

The R&T CONNECTION



A Publication of the U.S. Army Edgewood Chemical Biological Center's Research & Technology Directorate

Winter/Spring in Review 2015

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As I've been Acting Director for R&T a couple of months now, there are a few things that I wanted to share:

- As many of you know, we wrapped up another SMR Inspection earlier this year and got fantastic reviews back from the inspectors. So thank you again to everyone involved in this years' inspections and for doing all that is necessary to allow ECBC's laboratory facilities to be operated safely. Your efforts allow ECBC to remain the premier CB Defense research center in the United States.
- While there is still a process ahead to hiring and naming the Directorate's next permanent Director, there is a strategic plan in place to bridge the time until our permanent Director is named with capable, experienced Acting Directors, as well as a timeline for when we can expect a permanent solution. I will be hosting a Town Hall this summer to share that and more with everyone. Details on the exact date and location of the Town Hall will be forthcoming.
- Finally, this summer we will launch our annual Climate Survey again. Your responses are important and help shape




Leadership's strategic focus for the next year. Recent initiatives such as Town Halls, Lightning Lectures, and others all came about as a result of the survey. Please make the time to take the survey once it goes live.

Enjoy the great weather and keep working hard,

Frederic J. Berg, Ph.D
Acting Director, ECBC Research and Technology

There's more beyond the newsletter . . . Keep up with ECBC 24/7

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Do you have a story to share?

Have an item for the R&T Connection? Whether it's a technical accomplishment, an upcoming speech, an employee award or any other news story, please share it with R&T Communications Officer Kelly Outram at Kelly.A.Outram.ctr@mail.mil or 410.436.2262.

THERE'S MORE BEYOND THE NEWSLETTER . . . KEEP UP WITH ECBC 24/7



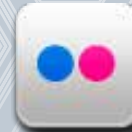
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COMMON FINANCIAL SYSTEM MISTAKES AND WAYS TO PREVENT THEM

Our primary goal in the Business Management Office is to help our teams be successful. For this installment, we talked with our Budget Analysts (BA) to determine the most common mistakes they see and how they can be prevented.

1. Performing work prior to receiving funding and not charging the proper accounts.

If funding has not yet been received, accepted and a WBS created, do not begin work on the project. If you are unsure of the WBS to charge, contact your Branch Chief.

2. Failure to provide all necessary data on documents (travel orders, PRs, etc).

To assist in this, the budget office has created step-by-step desk guides for filling out GFEBs related documents (located on CBCConnect/SharePoint). Because they are updated regularly, be sure you use the latest version.

3. Failure to log into GFEBs every 45 days.

Users who do not log in to GFEBs will lose access. Should this occur, contact your BA. Remember, restoration will take time, **so please don't ignore the three reminder emails!**

4. Failure to ensure contracting has received a PR

PR processors can check GFEBs using Transaction Code ZSSC_SPS_PR (desk guide on CBCConnect/SharePoint) to see the current status of their action. Once the document has been sent to contracting, it is the PR processor's responsibility to see it through award.

5. Failure to mark AXOL documents 'Final' and reconcile.

Once all items on a PR have been received, it is critical to mark documents final in AXOL. Failure to take this action will result in excess obligated (and sometimes lost) funding. Billing


statements need to be reconciled correctly and in a timely manner to avoid IDOCs, manual pays, ending up on the late list, and credit card suspension.

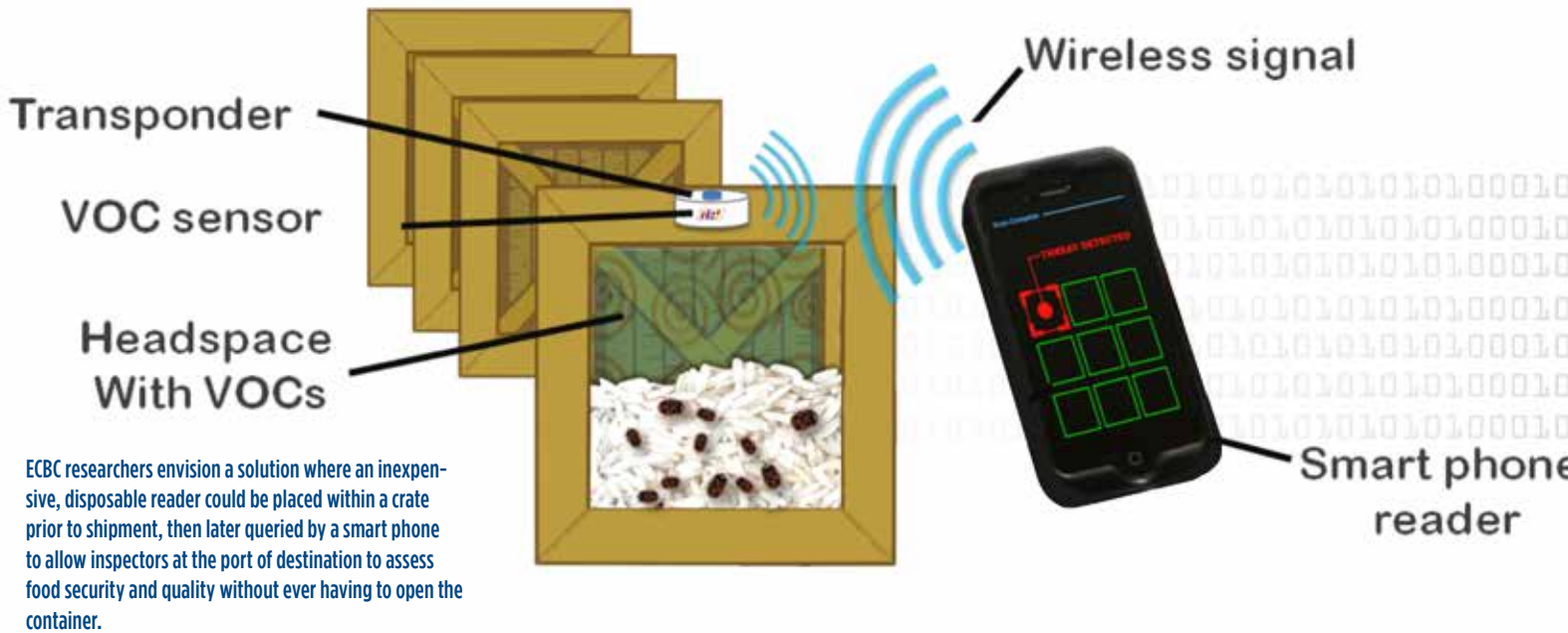
6. Failure to ensure proper approvals are received prior to authorizing vendors/customers to provide service

Fiscal Law requires all approvals prior to authorizing purchases or commencement of service. If you have questions, it is best to discuss the matter with your supervisor or BA prior to authorizing the purchase or service.

7. Bypassing the analysts.

Your BA should be your first stop for answers to financial questions and issues. Keeping them involved and informed can help prevent problems from arising.

Have a topic you'd like to see discussed? Send me an email at carmen.b.hayes.civ@mail.mil 



ARE THERE BUGS IN THERE?

Edgewood Chemical Biological Center researches the use of colorimetric

The introduction and establishment of invasive insect species pose a considerable threat to U.S. agriculture and natural resources, making it imperative that known invasive species are detected and their introduction prevented throughout global trade pathways. A particularly infamous example of this threat is the khapra beetle, an exotic species native to South Asia and parts of Africa which is considered one of the top 100 most invasive species in the world. Smaller than a grain of rice (three millimeters or less than an eighth inch long), the khapra beetle is difficult to control and can survive nearly anywhere they are protected from cold temperatures. Preferring low-moisture foods, khapra beetle larvae can destroy a significant proportion of unprotected grains stores due to their “dirty eating” behavior – a feeding habit where the beetle eats only a little of a single grain before moving on to others. In addition, khapra beetle contamination in food products presents a food safety concern as the hairs associated with larvae and cast skins are potential allergens and respiratory hazards, particularly for young children. Notorious as the only stored product pest with quarantine status in the U.S., the khapra beetle is also the only pest which automatically

triggers rejection of import shipments based solely on discovery of non-living life stages, cast skins or other body parts of the insect.

