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ON-SITE AND OFF-SITE FORENSIC ANALYSIS CAPABILITIES FOR PROLIFERATION AND TERRORISM PREVENTION

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INTRODUCTION

With the clandestine proliferation of improvised weapons of mass destruction (WMD) becoming a concern for global security and the need to adequately monitor our countries border to help prevent WMD terrorist attacks, requires special technologies. The more information that is available to identify WMD materials in the field can potentially provide law enforcement and first responders with the necessary information to prevent these situations from occurring. This task is becoming more demanding and complicated as we put more demands on our on-site chemical screening and detecting systems to prevent attacks and protect the nation's borders. The Forensic Science Center (FSC) at Lawrence Livermore National Laboratory (LLNL), with the assistance of other DOE labs such as Savannah River National Lab and Sandia National laboratories are providing the Department of Homeland Security (DHS) with such detection technologies. Examples of the technical capabilities developed at LLNL's Forensic Science Center are on-site and off-site chemical analyses include:

1. Having a deployment team in readiness to support DHS responders
2. Development of analysis techniques and protocols for field screening.
3. A coordinated network of LLNL analytical labs ready for response to WMD samples
4. A certified ISO-17025 quality control program to assure law enforcement sample handling requirements.

Even with state-of-the-art monitoring and interrogative systems, coordinated and comprehensive forensic analysis and response will be critical in both pre and post event involving WMD events. Several LLNL developed on-site detection technologies have been utilized to address some of these on-site screening and analysis needs:

- Portable thin layer chromatography kit (TLC)
- Colorimetric spot tests
- Portable gas chromatography-mass spectrometer (GC-MS)

Each on of these technologies is described in some detail highlighting its usefulness in an emergency deployment or field-monitoring situation.

PORTABLE THIN LAYER CHROMATOGRAPH

Thin-layer chromatography (TLC) is used extensively as a rapid separation and purification technique for organic, inorganic, and biochemical mixtures in the lab. This technique often is one of the best choices for rapid screening of large numbers of samples because it is cost-effective, requires minimal sample cleanup, and several samples can be run in parallel. It is well known, however, that identification of an unknown on a TLC plate is very difficult. For this reason, a set of analytical standards is needed to compare their rf values to the unknowns. In addition, conventional visualization reagents are used to increase the specificity of TLC, such as Griess reagent for explosives. LLNL's portable thin chromatography kit utilizes various coloring reagents to provide such a system for the fast screening of explosives in the field (Figure 1) and weighs less than 25 lbs.

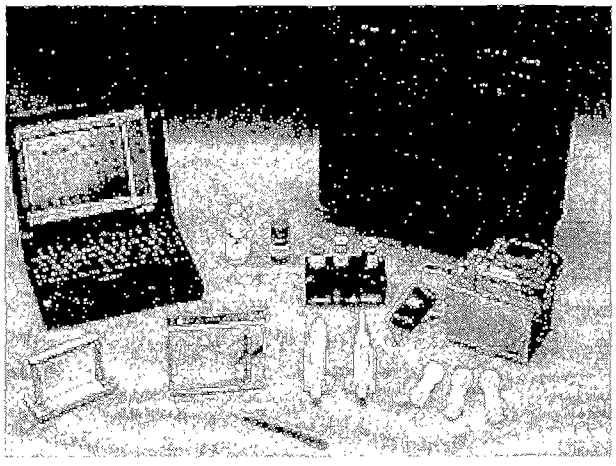

Fig. 1. LLNL Portable Thin-Layer Chromatography (TLC) System

COLORIMETRIC DETECTION OF EXPLOSIVES

A number of different visualization methods or colorimetric detection techniques for explosives are commercially available. However, some of these products are aerosol-based and are messy to use, or difficult to use outdoors in windy conditions. For this reason, LLNL decided to develop the Easy Litmus Test for Explosives (ELITE, Figure 2), it's a colorimetric system that detects over 30 explosives. It detects nitro aromatics, nitrate-esters, nitramines, inorganic nitrate compounds, and picric acid. The system works by sampling a potential contaminated area with a provided swipe, systematically exposing the swipe to reagents, and observing any color change. The system incorporates two different separate coloring reagents and a heating step to enable the detection of the 30 different explosives.

Fig. 2. LLNL Explosives Colorimetric Test Kit

PORTABLE GAS CHROMATOGRAPH-MASS SPECTROMETER (GC-MS)

LLNL has also developed portable spectrometers for the analysis of complex organic samples. Gas chromatography-mass spectrometry is generally recognized as one of the most powerful analytical separation and analysis methods available, and is widely employed in the forensic community and environmental monitoring laboratories. The combination of GC and mass spectrometry for field work can provide a great deal of information that can uniquely identify a suspect compound, providing that the available is stored in a mass spectral database (e.g., sarin, VX, sulfur mustard, etc.). The LLNL portable GC-MS system has been deployed to several locations to support various law enforcement agencies (Figure 3).

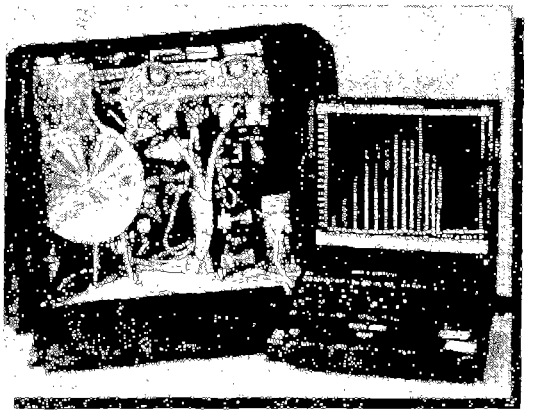

Fig. 3. LLNL Portable gas chromatograph mass spectrometer (GC-MS)

Under the leadership the Department of Homeland Security and the cooperation of other DOE laboratories, the framework to enable LLNL to assist local communities and federal agencies during time of need will continue. In addition, as LLNL develops new and improved on-site detection technologies, and they mature, they can be transition to the first responders units.

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TO QUESTION OF NPP POWER REACTOR CHOICE FOR KAZAKHSTAN

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The specific feature of atomic engineering development in Kazakhstan is an absence of any atomic power stations (" to start with a pure sheet); the unique power station with reactor on fast neutrons BN-350 has been closed. Kazakhstan is free from building work already done, constructional hobble and traditions of the modern atomic power stations as against Russia and Ukraine. Therefore Kazakhstan can choose the optimal way of development of atomic engineering from the very beginning. Kazakhstan should be oriented on construction of the most safe and economically competitive atomic power stations meeting the highest international requirements of XXI century.