Research and Development on Inhalation Toxicologic Evaluation of Red Phosphorus/Butyl Rubber Combustion Products.

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Abstract: Inhalation exposure facilities for laboratory rats with automatically controlled conditioned filtered air supply and appropriate chamber exhaust through a coalescent filter system were built with five 1-m3 exposure chambers. Red phosphorus/butyl rubber combustion generators provided by the Government were installed for each aerosol chamber. A separate room and air handling system were provided for two chambers to be used for exposure of control rats to filtered air. Aerosol sampling methods established for monitoring of the chamber atmosphere included measurements of mass concentration gravimetrically and optically, particle size by a quartz crystal microbalance-based cascade impactor and analysis of percentage phosphorus acid spectro-photometrically. Preliminary experiments were conducted testing generator performance and various RP/BR batches. Subsequently aerosol spatial and temporal homogeneity were tested in all chambers. Extensive statistical analysis of the pilot chamber revealed conditions of spatial and temporal homogeneity for filter and photosensor samples and for percent phosphoric acid levels. A statistically significant, spatial particle size gradient found, was not significant biologically in terms of inhalation and deposition into the lung. Particle size distribution was homogeneous when measured over time.

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