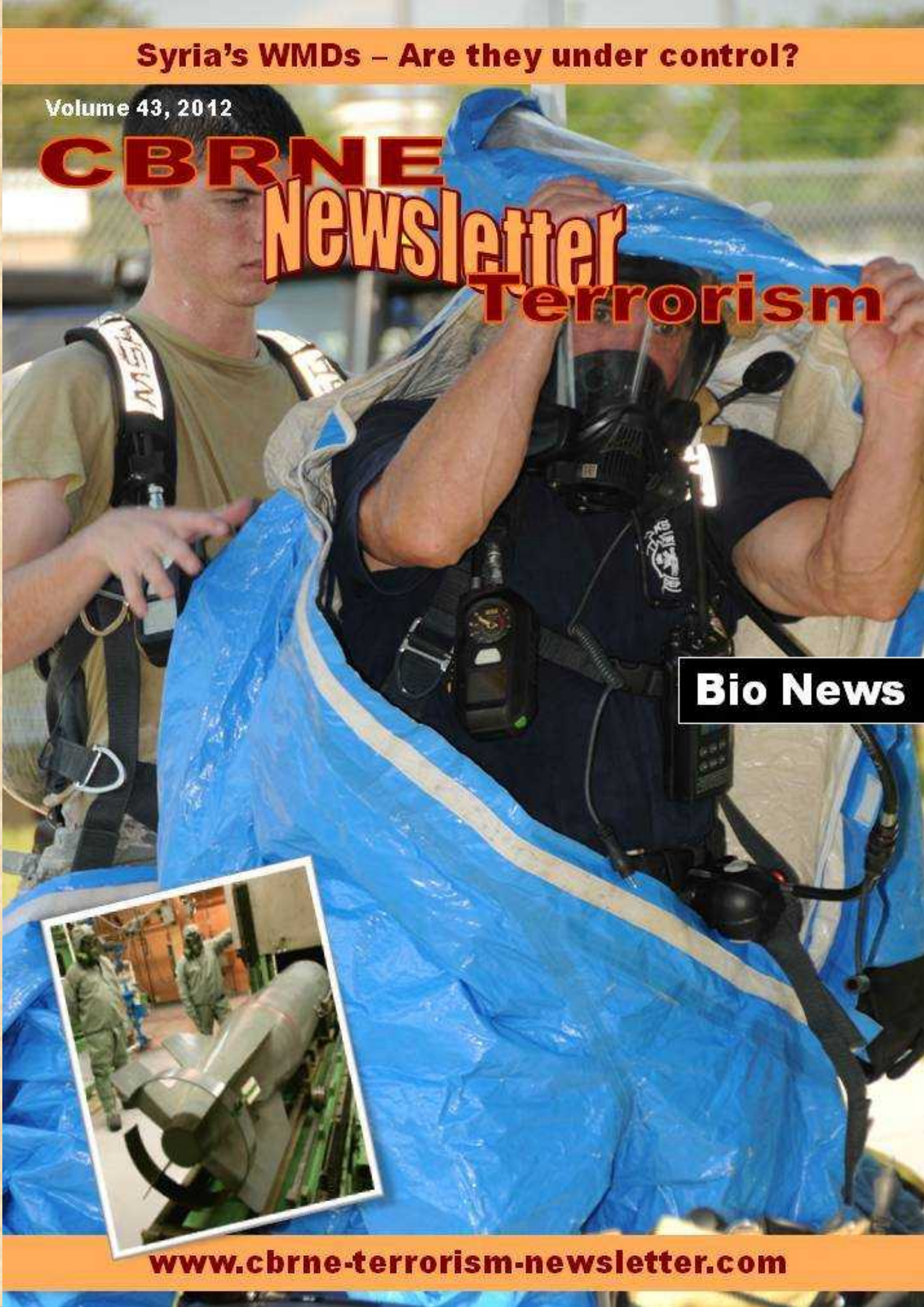
Syria's WMDs – Are they under control?

Volume 43, 2012

CBRNE Newsletter Terrorism



Bio News

www.cbrne-terrorism-newsletter.com

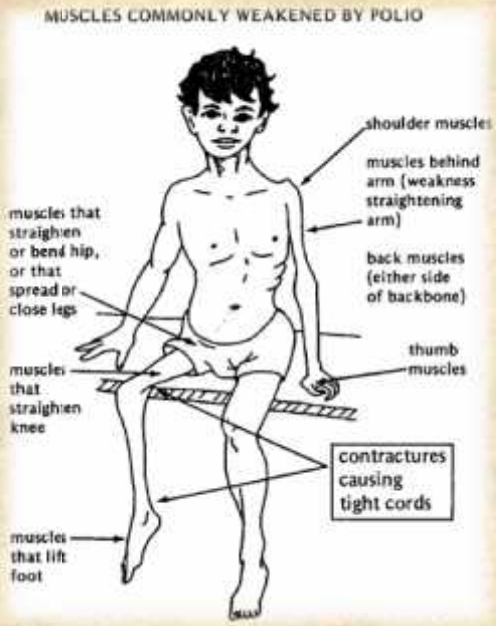
Taliban Block Vaccinations in Pakistan

Source:http://www.nytimes.com/2012/06/19/world/asia/taliban-block-vaccinations-in-pakistan.html?_r=2&ref=world

A Pakistani Taliban commander has banned polio vaccinations in North Waziristan, in the tribal belt, days before 161,000 children were to be inoculated. He linked the ban to American drone strikes and fears that the C.I.A. could use the polio campaign as cover for espionage, much as it did with Shakil Afridi, the Pakistani doctor who helped track Osama bin Laden.

The commander, Hafiz Gul Bahadur, said that the vaccinations would be banned until the Central Intelligence Agency stopped its drone campaign, which has been focused largely on North Waziristan.

Mr. Bahadur said the decision had been taken by the shura-e-mujahedeen, a council that unites the myriad jihadi factions in the area, including Taliban, Qaeda and Punjabi extremists.



The announcement, made over the weekend, is a blow to polio vaccination efforts in Pakistan, one of just three countries where the disease is still endemic, accounting for 198 new cases last year — the highest rate in the world, followed by Afghanistan and Nigeria.

The tribal belt, which has suffered decades of poverty and conflict, is the largest reservoir of the disease. A Unicef spokesman said health workers had hoped to reach 161,000 children younger than 5 in a vaccination drive scheduled to begin on Wednesday.

