EFFECT OF ICON®, A PYRETHROID INSECTICIDE ON REPRODUCTIVE COMPETENCE OF RATS

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Abstract

Icon® is a newly introduced water miscible type II synthetic pyrethroid insecticide based on active ingredient Lambda cyhalothrin (10% w/w). It is used in Sri Lanka as an adulticidal indoor spray against malaria vector mosquitoes. The goal of this study was to assess the effects of Icon® on pregnancy outcome, male fertility and masculine sexual behaviour of rats after repeated oral exposure. Different doses of Icon® 0, 63, 83 or 125 mg / kg body weight / day (active ingredient 0, 6.3, 8.3, 12.5 mg / kg body weight / day) were orally administered to pregnant (early: days 1-7 of pregnancy, mid: days 8 - 14 of pregnancy and late: days 15 –21of pregnancy) and male rats (only two doses: 63 and 100 mg / kg body weight/day of Icon®) for seven consecutive days. Several parameters of reproduction, pre - and post - natal development of pups and sexual behaviour and fertility of male rats were monitored. The results show, for the first time, that exposure of Icon® throughout the pregnancy period is detrimental to pregnancy outcome [early pregnancy (in terms of quantal pregnancy, number of uterine implants, implantation index and foetal deaths), mid pregnancy (in terms of number of uterine implants, number of viable implants, post implantation loss, number of pups born, litter index and foetal survival ratio), and late pregnancy (in terms of number of viable pups, gestation index, live birth index, pups survival ratio and viability index)]. Further, exposure to Icon® during late pregnancy but not in early and mid pregnancy prolonged gestation length and caused developmental defects (in terms of reduction in body weights, cranial length, cranial diameter, tail length, cranio – sacral length and viability on postnatal day 1). In

males, Icon® had no effect on ejaculation, sperm quality and fertility but sexual competence was seriously impaired (as judged by reduction in libido, sexual arousability/motivation, sexual vigour, erectile dysfunction). The anti reproductive effects of Icon® were mainly due to increased pre- and post implantation losses during early pregnancy, increased post implantation loss during mid pregnancy and retarded foetal growth in late pregnancy due to the intra uterine growth retardation (IUGR). All antireproductive effects were transient and reversible and mediated by a multiple mechanisms: maternal toxicity (in terms of ataxia, salivation, diarrhoea, vaginal bleeding), stress (in terms of exophthalmia, pilo erection and by the increased adrenal weights), uterotropic activity (induction of marked and sustained uterine contractions), impairment in decidualization process and embryo – foetotoxicity of Icon® (evident from Brine shrimp toxicity assay and spermicidal activity). Further, the progesterone had a protective effect against Icon® induced anti-reproductive effects. In males, Icon® - induced sexual dysfunction was mediated again by multiple mechanisms: mainly toxicity, stress, sedation (evident by the results of rat hole board experiment) and possibly by GABA, cholinergic and dopaminergic systems. Overall, the results suggest that exposure to Icon® may pose sexual dysfunction in males and in females poses a considerable threat to pregnancy. As such it is desirable to avoid Icon® exposure by sexually able men and pregnant women.