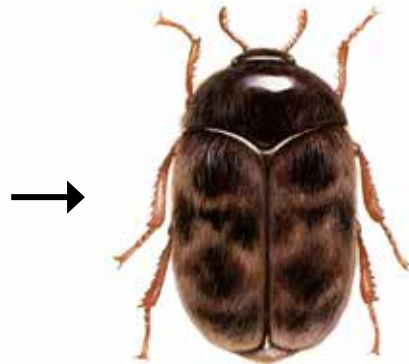
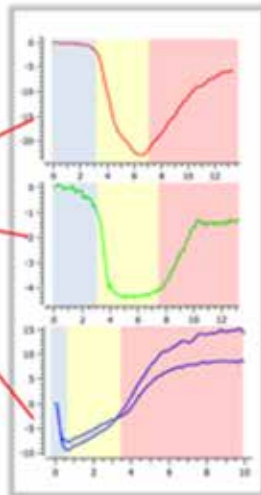
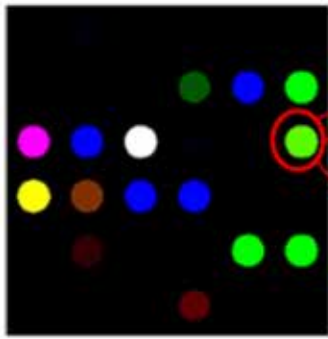
The establishment of the khapra beetle in the U.S. would be devastating to the multibillion dollar grain export business as shipments would be subject to increased inspection and insecticide treatments to prevent introduction to other countries. Underscoring this reality was an incident in 1953 where khapra beetles were discovered in California, resulting in a 13 year, \$15 million eradication effort. Adjusted for inflation, that cost would be equivalent to \$131 million today.

Current inspection methods involve targeting imports from countries where khapra beetles are known to be present, and visually examining high risk commodities. Department of Homeland Security (DHS) Customs and Border Protection Agriculture Specialists are currently required to open shipping containers in order to look for evidence of khapra infestation - a task that is extremely difficult considering the size of the insect, and puts surrounding shipping containers at risk for contamination. Detection of the khapra beetle is particularly challenging as the beetle is capable of living years

without food and can be found in non-food commodities such as textiles or packaging materials.

To address the khapra issue, scientists at the Edgewood Chemical Biological Center (ECBC) are working with the DHS Science and Technology Directorate (S&T) and the United States Department of Agriculture (USDA) Animal Plant Health Inspection Services Plant Protection Quarantine to find an easier, more effective way to inspect bulk food supply for khapra beetles. In a project funded by the DHS S&T Seedling Program under Interagency Agreement HSHQPM-14-X-00086 and leveraging support from the Defense Threat Reduction Agency, ECBC researchers in partnership with iSense LLC are currently studying the use of colorimetric sensor arrays (CSAs) to detect this invasive species in shipping containers. These inexpensive, disposable sensors, manufactured by iSense, are approximately one square inch in size (about the size of a postage stamp) and spotted with 73 dyes which change color in response to various vapors which come in contact with the CSAs from the sample. Samples are identified not by any single spot color change, but instead by the combination of color changes across multiple spots forming a “fingerprint” that can be

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During an assay, CSA sensors are exposed to odors emitted into the headspace above bulk grain infested with beetles. Over time, changes in the colored spot patterns emerge, and unique color fingerprints are revealed.

sensor arrays to detect insects in the food supply

used to identify compounds found in a sample. The CSA color changes are sensitive enough to detect even trace amounts of some vapors (odors), allowing for the broad spectrum detection of a number of volatile organic compounds (VOCs) which may be well below concentration levels attributable to health risks. A wide range of patterns or signatures resulting from emitted VOCs can be elucidated and stored for various compounds, creating a reference library for any previously recognized material.

During an assay, CSA sensors are exposed to odors emitted into the headspace above bulk grain infested with beetles. Over time, changes in the colored spot patterns emerge, and by using special software designed specifically for this project by Charles Davidson, Ph.D, unique color fingerprints are revealed. The goal of the project is the development of unique and individual spot patterns capable of differentiating between invasive, quarantined khapra beetle infestation and other non-invasive species. Since detection of infestation is based on volatile signatures within a closed container, this method has the potential of allowing infested cargo to be sequestered prior to being opened, thereby mitigating exposure or release

of the species within. With success, this technology could transition into a self-contained sampling and detection unit that could wirelessly transmit results to a smart phone for analysis.

“Our vision is to create remote interrogation of shipping containers that reduces the burden on customs officials,” said Jeff Ballin, Ph.D, ECBC lead for this project.

ECBC envisions a solution where an inexpensive, disposable reader could be placed within a crate prior to shipment, then later queried by a smart phone to allow inspectors at the port of destination to assess food security and quality without ever having to open the container.

The first step in making this method a reality is the development of a reproducible signature library capable of differentiating between beetle-infested grain and pristine grain. Since khapra beetles are a quarantined species, scientists began testing the CSAs using the common warehouse beetle which is closely related to the khapra beetle. The team simulated the highly infested environment of shipping containers by using grain-filled glass mason jars either with or without beetle contamination. The CSAs were placed in the jars and

scanned at regular intervals to track color changes.

“In most projects we do, we have a physical model of how the project should behave (e.g., how a beetle eats and breathes),” said Avishai Ben-David, Ph.D researcher with ECBC. “In this case, we have no model or precedent to how a single beetle behaves; we are creating all of these models right now (from observations) much like the Human Genome Project.”

While the research is still in its infancy, researchers have been able to distinguish between the warehouse beetle-infested and non-infested grain based on the response of the CSAs to the VOCs present in the headspace above the grain. The information that has been gathered is foundational in moving the project closer to its goal of creating an inexpensive, disposable tool to query shipping containers that will allow inspectors to assess food safety without ever opening the container. The group expects to complete its first round of testing by the fall of 2015. 🐞



TEAM EFFORT: ECBC, USAMRIID, and Thermo Fisher Scientific Partner to Erase Ebola

ECBC and USAMRIID are studying the use of Ebola vaccines and biomarkers using state-of-the-art equipment donated by Thermo Fisher Scientific

The U.S. Army Edgewood Chemical Biological Center (ECBC) and the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) are partnering to help expedite progress in the global fight against Ebola. ECBC is working with USAMRIID on two critical studies – a vaccine study and a biomarker study – that will advance the global fight against Ebola.

Ebola is a rare and deadly disease caused by infection with the Ebola virus. The largest Ebola outbreak in history, which began in December 2013, is still ongoing. This disease has a high death rate – to date there have been 22,000 cases and

9,000 deaths attributed to the current outbreak – with no known cure or effective vaccine. ECBC and USAMRIID are trying to change that.

USAMRIID, the U.S. Department of Defense's (DOD) lead laboratory for medical biological defense research, called upon the ECBC-US Army Medical Research Institute of Chemical Defense (USAMRICD) Mass Spectrometry Core Facility to assist with two of its ongoing Ebola research programs – characterizing a potential vaccine and identifying biomarkers of infection.

For the vaccine work, ECBC is analyzing several different vaccine preparations

provided by USAMRIID to quantify VP40 and glycoprotein (GP) concentrations expressed in virus-like particles (VLPs) generated from Ebola (strains Zaire and Sudan). The aim is to monitor quality control of the vaccine production process and to determine if a correlation can be made between protective immunity and the amount of Ebola-specific structural proteins, GP and VP40, that are present. This type of research is foundational in creating a long-term solution to a devastating disease.

“Our role was to blindly and independently quantitate the amount of protein present in each vaccine combination. With this information we



The Q Exactive Plus mass spectrometry system with a Dynex nanoflow liquid chromatography pump and autosampler will help researchers analyze samples faster and accurately.

hope to better understand the varying degrees of protection observed during the vaccine study,” said Trevor Glaros, an ECBC Mass Spectrometry Core Facility Manager leading the ECBC/USAMRIID Ebola collaboration.

In addition to vaccine research, ECBC is also supporting USAMRIID to discover Ebola-specific biomarkers in serum. The scientists will analyze Ebola-infected serum to discover a protein based panel of biomarkers.

