

INNOVATING CROSS-DOMAIN SOLUTIONS TO DETECT EMERGING BIOLOGICAL THREATS

Science Watch: A Systematic Approach To The Identification And Evaluation Of Rapidly Evolving 21st Century Chemical And Biological Threats

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The Hazard Awareness and Characterization Technology Center (HAC TC) within DHS is tasked with determining future and emerging chemical and biological threats that could impact our ability to prepare for, prevent, respond to, and recover from incidents involving chemical and biological threats to the homeland. The accelerating pace of research and global expansion of knowledge in the chemical and biological sciences could be appropriated by a variety of actors for offensive uses against the United States. HAC-TC has developed a program, Science Watch, to utilize intelligence-informed biological and chemical subject matter expertise to identify scientific literature that may transform the chemical and biological threat landscape. After identifying research topics, a subset of topics have follow-on deep-dive investigations into the current state of the technology, focusing on the evolving threat to the homeland. Topic analysis and deep-dive reporting are completed at multiple scientific institutions and reviewed by other subject matter experts before publication. When emerging biological agents or pathogens are identified, Master Question Lists (MQLs) are produced, which quickly present the current state of information on an agent for policy makers and stakeholders. The scientific topics and emerging pathogens of interest, deep-dive reporting, and MQLs are turned into published knowledge products, and shared among DHS and Interagency Partners.

Given the speed of research (~3.5M science and engineering peer-reviewed articles annually) eclipsing our capability to cull, analyze, and assimilate data into estimates of the risks posed by novel and emerging chemical and biological WMD attack pathways, Science Watch is also invested in the development of automated AI/ML tools to assist technical analysts. The approach develops AI-informed pipelines to deploy dynamic topic modeling tools in the DHS S&T cloud environment, incorporating and linking threat data to search pipelines, and refining intelligence-informed, analyst-executed searches. Initially, software tools extract, transform and load (ETL) article data, such as abstracts and keywords, into database entries for analysis. The next steps use ML approaches to extract and link topics, subjects, and entities (reagents, instruments, techniques, agents) to visualize trends over time. Concurrently, intelligence reporting is being ingested into the trained model to crosswalk articles identified with search terms and topics actively developing within the IC. These tools are expected to be completed and deployed over the next eighteen months and could be further transitioned to other end-users and topic areas.

The tools and knowledge products developed in the Science Watch program enable DHS S&T to continuously monitor how the integrated and evolving landscape both in basic scientific knowledge and technology impinges upon the potential for adversaries to develop, produce, process, and disseminate both known and unknown chemical, biochemical, and biological agents.