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Effect of Simulated Microgravity on Testosterone and Sperm Motility in Mice

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We examined changes in the serum testosterone level and in sperm in the testis and epididymis by using tail-suspended mice, which are a simulation model of the body fluid shift in space, to evaluate the possibility of spermatogenesis failure in space environment. We also studied pathological disorders of the testis in the tail-suspended mice. Tail suspension was imposed with a tail harness to a degree at which the hindlegs of mice did not touch the floor of the housing unit. In control mice, the tail was similarly fixed with a tail harness to impose the same stress, except that a hindleg remained on the floor. Body weight was not significantly different between the 2 groups during 7 days, and testicular weight was significantly different. The testosterone level was significantly lower in the tail-suspended group (0.71 ± 1.24 ng/mL) than in the control group (2.38 ± 3.50 ng/mL; $P < .05$). Microscopy with hematoxylin and eosin (HE) and periodic acid-Schiff (PAS) staining showed a small proportion of seminiferous tubules with impairment of spermatogenic function in the tail-suspended group, and multinucleated giant cells were occasionally noted. Terminal deoxynucleotidyl transferase-mediated nick end-labeling staining revealed positive cells even in animals in which impairment was considered to be mild based on HE and PAS staining. Many cells showed intense p53 immunostaining compared to the control group, with more intense staining of the nucleus in the tail-suspended group. The proportion of motile sperm was slightly but not significantly reduced in the tail-suspended group. However, the mean movement velocity of the motile spermatozoa was significantly decreased.

Key words: Tail suspension, space, simulated weightlessness, testicular function, spermatogenesis, mouse

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