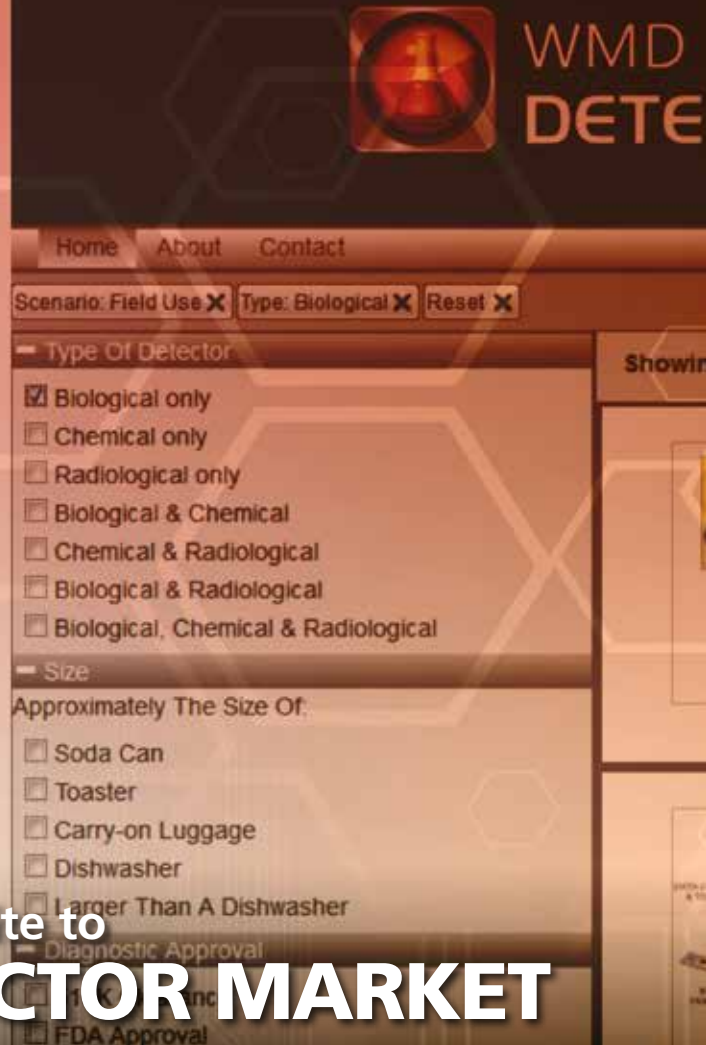
“The hope is that this panel of biomarkers will constitute a unique fingerprint for Ebola infection which can be used to diagnose patients before

symptoms develop,” stated Lisa Cazares, the USAMRIID researcher leading the project. A tool like this would give first responders the ability to administer the appropriate care and the unprecedented ability to track the disease outbreak in real-time. Biological analysis of this scope required additional instrumentation that ECBC was able to secure through partner, Thermo Fisher Scientific.

Thermo Fisher Scientific generously loaned ECBC a complete Q Exactive Plus mass spectrometry system with a Dynex nanoflow liquid chromatography pump and autosampler. This new equipment relieves the burden on existing instrumentation and, given its

technological advancements, allows for a more rapid and thorough analysis. ECBC’s contribution to USAMRIID’s Ebola research demonstrates how various organizations team up to provide solutions for the world’s most difficult and dangerous challenges.

“It is important for us to support our DOD partners with this kind of critical research,” said Jennifer Sekowski, Ph.D. of ECBC. “Our goal in creating the Mass Spectrometry Core Facility in 2013 was to set up a collaborative resource for all of the DOD. We have the equipment, the expertise, and the necessary safety protocols in place, so we are thrilled to be able to share it with our partners.”



ECBC Develops Comprehensive Website to ANALYZE CBRN DETECTOR MARKET

For warfighters and first responders, choosing the right device to detect and identify potentially harmful substances is critical. In today's marketplace, there are hundreds of different devices to choose from -- from large to handheld, from quick to specific -- but how does one determine which device is the best for his or her situation? Even if he or she finds a device that fits their profile, how well does that detector measure up to others like it?

Scientists at the U.S. Army Edgewood Chemical Biological Center (ECBC) have answered all those questions, through their Global CBRN Detector Market Survey (Market Survey) and www.WMDDetectorSelector.com online database. The Market Survey and www.WMDDetectorSelector.com allow first responders and warfighters to focus on using the equipment instead of choosing it. Now, figuring out the best equipment for the job is a simple click away.

ECBC has performed extensive analysis on hundreds of chemical, biological, radiological, and nuclear (CBRN) detection and identification devices. A device is evaluated utilizing a weighted model based on 99 different questions, from size and battery life to sensitivity and time to detection. The results are available for download from www.CBRNlibrary.com and posted to www.WMDDetectorSelector.com where after checking a few boxes about the potential use of the device, results are posted in order of relevance, easing the decision making-process and providing information to the people who need it most and fast.

"Recently, a number of similar databases have been released, but the size and methodology we employ make this a superior product in every way. Since this is now an app inside of the Biosurveillance Portal, it will be sustained as it is associated with a Program of Record," said Peter Emanuel, Ph.D, Market Survey creator and ECBC Biosciences Division Chief.

When Emanuel and Matthew Caples, Ph.D., created the first Market Survey in 2007, it was published as a 664-page textbook. In the past eight years, the team increased the number of detectors they analyzed, expanding from just biological detectors, to all-hazard detectors. Today the Market Survey analyzes more than 400 detectors. Publishing the survey simply in a hard copy book format, reached a breaking point when the print shop informed Emanuel that the only way to publish all of their results was in two, 500-plus page textbooks.

In 2015, the Market Survey has shed some pounds transforming from a 664-page book into www.WMDDetectorSelector.com, an interactive database that gives the survey a greater size and complexity with searchable functions. On the database, users can learn more about detectors through answering simple fields such as scenario use, type of detector, size, diagnostic approval and more.

The ECBC Biological Detector Market Survey, now a website and a mobile application allow first responders and warfighters to learn about hundreds of CBRN detectors from any location.

CTOR SELECTOR



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Advanced

Advanced Liquid Logic is a cost-effective autonomous, proprietary digital molecular diagnostic of molecular diagnosis products and accelerated developed a patented

Sort By Scenario Tier

View 15 per page

ological Tier:

Rating: Not Yet Rated

Ratings: 0

AIDA: Autonomous

The AIDA™ system is comprised of a diagnostic strip, a smart telephone for capturing the results indicated on the diagnostic strip, and an (encrypted) web portal for capturing test data, diagnosis, prognosis, decision support, and mapping of identified pathogens and toxins anywhere on the globe. AIDA™ can be used to detect as m

User Rating: Not Yet Rated

Total User Ratings: 0

Rate Detector

“WMDDetectorSelector.com brings the robust analysis and user friendly appeal of all the ECBC survey products to an online database that can be accessed from any computer, eliminating the need for carrying around a 10 pound book,” said Caples.

The Joint Program Executive Office for Chemical and Biological Defense facilitated another Market Survey transformation, when they funded ECBC to develop WMDDetectorSelector.com into an app that could be integrated into the Biological Identification Capability Sets portion of the Joint United States Forces Korea Portal and Integrated Threat Recognition’s (JUPITR) Biosurveillance Portal. This creation allows for all First Responders and Warfighters to access WMDDetectorSelector with a click of a button.

Developing the Market Survey is a precise process. In order to capture the usefulness of each technology, four

scenarios of use were devised: Field & Man portable; Mobile laboratory & Field laboratory; Diagnostic laboratory & Point of care; and High sensitivity, high throughput analytical laboratory. Employing this approach, the Market Survey and WMDDetectorSelector.com accurately describe the usefulness of each device based on its specific characteristics. Each of the four scenarios clearly defines the different objectives and requirements of each device.

Each detector vendor is responsible for filling out surveys on their own equipment. The intent of the vendor completing their own survey is to ensure the information is accurate and up to date. Each multiple choice survey question is aligned to a performance scale; the scales provide a means of measuring how well each technology “performs” relative to each criterion. The final step in developing the evaluation model is to weight the criteria. The weights indicate the relative

value of a criterion, as defined by its performance scale, compared to the other criteria. Because each scenario is concerned with different objectives and requirements, the criteria weights vary depending on the scenario.

“The S&T and Acquisition program is required to constantly conduct market surveys to select systems,” Emanuel said. “The users have told us that the searchable website is invaluable, and have thanked us for giving them this tool. It [Market Survey] has become a valuable asset to conduct market research in CWMD, numerous users have told us that.”

Based on the popularity of the Market Survey and WMDDetectorSelector.com, ECBC is currently working on delivering Version 2.0 of the website that will feature more devices and increased functionality. 🍀



JUPITR Team prepares to send shipping containers of sensors to the Republic of Korea for the JUPITR Operational Demonstration.



JUPITR Operators Stella Lee of ECBC and Hazel Gauani of JPM NBC CA work prepare the Ambient Breeze Tunnel for the full-scale aerosol testing.



JUPITR will give the Republic of Korea upgraded biological surveillance capabilities.



The Aerosol testing was critical to the JUPITR project's success. The testing required 20 pieces of equipment to be configured within ECBC's Ambient Breeze Tunnel.

WATCHFUL EYES

After two years of preparation the JUPITR Operational Demonstration is poised to illustrate a means for detection, protection and early warning of Biological Agent exposure on the Korean Peninsula

On March 30, a caravan packed to capacity with biological detection equipment pulled away from Aberdeen Proving Ground, Maryland to start a cross-country road trip to Travis Air Base in California.