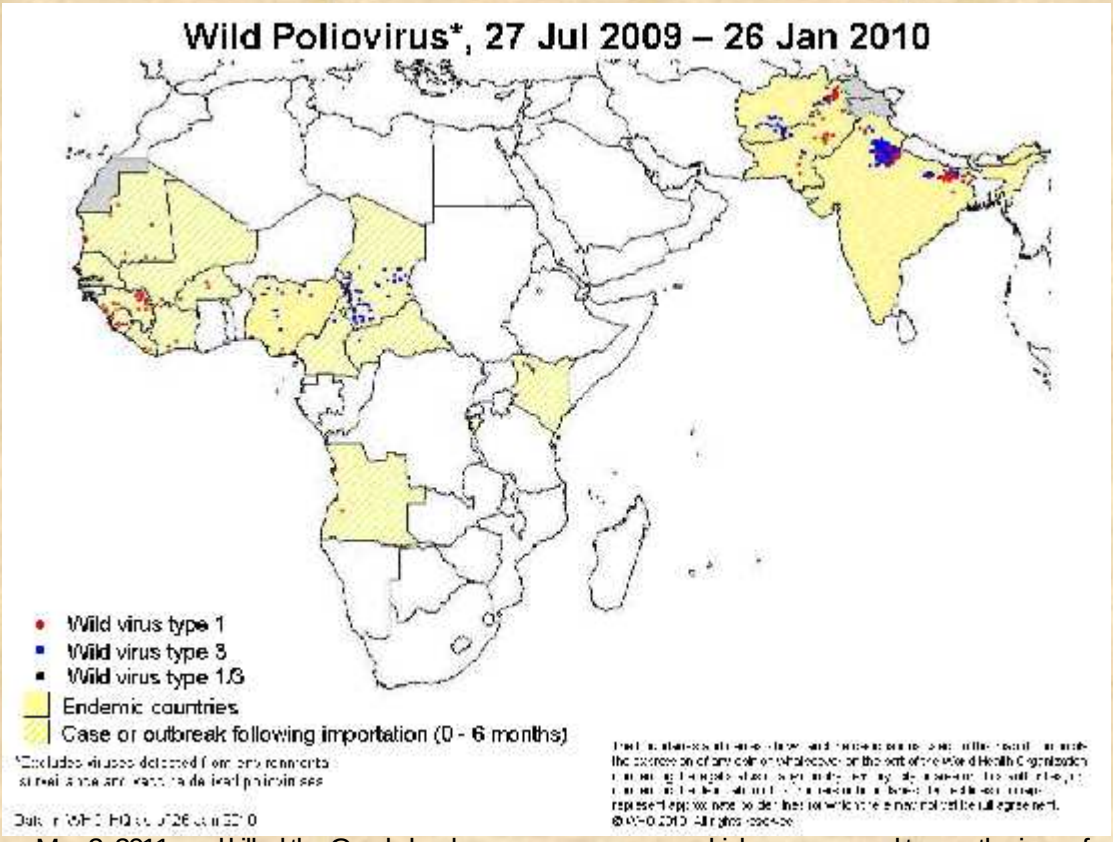
That is likely to be canceled, at a time when officials felt they were making progress. So far this year, Pakistan has recorded 22 new polio cases, compared with 52 in the same period last year.

The Taliban announcement is also likely to rekindle controversy surrounding Dr. Afridi, who was recently convicted by a tribal court and sentenced to 33 years in prison.

In March and April 2011, Dr. Afridi ran a vaccination campaign in Abbottabad that was intended to determine covertly whether Bin Laden lived in a house in the city. Dr. Afridi failed to obtain a DNA sample, a senior American official said, but did help establish that Bin Laden's local protector, known as the "courier," was inside the Bin Laden compound.

Dr. Afridi was arrested three weeks after an American Navy SEAL team raided the house on May 2, 2011, and killed the Qaeda leader.

American officials said Dr. Afridi had been working with the C.I.A. for several years, at a time when he was leading polio vaccination efforts in Khyber Agency, a corner of the tribal belt that harbors a rare strain of the disease.



Western aid workers have criticized the C.I.A. for recruiting medical personnel and have complained of harsh restrictions imposed by suspicious Pakistani authorities. American officials say Dr. Afridi was targeting a mutual enemy of Pakistan and the United States.

The Taliban statement suggests that suspicion about health workers has spread to militant groups, which are prepared to use the issue for propaganda purposes.

Despite the challenges of North Waziristan, a hub of Taliban and Qaeda fighters, Unicef says that 143,000 of the area's 161,000 children younger than 5 were reached in the last round of oral vaccinations from June 4 to 6. Health officials say that in active polio zones it is vital that children receive several doses of vaccine over time.

Dr. Muhammad Sadiq, the surgeon general for North Waziristan, said he had already received Taliban orders to cancel the vaccination drive planned for Wednesday and Thursday. "Under these circumstances," he said in a telephone interview, "we cannot continue."

Din Muhammad, a journalist in South Waziristan, said the main Taliban commander there, Mullah Nazir, was also planning to block polio vaccinations.

The bans may be a result of paranoia about the American drone strikes, which have increased in frequency and accuracy in the past year. Two weeks ago, American officials said that a

strike killed Abu Yahya al-Libi, Al Qaeda's deputy leader, at a farmhouse near Mir Ali in North Waziristan.
In his statement, Mr. Bahadur, the local warlord, said there was a "strong possibility of spying on mujahedeen for the U.S. during the polio vaccination campaign; one such example is Dr. Shakil Afridi."
Dr. Afridi is in prison in Peshawar, where the authorities have acknowledged he faces death threats from fellow inmates. An appeal filed by his family was to be heard on Wednesday.

Anthrax alert system at risk

Source:http://www.washingtonpost.com/business/economy/anthrax-alert-system-at-risk-as-cost-estimate-hits-57-billion/2012/06/18/gJQAZQwTkV_print.html

Funding for BioWatch, an early warning system to detect deadly pathogens in 30 U.S. cities, may be in jeopardy after cost estimates surged to $5.7 billion, six times the initial assessment.
The Department of Homeland Security wants to open bidding before October on the next phase of the program, which monitors the air for pathogens such as anthrax and smallpox.

The five-year contract for as much as $3.1 billion would upgrade the system to automatically transmit collected data to laboratories, eliminating the present manual handling.
BioWatch has suffered cost overruns and delays since then-President George W. Bush, prompted by the post-Sept. 11, 2001, anthrax attacks, started it in 2003. Rep. Gus Bilirakis (R-Fla.), chairman of the House subcommittee with jurisdiction over BioWatch, says he wants assurances that costs are under control and has asked the Government Accountability Office to analyze the proposed spending.
"The program could find itself in danger of being cut back or completely scrapped if law-makers determine that it's becoming a major and costly acquisition failure," Jessica Herrera-Flanigan, a partner with Monument Policy Group, a Washington-based consulting firm, said in a telephone interview. Herrera-Flanigan was staff director for the House Homeland Security Committee from 2005 through 2008.
Companies with investments at stake include Northrop Grumman, which has worked since at least 2009 to develop technology for BioWatch.

BioWatch was developed after it took more than two weeks to identify what was killing U.S. citizens during the anthrax attacks in 2001, said Leonard Cole, an adjunct professor at Rutgers University's Newark branch, and author of the book, "The Anthrax Letters."

Letters laced with anthrax were sent through the mail and resulted in five deaths, including two postal workers and a newspaper photo editor. Another 17 people became ill. No one has been charged in the attacks, Chris Allen, a Federal Bureau of Investigation spokesman, said by telephone.

"Before BioWatch, we were all canaries in a coal mine," Cole said in a phone interview. "Only after people dropped dead or became ill did we understand that a pathogen was floating around."

August report

The federal government has spent about $800 million on BioWatch since 2003, Rep. Bennie Thompson (D-Miss.), ranking member of the subcommittee overseeing the program, said at a March 29 hearing.

He and Bilirakis both questioned the cost of upgrading BioWatch. Lawmakers are "increasingly concerned about the viability of this developing technology and also about the department's ability to deploy it on time and within budget," Bilirakis said at the hearing of the Homeland Security subcommittee on emergency preparedness, response and communications.

The GAO report, due in August, "will not be considered lightly, especially given our country's current fiscal situation and the price tag for the BioWatch program," he said in an e-mail message last week.

The estimated lifetime cost of the program rose from $921 million in 2010 to $2.1 billion the following year, according to a June 2010 report by the GAO, citing figures from the Office of Management and Budget.

