Journal of Andrology, Vol 19, Issue 6 736-746, Copyright © 1998 by The American Society of Andrology

JOURNAL ARTICLE

Extender components and surfactants affect boar sperm function and membrane behavior during cryopreservation

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To determine how the individual components of extenders affected boar sperm function and membrane structure and to test a new surfactant's cryoprotective ability, boar sperm were cryopreserved in straws in BF5 extender plus or minus egg yolk plus or minus glycerol plus or minus a surfactant (Orvus ES Paste [OEP] or various concentrations of Pluronic F-127). After thawing, sperm function and fluidity of the isolated head plasma membrane (HPM) were determined. Total motility and adenosine triphosphate content (a measure of viability) were superior postthaw in sperm extended in egg yolk plus glycerol ($P < 0.05$); neither surfactant improved function. Egg yolk plus any other ingredients improved normal acrosome morphology, whereas a combined measure of motility and normal acrosome morphology was better in the presence of 0.33% OEP or 0.1% Pluronic F-127 ($P < 0.05$ vs. controls). Head plasma membrane was isolated from freshly collected spermatozoa and spermatozoa cryopreserved in the various extenders. Membrane fluidity was monitored with the probes cis-parinaric acid (cPNA), transparinaric acid (tPNA), and 1,6-diphenyl-1 ,3,5-hexatriene (DPH). The cPNA and the DPH monitor the fluidity of gel and liquid-crystalline areas of the membrane, whereas the tPNA preferentially monitors the gel-phase domains of the membrane. Additionally, DPH monitors the hydrophobic core of the bilayer. In the HPM from fresh sperm, the fluidity of each domain changed over time in a manner unique to that domain, and the behavior of the DPH domain varied among boars. The fluidity dynamics of each domain responded uniquely to cryopreservation. The cPNA domain was unaffected, the tPNA domain was altered by four of the eight extenders, and all extenders affected the fluidity of the DPH domain. Membrane structure was significantly correlated with cell function for sperm cryopreserved in extenders that preserved viability and motility. Sperm cryopreserved in egg yolk plus glycerol plus either OEP or 0.1% Pluronic F-127 functioned best when the bulk domains were less fluid initially and the gel domain solidified more slowly. Therefore, the behavior of domains in the HPM of boar spermatozoa is affected by cryopreservation and is related to the postthaw function of boar sperm cryopreserved in different extenders.

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