K44 Toxicological Testing of Emergency Responders Following the World Trade Center Attack

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After attending this presentation, attendees will learn of the specimen collection and analysis methods needed to quantify beryllium, mercury, and polychlorinated biphenyls (PCBs) in exposed workers; understand the toxicology of these substances, and their sources along with other toxic substances that were released from the World Trade Center collapse.

This presentation will impact the forensic community and/or humanity by providing results of toxicological testing of workers following exposure incidents such as this and may be useful in assessing the adequacy of the respiratory protection equipment to help improve safety equipment in the future. Results may also be used to predict the risk of subsequent potential health effects and to implement prevention programs and to reduce morbidity and mortality from exposure. Human biological monitoring results may also be useful in re-engineering building materials and reducing production of toxic aerosols in the event of fire or collapse.

Post-incident testing of workers for exposure to toxic substances is essential in order to determine whether or not such substances caused or contributed to morbidity or mortality of individual workers. Blood and urine specimens must be collected in an appropriate manner to avoid contamination and degradation. In an emergency action such as the second attack on the World Trade Center leading to collapse of the buildings, preshift specimens from emergency responders were not collected. Such specimens are important in determining workers body burden prior to the exposure event. Post-event specimens were collected for testing of specific analytes.

Specimen collection included 5,314 urine specimens that were tested for beryllium and mercury; and 5,312 serum specimens were tested for PCB's. Tests for specific gravity and creatinine were performed on urine samples to validate the samples and for calculating final concentrations of the metals using a creatinine correction algorithm. Beryllium and mercury were analyzed by inductively coupled plasma/mass spectrometry (ICPMS) and polychlorinated biphenyls were analyzed by gas chromatography using electron capture detection; calculation was based on Arochlor 1260. All

three analytes may be found normally at low concentrations in the general population. Beryllium is elevated in tobacco smokers whose levels may be double the concentration of non-smokers. Smoking history and other factors need to be recounted for the final interpretation of test results.

A statistical analysis of test groups showed beryllium, mercury and PCB concentrations to be within that expected for the general population for almost all specimens tested. Only a few of the 5000 or so specimens tested demonstrated results that appeared elevated from reference ranges, yet not within the realm of where toxicity is expected.

Results of toxicological testing of workers following exposure incidents such as this may be useful in assessing the adequacy of the respiratory protection equipment to help improve safety equipment in the future. Results may also be used to predict the risk of subsequent potential health effects and to implement prevention programs and to reduce morbidity and mortality from exposure. Human biological monitoring results may also be useful in re-engineering building materials and reducing production of toxic aerosols in the event of fire or collapse.

Heavy Metals, PCB's, World Trade Center

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