The total price may reach $5.7 billion, according to a 2011 report by LMI, a McLean-based consulting firm hired by the Department of Homeland Security.

The $2.1 billion and $5.7 billion "cannot be validly compared," Noah Bartolucci, a BioWatch spokesman, said in an e-mail.

The $5.7 billion figure covers a longer time period — 17 years, vs. 10 years — and program planners "assigned no confidence level" to the $2.1 billion estimate, he said.

BioWatch currently uses canisters that must be installed manually and taken to a lab for analysis. It can take 48 hours to get the results. That delay could mean lost lives in an emergency, Michael Walter, program manager for BioWatch, said in a phone interview.

Automated labs

The upgraded system, called Gen-3, would use permanent boxes containing small, automated laboratories that would detect pathogens and then securely transmit the information to local health departments. Results would be available in as little as three hours, Walter said.

BioWatch is installed at undisclosed locations in cities that include Boston, Chicago and Houston. The system is set up to detect pathogens indoors and out, Walter said.

In one incident, after an antiwar protest in 2005, BioWatch filters in Washington picked up traces of a bacterium that causes a potentially deadly infection called tularemia, according to the Department of Homeland Security and city health department. No cases of illness were reported. Health officials later said the protesters may have kicked up soil contaminated with harmless quantities of the bacterium.

Northrop, based in Falls Church, tested its BioWatch technology in 2010 with an $8.4 million contract. In all,Northrop has received about $18 million for BioWatch from the federal government, Yolanda Murphy, a company spokeswoman, said in an e-mail.

The company has experience overseeing the U.S. Postal Service's biodetection system, said Dave Tilles, Northrop's director of chemical, biological, radiological, nuclear and enhanced conventional weapons defense systems.

"We understand what it takes to develop, manufacture and support automated biodetection systems," he said in a telephone interview. "We think the technology for BioWatch Gen-3 is ready, and we hope that Congress moves ahead with this important mission."

As the costs of BioWatch rise, they will need to be weighed against the system's intended benefits, Walter said.

"From a public health standpoint we have to ask if this program is going to be useful in reducing casualties and will it be an improvement over the current

system," he said. "How do you deal with the value of human life and human suffering?"

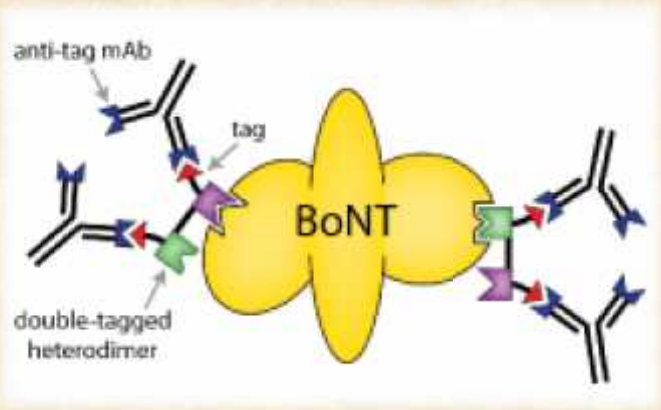
Antitoxin Strategy May Help Target Other Pathogens

Source: http://now.tufts.edu/news-releases/antitoxin-strategy-may-help-target-other-path

Researchers have unveiled a novel strategy for neutralizing unwanted molecules and clearing them from the body.

The strategy employs chains of binding agents, like "beads on a string", which target two sites on one or more pathogenic molecules to neutralize their activity and promote their clearance by the body's immune system. The low-cost, easy-to-replicate tool has demonstrated applications against several different toxins, from those found in contaminated food to those used in bioterrorism, and may also prove effective in targeting other types of pathogens.

The research team, based at Tufts University's



Cummings School of Veterinary Medicine, demonstrated the method's efficacy in preventing the symptoms of botulism, a rare but deadly disease caused by *Clostridium botulinum* neurotoxin (BoNT), considered one of the most dangerous bioterror threat agents. The findings were presented earlier this year in *PLoS ONE*.

"Currently, antitoxins are difficult to produce and have a short shelf life, making them very expensive. This new approach provides a low-cost way to develop highly effective antitoxins," said senior author Charles B. Shoemaker, PhD, professor of biomedical sciences at Tufts University's Cummings School of Veterinary Medicine.

"This method has the potential to target a number of pathogens – not only toxins such as BoNT, but viruses or inflammatory cytokines. It is an important platform through which to address other significant diseases," says co-author Saul Tzipori, BVSc., DSc, PhD, professor of biomedical sciences and director of the Division of Infectious Diseases at the Cummings School.

Shoemaker and team had earlier found that pools of small 'tagged' binding agents were highly effective in targeting toxins, neutralizing their function, and flagging them for removal via the body's immune system in the presence of an anti-tag monoclonal antibody.

In the newly published *in vivo* study, the researchers have advanced this approach by linking two BoNT-binding agents together and including two copies of the tag. The binding agents are small, stable proteins derived genetically from unusual antibodies produced by toxin-immune alpacas. The resulting molecule, called a 'double-tagged heterodimer,' binds to two separate sites on the toxin. Binding of this single heterodimeric agent much more effectively neutralizes the toxin than the unlinked monomer binding agents used in the prior research. In addition, attaching two tags to each of the two linked agents leads to toxin decoration by up to four anti-tag monoclonal antibodies, which promotes rapid toxin clearance from the blood, the researchers found (see figure).

The double-tagged heterodimer antitoxin agent strategy was shown to be efficacious against two types of BoNT in the *PLoS ONE* report. The antitoxin agents were administered at the time of exposure, or shortly after. Treated mice did not show any symptoms of botulism – including the lethal paralysis which characterizes the disease, even when exposed to high toxin doses. Thus, the benefits of complex antitoxins were equaled or bettered by administration of two easy-to-produce agents; a heterodimer binding agent and an anti-tag monoclonal antibody.

According to Shoemaker, a major advantage of this approach is that, unlike treatments that only neutralize toxins, this treatment both neutralizes toxins and ensures their rapid clearance from the body. "Agents that only neutralize their

pathogenic target will eventually dissociate which will allow the pathogen to continue doing damage if it is not eliminated," he said.
The group has now successfully taken the research further by building longer strings of binding agents that target multiple toxins with a single molecule—for example, the two types of Shiga toxins that are produced by some E. coli found in contaminated foods or the two toxins produced by hospital-acquired C. *difficile* infections.
The work was funded in part by the National Institute of Allergy and Infectious Diseases (NIAID), National Institutes of Health (NIH), the Department of Health and Human Services, and the Intramural Research Program of the NIAID

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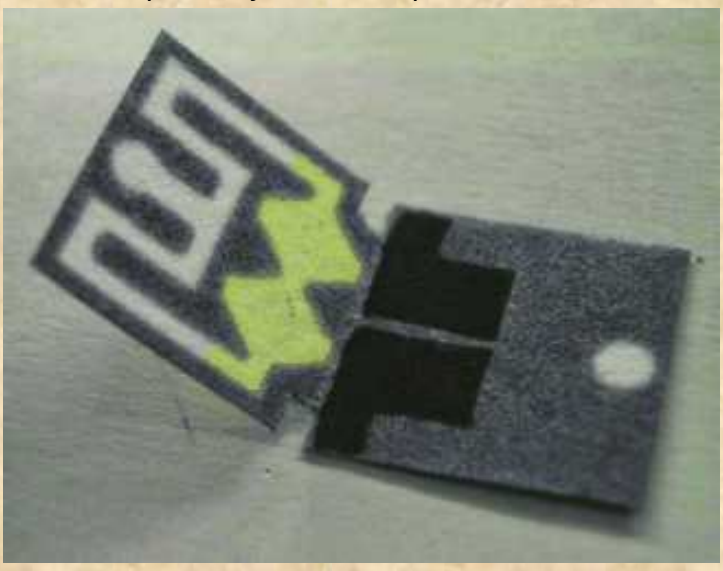
Paper-printed rapid disease detection test