From California, the two tons of equipment was loaded onto a Military Aircraft and sent nearly 9,000 miles away to Osan Air Base in the Republic of Korea (ROK), where scientists and engineers anxiously awaited its arrival. The globe-trotting equipment will be demonstrated at the Joint United States Forces Korea [USFK] and Integrated Threat Recognition Program (JUPITR) Operational Demonstration, where all of the equipment and facilities tested over the past two years will be demonstrated by the user community in a seven-day scenario-based event.

The JUPITR program is an effort to develop unique biological detection capabilities on the Korean Peninsula to address the demand for stronger biosurveillance. The program is led by the Joint Program Executive Office for Chemical and Biological Defense (JPEO) and supported by the U.S. Army Edgewood Chemical Biological Center (ECBC). JUPITR supports the Homeland Security Presidential Directive-21, a policy stating that biological threats can take many forms, including naturally occurring disease outbreaks. The program's presence on the Korean Peninsula aligns with the Joint Force's strategy to rebalance military efforts toward the Asia-Pacific region.

"The Operational Demonstration not only shows the Korean community that our efforts to upgrade the biosurveillance capabilities were successful, but it also shows users exactly how all the equipment and facilities will work together to keep the peninsula safe from widespread biological incidents," said Peter Emanuel, Ph.D JUPITR ATD lead and ECBC Biosciences Division Chief.

JUPITR is comprised of four distinct thrust areas which work together to give ROK an integrated biosurveillance solution. The first JUPITR area is the Biosurveillance Portal which is similar to a web management tool for health surveillance that can be accessed by government and civilian agencies. The second is Biological Identification Capability Sets (BICS), an effort to upgrade ROK facilities such as laboratories and equipment to allow for on-site sample analysis. The third, called Assessment of Environmental Detectors (AED), evaluates multiple biological detectors to determine which are best suited for the ROK environment. The Final thrust area examined early warning detection.

Much like the equipment making a nearly 9,000 mile trip to Korea, the JUPITR program endured a long journey to the Operational Demonstration phase.

JUPITR personnel needed to complete two key milestones before the Operational Demonstration –the Technical Demonstration and Aerosol Testing –both which were heavily supported by partner organizations. These two milestones helped researchers gather the valuable data to validate and update the JUPITR program.

The Technical Demonstration combined the Early Warning and AED legs together to show users how the two could interact. The Demonstration involved collaboration between many organizations including JPEO, JPM Nuclear, Biological and Chemical Contamination Avoidance, and JPM Protection, and was held at Dugway Proving Ground in Utah. To do this, JUPITR personnel put existing and new force and biological protection systems together in a common feed, allowing Battlefield Commanders and EOC personnel to see how all of these systems react when exposed to threats at the same time. Performing this kind of testing allows researchers to see the big picture and understand why some equipment performs differently than others.


"Combining these capabilities has not been done with CBRN equipment and force protection in the past. It gives that whole flash bang approach of understanding what happened and how it affects other outcomes," said Drew Murphy, JUPITR AED Operational Demonstration Lead.

The successful execution of the Technical Demonstration gave the group the confidence and practice they needed to approach the upcoming Operational Demonstration. "Our goal was to have a successful tech demo in Dugway and we accomplished that," Murphy said. "Since everything went well, we can continue down the path to successfully have an Operational Demonstration. Had it not gone well, we would be unable to proceed."

The other large milestone was the Aerosol Testing. This testing assessed environmental detectors against real-world biological agent exposure scenarios in a controlled chamber. The aerosol testing lasted from September to December 2014, with several additional months devoted to planning, set-up, training and troubleshooting. Logistics and coordination were key as the aerosol testing required 20 pieces of equipment to be configured within ECBC's Ambient Breeze Tunnel (ABT), which is roughly 14' x 14' x 200,' and is the only BioSafety Level-2 ABT in the United States. For the ABT testing, a simulant agent was used for initial data gathering.

"In the ABT, researchers put all that technology together and analyzed their performance side-by-side which has never happened before," said Steve Carrig, Technical Demonstration lead.

After two successful milestones, researchers look forward to putting their solutions to the test this summer.

"JUPITR brought together people from different disciplines to work together and create this Biosurveillance capability," Emanuel said. "We are ready to deliver a complete solution." 



ECBC Scientists Team Up with Biotech Firm Scientists to Develop an IMPROVED METHOD OF DETECTING ANTHRAX

On a summer day in 2012, Amber Prugh received a phone call from fellow ECBC microbiologist and supervisor, Dr. Jason Guicheteau. It turned out to be a classic good news and bad news call. “Amber, we have a wonderful opportunity to do pioneering research on anthrax spores detection with a private biotech firm out of New England, but we have to be able to do it in one week and for no more than \$23,000.”

The biotech company, Real-Time Analyzers, Inc, from Middletown Connecticut, needed ECBC’s BSL-3 laboratory facilities, access to the biological agents ECBC can produce, and the expertise ECBC scientists could bring to bear to test their concept. After a year and a half of advance planning with the company’s scientists, Guicheteau, Prugh and another ECBC microbiologist, Todd Sickler, had pulled it off, and a year after that, they co-authored, with several of the Real-Time Analyzers scientists, their findings in the prestigious UK journal “Analyst.” Their paper titled, “Selective detection of 1000 *B. anthracis* spores within 15 minutes using a peptide functionalized SERS assay” was featured on the front cover of the journal’s December issue.

The story begins in 2001 when anthrax spores, technically known as *B. anthracis* Ames, were distributed through the U.S. Mail as a terrorist act. Nationwide, the search was on for a method to detect and identify anthrax spores in the field. However, the detection system had to be easy for Soldiers and first responders to use – portable, with easily procured and used reagents, the sensitivity to detect anthrax in very low concentrations, but also selective enough to avoid false positives.

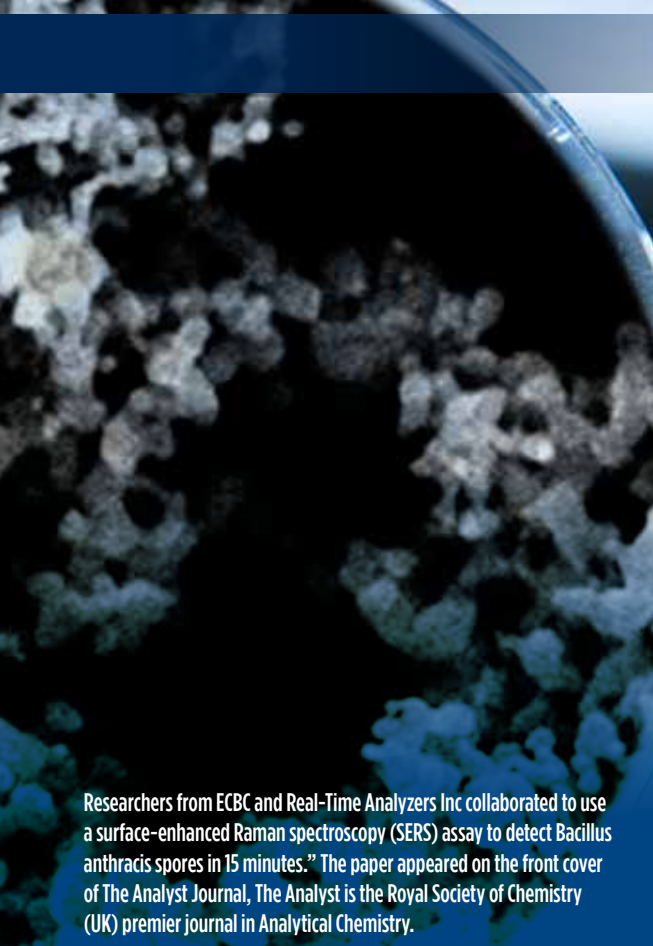
Existing detection methods were either too slow or impractical, samples had to be sent to a laboratory for analysis, or not sensitive or selective enough. What makes the ideal method of detection and identification so difficult is that Bacilli all share very similar wavelengths. Making it very difficult to distinguish between Bacilli types. The team needed to create a means to detect *B. anthracis* Ames and only that type. What was also needed was a way to enhance the signal that the *B. anthracis* Ames gives off when laser light bounces it off it and scatters to form a telltale pattern.

The team of ECBC and Real-Time Analyzers scientists started out by searching for a peptide, to use in pulling

B. anthracis Ames spores most commonly enter the body through inhalation where they incubate in the lungs. Once there, they turn into vegetative bacteria and enter the blood stream where they release toxins. The toxins ultimately cause septic shock and pulmonary stoppage.

