

Effect of micromycetes on sows productivity

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Seminal quality examinations readily identify animals with low fertility. The influence of fungal contamination of boar-sire semen on the sows' reproductive parameters is studied. Mycological studies of boar semen established the contamination of the ejaculate with microscopic fungi in 55 cases (39 %). It was suggested that the fungal contamination not affected on the volume and concentration of the boar's ejaculates. On the contrary, the volume of the ejaculates that are contaminated by fungi was higher an average of 33.6 cm³ in the comparison with volume of the noncontaminated ejaculates. It was also established that the contamination of semen by microscopic fungi causes a reducing of reproductive indicators of sows. The sow's fertility and survival of piglets are reduced by 18.0 % and 5.8 % respectively. According to our results, the volume and concentration of ejaculates of boars-sires did not change due to presence of microscopic fungi.

Key words: micromycetes (fungi); fertility; sows; semen quality; boar-sires; contamination; artificial insemination; porcine semen

Introduction

Bacteriospermia is a frequent finding in freshly extended porcine semen and can result in detrimental effects on semen quality and longevity if left uncontrolled. The primary source of bacterial contamination is the boar.

Other sources that have been identified include environment, personnel, and the water that is used for preparation of extender. An investigation of microbial contamination of sire's semen was begun in 1950 and further extended in different directions such as determining the degree of contamination and species isolated microorganisms, establishing their influence on semen quality, pregnancy, growth and development of embryos and fetuses, frequency of disease of the reproductive organs of females, fertilized with sperm with varying degrees of contamination by bacteria (Bielanski, 2003; Kumar et al., 2015).

The economic importance of a high breeding efficiency in sows and dairy cows emphasizes the benefit of accurate prediction of fertility of boar and bull semen. The artificial insemination (AI) studs need an objective and rapid, but inexpensive, method to evaluate ejaculates. Currently, artificial insemination (AI) is the technology of reproduction most used on swine breeding farms. However, to have success in AI programs it is essential that boar produce semen doses that can keep both in vitro quality and longevity of post-ejaculated semen. High quality semen doses, able to guarantee the reproductive performance of sows, can only be produced when using ejaculates approved in morphology test, with sperm motility over 70 % and sperm agglutination below 40 %. A critical point in extended semen production is the level of bacterial contamination in raw semen (Al-Makhzoomi et al., 2008; Kirkwood et al., 2012).

It is established that presence of the microorganisms in the semen, reducing the biological quality of sperm, cause changes in the structure of sperm cells. Their number and species composition are growing in the process of semen collection and its storing (Miroshnikova, 2009; 2011). High levels of bacterial contamination are associated with a high incidence of sperm-to-sperm agglutination, damaged acrosomes, poor sperm motility, and reduced shelf life (i.e., decreased sperm longevity) of the extended semen product. If bacterial contamination is left uncontrolled, the result is a decreased reproductive performance of swine females (Alm-Packalén, 2009; Al-Makhzoomi et al., 2008). More than 400 species of saprophytic, relatively pathogenic and pathogenic microorganisms was isolated from semen. Among them 50 species are pathogenic and toxic micromycetes. The result of mycological research of the native and the diluted semen of boars showed its contamination by fungi at 39.0 % and 61.9%, respectively.

The aim of our study was to evaluate the influence of fungal contamination of semen during routine semen collection in modern boar studs and to analyze the productivity of sows, inseminated with contaminative sperm.

Methods

The study was conducted for 6 months and performed on swine farm "Multi-unit agriculture enterprise Slobozhanskiy". At the moment of the study, 90 boar-sires and 1047 sows were kept. The evaluated boar studs follow the rules for swine breeding

farms and are according to the established norms of technological design of the Ukraine ministry of agriculture (Instruktsiya, 2003).

Ejaculates were collected by the artificial vagina in specific plastic bags. A specific filter to retain the gelatinous fraction of the bulbourethral glands was also used. Each of ejaculate was evaluated by quality indicators visually and microscopically. To determine the fertilizing capacity of sperm of boars was performed the artificial insemination of sows. Artificial insemination of sows was carried out by non-fractional way twice. Dose of diluted semen for one sow was 100 cm³ (3-5 billion sperm). Microbiological evaluation of the boar's semen includes the contamination by microscopic fungi. The number of colony forming units per milliliter (CFU/cm³) of semen was calculated by multiplying the average number of colonies counted in duplicate by the reciprocal of the dilution at which the count was performed. Mean values and standard errors were calculated and the results were treated statistically using t-test to evaluate the mutual statistical differences between groups of animals.