Source: http://www.homelandsecuritynewswire.com/dr20120622-paperprinted-rapid-disease-detection-test

Complex laboratory investigations do produce reliable results, but they are not useful for point-of-care diagnostics. This is especially true in developing countries, which must rely on simple, inexpensive test methods that do not require a power source.
Biosensors based on paper are an interesting alternative. American researchers from the University of Texas at Austin and the University of Illinois at Urbana-Champaign have now introduced a particularly clever concept in the journal *Angewandte Chemie*: print on one side of the paper, fold it up origami-style, laminate it, and the test is ready. Test evaluation requires only a voltmeter.



Paper biosensors: An origami sensor is printed on a single piece of paper, folded into a three-dimensional fluidic device, and encapsulated by thermal lamination. Aptamer is trapped in the fluidic channel, where it binds to the target and releases an enzyme to generate a signal. The device is read out using a digital multimeter.

A Wiley release reports that the team of researchers uses chromatography paper fabricated by wax printing. The printed areas become hydrophobic, while the unprinted paper remains hydrophilic. On one half of the paper, the researchers led by Richard M. Crooks and Hong Liu created a sample inlet and two hydrophilic channels, each leading from the inlet to a small chamber. The two chambers are connected to each other through a narrow opening. The required reagents are also "printed" onto the paper. On the second half of the paper, a screen-printing process is used to add two electrodes made of conductive carbon ink. When the paper is then folded down the middle according to the principles of origami — no tape or glue — a three-dimensional structure is formed. This causes the electrodes to come into contact with the chambers. Finally, the folded paper is laminated.

When a drop of the sample is put into the inlet, the liquid moves through the two channels. One of the channels contains microspheres coated with an aptamer. An aptamer is a strand of DNA that can be constructed so as to selectively bind nearly any desired analyte molecule. For the purpose of demonstration, the researchers chose an aptamer for adenosine. If adenosine is in the sample, the aptamer binds to it. This releases an enzyme that was coupled to the aptamer. The enzyme continues to flow through the channel and reaches the chamber, which contains glucose and Prussian

blue (iron hexacyanoferrate). This complex contains trivalent iron. The enzyme, glucose oxidase, oxidizes the glucose, which causes the iron in the Prussian blue to be reduced to the divalent form.

The second channel contains spheres with no aptamer. In the second chamber, therefore, no iron is reduced. Because the oxidation state of the iron in one chamber has been changed, the two chambers no longer have the same composition and an electric potential builds up. This can be measured by means of a capacitor and a measuring device like those used to test the voltage of a battery.

The release notes that this principle can be used to easily and inexpensively produce rapid tests for a broad spectrum of different target molecules.

— Read more in Hong Liu et al., "Aptamer-Based Origami Paper Analytical Device for Electrochemical Detection of Adenosine," Angewandte Chemie (25 MAY 2012)

Some bird flu strains only three mutations away from a pandemic, researchers find

Source: http://www.foxnews.com/health/2012/06/21/how-likely-is-human-bird-flu-pandemic/

A new study raises concerns that it may be possible for airborne transmissible, human-to-human avian H5N1 flu viruses to evolve in nature.

The study looked at five mutations identified previously in the controversial bird flu studies published in the journals *Nature* and *Science*—led by Yoshihiro Kawaoka of the University of Wisconsin and Ron Fouchier of Erasmus Medical Center in Rotterdam, the Netherlands, respectively—which would make it possible for bird flu to spread from human to human.

In those studies, the researchers experimented with bird flu strains to show which mutations would be necessary for the virus to evolve to become transmissible between mammals.

The papers revealed with only five mutations (amino acid substitutions), or four mutations plus reassortment, bird flu can become transmissible between mammals – and potentially humans. Currently, bird flu can be transmitted from birds to humans, but not from humans to humans.

U.S. federal officials initially asked the journals to withhold publishing the papers, based on bioterrorism fears, but relented after an independent panel of experts determined there was no threat to public health.

Now, in an accompanying study, led by Professor Derek Smith and Dr. Colin Russell at the University of Cambridge, researchers analyzed all the surveillance data available on avian H5N1 flu viruses in the past 15 years and discovered two of the five mutations needed to make bird flu transmissible between mammals had already occurred in numerous avian flu strains that exist in nature.

Not only that, but a number of the virus strains had both of the mutations, the researchers added.

"Viruses that have two of these mutations are already common in birds, meaning that there are viruses that might have to acquire only three additional mutations in a human to become airborne transmissible," Russell said in a released statement. "The next key question is, 'Is three a lot, or a little?"'

In order to address the question, the researchers used a mathematical model of how viruses replicate and evolve in mammals to see which factors would increase the likelihood

of the three mutations occurring spontaneously in nature.

According to the model, factors that increased the likelihood of the virus evolving included random mutations and positive selection. Viruses can replicate billions of times within a single host, sometimes imperfectly, leading to random mutations. Positive selection may favor some of these mutations if they help the virus adapt to mammals and spread.

A long period of infection can also increase the likelihood of the virus evolving, because the longer a person is infected, the more the virus replicates and mutations can accumulate. According to the researchers, it is also likely that there are other mutations not identified by the Foucheir and Kawaoka papers, which can act as functional substitutes for the three remaining mutations.

Finally, the diversity of the virus within the bird population can spell trouble for humans as well. The more mutations there are within the bird population, the higher probability there is that a key mutation may be missed by routine surveillance.

However, even after identifying those factors, as well as a few factors that may actually decrease the likelihood of bird flu evolving, the researchers said it was impossible to determine the exact risk.

"You can't put a number on it," Dr. Anthony Fauci, the director of the National Institute of Allergy and Infectious Disease at the National Institutes of Health, told FoxNews.com. " But nature has already told us this is very unlikely—not impossible, but unlikely."

According to Fauci, health officials first noticed the bird flu virus in 1997 and started following it closely since 2003.

"In nine years, there have been 600 cases in that period, and the virus has not naturally mutated to get to the point where investigators got it in [the papers by Kawaoka and Fouchier]," Fauci said. "…But some of the mutations induced experimentally are to a certain extent occurring naturally in the wild, so the bottom line is, it is feasible."

The U.S. Department of Agriculture continually does surveillance on chickens for traces of H5N1, while the Centers for Disease Control and Prevention periodically samples influenza strains in people, according to Fauci—who added that no potential pandemics have been observed as intensively as this one in the past. So far, there have been no reported cases in the U.S. of H5N1 in humans.

The Cambridge researchers recommended continued surveillance of the bird flu virus, particularly in regions where mutations necessary for human transmission have occurred, as well as in regions connected to those by bird migration and trade. They also called for additional studies and deep sequencing of bird flu viruses to identify any other mutations that may play a role in human-to-human transmission.

In a statement, Smith compared the situation to assessing the risk of an earthquake or tsunami. "We don't know exactly when and where, but by increasing monitoring and research – some of which is already underway – scientists and public health officials will be able to increase the accuracy with which the risk can be assessed and to minimize those risks."