B. anthracis Ames away from the rest of the substrate in a sample. They found a commercially available peptide known as ATYPLPIR that would discriminately bind *B. anthracis* Ames.

Next, they needed to select a biomarker specific to *B. anthracis* Ames. They selected dipicolinic acid (DPA) because it is unique to spores and forms roughly 10 percent of their molecular structure. Finally, they needed to find an assay to enhance the light signature of *B. anthracis* Ames when exposed to a laser – the “surface enhanced” part of the method’s name, Surface-enhanced



Researchers from ECBC and Real-Time Analyzers Inc collaborated to use a surface-enhanced Raman spectroscopy (SERS) assay to detect *Bacillus anthracis* spores in 15 minutes.” The paper appeared on the front cover of *The Analyst Journal*, *The Analyst* is the Royal Society of Chemistry (UK) premier journal in Analytical Chemistry.

The team utilized ECBC’s Biosafety-Level 3 facilities in order to complete this work.”

Raman Spectroscopy or SERS. The Real-Time Analyzers scientists had already developed a silver colloid, which is a suspension of silver nanoparticles to use as an enhancer.

When their version of finals week came, the SERS laser hit the DPA present in the spores that the peptide was drawn to, the molecules in the spores were excited – enhanced by the silver colloid – scattering the laser light and causing a shift in the light unique to *B. anthracis* Ames. Distinct from all the other *Bacilli* wavelength signatures, identification

was confirmed, even in the case of only a very few spores being present. This SERS technique turned out to be so sensitive that as few as 1,000 spores could be detected in a milliliter of solution, the same number needed to kill an average-size person.

In the end, the Real-Time Analyzers scientists were very pleased and impressed with ECBC’s capabilities, and discussions are underway to adapt the method to detect and identify ricin. Prugh and Sickler are hoping they will get more than a week this time. 🍀



ECBC researchers findings was featured on the front cover of “Analyst” Journal.

B. anthracis Ames spores are, on average, four microns wide. An inch is 25,400 microns and a period at the end of a sentence is 615 microns.



ECBC Creates Test Method of Choice for U.S. DEPARTMENT OF DEFENSE

ECBC and several partner organization developed a new test method standard for the U.S. Department of Defense called LVAP. The Low Volatility Agent Permeation test method is a contact-based method, using a sorbent pad to collect the total permeated mass of contaminant

Researchers at the Edgewood Chemical Biological Center (ECBC) recently developed a new test fixture and experimental method, named the Low-volatility Agent Permeation (LVAP) method. LVAP is on track to become a U.S. Department of Defense (DOD) official test and evaluation (T&E) method for VX permeation through protective equipment. A U.S. patent on the LVAP fixture and method will be issued in spring 2015.

The LVAP method built upon multiple years of ECBC research, with support from the Joint Science and Technology Office (JSTO), Natick Soldier Research and Development Center (NSRDC), Deputy Under Secretary of the Army for Test and Evaluation (DUSA TE) and the Joint Project Manager for Protection (JPM-P).

LVAP has shown increased accuracy for measuring the permeation of low-volatility contaminants, such as VX. LVAP is a contact-based method, using a sorbent pad to collect the total permeated mass of contaminant. A weight is applied to the fixture, ensuring that all layers are in good contact. This weight corresponds to 1 psi, which is consistent with the pressure used when grasping an object with the hand.

Traditional methods of measuring permeation are dependent on collecting vapors of the permeated contaminant. This can be less accurate for low-volatility contaminants, since the vapor concentration may not represent the potential hazard that has permeated through.

LVAP has recently completed an official verification and validation (V&V), under the auspices of DUSA TE. Using standard ISO calculation, the V&V documented the variability of the method to be $\pm 8.2\%$, which is much improved from the $\pm 80\%$ for similar materials using a traditional permeation method. LVAP is awaiting final transition, expected Spring 2015, when the T&E community formally accept LVAP as a method for Acquisition-level testing.

As part of the V&V study, a physics-based model was developed to predict neat agent permeation through the test materials. This was based on a Fickian diffusion model with the diffusivity and solubility of VX in the latex material estimated by correlation with published values. The model was successful in predicting the measured permeation for VX through latex at 24 hour and 48 hour time points, prior to the experiments being conducted. This modeling effort was conducted in

collaboration with scientists from the Decontamination Sciences Branch.

"The modeling of this method was remarkable," said Terrence D'Onofrio, Ph.D., principal investigator for this research. "We can describe how VX interacts with different materials, and predict how much will come through over time, using these physics-based approaches."

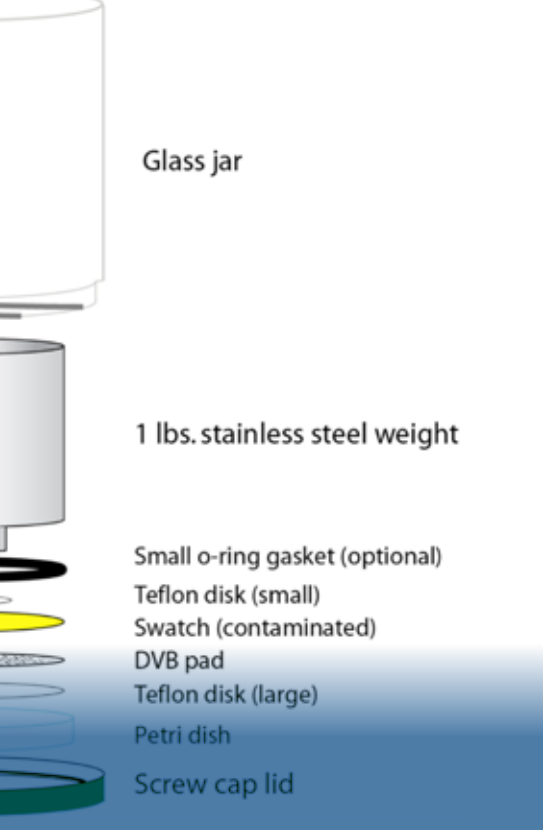
The modeling predicted the levels of permeation that occur over time, guiding experiments to the enable focus on critical time points. The modeling also enables comparison with data obtained by traditional vapor-collection methods.

"This ability to predict the changes over time fills a huge gap from the previous methods," says D'Onofrio.

LVAP has already had an impact on personal protective equipment and laboratory procedures used at ECBC. D'Onofrio and his colleagues within ECBC's Engineering Directorate used LVAP as part of a safety initiative to test laboratory gloves against high-concentration VX solutions. Through the use of LVAP, they were able to demonstrate that the gloves offered protection for the laboratory scenario tested.




Seven Things to Know About METAL-ORGANIC FRAMEWORKS (MOFs)



The Technical Report of this research will be used to update the lab procedures and safety training.

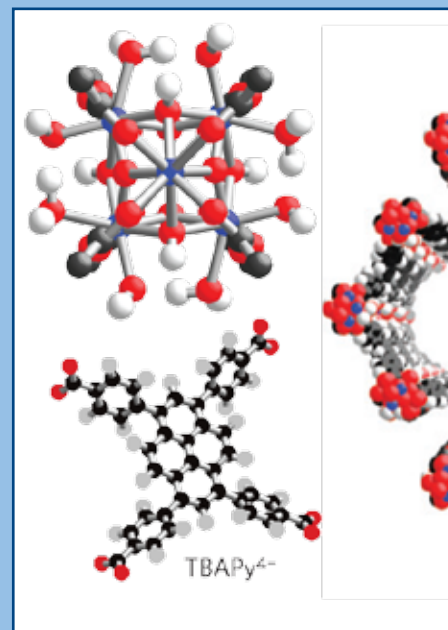
The Operational Toxicology Branch, Decontamination Sciences Branch and Permeation and Analytical Solutions Branch all collaborated to perfect the LVAP method. This method is now being transitioned to ECBC partners at the West Desert Test Center at Dugway Proving Grounds.

Beyond DoD, domestic elements such as the Federal Bureau of Investigation and the Department of Homeland Security, have discussed using LVAP to test their First Responder suits. British Agencies have also expressed interest in the method.

An official ceremony recognizing LVAP as a program and test method of choice for the DOD is scheduled to be held in Spring 2015. 

