

**Study on lambda cyhalothrin-induced
haematological, hepatic, and
reproductive system dysfunction in
rat and its modulation by taurine**

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Synopsis

Pyrethroids, synthetic derivatives of natural insecticide pyrethrins, are used for many applications and as possible replacements for organophosphates may not be a benign alternative because of their potential for neurotoxicity, reproductive toxicity and other systemic toxicity. Lambda cyhalothrin(LTC), a synthetic type II α -cyano-pyrethroid, is used worldwide to control a broad spectrum of insects and ectoparasites in agricultural production, forestry, animal husbandry and public health applications but reported to produce serious health problems. So, in this study lambda cyhalothrin induced haematological, hepatic, male and female reproductive toxicity were investigated in rat and alleviation of these toxicities by taurine was also examined. Lambda cyhalothrin (10.83 and 15.17mg/kg body wt. for male and 6.29 mg/kg body wt. and 11.33mg/ kg body wt.for female)was orally administered alone or combined with taurine (50mg/kg body wt.) for 14 consecutive days. Intoxication of lambda cyhalothrin caused haematological alterations with an increase in oxidative stress and morphological change in erythrocytes. Lambda cyhalothrin treatment generated excess reactive oxygen species (ROS) which leads to DNA damage and a decrease in mitochondrial membrane potential in hepatic cells. Hepatic dysfunction was reflected by significant changes in lipid profile, liver biomarker enzymes and hepatic histo-architecture in lambda cyhalothrin intoxicated rats. Spermatogenic and steroidogenic disorders were observed by a significant decrease in sperm count, viability, motility, hypo-osmotic swelling, mitochondrial membrane potential, seminal fructose concentration, serum testosterone and pituitary gonadotrophins and increase in testicular oxidative stress, sperm DNA fragmentation

in lambda cyhalothrin intoxicated rats. LCT treatment also altered testicular histology, reduced testicular $\Delta^53\beta$ and 17β -hydroxy steroid dehydrogenase activities and their protein expression along with steroidogenic acute regulatory protein (StAR) and cholesterol side chain cleavage enzyme (P450scc) expression. Increased ovarian malondialdehyde level, decreased ovarian reduced glutathione and antioxidant enzyme activity, high ovarian cholesterol, diminished activity of ovarian $\Delta^53\beta$ - and 17β -hydroxysteroid dehydrogenase (HSD) and significant reduction in estradiol, progesterone and gonadotropic level with suppressed expression of 17β -HSD and StAR and altered ovarian histo-architecture in LCT-treated rat were observed as a result of LCT exposure. Pretreatment with taurine significantly restored the haematological parameters, mitigated the hepatic abnormalities and exhibited the protective effect on male and female reproductive toxicity by normalizing the hypothalamo-pituitary gonadal axis in LCT induced rat. All these attenuating effects of taurine are mediated by its antioxidant action to scavenge ROS that are responsible for lambda cyhalothrin induced systemic toxicity.