Fauci added: "If in fact the mutations can happen, you want to get an idea of what the virus would look like in order to have better surveillance, determine its sensitivity to current drugs and see if the vaccine still protects against it."

The study will be published in the journal *Science*.

DIY biology

By Laura H. Kahn

Source: http://thebulletin.org/web-edition/columnists/laura-h-kahn/diy-biology

In the nineteenth century, research in the natural and life sciences was largely self-supported. Charles Darwin had the good fortune of being born into a wealthy family, enabling him to pursue his passions as a gentleman naturalist and to develop the trailblazing theory of evolution. Darwin's good fortune ended up being science's as well. Not incidentally, Darwin also had great connections: His botany professor at Cambridge recommended Darwin as a "scientific person" to Robert FitzRoy, captain of the *HMS Beagle*. Darwin spent five years traveling on

the *Beagle* and studying the zoology, botany, and geography of new lands.

A free trip around the world to study the natural history of exciting new places? What "scientific person" wouldn't sign up?

Of course, not everyone who wanted to explore the natural sciences had Darwin's financial advantages. Gregor Johann Mendel, the son of a peasant farmer, became a priest and did his research in addition to his duties as a friar. At the Augustinian Abbey of St. Thomas, Mendel conducted plant-hybridization experiments on a four-acre plot using 10,000 pea plants. He obsessively checked his results, kept meticulous records, and used sophisticated mathematical analysis for his research. Fortunately, Mendel's abbot in charge of the monastery fully supported his scientific endeavors. As a result, Mendel was able to lay the groundwork for the field of genetics and to provide the scientific basis for Darwin's theory of evolution.

In the twentieth century, state-of-the-art biology largely moved from the natural world to high-tech laboratories, where it became prohibitively expensive to conduct self-funded research.

Not anymore.

Welcome to the new millennium of do-it-yourself (DIY) biology. Advances in technology in the twenty-first century have enabled anybody, with the desire and the disposable income, to build rather sophisticated laboratories in their own homes. Entire communities have even materialized to promote these efforts -- like the thousands of amateur biologists who contribute to **DIYbio.org**, a website "dedicated to making biology an accessible pursuit for citizen scientists, amateur biologists and biological engineers."

But the DIY biology crowd has left security experts scratching their heads. Are home laboratories a good or bad thing?

First, the downside: Obviously, in an unregulated and unsupervised environment, there's always the risk of a lone-wolf scientist developing a doomsday bug in his or her garage. President Bill Clinton was so frightened by Richard Preston's 1998 novel, *The Cobra Event* -- which depicted a crazed scientist creating a deadly bioweapon in his Manhattan apartment -- that he decided to target government funds to fight bioterrorism. Today, those fears are potentially more grounded in reality than ever. A glance at the DIYbio discussion boards currently has more than 3,300 ongoing conversations about everything from bacterial DNA and biohacking to finding the best prices for centrifuges and thermocyclers.

Adding to the threat of rogue amateur bioterrorists is the nearly impossible task of tracking down biocrime perpetrators. Let's not forget that the FBI never conclusively solved the 2001 anthrax murders. Unfortunately, solving biocrimes is extremely difficult to do. Following the anthrax attacks, the FBI became so jumpy about home laboratories that, in 2004, they went so far as to arrest a University of Buffalo professor who used bacteria in his artwork at home. (The terrorism charges against him were subsequently dropped.) Luckily, the FBI has come a long way since then and is now engaging the academic, industrial, and home biology communities with WMD coordinators in each of their 56 field offices. The FBI has learned that the best prevention strategy is open and congenial communication.

This brings us to the upside of the home biology movement. In his book, *Biology is Technology*, Robert Carlson -- a principal at Biodesic, a biotech consulting firm -- reminds us that many of the world's greatest advances in science and technology have, after all, taken place in garages. Where would aviation be without hobbyists and tinkerers?

In the late 19th century, French-born and self-taught railroad engineer Octave Chanute retired to Chicago and decided to solve the challenge of flight. Just like the DIY crowd, Chanute cultivated a cadre of likeminded aviation pioneers to share data and experiences -- including Orville and Wilbur Wright. The Wright brothers took Chanute's suggestions to the next level by using their knowledge of bicycle design to successfully build and fly an aircraft. Their hard work and ingenuity provided the foundation for the modern airline industry.

And, of course, there is perhaps the planet's most famous garage lab: Apple Inc. Steve Jobs and Steve Wozniak developed the prototypes for personal computers first in Jobs's bedroom and later, when they ran out of space, in his

garage. The rest, of course, is iHistory.
Carlson believes that the next revolution in biotechnology is also likely to take place in someone's home or start-up laboratory. Unlike formally trained scientists, self-taught biologists may think a bit more outside of the box. Developing the next-generation vaccines and anti-microbials, and autologous replacement organs -- which have the potential to completely transform medicine and public health -- is going to take novel, visionary approaches. Start-up biotechnology efforts and their creative DIY enthusiasts, like Jobs and Wozniak, have the potential to fuel the economy with thousands of new jobs. Carlson estimates that revenue from "genetically modified stuff" in the United States is about $300 billion annually -- more than 2 percent of gross domestic product -- and growing at an annual rate of about 15 to 20 percent.
So while there are certainly risks, the upside to DIY biotech is tremendous. The challenge in a global economy is that people across the planet are also self-funding biotech work in garages and small start-up labs; some are even becoming fabulously wealthy. Kiran Mazumdar-Shaw started Biocon in her garage, making industrial enzymes; today, Biocon is the largest biotech firm in India. So for those of you with the interest, stamina, funds, and a small garage or start-up laboratory, your idea just might be the next breakthrough discovery.

Laura H. Kahn *is a general internist who began her career in health care as a registered nurse, Kahn works on the research staff of Princeton University's Program on Science and Global Security. Her expertise is in public health, biodefense, and pandemics. From 2003-2005, she led a study that assessed the public health infrastructures of New Hampshire, New Jersey, New York, and Pennsylvania. She has also co-organized the Carnegie Corporation's "Biodefense Challenge" seminar series, which introduces biosecurity, codes of conduct, and dual-use biotech threats to the life sciences community. Prior to joining Princeton, she was a managing physician for the New Jersey Department of Health and Senior Services and a medical officer for the Food and Drug Administration.*

Are nurses prepared to respond to a bioterrorist attack: a narrative synthesis

By Claire Smith and Alistair Hewison (Journal of Advanced Nursing)
Source: http://onlinelibrary.wiley.com/doi/10.1111/j.1365-648.2012.06061.x/abstract

Abstract

Aim. To report a review and narrative synthesis conducted to analyse and evaluate nurses' preparedness to respond to a bioterrorist event.

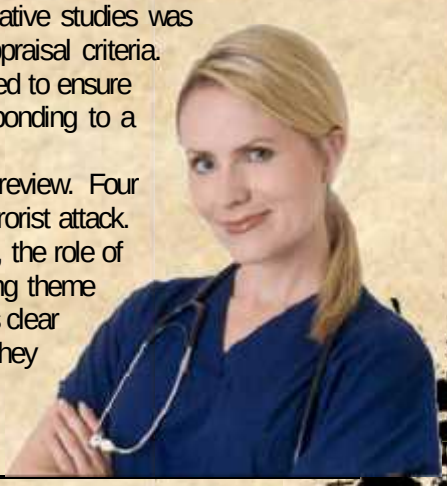
Background. The anthrax attack on the USA in 2001 resulted in the development of global response strategies for future bioterrorist events. However, despite these actions, it remains unclear whether nurses are prepared to respond to such events.

