TATRC's BHSAI is Predicting Chemical Toxicity Threats to the Warfighter

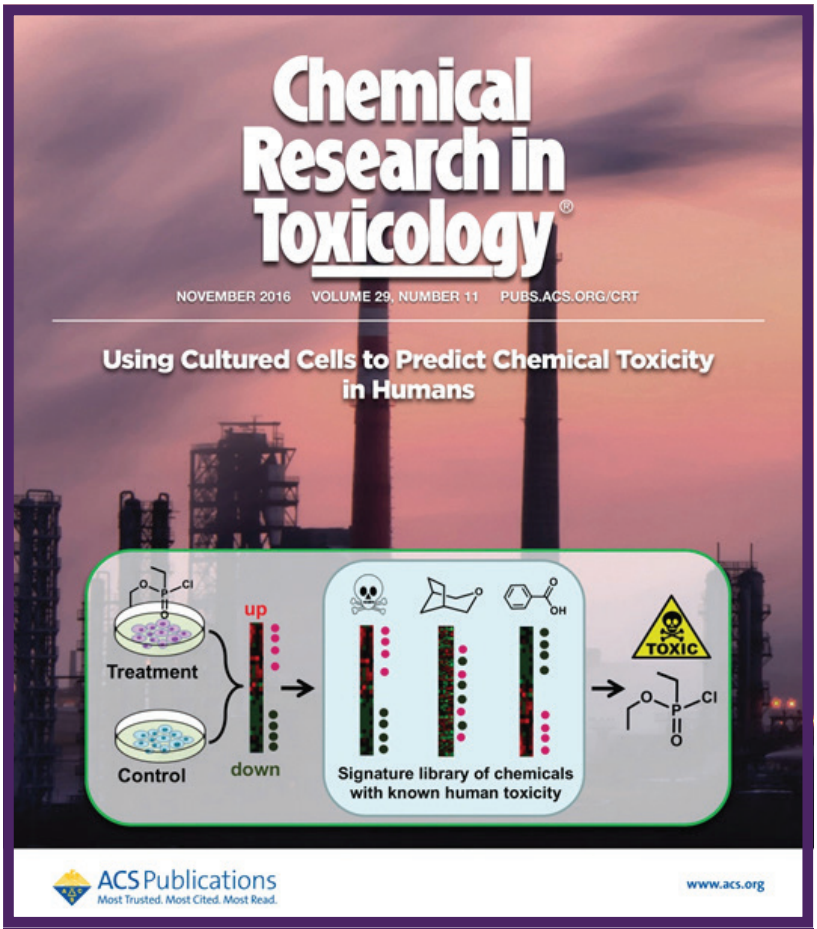
Warfighters are increasingly at risk from environmental health hazards during deployment, where exposure to an accidental or intentional release of chemical toxicants can cause both acute and long-term health problems. Threats from common chemicals and industrial toxicants are heightened by their high level of availability from many different sources and relative ease of handling compared with biological warfare agents, nerve agents, and other highly controlled substances. The high potential for accidental or deliberate chemical and toxicant release makes it critical for us to understand the short- and long-term health consequences of such threats.

Given the large number of chemicals on the market, it is impractical to perform any in-depth laboratory characterization or animal testing to evaluate any potential health effects of all commercially available chemicals. Scientists at TATRC's Biotechnology High Performance Computing Software Applications Institute (BHSAI; www.bhsai.org) are developing alternative computational methods to rapidly assess and gauge potential health effects of chemical exposures.

BHSAI's Deputy Director , Dr. S. Anders Wallqvist

Sponsored by the Defense Threat Reduction Agency, the BHSAI work focuses on developing models that directly relate to human responses and diseases. Dr. Sven A. Wallqvist and his team developed an alternative method for assessing chemical toxicity. They based their modeling efforts on large-scale toxicogenomics data generated by the US National Institutes of Health Library of Integrated Network-Based Cellular Signatures program. By analyzing data from over 15,000 chemical compounds tested in cultured human cells, they developed a novel model to predict the potential of a chemical to cause specific liver, kidney, or heart injuries in humans. To validate their approach, they showed how model predictions of toxicity for drugs and dietary supplements, which are not formally recognized as injurious, were corroborated in independent case reports of cholestasis (liver disease), interstitial nephritis (kidney disease), and long QT syndrome (heart disease).

Dr. Wallqvist commented that, "The developed technology provides a robust technique to model human exposure to chemicals and may serve as a promising alternative to animal-based chemical toxicity assessment." The findings of this study were recently published in Chemical Research in Toxicology*.



The research of Dr. Wallqvist and his colleagues on predicting chemical toxicity threats was featured on the cover of the November 2016 issue of Chemical Research in Toxicology.

*Liu R., Yu X., Wallqvist A. Using Chemical-Induced Gene Expression in Cultured Human Cells to Predict Chemical Toxicity. Chem Res Toxicol. 2016; 29(11):1883-1893. DOI: 10.1021/acs.chemrestox.6b00287