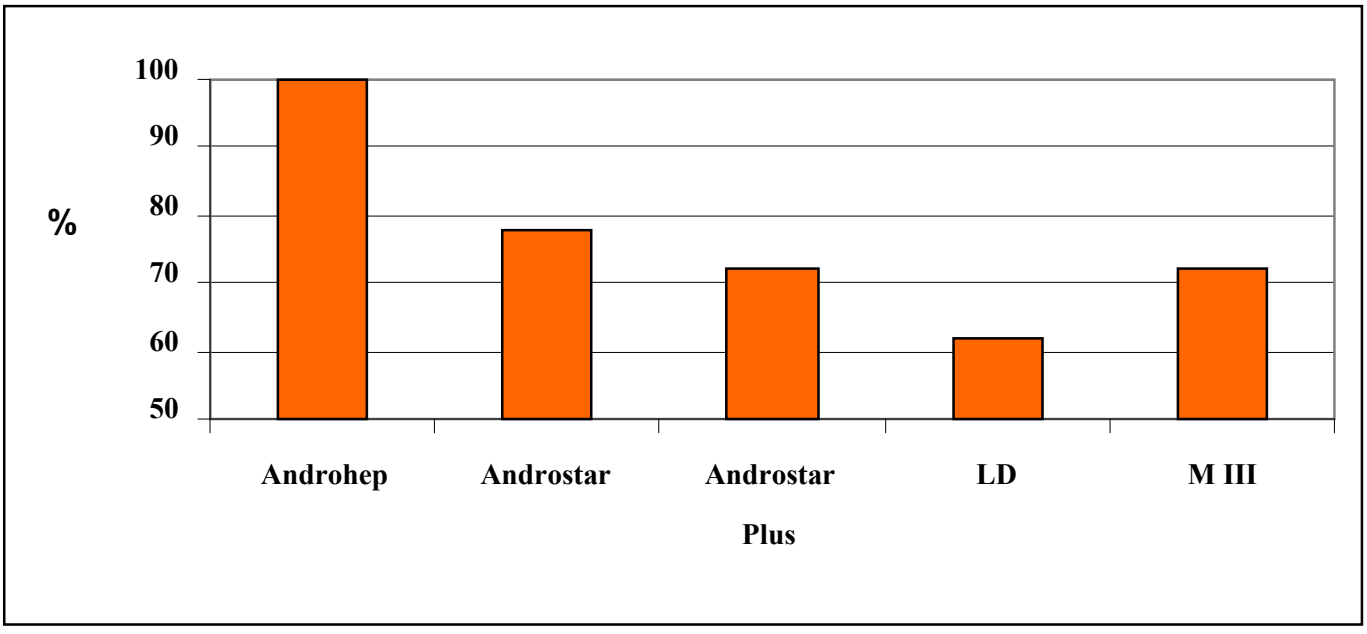
Research of the optimal composition of extenders and their efficacy as a preservative is hampered by the degree to which native semen is being diluted and the proportion of seminal plasma in the insemination dose. To date, the role of the individual components of seminal plasma on the fertilizing capacity in the given insemination dose has not been yet sufficiently studied.

The issue of short-term preservation is at the center of current research interest, as can be seen from a number of published papers on testing the efficacy of available extenders, such as VYT et al. (2004), ESTIENNE et al. (2007), to name but a few, from the fact that the selection of various commercially available extenders is becoming larger and from the efforts made towards achieving an optimal level of short-term preservation of boar semen also e.g. in the Czech Republic (VIP 3 and VIP 5 – Hema Malšice).

The preservation ability of five long-term commercial semen extenders by means of spermatozoa long-term thermo-resistance survival test was evaluated and compared in our study. Ejaculates from 21 fertile boars were collected by hand method. Semen gelfree volume, motility, viability, sperm concentration, total morphologically abnormal spermatozoa and total number of spermatozoa per ejaculate were determined. The samples of diluted sperm in a semen-dilution rate of 1+4 in Androhep (A), Androstar (AS), Androstar plus (AS+); LD and M III were stored at a temperature 17 °C up to 96 h. The test was performed on 3 ml samples kept at 38 °C in water bath each day and motility of spermatozoa was evaluated at the 1st, 3rd and 5th hour during the incubation.

The survival rate significantly decreased parallel with the storage length in all the tested extenders. The total mean values sperm motility was 39.66 %, 30.77 %, 28.55 %, 28.67 % and 24.50 %, respectively, in A, AS, AS+, M III and LD. The total mean value motility observed of Androhep was significantly ($P<0.001$) higher than of the others extenders. In conclusion, the results of this study showed that Androhep was a better extender than Androstar, M III, Androstar plus and LD inters of survival rate of boar spermatozoa for long-term liquid preservation (Fig.1).

Figure 1. Comparison of preservation effects of extenders to Androhep (100 %) in long-term thermo-resistance survival test



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