CO_2 concentrations ranged between 6-11% and CO concentrations ranged from 200-300 ppm. In the final smoldering phase CO levels rose to 2000 ppm and CO_2 levels dropped to 1%. Aerosol size distribution was examined using a time of flight, laser optical, aerodynamic particle sizer. Typical aerosol concentration during the non-flaming phase was 1.70×10^7 particles/cm^3 (1.5 g/m3). Aerosol mass median aerodynamic diameter was 0.84 μ m.

549 THE GENERATION OF RESPIRABLE PARTICULATE AND FIBERS FROM THE PARTIAL PYROLIZATION OF ADVANCED COMPOSITE MATERIALS.

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The increasing use of advanced composite materials (ACM) in weapons platforms and commercial applications has stimulated interest in their potential combustion toxicity. A system based on a modified UPITT II mini-cone calorimeter was used to characterize ACM combustion atmospheres. Partial pyrolysis of ACM (26 g at 625 C°) generated aerosols composed of small, nearly spherical particles, agglomerates of these particles and respirable fibers. Vapor and gas phase chemistry from this ACM generated pyrolysate atmosphere has been reported previously (Kuhlmann et. al. 1997). Aerosol particles were collected using inertial impaction and electrostatic precipitation methods. SEM samples revealed 3 populations of particles: agglomerates, small spherical particles and fibers. Agglomerate chains ranged in size from (approximately 500 nm in length up to non-respirable sizes). Individual particles were (approximately 100 nm diameter up to 450 nm diameter). Fibers were found to be relatively homogenous (approximately 200 nm x 500 nm up to approximately 500 nm x 10 μ m). Energy dispersive x-ray (EDX) of fibers showed them to be predominantly silica, carbon, titanium, copper and aluminum. The combination of these collection techniques coupled with scanning electron microscopic examination and spectral processing and analysis of particle morphometry have provided conclusive evidence for the presence of respirable fibers, though their formation/liberation from pyrolysate ACM generated atmospheres.

550 A 13-WEEK INHALATION TOXICITY STUDY (WITH RECOVERY) OF AMMONIUM PERSULFATE IN ALBINO RATS.

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The subchronic inhalation toxicity of ammonium persulfate was characterized using Sprague-Dawley rats (20/sex/group) at respirable dust concentrations of 0, 5.0, 10.3 and 25 mg/m3. Whole-body exposures were conducted 6 hours/day, 5 days/week for 13 weeks. Gravimetric airborne test material samples were taken daily from each exposure chamber. Particle size samples were taken weekly from each exposure chamber. Ten animals/sex/group were necropsied after 13 weeks of exposure and 5 animals/sex/group were held for either a 6- or 13-week non-exposure recovery period. Animals were observed for clinical signs of toxicity, effects on body weight, food consumption, clinical pathology, ophthalmologic parameters, organ weights and macroscopic and microscopic pathology. There were no exposure-related deaths during the study. Rales and increased respiration rate were noted in both males and females in the 25 mg/m3 group, and in a few animals in the 10.3 mg/m3 group. The incidence of these clinical signs decreased to zero during the first few weeks of the recovery period. Body weights for both males and females in the 25 mg/m3 group were significantly depressed during most of the exposure period when compared to the control group. Body weights completely recovered during the recovery period. Lung weights were elevated in the 25 mg/m3 group after 13 weeks of exposure, but were similar to controls at 6 weeks post-exposure. Irritation of the trachea and bronchi/bronchiole was noted microscopically after 13 weeks of exposure to 25 mg/m3. These lesions had recovered by 6 weeks post-exposure. Based on the results of this study, the NOEL for exposure of rats to a dust aerosol of ammonium persulfate was 5.0 mg/m3, while the NOAEL was 10.3 mg/m3.

551 ACUTE INHALATION TOXICITY OF ETHYLAMINE, DIETHYLAMINE AND TRIETHYLAMINE - EFFECTS ON RODENT NASAL PASSAGES.

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Sponsor: K L Cheever.

To address occupational toxicology needs, the acute inhalation toxicity of ethylamine (EA), diethylamine (DEA) and triethylamine (TEA) was investigated using F344 rats, and B6C3F1 mice (DEA only). Groups of 4-5 animals were exposed via whole body inhalation to each amine at 250 or 1000 ppm for 6 hrs/day for a total of 10 exposure days. Body weights and histopathological evaluations of major organs including the nasal passages were conducted. In general, mean body weights were unchanged or decreased slightly in the groups exposed at 250 ppm. In contrast, mean body weights were significantly decreased in both sexes from all groups exposed at 1000 ppm, regardless of amine. No deaths occurred in rats exposed to EA or to the other amines at 250 ppm. Two of five male and 1/5 female rats exposed to 1000 ppm TEA died. Four of five male and female rats and 1/5 male and female mice exposed at 1000 ppm DEA also died. Histopathology of the major organs was unremarkable except for the upper respiratory tract and nares. Treatment-related effects seen in the nasal passages of animals exposed at 1000 ppm ranged from moderate necrotizing inflammation (EA, TEA) to squamous metaplasia and turbinate atrophy (DEA, both species). Effects seen in the nasal passages of animals exposed at 250 ppm ranged from slight necrotizing inflammation (EA) to squamous metaplasia and localized turbinate atrophy (DEA, both species). No effects were seen in the nasal passages of rats exposed at 250 ppm TEA. Squamous metaplasia of the tracheal mucosa was found in rats exposed to 1000 ppm TEA and 1000 ppm DEA. Ulcerative tracheitis was also found in rats exposed to 1000 ppm DEA. Squamous metaplasia of the trachea and the mainstem bronchi was found in mice exposed to 1000 ppm DEA. Based on acute toxicity to the nasal passages, the ethylamine series is ranked as follows: DEA > EA > TEA.

552 EFFECTS OF DIFFERENT CELLULOSE-CONTAINING RESPIRABLE SAMPLES IN THE LUNG OF FISCHER 344 RATS.

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Persistent inflammatory effects of cellulose containing materials, such as cellulose insulation and microcrystalline cotton cellulose, in the lung have been reported previously. Also, prior studies have used high doses likely to overwhelm lung clearance mechanisms. The objectives of the present study were to compare effects of respirable fractions of bleached cellulose (BC), cellulose insulation (CI), and microcrystalline cotton cellulose (MC), following intratracheal instillation. Also, to examine lung effects at low dose to avoid confounding effects of potential lung overload. Male Fischer 344 rats were given four consecutive daily instillations of pre-sized particulate for total doses of 0, 0.25, 1.0 and 4.0 mg/animal. Interim sacrifices were conducted at days 3, 7, 14, 28 and 90 for bronchoalveolar lavage fluid analysis for biochemical markers and differential cell counts, and for histopathology at days 28 and 90. Sample characterization indicated significant differences in size and shape of the three materials influenced by the type of bulk material. Also CI exhibited significant enrichment for borax content with 13% in bulk material and 48% in the respirable fraction. BC caused no significant effects at any dose in the lung. Significant cytotoxicity was observed in the high dose of CI and MC, with greater severity and persistence seen with CI. Evidence of inflammation was also observed with the high dose of MC and CI, exhibited as neutrophyl and leukocyte infiltration. Therefore, there are differences in severity and duration of response to instilled respirable particulate, depending on the type of cellulose-containing material. Differences in response may be due to differences in particulate characteristics and/or different locations of instilled materials in the respiratory tract. Also the high borax content may influence the effects seen for CI. Finally, responses were only observed at the highest dose where lung overload may be an influencing factor.

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