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## JOURNAL ARTICLE

# Acute and long-term effects of a single dose of the fungicide carbendazim (methyl 2-benzimidazole carbamate) on the male reproductive system in the rat

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The effects of carbendazim (methyl 2-benzimidazole carbamate) on the testis, efferent ductules, and sperm were determined in the adult rat after a single oral dose. Two experimental trials were performed: a time response between 2 hours and 32 days after exposure using 0 and 400 mg/kg, and a dose response at 2 and 70 days after exposure using 0 to 800 mg/kg doses. In experiment 1, effects were seen throughout the 32-day period, beginning 8 hours after exposure; the effects included first an increase in testis weight, then decreases in testicular spermatid numbers and in the percentage of morphologically normal cauda sperm. In experiment 2, significant testicular and efferent ductal alterations occurred in animals treated with doses of 100 mg/kg or greater. A dose-dependent increase in testicular weight 2 days after treatment was accompanied by increases in seminiferous tubular diameter and excessive loss of immature germ cells in a stage-dependent manner. There was also a dose-dependent increased incidence of occlusions in the efferent ductules. The occluded ductules were characterized by severe inflammation and exhibited disorganization of the epithelium. At 70 days, there were dose-dependent decreases in mean testis weight and mean seminiferous tubular diameter; however, only minimal long-term effects were seen at 50 mg/kg. In testes exhibiting seminiferous tubular atrophy of greater than 25% (100 mg/kg or greater doses), all of the testes were associated with efferent ductules containing occlusions. Caput sperm numbers were significantly reduced in these testes. Occlusions, abnormal ductules, fibrosis, spermatid granulomas, and mineralization were observed in the ductuli efferents. Long-term effects of carbendazim on the testis were induced primarily by ductal occlusions. Results show that carbendazim produces more severe short- and long-term effects on the male reproductive system than the fungicide benomyl.

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