

Summary of Toxicology Screening of Pyrotechnic Smoke Containing Oleoresin Capsicum

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Abstract

A whole-body inhalation exposure was conducted on Sprague-Dawley rats to assess the short term toxicity of pyrotechnically generated smoke containing Oleoresin Capsicum (OC). OC has historically been used as an irritant and inflammatory agent in defense spray products, and is typically delivered as a liquid stream or an aerosol. OC has recently been incorporated into smoke formulations which allow the irritant agent to be carried on the smoke generated from pyrotechnic grenades and munitions. Evaluation of OC-containing smoke was conducted at MB Research Laboratories, Spinnerstown, PA, using whole-body inhalation exposure methodology. The test article used to generate the smoke was a Flameless Tri-Chamber OC grenade, manufactured by Safariland. Five male and five female Crl:SD(CD) rats were exposed at a total smoke concentration of 19.3 mg/l for five minutes. Particle size of the smoke was determined using cascade impaction; the mass median aerodynamic diameter (MMAD) was 1.9 μm . The concentration of the total smoke was determined by gravimetric technique, and the corresponding OC concentration in air was calculated based on the fraction of the combusted product containing OC.

Animals were observed throughout exposure and daily for 14 days afterward. Body weights were collected on Study Days 0, 7 and 14. Early in the exposure period, all rats displayed avoidant behaviors such as efforts to escape the enclosures within the exposure chamber. By the end of the exposure period, all animals were lethargic, but regained normal activity levels after removal from the chamber and being washed free of smoke residue. All rats were essentially normal at three hours post-exposure. All animals gained weight during the study, and survived to the scheduled necropsy. The gross necropsy revealed no observable abnormalities.

The test parameters used for this study generated worst-case exposure conditions that are far above the human exposure levels that would be expected during normal operational deployment of the product. The total smoke concentration used during this exposure would be approximately equivalent to deploying a large smoke grenade (such as a Defense Technology Triple Chaser or Riot Control grenade) in an enclosed cell measuring 8 ft x 6 ft x 8 ft, without ventilation. Generating this level of smoke concentration in an outdoor setting is highly unlikely, and it would also be unlikely to produce a continuous 5-minute exposure at this concentration during an operational deployment. Based on the study findings using extreme exposure conditions, pyrotechnically generated smoke containing OC appears to have very low acute inhalation toxicity.