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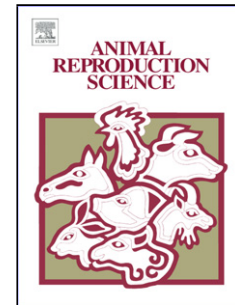
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Possible mechanisms of cholesterol-loaded cyclodextrin action on sperm during cryopreservation

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ABSTRACT

Artificial insemination (AI) with cryopreserved semen has a pivotal role in wider dissemination of germplasm of elite livestock and also for conservation of various endangered species. Cryopreservation allows storage of semen for a prolonged period of time and facilitates greater exchange of genetic material among distant populations. Cryopreservation, however, leads to certain deleterious effects on sperm including premature induction of the acrosome reaction, reduced sperm motility and viability, and impaired sperm DNA integrity and fertility. During cooling procedures, membrane phase transitions take place, which result in micro-domain formation from aggregation of lipids, leading to impaired functions of the sperm membrane, and gap formation between gel and fluid domains. Cyclodextrins are produced by enzymatic degradation of starch and possess a unique feature, that when added alone to sperm cyclodextrins facilitate the removal of cholesterol from the membrane. When preloaded with cholesterol, however, cyclodextrins stimulate the insertion of cholesterol into the sperm membrane due to presence of a hydrophobic core in addition to an outer hydrophilic face. Treating sperm of various species with cholesterol-loaded cyclodextrin improves the quality of sperm during cryopreservation. It is still not clearly known how cholesterol-loaded cyclodextrin functions at sperm cells to enhance the survival during cryopreservation. The present review, therefore, highlights possible mechanisms of cholesterol-loaded cyclodextrin action on sperm during cryopreservation.

Keywords: Cholesterol; Cyclodextrin; Sperm; Mechanism; Cryopreservation

1. Introduction

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