Data sources. A search for relevant research articles was conducted using the MEDLINE, CINAHL, BNI, and EMBASE databases to locate articles published in the period 1996–March 2010.

Design. Narrative Synthesis

Review methods. A narrative synthesis of qualitative and quantitative studies was undertaken and the articles reviewed using Greenhalgh's critical appraisal criteria. The review was conducted with inclusion and exclusion criteria applied to ensure the studies examined focussed on the hospital nurse's role in responding to a bioterrorist event.

Results. Seven original research studies were included in the review. Four themes were identified as affecting nurses' preparedness for a bioterrorist attack. These were perceptions of bioterrorism, the role of formal knowledge, the role of institutional plans and policies, and personal factors. The overarching theme centred on nurses' willingness to respond to a bioterrorist event. It was clear that, although nurses were willing to respond to a bioterrorist attack, they felt unprepared to do so.

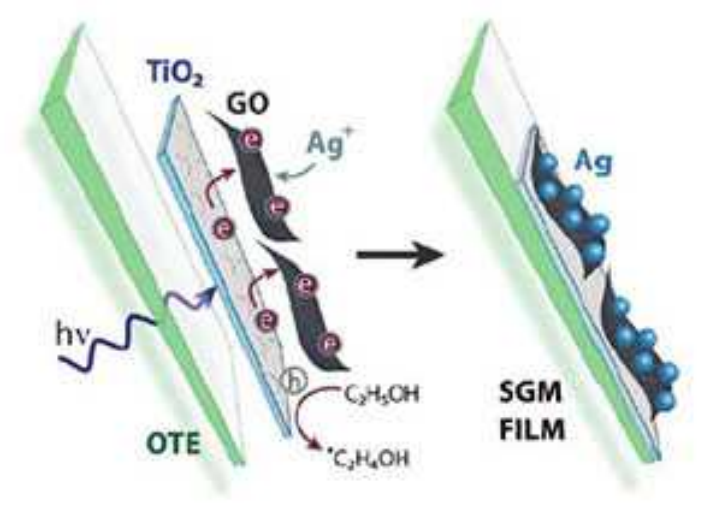


Conclusions. Existing nurse education in areas such as infection control can incorporate bioterrorism training to improve preparedness, yet nurses must also prepare themselves personally for a bioterrorist attack.

New research leads to sensors that detect contaminants in water

Source: http://newsinfo.nd.edu/news/31213-new-advances-in-graphene-oxide-tio2-films-could-lead-to-the-development-of-sensors-to-detect-low-level-organic-contaminants-in-water/

Many organic contaminants in the air and in drinking water need to be detected at very low-level concentrations. Research published by the laboratory of Prashant V. Kamat, the John A. Zahm Professor of Science at the University of Notre Dame, could be beneficial in detecting those contaminants.



The Kamat laboratory uses Surface-Enhanced Raman Spectroscopy to make use of silver nanoparticles to increase the sensitivity limit of chemical detection. Researchers in this study have prepared a semiconductor-graphene-metal film that has distinct advantages: The absorption of organic molecules on the film's graphene surface increases the local contaminant concentration adjacent to silver nanoparticles.

The researchers have investigated the use of graphene oxide films in which the semiconductor titanium dioxide (TiO2) and metal nanoparticles are deposited on opposite sides of the graphene surface. "We are currently working toward the detection of environmental contaminants at even lower levels," Kamat says. "Careful control of metal size and loading will be the key to optimize strips for testing water quality."

Under UV illumination, the electrons from TiO2 are captured by the graphene oxide film and shuttled across the film to reduce metal ions into metal nanoparticles. This electron-hopping process across the graphene oxide film allows the design of a side-separated semiconductor-metal nanoparticle architecture.

Graphene, a two-dimensional crystalline form of carbon, is known for its remarkable mechanical strength, very high thermal and electrical conductivity and broad variety of applications. While the conducting properties of graphene sheets deposited on various substrates are well understood, the Kamat group has demonstrated that the transport of electrons is not limited to the 2-D plane. Here, the hopping of electrons from one side of the graphene allows for the side-selective deposition of silver nanoparticles.

"Another potential application is in the area of photocatalytic generation of solar fuels," Kamat says. "For example, having semiconductor nanoparticles on one side of a graphene sheet and a metal catalyst on the other side, one can create a hybrid assembly that can selectively split water into oxygen and hydrogen."

— Read more in Ian V. Lightcap et al., "Electron Hopping Through Single-to-Few-Layer Graphene Oxide Films. Side-Selective Photocatalytic Deposition of Metal Nanoparticles," Journal of Physical Chemistry Letters 3, no. 11 (7 May 2012): 1453–58

A new test for safer milk

Source: http://newsinfo.nd.edu/news/31806-usda-funds-development-of-a-new-test-for-safer-milk/

A team of researchers from the University of Notre Dame and Purdue University has received a three-year grant of $500,000 from the U.S. Department of Agriculture to develop a new technology that can rapidly test milk and other dairy products for harmful pathogens.

Though the research will be applicable to many microorganisms, the team's first goal is to reduce the incidence of brucellosis, a condition caused by infection from Brucella bacteria, various strains of which are found in sheep, goats, cattle and swine. Brucellosis is the most common animal-to-human infection worldwide, with more than 500,000 new cases reported each year. It rarely causes death, but it can result in prolonged health problems.

"The infection is usually acquired by ingestion of contaminated animal products, typically raw milk and other unpasteurized dairy products such as soft cheeses," says Ramesh Vemulapalli, professor of veterinary immunology and microbiology at Purdue and a collaborating investigator on the project.

"Although it is rarely seen in developed countries, there is growing concern that these pathogens are spreading because of increased global tourism and immigration."

The researchers are using the USDA funding to design and build **a portable device that can analyze a food sample and provide a reading within 15 minutes.**

The technology is based on a microfluidic detection platform developed in the lab of project leader Chia Chang, Bayer Professor of Chemical and Biomolecular Engineering at Notre Dame and an investigator in the University's Advanced Diagnostics and Therapeutics initiative.

"Our system is very sensitive and selective," explains Chang. "We can take a sample, concentrate the microorganisms in it and then detect fewer than a hundred bacteria per milliliter."

One major technical challenge is pretreating the milk before it hits the instrument's sensors.

"There are many solids and large molecules, such as fat, in milk," says co-investigator Arun Bhunia, professor of food science at Purdue. "We are working on a way to incorporate a quick and seamless pretreatment phase into the system."

Team members are also focused on usability and design, because they want the device to be functional for people without high levels of technical training.

Advanced Diagnostics and Therapeutics — a component of Notre Dame's Strategic Research Investment initiative — is dedicated to developing tools and technologies to combat disease, promote health and safeguard the environment.

Bioterrorism Lab of CDC In ATL Under Investigation For Security Lapses

Source: http://romerobrooks.com/2012/07/cdcsecuritylapse/

Congress is currently investigating the Atlanta branch of the Center for Disease Control for multiple incidents of safety hazards stemming from unsecured doors in high risk zones of the laboratories. Yup. You read that right.

A Centers for Disease Control and Prevention spokesman says the unsecured door incidents in 2010 and 2009 inside its Emerging Infectious Diseases Laboratory in Atlanta were "not an acceptable practice of the agency." At no time, though, were bioterror organisms such

as anthrax at risk of falling into the wrong hands, he said.

