Three agencies collaborate to update respirator
testing and ensure emergency responder safety

Scientists from three FLC Mid-Atlantic Region agencies have collaborated to update the respirator testing process used to verify the safety of the nation's emergency responders.

The collaboration included the Department of Homeland Security's (DHS) Science and Technology Directorate (S&T) Chemical Security Analysis Center (CSAC), the U.S. Army's Combat Capabilities Development Command Chemical Biological Center (CCDC CBC), and the National Institute of Safety and Occupational Health's (NIOSH) National Personal Protective Technology Laboratory (NPPTL).

Each laboratory made unique contributions to the interagency partnership: CSAC's understanding of chemical threats to the homeland and its modeling and hazard assessment capabilities; CCDC CBC's filtration science expertise; and NPPTL's outreach to industry and the responder community.

In the event of a chemical, biological, radiological, or nuclear (CBRN) hazard release, emergency responders rely on respiratory protection to prevent inhalation exposure to these hazards. NIOSH evaluates CBRN air-purifying respirator (APR) canisters by challenging the ability of the respirator filter media and carbon bed to protect against 11 test representative agents (TRAs). This approach dates back to the original 2001 CBRN hazard assessment and the hazards landscape at that time.

However, CBRN hazards are constantly evolving in type, usage, and dissemination. Therefore, there was a compelling need to re-evaluate CBRN hazards to ensure existing and future NIOSH-approved CBRN APR canisters provide adequate protection from both existing and newly emerging hazards. A preliminary analysis supported starting the reassessment process by focusing on chemical hazards.

NIOSH, working with the responder community and with CSAC scientists, generated a comprehensive list of chemical inhalation hazards relevant to emergency responders. CSAC then conducted hazard assessments using its state-of-the-art modeling tools and extensive data bases of toxicological properties. CSAC also collected data on the physical properties of these chemicals as relevant to predicting filter behavior.

With CCDC CBC, CSAC grouped the chemicals into classes. These classes formed the underlying basis for the testing methodology. CCDC CBC was responsible for applying cutting edge science relevant to filter

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behavior. The result was a determination of TRAs for each chemical class.

The researchers determined that the current 11 NIOSH TRAs adequately represented all chemical hazards identified in the updated Hazard Assessment. Consequently, there was no need to change or add to the TRAs that had been instituted two decades ago. This finding generates confidence in the safety of the filtration canisters that have been used by the emergency responder community since 2001. The process also resulted in a standardized methodology upon which to evaluate future hazards—an important scientific advancement.

The project was completed in 2019, with science having been transferred into guidance. The findings and their implications are continuously being transferred to respirator stakeholders, professional societies, standard-setting organizations, and the emergency responder community.

The results are being used as the basis for updating NIOSH publications, including the NIOSH CBRN Respiratory Protection Handbook and an updated protocol for canister certification. NIOSH is also communicating the findings to the responder community - the ultimate customers and beneficiaries of the testing methodology.

In July 2020, the project team was awarded the 2020 NIOSH Bullard-Sherwood Research to Practice Science and Service Award, in the Intervention category. This award recognizes outstanding application of occupational safety and health research. ✤