Results

The researches were carried out with use 141 native ejaculate. Mycological studies established on contamination of the ejaculate with microscopic fungi in 55 cases (39 %). Diluent sperm are used for insemination of the sows. Overall, 1047 sows were inseminated. From 865 sows were inseminated efficiently, 171 sows were inseminated no efficiently (unfertilized) and 11 sows were aborted. 405 sows were inseminated by semen contaminative with microscopic fungi. From these 106 sows were inseminated efficiently and 9 sows were aborted. 642 sows were inseminated with semen free from micromycetes. From these 65 sows were inseminated no efficiently and 2 sows were aborted. Analysis of boar's semen quality and productivity of sows are presented in Table 1. The indicators suggest that the fungal contamination not affected on the volume and concentration of the boar's ejaculates. On the contrary, the volume of the ejaculates that are contaminated by fungi was higher an average of 33.6 cm³ in the comparison with volume of the noncontaminated ejaculates.

Table 1. The indicators of boar's semen quality and productivity of sows depending on fungal contamination of the semen (M±m)

Characteristics of the semen	Volume of the ejaculate, cm ³	Concentration of the semen, million /cm ³	Farrowing, piglets	Weight of one head, kg	Weight of the socket, kg	Preservation of the piglets, %	Fertilization of sows, %
Contaminative with micromycetes (n=51)	280.40±0.99	205.00±0.84	10.20±0.19	0.99±0.06	9.88±0.19	85.60***±0.55	71.60
Free from micromycetes (n=82)	246.80±0.66	221,1±0.62	10,3±0,13	1,01±0,04	10,72±0,14	91.40**±0.39	89.60
Total population (n=133)	258.10±2.97	215.70±1.78	10.30±0.07	1.01±0.01	10.43±0.18	89.50±0.56	82.60

p>0.99 *p>0.999

The differences of the ejaculate concentration were also insignificant and amounted to 16.1 cm³. An important factor in productivity of sows is a survival rate of piglets, which indicates the level of survival "business" piglets, which will be transferred to the technological rearing group after weaning them from sows.

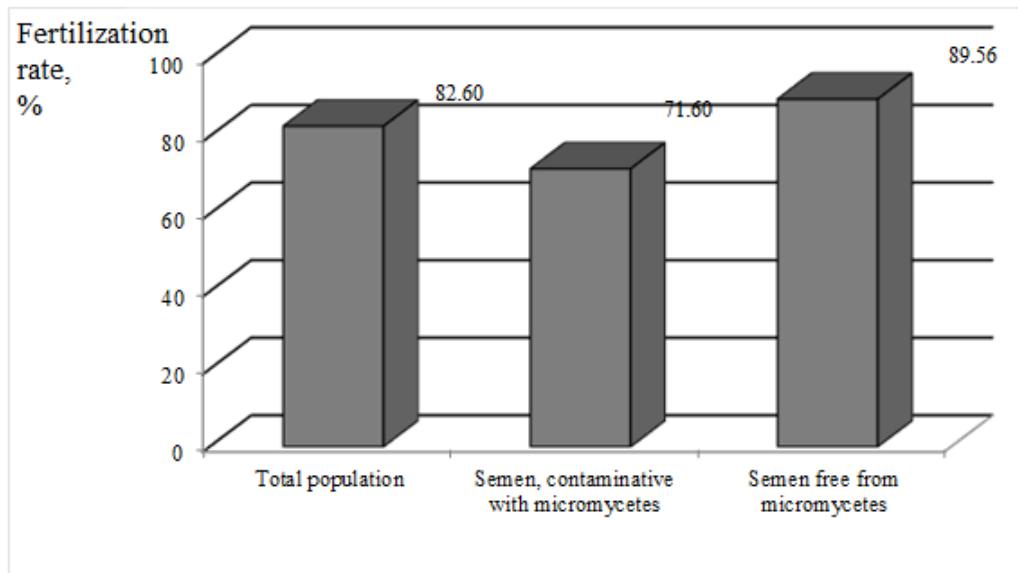


Fig. 1. Fertilization rate of sows after their insemination by contaminated and noncontaminated semen, % Survival rate of piglets from sows, which inseminated with semen free of micromycetes, amounted to 91.4. It indicator is higher on 5.8 % than same indicator (85.6 %) of the sows, which were inseminated with sperm, contaminative with fungi ($p>0.999$). The fertilization rate of sows, which are inseminated by sperm contaminating micromycetes, was 71.6 %. It was on 18.0 % lower than the fertilization rate of sows, which are inseminated sperm free of micromycetes ($p>0.999$), and on 11.0 % lower this indicator in the general population of sows. In addition, the fertilization rate of sows is increased after insemination their by semen contaminated by micromycetes on 3.4% in comparison to technological standards (75.0 %), which are established by current regulations documents.

Conclusions

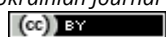
Contamination of semen by microscopic fungi causes a reduction of reproductive indicators of sows. The sow's fertility and survival of piglets are reduced by 18.0 % and 5.8% respectively ($p>0.999$). The volume and concentration of ejaculates of boarsires did not change due to presence of microscopic fungi.

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