Submission Summary

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Paper Title
Beneficial effect of zinc oxide nanoparticles on the outcome of testicular tissue cryopreservation

Abstract

Gonadal tissue cryopreservation plays a pivotal role in fertility preservation programs. In spite of its wide application in fertility preservation field, loss of viability in approximately 50% of the cells in inevitable. Detrimental effects of cryopreservation process is known to be mediated through membrane and DNA damage, leading to compromised cellular viability and function. Efforts to mitigate the detrimental effects of the freeze-thaw process by altering the composition of the freezing medium and prevention of membrane and DNA damage has been tried earlier with considerable success. Zinc, an essential micronutrient crucial for normal testicular function and spermatogenesis, is known for its stabilizing effects on membranes and DNA. Based on this property of zinc, the present study was designed to evaluate the impact of zinc oxide nanoparticles (ZnONPs) on enhancing outcomes in testicular tissue cryopreservation. Testicular tissues from pre-pubertal (2-3 weeks) and adult (8-10 weeks) Swiss albino mice were used in the study. Testicular tissues were cryopreserved with freezing medium (30% FBS, 5% DMSO, and 65% DMEM) supplemented with various concentrations (50, 100, 250, and 500µg/ml) of ZnONPs of two different sizes (<100nm and <500nm). Incorporating 50 µg/ml ZnONPs in the cryopreservation medium exhibited significant enhancements in cell viability ($p<0.05$), DNA integrity ($p<0.01$), and reduced apoptosis ($p<0.05$) compared to the control freezing medium. Interestingly, the advantageous effects of ZnONPs were independent of ZnONP particle size. In conclusion, the addition of ZnONPs to the cryopreservation medium demonstrated benefits in preserving testicular tissue by providing stability to membrane and DNA. Therefore, ZnONP based cryopreservation medium may have significant beneficial role in fertility preservation field.

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