HYDROXYL RADICAL FORMATION IN AQUEOUS SUSPENSIONS OF FRESH QUARTZ. N.S. Dalal, X. Shi, and V. Vallyathan. Chemistry Department, West Virginia University, Morgantown, WV 26506, and Division of Respiratory Disease Studies, National Institute for Occupational Safety and Health, Morgantown, WV 26505.

Silicosis, a disease of historical importance, continues to occur today as a major health hazard in the mineral and metal mining industries. It is important to find new clues to the biochemical mechanism as new concepts of biology and chemistry evolve. It is generally agreed that the interaction of quartz particles with a membrane is the starting point of the silicotic process. We hypothesized that the mechanism of membrane damage by quartz might involve oxygenated free radicals and in particular the hydroxyl (·OH) radicals. The ·OH radicals are known to be capable of lipid peroxidation by abstracting hydrogen atoms from cell-membrane lipids. We studied the formation of ·OH radicals in aqueous suspensions of quartz particles using well-established electron spin resonance (ESR) technique with the aid of spin trap methodology. Conclusive evidence was obtained by this technique for the formation of ·OH radicals in aqueous suspensions of freshly crushed quartz. The amount of ·OH radicals formed was proportional to the extent of grinding. Moreover, the ·OH generation potential of the freshly ground quartz decreased on storage in air, with an approximate half-life of about 20 hours, thus implying a much higher fibrogenic potential for freshly broken quartz particles, as compared to that of the same sample when aged in air or other environments. Another significant result was that the ·OH radical generation could be quenched via addition of catalase, DMTU, ethanol and other radical scavengers. Thus the higher oxidative potential of freshly crushed quartz particles and its sensitivity to the environment should be taken into consideration in the future *in vitro* and *in vivo* studies of quartz-cell interactions.

Refractory Ceramic Fibers (RCF): Experimental Design and Results from a 28-day Nose-Only Inhalation Toxicology Range Finding Study in rats.*

Bernstein, D.M., H. Fleissner and C. Bouvier
Research and Consulting Company AG, 1 route de Troinex, CH-1227 Carouge, Geneva, Switzerland

Preliminary to a series of oncogenicity studies on a wide variety of Refractory Ceramic Fibers, a 28-day inhalation toxicology study was performed to verify the fiber aerosol generation and exposure procedures and to determine the exposure concentration for the oncogenicity studies.

The design of the fiber generation and exposure system is unique as compared to previous studies in that:

- the fiber aerosol generator was designed to produce a fiber aerosol of the original stock of fibers without breaking the fibers and without producing fiber dust,
- the commercial fibers tested were preselected to be respirable by the rat using a fluid dynamic cascading water selection procedure,
- the animals were exposed using a 160 animal flow-past nose-only exposure system which was designed for the chronic studies to deliver the fiber aerosol individually to each animal with a laminar flow, thus maximising fiber penetration through the rat's nasal passages and into the alveolar region.

Four groups of 25 male Fisher 344 (Charles River) were exposed to either 0, 14, 39 or 54 mg/m³ (mean values) of fiber aerosol for 6 hours/day, 5 days/week for 4 weeks. Animals were sacrificed at 2 weeks after the start of exposure, at the end of exposure at 4 weeks, and following a 2 week recovery period.

Histopathological examination by light and scanning microscopy revealed numerous long fibers in the alveolar region with fibers clearly noted near the plural wall. Many of these fibers were partially engulfed by macrophages. The histopathological results provided a clear basis for the selection of exposure concentration for the oncogenicity study.

* This program has been sponsored by BP America Inc. and Manville Sales Corporation.

Fourth International Workshop

Effects of Mineral Dusts on Cells

a N.A.T.O. Advanced Research Workshop

SEPTEMBER 21–23, 1988
Auberge Estrimont, Orford, Québec