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JOURNAL ARTICLE

Effects of heat stress on mouse testicular cells and sperm chromatin structure

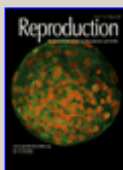
B. L. Sailer, L. J. Sarkar, J. A. Bjordahl, L. K. Jost and D. P. Evenson

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Scrotal regions of mice were exposed to a 38.0, 40.0, or 42.0 degrees C (+/-0.1) H₂O bath for 60 minutes to determine the effects of elevated temperatures on testicular cells and sperm chromatin structure. Mice were killed on various days after exposure, and ratios of acridine orange-stained testicular cell populations were determined by flow cytometry. Testicular weights of mice exposed to 42.0 degrees C decreased significantly day 1 ($P < 0.01$) through 35 ($P < 0.001$).

Also, a significant relative decrease in testicular haploid cells was seen on days 3-35 ($P < 0.001$) with a corresponding increase in the diploid population ($P < 0.001$). Testicular analyses of mice exposed to 38.0 degrees C were not significantly different from control values. Testis weights of mice exposed to 40.0 degrees C were not affected, but a relative decrease in percent haploid cells occurred on days 11 and 14 ($P < 0.001$). The sperm chromatin structure assay (SCSA) was used to measure the susceptibility of cauda epididymal sperm DNA to in situ denaturation at low pH. Caudal epididymides of mice exposed to 42.0 degrees C had no sperm. Caudal epididymal sperm from mice exposed to 40.0 degrees C were most susceptible to acid-induced DNA denaturation on days 3 ($P < 0.05$), 7, 11, and 14 (all $P < 0.001$). The 38.0 degrees C exposed mice showed some minor sperm chromatin abnormalities at later time points (days 11-35). When compared to sperm head morphology measurements, SCSA parameters were more sensitive indicators of heat-induced sperm abnormalities. These results show that mouse spermatogenesis is disrupted by scrotal exposure to environmental temperatures several degrees over normal physiological temperature and, of more biological interest, that some thermal ranges above normal allowed production of sperm with compromised nuclear chromatin structure.

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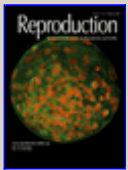
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