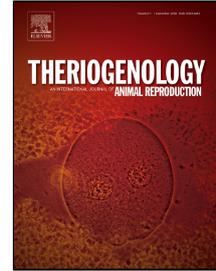


Accepted Manuscript

Effect of Astragalus polysaccharide addition to thawed boar sperm on *in vitro* fertilization and embryo development

Xiao-gang Weng, Ming-ming Cai, Yu-ting Zhang, Yan Liu, Zheng-ling Gao, Jian Song, Zhong-hua Liu



PII: S0093-691X(18)30566-1
DOI: 10.1016/j.theriogenology.2018.07.030
Reference: THE 14644
To appear in: *Theriogenology*
Received Date: 23 February 2018
Accepted Date: 26 July 2018

Please cite this article as: Xiao-gang Weng, Ming-ming Cai, Yu-ting Zhang, Yan Liu, Zheng-ling Gao, Jian Song, Zhong-hua Liu, Effect of Astragalus polysaccharide addition to thawed boar sperm on *in vitro* fertilization and embryo development, *Theriogenology* (2018), doi: 10.1016/j.theriogenology.2018.07.030

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1 **Effect of Astragalus polysaccharide addition to thawed boar sperm on *in vitro***
2 **fertilization and embryo development**

3 Xiao-gang Weng[#], Ming-ming Cai[#], Yu-ting Zhang, Yan Liu, Zheng-ling Gao, Jian Song, Zhong-hua Liu^{*}

4 College of Life Science, Northeast Agricultural University, Harbin 150030, Heilongjiang, P.R. China

5 [#]These authors contribute equally to this work.

6 ^{*}Correspondence:

7 liuzhonghua@neau.edu.cn

8

9 **ABSTRACT**

10 It is important to utilize an antioxidant to ameliorate oxidative damage during boar sperm cryopreservation and
11 thawing. Some studies have shown that Astragalus polysaccharide (APS) has antioxidant capabilities in sperm
12 storage at low temperatures. However, the effects of APS on thawed sperm are unclear. In this study, the effect of
13 supplementation of thawing boar semen extender with APS (0.5, 1, 5, 10 mg/mL) on sperm quality parameters
14 (viability, motility, acrosome integrity and mitochondrial activity) was evaluated. Next, we investigated the effect
15 of APS (0.5 mg/mL) supplementation on antioxidant parameters. Semen from two straws was thawed and diluted
16 with three volumes of Beltsville Thawing Solution (BTS) and immediately divided into a control group without
17 addition of antioxidants (CTR) and the APS group. Sperm and antioxidant parameters were evaluated in the CTR
18 and APS groups after 1 h of incubation at 37°C. Finally, we studied the effect of APS (0.5 mg/mL)
19 supplementation on *in vitro* fertilization (IVF) and embryo development. The addition of different doses of APS to
20 thawed sperm did not induce any significant effects on the sperm viability or motility compared to the sperm
21 without APS treatment. However, the addition of 0.5 mg/mL APS to thawed sperm showed improved
22 mitochondrial activity, higher penetration rate and increased total IVF efficiency compared with those of the
23 control group. Moreover, our results indicate that the supplementation of APS in thawed sperm decreased the
24 concentration of reactive oxygen species (ROS) and improved the activity of superoxide dismutase (SOD) and
25 catalase (CAT). Finally, the addition of APS significantly increased the cleavage rate and blastocyst rate
26 compared to those of the control group. In conclusion, the addition of APS to thawed boar sperm can enhance the
27 antioxidant ability of sperm and improve *in vitro* fertilization (IVF) parameters and the outcomes of embryonic
28 development. These results imply that APS has practical potential to enhance boar sperm reproductive
29 performance.

30 **Keywords:** astragalus polysaccharide; boar sperm; *in vitro* fertilization; embryonic development

31 **1. Introduction**

32 Cryopreservation is the most practical approach for long-term storage of sperm in boars [1]. For example,
33 cryopreservation of boar sperm facilitates the distribution of agriculturally desirable genes, provides more

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