ECBC scientists teamed up with experts from Northwestern University, University of Minnesota, and King Abdulaziz University in Jeddah, Saudi Arabia, to research NU-1000, a metal-organic framework (MOF) material which has demonstrated high porosity and exceptional chemical stability that is effective for the degradation of nerve agents and their simulants. In just three minutes, NU-1000 was able to break down half of the GD nerve agent. This rate is 80 times faster than similar compounds. A recent paper about these findings and more will be published in an upcoming issue of *Nature Materials*. After speaking with Greg Peterson and Jared DeCoste, ECBC leads on the research of NU-1000 and other MOFs, here are the seven things to know about ECBC's MOF Program:


- Several MOFs are currently under investigation by ECBC's CBR Filtration Branch, in conjunction with Universities such as Northwestern, Georgia Tech, UC Berkeley, and others.
- Work conducted specifically for the *Nature Materials* piece was done under a JSTO-funded program called "Multifunctional Materials for Force Protection"
- The objective of the program is to provide nanostructured, multifunctional materials for enhanced capabilities in the areas of physical protection, sensing, adsorption, catalysis, and decontamination
- ECBC CBR Filtration is actively pursuing metal-organic frameworks because the team can tailor their reactivity and structure to target specific (or broad) chemical reactivity
- UiO-66 and UiO-66-NH₂ MOFs are two early promising materials that have substantial reactivity towards G and H agents. The team is actively modifying the pore structure to



Pictured above: Metal Organic Frameworks

increase reaction rates.

- NU-1000 is a newer material from Northwestern University. It contains zirconium oxide secondary building units (SBU) that are incredibly reactive towards G agents. The larger pore size allows for enhanced agent diffusion. The team can also modify the SBU to integrate buffers and indicators to increase/stabilize reactivity and provide sensing capabilities
- ECBC is working with North Carolina State University, to modify fibers through atomic layer deposition to grow these MOFs. The main idea is to provide new suits, patches, or even fabric-based filters for low burden protection against CWAs and eventually emerging threats.
- In addition to the *Nature* article, this work has been highlighted in the December 8, 2014 and February 9, 2015 issues of C&E News, the ACS weekly newsletter.

Read the *Nature Materials* Journal article here: <http://www.nature.com/nmat/journal/vaop/ncurrent/full/nmat4238.html> 



LIVING IN AMERICA: a Q&A with Daan Noort, Dutch Engineering and Scientist Exchange Program scientist

Pictured above from left to right: Jennifer Sekowski, Ph.D, Daan Noort, and Trevor Glaros, Ph.D of Biosciences worked together during Noort's time in the U.S.

When Daan Noort, a research chemist and principal scientist from the Netherlands Organization of Applied Scientific Research (TNO), first pitched the idea of moving his family from The Netherlands to the United States for a few months, so that he could participate in the Engineer and Scientist Exchange Program (ESEP), his three children –all in middle and high school –were not enthusiastic.

“They had their friends and their routines, and did not want any change,” Noort explained. Now, five months later as Noort and his family are preparing to return to The Netherlands, his children are asking if the family could extend their stay.

“At this point, we like it here, and have really become a part of the community. Now the idea of leaving is hard,” Noort said. “Our time here has been smoother and more memorable than any of us imagined.”

Noort and his family spent five months living in Bel Air, MD while he worked at ECBC as a part of ESEP. ESEP is an international exchange program that

promotes international cooperation in military research, development, test and evaluation (RDT&E) through the exchange of military and/or government civilian engineers and scientists. ECBC has been an active participant in the ESEP program for many years. Currently, ECBC employees are serving ESEP rotations in the United Kingdom, Germany, Chile, Australia and The Netherlands. The ESEP experience helps ECBC scientists create personal working relationships with international partners and have resulted in efforts such as mutually beneficial leveraging of technology between participating organizations.

“Having Daan work with us was very beneficial to our work, as well as personally and professionally enjoyable for our whole group,” said Jennifer Sekowski, Ph.D, DABT, Principal Investigator for the Systems Biology of Host-Toxicant Response Project in ECBC's Biosciences Division. One of the projects Noort worked on at ECBC was to transition an assay from his laboratory at TNO to ECBC. Sekowski first started this project in summer 2013 during a week-long visit to TNO. Sekowski said it was invaluable to have Noort at ECBC

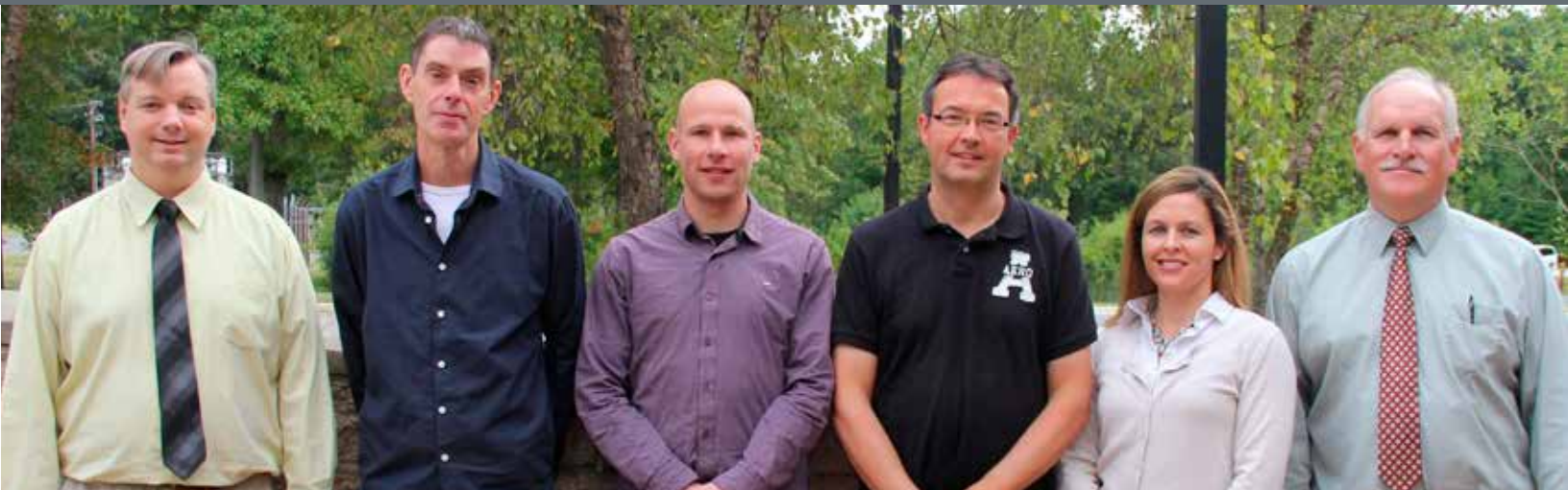
working to continue that project with the rest of the team.

“His chemistry background and international perspective helped us develop important new tools and protocols which have opened new possibilities in our DTRA funded work. Already, the chemical analog probes he synthesized while here will allow us to publish an extra manuscript this year, an extra deliverable we can provide for our customer, DTRA. We also plan to follow-up on this and related work in future collaborative efforts of interest to DTRA and DHS.” Before Noort returned to The Netherlands, he discussed his experiences working and living in a different country.

- **Why did you get involved with the ESEP Program?**

In The Netherlands, I am in charge of running various projects at TNO, so I do not get the chance to get in the labs and do hands-on research. Participating in ESEP gave me that opportunity to get back in the labs as a scientist, and sharpen my skills in a completely different atmosphere and culture. During my five months with

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Dutch scientist Daan Noort spent five months in the U.S. working in ECBC's R&T Directorate. He supported multiple teams on various projects. Pictured above (from left to right): Dan Carmany, Excerpt Inc, Alex Fidder, TNO, Roland van den Berg, TNO, Daan Noort, Jennifer Sekowski Ph.D., ECBC, and E. Michael Jakubowski Ph.D, ECBC.

ECBC, I worked with the Biosciences, Chemistry and Toxicology Divisions, so I had the opportunity to gain multiple perspectives and see how differently each one operated. I truly feel like I was able to contribute a lot and learn a lot with each team that I worked with. I also wanted to participate in ESEP to get the international experience. I had been to the United States many times, but just for a few weeks or days, this program gave me chance to come here in a completely different way, and become a part of the community here.

• **What was it like to move your family to a different country for five months?**

Moving the entire family –my wife and three children –to the U.S. for five months was difficult, but not as difficult as we thought it would be. The Harford County community was so helpful and welcoming, that it made our transition very easy, and makes leaving tough. The teachers at the local public schools my children attended took the extra time to help my children get adjusted to a new country and a new language. My children also made friends and participated in after school sports and other activities. My wife and I met several people in the community. We traveled a little bit and visited New York City, Niagara Falls, Washington, D.C., Baltimore and went to a large number of sport events. Although it was just five months, we were able to build a life here and get comfortable,

so I thank the community for that.

