

NEUROTOXICITY PROFILE OF SUPERMETHRIN, A NEW PYRETHROID INSECTICIDE

M. Hornychová, E. Frantík, J. Kubát, J. Formánek
National Institute of Public Health, Prague, Czech Republic

SUMMARY

The use of a standard two-tier neurotoxicity screening procedure in the context of risk assessment is exemplified. Testing of a new pyrethroid in rats addressed the following sequence of questions: Does the substance evoke neurotoxic symptoms in sublethal doses? Do these symptoms reflect a primary neurotropic action? What are the dynamic characteristics of injury, the clinical profile of effect, and the relative potency of the tested substance compared to similar compounds? - The testing protocol is an animal analogue of a systematic neurological and psychological examination in man. First tier tests (structured observation, motor activity measurement, simple neurological examination) were applied after the first dose, during repeated dosing phase and in the restitution phase. Facultative tests for the second-tier examination (motor activity pattern, learning/retention test, evoked potentials, dynamic motor performance) were selected on the basis of effects revealed by the first-tier testing.

Supermethrin evoked acute neurotoxicity in sublethal doses, ranging from 1/30 to 1/15 of LD₅₀. The clinical pattern was similar to other cyano-substituted pyrethroids. Behavioural inhibition was transient and complete tolerance to it developed after 4-week repeated dosing. No indications of long-lasting changes in neuronal excitability or in learning and memory processes were found. Ataxia and excitomotoric phenomena dominated both the acute and the subchronic picture. Marked and persistent motor disturbances, including symptoms of lower motoneuron injury, were limited to individual animals of the highest, near-lethal dose group (27 mg·kg⁻¹). Compared to λ -cyhalothrin, the effects of supermethrin were 2 to 3 times weaker, disappeared more rapidly, cumulated less, and had higher tendency to tolerance.

Key words: neurotoxicity, behavioural toxicity, pesticides, pyrethroids, supermethrin

Address for correspondence: M. Hornychová, National Institute of Public Health, Šrobárova 48, 100 42 Prague 10, Czech Republic