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Functional Analysis of the Cooled Rat Testis

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Direct cooling of the testis results in the depletion of most germ cells in vivo. Germ cell-depleted testes are now commonly used to investigate spermatogenic regeneration and can serve as recipients for germ cell transplantation. The present study explored the effects of cooling rat testes on the depletion of endogenous germ cells, spermatogenic regeneration, and Sertoli cell function. Adult rat testes were cooled with iced Ringer's solution for 60 minutes, which results in the initiation of apoptotic germ cell loss within 8 hours. Pachytene spermatocytes at stages XII-I were the cells most sensitive to cooling. In 46%-67% of seminiferous tubule cross-sections, only Sertoli cells remained in the cooled testes 3-10 weeks after treatment. Germ cell loss was accompanied by a significant decrease in circulating inhibin B and an increase in follicle-stimulating hormone concentrations, which indicated a change in Sertoli cell function. Quantitative analysis of mRNA expression associated with apoptotic signals showed no significant uniform changes among the cooled testes, although some individuals had a distinct up-regulation of FAS mRNA at 24 hours. Attempts to use the cooled testes as recipient testes for mouse-to-rat germ cell transplantation were undertaken, but none of the mouse germ cells transplanted into the testes 15-34 days after cooling appeared to have undergone spermatogenesis 64-92 days after transplantation. These data suggest that modifications to Sertoli cell function resulting from testicular cooling create an environment that is unable to support spermatogenesis by donor germ cells.

Key words: Spermatogonia, testis, apoptosis, cooling, transplantation

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