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Exposure of acephate alters DNA integrity and sperm function of human spermatozoa *in vitro*

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Acephate (O, S-dimethyl acetyl-phosphoramidothioate) is an organophosphate insecticide, widely used in Sri Lanka. Therefore, the present study was undertaken to investigate the effects of acephate on human sperm function *in vitro*. Healthy spermatozoa (sperm concentration > 40 X 10^6, total sperm motility > 50%, normal sperm morphology > 50%) from young donors (age 20-28) were collected (Ethical clearance ref. no: 712/13) and diluted with physiological saline to formulate a final concentration of 40 X 10^6 spermatozoa/ml. Sperms were exposed to different concentrations (low = 50 µg/ml, mid = 100 µg/ml and high = 200 µg/ml) of acephate and incubated for 1 h, 2 h and 3 h at 37 °C and 5% CO_2. Upon incubation, sperm motility, vitality, functional integrity of plasma membrane, hyperactivation and DNA damage were examined using different techniques. The motility was reduced significantly ($P \leq 0.05$) in low dosage after 2 h and 3 h by 3.9% and 4% respectively. Highly significant reduction of motility (by 25.9%; $P \leq 0.001$) was recorded in high dosage after 2 h and 3 h (by 24.8%; $P \leq 0.001$) of incubation. Vitality was significantly ($P \leq 0.05$) reduced at mid dosage by 1.4% after 2 h. Further, in higher dosage vitality was reduced after 1 h (by 24.56%; $P \leq 0.05$), 2 h (by 20.44%; $P \leq 0.05$) and 3 h (by 21%; $P \leq 0.001$) when compared with control. Functional integrity was significantly reduced in mid dosage after 3 h (by 6%; $P \leq 0.05$) and in high dosage after 2 h (3%; $P \leq 0.05$). A highly significant effect was recorded at high dosage after 3 h (by 24%; $P \leq 0.001$). Sperm hyperactivation was significantly reduced in high dosage after 1 h (by 10.33%; $P \leq 0.05$), 2 h (11.11%; $P \leq 0.05$) and 3 h (by 19.44%; $P \leq 0.05$) when compared with their controls. However, DNA damages were significantly ($P \leq 0.05$) increased only in high dose by 5.9% after 3 h. Moreover, highly significant effects ($P \leq 0.001$) for all tests were recorded in high dosage after 3 h of incubation. In conclusion, high dosage of acephate tested in this study altered human sperm motility, vitality, functional integrity of plasma membrane, hyperactivation and DNA damage *in vitro*. Therefore, acephate could be considered as a reproductive toxicant and may carry a risk to human health and precautions should be taken when using.

Keywords: Acephate, organophosphate, reproductive toxicant, sperm function

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