• **What ECBC projects and programs did you support?**

I spent some time working in the Synthesis lab in the Chemistry Division, and then I moved to the Proteomics Core lab in the BioSciences Division. Currently, I have just finished evaluating compounds that I have prepared. Working in both labs has given me multiple perspectives on different labs and how we approach similar questions. For example, while working on the Systems Biology of Host-Toxicant Response Project, I was able to synthesize a series of new “click chemistry” probes, opening up a new type of activity based protein profiling (ABPP) assay which should be able to more precisely identify proteins and peptide adducts that bind directly to chemical agents of interest.

• **What was the most important lesson that you've learned while with ECBC?**

Being at ECBC and working in the labs again have reiterated to me the importance of details. In every experiment, you have to be sure that every detail is correct, or else it could ruin your entire outcome. You can't think only of the big picture in scientific research, or you will miss something. Rather you have to focus on the small, solid details and slowly build a strong knowledge basis for your project. Although this is a basic research principle, I don't work in the

labs on a day-to-day basis back at TNO, so doing that here served as a good reminder for me that I can apply in my project manager role.

• **What is the biggest benefit to participating in ESEP?**

After completing five months in the program, I can say that there is no better way to create meaningful partnerships and build trust with international colleagues, than to work alongside them for a few months. Now I feel like I can reach to the people I worked with at ECBC for anything, and they can reach back to me in a way that is more personal than before. We have become natural collaborators through this process, and I know that we will continue that relationship when I return to The Netherlands.

• **What will you miss the most about living in the U.S.?**

I will miss how convenient everything is in this country. In the U.S., stores are open late, so you can go shopping after dinner if necessary. If you don't want to cook, there is a restaurant on every corner and it is easy to get a table. Also, so many different types of food are available; you can try something different every day. I will also miss the space that we had in the U.S. Back home, we live in a small city, so our homes are not as big and we don't have yard space or much personal space in general. I'll miss having those types of luxuries. 🍷



Dr. Fu-Lian Hsu earns ECBC'S FIRST MATTA AWARD IN 18 YEARS

Pictured above Joseph Corriveau, Ph.D ECBC Director awards Fu-Lian Hsu with the Joseph E. Matta Award at Hsu's retirement ceremony.

Dr. Fu-Lian Hsu was presented the Dr. Joseph E. Matta award in honor of his influential career and demonstrated impact at the Edgewood Chemical Biological Center (ECBC) this past February. Hsu, a chemist within ECBC's Chemical Sciences Division recently retired from ECBC after 36 years of service to the government and the organization.

The Dr. Joseph E. Matta Award is awarded "to a researcher whose cumulative contributions have demonstrated initiative, creativity, innovative ability and overall competence in his/her field to enhance the professional image of ECBC." Since the Center was reorganized to become the Edgewood Chemical Biological Center, the Matta Award had not been awarded. This is the first time since 1997 that the Matta award has been given.

Dr. Fred Berg, Hsu's former Division Chief, said he is proud that after an 18 year hiatus, Hsu could be the one who earned the first Matta Award.

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"Fu-Lian is exactly the type of scientist the Matta award was established to recognize. He has been the lead synthetic chemist at ECBC for many years and has served as a valuable resource and mentor to the other chemists' in the group. While ECBC is sad to see Fu-Lian go, we are humbled and happy that he shared 36 years with us and that we were able to give him this award," Berg said.

Hsu's vast contributions make him an obvious candidate for the Matta Award. In his career, Hsu has published 53 Government technical reports, more than 25 open literature papers and has three patents. He has also helped the Center grow the next generation of scientists and engineers through supervising two NRC post doctoral researchers, hosting two HBCU researchers, and mentoring young scientists in the Threat Agent Chemistry Branch. Hsu collaborates and consults with a number of scientists from other organizations including National Institutes of Health (NIH), United

States Army Medical Research Institute of Chemical Defense, Navy Research Laboratory, University of Delaware, and Leidos.

Hsu first started his career working on the design, synthesis and structure activity relationships in three different classes of compounds for the less-than-lethal program. In his 36 years, he has worked with academia and industry to contribute to breakthroughs in short-acting anesthetic and other research of interest to the pharmaceutical community. Hsu has also worked with international demilitarization programs such as non-stockpile, Russian Demilitarization, and Treaty Verification.

Hsu is a reviewer for prestigious American Chemical Society (ACS) publications such as the Journal of Organic Chemistry, the Journal of Medicinal Chemistry and the Journal of Pharmaceutical Science. Hsu plans on maintaining this role in his retirement. 🍀



RESEARCHERS DEMONSTRATE NOVEL Uses of MinION™

ECBC researchers were able to show a unique use of a pocket-sized MinION Nanopore Sequencer could be useful in disease surveillance.

A Post-Doctoral research fellow from the U.S. Army Edgewood Chemical Biological Center (ECBC) led a team of researchers from ECBC and Signature Science, LLC to a potential disease detection and surveillance breakthrough after just six months of research.

Andy Kilianski, Ph.D, ECBC NRC Post-Doctorate with the BioDefense Branch and his team demonstrated a unique use of the MinION™ ‘Nanopore sequencer’ to accurately identify a range of closely-related bacteria and viruses within six hours, demonstrating the potential for this technology to be used as a mobile diagnostic clinic during outbreaks. The team’s findings were published in the March 2015 edition of the open access, open data journal, *Gigascience*.

The MinION™ is a low-cost palm-sized sequencing device from Oxford Nanopore Technologies that has been made available to some research groups for testing. It is powered and operated through a USB connection plugged into a laptop, which means that it could potentially be used for on-site clinical analyses in remote locations.

“Being able to accurately identify and characterize strains of viruses and bacteria using a mobile platform is attractive to anyone collecting biological samples in the field. And we expect that as the technology improves, the sequencing will generally become cheaper, faster and more accurate, and could have further clinical applications,”

said Kilianski.

The researchers were able to use the MinION™ to accurately identify and differentiate viral and bacterial species from samples. Within six hours, the device generated sufficient data to identify an E. coli sample down to species level, and three poxviruses (cowpox, vaccinia-MVA, and vaccinia-Lister) down to strain level. The device was able to distinguish between the two vaccinia strains despite them being closely related and over 98 percent similar to each other.

The technology relies on protein ‘nanopores’ to determine the sequence of a strand of DNA. At the core of the protein is a hollow tube only a few nanometres in diameter, through which a single DNA strand can pass. As the DNA strand passes through the nanopore, it causes characteristic electrical signatures, from which bases can be identified, and the sequence of the strand determined.

The MinION™ showed an observed per-base error rate of approximately 30 percent, which is higher than that of other DNA sequencing methods, however, the latest updates of the technology have since improved the accuracy.

Kilianski and his team are part of a group of different laboratories performing an alpha technology evaluation of the MinION™. The laboratories use an online central portal called, Mania Access Program (MAP)

to collaborate and share updates and progress across various locations.

“It’s similar to crowdsourcing, and is a unique way to discover different uses of the MinION™,” Kilianski said.

The group has two distinct paths for the future of their MinION™ research. The first path is to continue the current research and look for ways to further improve accuracy. The second path is through ECBC’s in-house Innovative Proposal Project Program where selected proposals earn internal funding to perform applied research. Under this program, Kilianski and team will explore full genome sequencing for viruses as opposed to the amplicon sequencing that was done originally.

“There are some inherent challenges with that [whole genome sequencing], but we are really pushing the limits of this device whereas the amplicon approach is something that we knew would work, the whole genome sequencing is a little riskier,” Kilianski said.