"The doors in question here are but one layer of multiple layers of security when it comes to both the animals and the agents that are worked on," CDC spokesman Tom Skinner said. "The security measures we have in place, without going into detail, make it close to impossible for anyone who doesn't have approved access to the agents to get their hands on them." – USA Today

I've got to call shenanigans on Mr. Spokesman. That sounds like jargon anyone would say who's trying to cover his/her ass right before sh*t hits the fan. USA Today delved even deeper by unveiling some information regarding the security lapses. The doors that were unlocked were level 3 labs where experiments with microbes such as Anthrax, monkeypox, SARS, and dangerous strains of influenza were held. Not to mention the test animals being held in the same area. Rage Virus anyone? An email by a safety manager revealed that an unauthorized person was found in the unlocked areas, which sounds mighty suspicious. This person was a CDC scientist, but there's no explanation as to why this dude was there in the first place. Someone better check his bank account to make sure he's not getting paid off to steal some bioweapons.

E-mails written by CDC Safety and Occupational Health manager Patrick Stockton indicate the lab has had security lapses that Rutgers University biosafety expert Richard Ebright said may be a "major violation" of security standards for labs that work with potential bioterror agents.

Ebright, of Rutgers University, expressed concern about the repeated issues revealed in news reports about Building 18 since the $214 million building opened in 2005, including articles in 2007 about backup generators that failed to keep airflow systems working during a power outage, and in 2008 about a high-containment lab door that the CDC sealed with duct tape after an incident where an airflow system malfunctioned and sent potentially contaminated air into a "clean" corridor.

The "documents you have obtained over the past several years make it clear that there has been a pattern of corner-cutting and negligence at CDC biocontainment facilities —starting with the failure to include provisions for emergency backup power, and encompassing inadequate door seals, improper airflow, jury-rigged repairs, and unsecured access points," Ebright said. If the security issues described in Stockton's 2010 e-mail continue and bioterror agents are being used in that area, Ebright said, "then heads should fall."

The CDC currently is responsible for inspecting the safety and security of its labs that work with bioterror agents. Skinner said CDC has a 66-year record of operating its labs safely.

More like **had** a 66-year record of safe operating. There's definitely more than a few lapses at work in Atlanta. Unlocked doors, unauthorized entry, and even jimmy rigged repairs on dangerous areas seem like a cocktail for disaster. If not for the zombie apocalypse then perhaps the release of a microbe that

could devastate America and possibly the rest of the world. The fact that these issues weren't more widely generated across media outlets concerns me. God forbid our airwaves aren't overcome by REAL news instead of bipartisan bickering.

California's Bioterror Mystery

By Zoë Corbyn

Source: http://failuremag.com/index.php/feature/article/californias_bioterror_mystery/

Homeowner John Bourzac weaves in and out of the tall line of fragrant eucalyptus trees on his property in Clovis, California, and wonders what the fuzzy white balls on the leaves are. "I started to notice them about four or five years ago," he says, worrying that while his trees seem to be tolerating them thus far, they can't be good news.

Bourzac really likes his red gum (*Eucalyptus camaldulensis*) trees, which along with the blue gum (*Eucalyptus globulus*) are the two most common varieties of the over two-hundred species currently growing in the state. So ubiquitous and integrated into the landscape are they—planted as street trees in urban areas and groves in rural parts of the state—that many Californians assume they are native, though they were initially introduced as agricultural oddities, and later seen as a source of lumber. (Eucalyptus is in fact native only to Australia, extending into New Guinea, the Philippines and Indonesia.) Thirty years ago Bourzac planted red gums as a screen because they are quick growing and drought tolerant. Today they provide him with privacy from a busy road and give his property a secluded and tranquil feel.

Tim Paine in front of a sick red gum eucalyptus. Photo by Zoë Corbyn.

But those white balls on the leaves indicate that Bourzac's trees are under attack—and the prognosis isn't good. The culprit is the redgum lerp psyllid (*Glycaspis brimblecombei*), a small green flying insect, also native to Australia, which was first discovered in 1998 in Los Angeles County before it spread through much of California. Peel away a fuzzy white ball and underneath lies a tiny yellow speck: the insect in its immature form, which is vulnerable without the protective coating it spins from sugar and wax. While the infestation is unlikely to kill Bourzac's trees outright, it will suck sap from the leaves, causing some to drop off. This, in turn, stresses the tree, making it more vulnerable to attack by other insects. In the future, Bourzac can expect balding trees and sticky secretions underfoot, not to mention the sight and sound of cars roaring past.

But the redgum lerp psyllid isn't the only pest that has been found attacking California's eucalyptus trees in recent years. In the past three decades, sixteen new insect pests—all native to Australia—have become established. (Prior to 1983 there had been two since the introduction of blue gum to the state in the 1850s.) The arrivals have prompted a painstaking effort to find other Australian insects which are natural enemies of the pests, ones which can be brought in to save the trees. But of the sixteen, biological controls have been successfully introduced for just four.

The accumulation of so many pests in such a short time has led to a sneaking suspicion. For while California's eucalyptus trees have passionate defenders, there are also those equally passionate about their eradication. While eucalyptus may be well adapted to an environment that contains few big shady trees, they are not well behaved everywhere. In some wetter coastal areas in northern California the blue gum has become an invasive, difficult-to-eradicate weed, crowding out California natives. Both the blue gum and the red gum have been designated "invasive plants" by the California Invasive Plant Council (Cal-IPC)—a non-profit whose "mission is to protect

California's lands and waters from ecologically-damaging invasive plants through science, education and policy"—with the blue gum's ecological impact rated as "moderate" and red gum's "limited".

Contributing to the controversy is the threat of urban wildfire. Not only are eucalyptus leaves highly flammable, many species shed large amounts of bark and leaf litter, which may serve as a fuel source for fires. It begs the question: Could the pests have been deliberately introduced in an attempt to kill the trees? A case of biological sabotage by those minded to rid the state of an invader?

The man with the suspicion is Timothy Paine, an entomologist at the University of California (Riverside), who, for more than twenty-five years, has led the combat mission against the pests attacking California's eucalyptus. Recently, after much hand wringing, he committed to the scientific record the idea that California's eucalyptus may have been biologically sabotaged, publishing a journal article raising the possibility of bioterrorism. If he is right, it would be the first documented case of the intentional introduction of a plant pest in the U.S.

"We took all of the available information we had on the introduction of eucalyptus pests into California and the conclusion we drew is that there is a very high probability that someone was intentionally introducing them," he explains, referring to himself and his co-authors. "There is likely intentional movement of insect pests of eucalyptus into the state. The patterns suggest that."

The Beetles

I meet Paine at a café near the university before going to view his experimental eucalyptus groves and rearing laboratory, where he produces large quantities of biological controls for release. A tall and thoughtful man, he carries a magnifying glass on his key chain to better observe bugs up close. With a caution typical of a scientist, he chooses his words with extreme care, sometimes taking long pauses before his sentences. Occasionally he cups his head in his hands. As he tells his tale, it's as if a weight is being lifted from his shoulders.

The story begins in 1985 when Paine's department began receiving calls from county officials relaying concerns that large numbers of eucalyptus trees were dying and costing upwards of ten-thousand-dollars each to remove. First the calls came from residents in southern California but they soon began coming from the San Francisco Bay Area too. "At its peak, the University of California (San Diego) were saying they could spend their entire landscape budget for the whole campus just taking out eucalyptus trees," he recalls. "It was a serious economic problem."

