Mirta Milic et al., J Clin Toxicol 2016, 6:6(Suppl)
http://dx.doi.org/10.4172/2161-0495.C1.022

Effects of tembotrione herbicide on cytotoxic, genotoxic and biochemical markers in HepG2 cell line

Mirta Milic, Suzana Žunec, Ivan Pavičic, Vilena Kašuba, Ana Lucic Vrdoljak and **Davor Želježic**
Institute for Medical Research and Occupational Health, Croatia

Tembotrione is the youngest member of the triketone herbicide family, used for postemergence weed control in corn. Although tembotrione's impacts on the environment and human and animal health have been determined to be acceptable with regard to regulations, the biomarkers of exposure to this compound have not been strictly defined. To our knowledge, no studies using molecular biology and biochemistry methods have been performed evaluating tembotrione's cytotoxic and oxidative potential in mammals. Therefore, we evaluated the impact of acute (4 and 24 h) exposure to low concentrations of tembotrione corresponding to the occupational exposure limit (0.0012 µg/ml), residential exposure level (0.002 µg/ml), acceptable daily intake (0.17 µg/ml), and reference concentration (3 µg/ml) on human hepatocellular carcinoma cell line HepG2 by assessing the extent of lipid peroxidation and total anti-oxidant capacity as well as the DNA damage using the alkaline comet assay. Viability of HepG2 cells after treatment with tembotrione was assessed using CCK-8 colorimetric assay. Our results have shown that low concentrations of tembotrione possess DNA damaging potential even though the viability of HepG2 cells was not significantly impaired. Considering that biomarkers of oxidative stress were not significantly altered at the tested concentrations, the indirect effects mediated through free radicals probably did not play an important role in the formation of DNA damage. Taking into account that similar investigations on the toxicity of low pesticide doses are rare, the present study points to the use of other model systems and methods for clarifying a compound's toxic mode of action.

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