Read more about the team’s research in their *Gigascience* paper, “Bacterial and viral identification and differentiation by amplicon sequencing on the MinION nanopore sequencer.” The other authors on this were Jamie L Haas, Elizabeth J Corriveau, Alvin T Liem, Kristen L Willis, Dana R Kadavy, C Nicole Rosenzweig and Samuel S Minot. <http://www.gigasciencejournal.com/content/4/1/12>



R&T Tech Reports

A number of R&T staff members and contractors have showcase their great work through technical reports. Here is a sampling from 1 October 14– 31 March 15:

- **ECBC-TR-1238 - Testing of Six Commercial Off-the-Shelf Riot-Control Grenades**
Roop, Terrence; Black, Ernest; Shomo, James; Sumpter, Kenneth; Bickford, Lawrence; and DeLacy, Brendan
- **ECBC-TR-1239 - Biological Standoff Test Chamber Capability Study**
Walther, John; Davies, Shawn; Richards, Aileen; and Caudill, Lisa
- **ECBC-TR-1248 - Adapting the Colorimetric Reconnaissance Explosives Squad Screening Field Kit to Include Detection Capabilities for Carbohydrates**
- **ECBC-TR-1273 - Toxicity Determinations for Five Energetic Materials, Weathered and Aged in Soil, to the Collembolan *Folsomia candida***
Phillips, Carlton T.; Checkai, Ronald T.; Kuperman, Roman G.; Simini, Michael (ECBC); Sunahara, Geoffrey I. (NRC); and Hawari, Jalal (Polytechnique Montréal)
- **ECBC-TR-1275 - Assessment of Wearable Sensor Technologies for Biosurveillance**
Hirschberg, David L. (Columbia University); Betts, Kelley (Leidos Inc.); Emanuel, Peter (ECBC); and Caples, Matt (Booz Allen Hamilton)
- **ECBC-TR-1278 - Vapor Pressure Determination of VM Using the Denuder–Liquid Chromatography–Mass Spectrometry Technique**
Jenkins, Amanda L. (Ask); Bruni, Eric J. (Leidos); Buettner, Leonard C. (Consulta Chem); Sohribi, Ai; and Ellyz, Michael W. (ECBC)
- **ECBC-TR-1279 - Permeation Measurements of High-Concentration VX Standards through Butyl Gloves**
D'Onofrio, Terrence
- **ECBC-TR-1280 - Headspace Gas Chromatography Method for Studies of Reaction and Permeation of Volatile Agents with Solid Materials**
McGarvey, David J. (ECBC); and Creasy, William R. (Leidos)

Publications

R&T personnel have authored 26 scientific journal articles between 1 October 14 and 31 March 2015. Below is a sampling of the most recent titles. For the complete list please visit: <https://cbconnect.apgea.army.mil/RT/Lists/pubs/AllItems.aspx>

- **Bacterial and viral identification and differentiation by amplicon sequencing on the MinION nanopore sequencer**
Kilianski, Andy; Corriveau Elizabeth, J.; Liem Alvin, T.; Rosenzweig, C. Nicole; Haas Jamie, L.; Kadavy Dana, R.; Minot Samuel, S.; Willis Kristen, L.
Source: *Gigascience* Volume: 4 Issue: 12
DOI: 10.1186/s13742-015-0051-z Published: MAR 26 2015, ISSN: 2047-217X
FULL-TEXT: <http://www.gigasciencejournal.com/content/pdf/s13742-015-0051-z.pdf>
- **A robust platform for functional microgels via thiol-ene chemistry with reactive polyether-based nanoparticles**
Fleischmann, C (Fleischmann, Carolin); Gopez, J (Gopez, Jeffrey); Lundberg, P (Lundberg, Pontus); Ritter, H (Ritter, Helmut); Killops, KL (Killops, Kato L.); Hawker, CJ (Hawker, Craig J.); Klinger, D (Klinger, Daniel)
Source: *POLYMER CHEMISTRY* Volume: 6 Issue: 11 Pages: 2029-2037, DOI: 10.1039/c4py01766h Published: MAR 21 2015, ISSN: 1759-9954 eISSN: 1759-9962, FULL-TEXT: <http://pubs.rsc.org/en/content/articlepdf/2015/py/c4py01766h>
- **Studies on Residue-Free Decontaminants for Chemical Warfare Agents**
Wagner, George W.
Source: *Environmental Science & Technology* Volume: 49 Issue: 6 Pages: 3755-3760
DOI: 10.1021/es506045a Published: MAR 17 2015, ISSN: 0013-936X
FULL-TEXT: <http://pubs.acs.org/doi/pdf/10.1021/es506045a>
- **A synthetic strategy for the preparation of sub-100 nm functional polymer particles of uniform diameter**
Killops, KL (Killops, Kato L.); Rodriguez, CG (Rodriguez, Christina G.); Lundberg, P (Lundberg, Pontus); Hawker, CJ (Hawker, Craig J.); Lynd, NA (Lynd, Nathaniel A.),
Source: *POLYMER CHEMISTRY* Volume: 6 Issue: 9 Pages: 1431-1435, DOI: 10.1039/c4py01703j Published: MAR 7 2015
ISSN: 1759-9954 eISSN: 1759-9962
FULL-TEXT: <http://jat.oxfordjournals.org/content/39/1/129>
- **Evaluation of MOFs for air purification and air quality control applications: Ammonia removal from air**
Jasuja, H (Jasuja, Himanshu); Peterson, GW (Peterson, Gregory W.); Decoste, JB (Decoste, Jared B.); Browe, MA (Browe, Matthew A.); Walton, KS (Walton, Krista S.)
Source: *CHEMICAL ENGINEERING SCIENCE* Volume: 124 Pages: 118-124, DOI: 10.1016/j.ces.2014.08.050 Published: MAR 3 2015
ISSN: 0009-2509 eISSN: 1873-4405
FULL-TEXT: <http://www.sciencedirect.com/science/article/pii/S0009250914004758>
- **Evaluation criteria for bioaerosol samplers**
Kesavan, Jana; Sagripanti, Jose-Luis
Source: *ENVIRONMENTAL SCIENCE: PROCESSES & IMPACTS* Volume: 17 Issue: 3 Pages: 638-645
DOI:10.1039/c4em00510d Published : MAR 1 2015, ISSN: 2050-7895
FULL-TEXT: <http://pubs.rsc.org/en/content/articlepdf/2015/EM/C4EM00510D>
- **Genomic sequences of six botulinum neurotoxin-producing strains representing three clostridial species illustrate the mobility and diversity of botulinum neurotoxin genes**
Smith, TJ (Smith, Theresa J.); Hill, KK (Hill, Karen K.); Xie, G (Xie, Gary); Foley, BT (Foley, Brian T.); Williamson, CHD (Williamson, Charles H. D.); Foster, JT (Foster, Jeffrey T.); Johnson, SL (Johnson, Shannon L.); Chertkov, O (Chertkov, Olga); Teshima, H (Teshima, Hazuki); Gibbons, HS (Gibbons, Henry S.); Johnsky, LA (Johnsky, Lauren A.); Karavis, MA (Karavis, Mark A.); Smith, LA (Smith, Leonard A.)
Source: *INFECTION GENETICS AND EVOLUTION* Volume: 30 Pages: 102-113, DOI: 10.1016/j.meegid.2014.12.002 Published: MAR 2015
ISSN: 1567-1348 eISSN: 1567-7257
ABSTRACT: <http://www.sciencedirect.com/science/article/pii/S1567134814004481>
- **Simultaneous Quantification of Diazepam, Flunitrazepam and Metabolites in Reinforced Clostridial Medium by Liquid Chromatography-Tandem Mass Spectrometry**
Martindale, SM (Martindale, Stephanie M.); Powers, RH (Powers, Robert H.); Bell, SC (Bell, Suzanne C.)
Source: *JOURNAL OF ANALYTICAL TOXICOLOGY* Volume: 39 Issue: 1 Pages: 29-34, DOI: 10.1093/jat/bku110 Published: JAN-FEB 2015
ISSN: 0146-4760 eISSN: 1945-2403
ABSTRACT: <http://jat.oxfordjournals.org/content/39/1/>

Patents

Below is sampling of Patents received by R&T personnel in FY15 as of April 30, 2015:

- **Patent 8,925,882, awarded January 6, 2015 - Mount for Telemetry receiver, Dennis B Miller**
A mount for a telemetry receiver having a data connector and used in conjunction with a cage for housing animals and having at least one wall. The mount includes a base plate and a pair of rails which are attached to the base plate. These rails are dimensioned to slidably receive opposed sides of the telemetry receiver. The base plate includes at least one opening aligned with the telemetry receiver data connector when the telemetry receiver is inserted between the rails. The opening is dimensioned to receive a data cable therethrough. A fastener then secures the base plate to the inside of the wall of the cage.
- **Patent 8,982,131, awarded March 17, 2015 – Multivariate digital camera device and method for generating 2D and 3D pictures of datasets comprised of points in hyperspace, Waleed Maswadeh**

A multivariate digital camera device and method for generating pictures of datasets comprised of points in hyperspace is provided. The invention may be embodied in an input device, a computer processor, and an output device. The input device may be a keyboard, a laboratory instrument such as a mass spectrometer, a reader of computer readable medium, or a network interface device. The output device may be a monitor used in conjunction with either a 2D or 3D printer or both. The computer processor receives data from the input device and performs a series of steps to create a 2D or 3D image of the hyperspace object. The resulting image is then produced in a non-transitory medium by at least one of the output devices. The processor steps include the use of a maximum distance method in which distances and angles information from the points in the hyperspace dataset are preserved to produce a more picture-like quality.