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

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ABSTRACT

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

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

1. Introduction

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