Paine's team identified the killer as the eucalyptus longhorned borer (*Phoracantha semipunctata*), an Australian wood boring beetle that resembles a cockroach but with extra-long antennae. Its first appearance—based on the earliest complaints—was traced to an old eucalyptus plantation in Lake Forest, California, one located near a marine air station. Paine assumed the borer entered via a packing create that happened to be made of eucalyptus wood. The borer is as Australian as eucalyptus but blue gum is grown commercially around the world for paper production and the pest has been found in other countries. "It could have come from anywhere," he says.

Cobbling together funding from a variety of sources (including counties and cities, parks departments, universities, homeowners associations and the nursery industry), the UC-Riverside team began to study how their new insect foe might be managed, and soon began searching for an ally in the form of a natural enemy. "It was my first adventure in biological control," recalls Paine. It seemed a logical strategy given that the trees were diffuse rather than in one spot. And in contrast to insecticides, the method has the advantage of being a permanent solution.

After a painstaking process testing the fitness and safety of a number of insects Paine's team struck gold: a control that was so specific it would attack only the borer. Following the necessary federal and state government permits, in 1993 another Australian native, a tiny parasitic wasp (*Avetianella longoi*) the size of a grain of pepper, was let loose to combat the borer. It was a spectacular success. Laying its eggs inside those of the borer—so instead of a borer grub emerging a wasp does—the million tiny wasps Paine estimates his lab produced for release throughout California cut borer populations dramatically, which had by this time spread across the state.

"Populations of that borer are so low it is really hard to find now," he advises.

Paine was about to check off the problem and publish the success story when one of his undergraduate students working in the rearing laboratory noticed something strange. Some borers collected in southern California to boost the laboratory colony (they are needed to rear the wasps for release) had slightly different markings. "We realized we had a second borer species," he laments.

The second borer, also from Australia and traced to southern California, wasn't the only new kid on the block. Other pests specific to eucalyptus (including various species of leaf beetle and psyllid), all native to Australia, also showed up. "Every time we turned around there would be a new one," recalls Paine. "We would solve one problem and we would have another."

Ultimately successful biological controls were implemented for the first borer, as well as the eucalyptus snout beetle (*Gonipterus scutellatus*). Similarly, controls for the blue gum lerp psyllid and red gum lerp psyllid were developed by Donald Dahlsten, an insect biologist at the University of California (Berkeley), who, after his death in 2003, left Paine the only individual pursing the problem in earnest. (The blue gum lerp psyllid is now under excellent biological control while the control for the red gum lerp psyllid has only been moderately successful.)

Meanwhile, an attempt by Paine to eradicate the leaf-eating eucalyptus tortoise beetle (*Trachymela sloanei*) failed: his team released thousands of controls but were unable to get them established. Controls for two more psyllids were due to be released when they arrived of their own accord. "We are doing what we can," says Paine, noting that pests have been prioritized based on the amount of damage they do.

Paine's quest to find a control on the second eucalyptus longhorned borer (*Phoracantha recurva*) began around 1995. The expectation was that the parasitic wasp used for the first borer would work, but to his team's surprise the second borer actually killed it. The answer has been a slightly different parasitic wasp (indeed all the controls introduced have been wasps), which they have been breeding in the rearing laboratory and releasing for the past three years. Paine isn't yet sure how successful the control has been. While numbers of the second borer have dropped, his team hasn't been able to find the wasps in the environment, which is the proof necessary to know the biological control is working. "It is frustrating," he says. "We think we have a very good parasite but we can't prove it because we can't recollect it."

The damage the borers can do is breathtaking. Tucked in the back of the university's Agricultural Experiment Station behind the citrus experiments, Paine takes me to what he calls his "natural laboratory"—an abandoned eighty-year-old eucalyptus grove of various species of tree, which is used for observing and as a release site.

We head for the dead trees in the center—some killed by borers, others by psyllids—and examine a fallen one. Masses of squiggly trails are deeply engraved into the trunk, like the work of a crazed carpenter. The wood is permeated by holes. It is the tell-tale sign of borers. They lay eggs underneath the bark and when the grubs hatch, they begin audibly devouring the conductive tissue of the tree that brings the sugars down from the foliage to the roots. The tracks are left by the grubs which, at the end of the feeding period, sign their handiwork by tunnelling into the wood, making the holes from which they emerge as flying adults. "Basically they are just girdling the tree," says Paine. "I have seen trees die in thirty days."

Matt Ritter is a botanist at California Polytechnic State University (San Luis Obispo) who studies eucalyptus. The pests have really become apparent in the last ten or fifteen years, he says. "I don't think you can look at eucalyptus in California anymore and not notice. You can actually identify the red gum by the fact that it has lerp psyllid on it and the blue gum very rarely has a leaf that is not partially eaten." The longhorned borers, he confirms, have the potential to kill "a lot of trees," which in turn adds to the fire risk.

Yet many Californians seem oblivious that their eucalyptus trees are being preyed upon. That is unsurprising, says Paine. There aren't continuous swathes of eucalyptus forest in California that would make the insects' damage stand out, and the only commercial production is on a very small scale—for foliage and the landscape trade. (The notion that it would be a timber tree was abandoned long ago after the young wood was found to twist and crack too easily.) A relatively small number of sick or dead ornamental trees are hardly eye-catching.

The Evidence for Bioterrorism

It was how the first longhorned borer spread when it arrived in California that first opened Paine's eyes to the possibility of ecological sabotage. "It jumped," he recalls. "It was infesting southern California and all of a sudden it started infesting the San Francisco Bay Area. It wasn't a progression. We got two separate infestations and it filled in the rest of the state." Rumors circulated, he recalls, which even state officials would repeat: an individual had been heard bragging about having moved the borer. But it was also entirely possible that that was a coincidence, a separate introduction from outside, so he put the rumors out of his mind. Yet with more pests arriving, Paine's group began doing some detective work to trace the timing and location of the arrivals and started to wonder about the patterns they were seeing.

After a long period of sitting on the findings, Paine finally published the paper, Accumulation of Pest Insects on Eucalyptus in California: Random Process or Smoking Gun, in the *Journal of Economic Entomology*. The paper advanced the idea that it could be a case of biological sabotage—someone deliberately introducing the insects, motivated by the desire to get rid of the trees. The case is "a cautionary example of what could happen if a major food or fiber crop were intentionally targeted," it notes.

Publishing was a difficult decision, recalls Paine. First, there is no direct evidence: "We don't have somebody who has said 'I did it.' All we have is a series of coincident patterns that becomes suspicious," he says. Second, he didn't want to give anyone ideas about the potential for insects to become weapons, against eucalyptus or anything else. Bioterrorism is a concern, especially since 9/11, says Paine. "We didn't want to plant any seeds." But Paine—and co-authors Jocelyn Millar and Kent Daane—finally decided to go ahead and publish to raise the visibility of a potential problem. They also figured that if someone was sabotaging the trees, they might be deterred if they knew people were on to them.

Paine outlines the patterns. First, the introductions, which his team traced to between 1983 and 2008, were all—bar one—first detected in southern California, either in Los Angeles County or Orange County. If it was accidental—through the movement of goods or people—we would have expected more in the northern part of the state, says Paine. The Port of Oakland in the San Francisco Bay Area is one of the busiest container shipping ports in the country, rivalling the Port of Long Beach near Los Angeles. And while San Francisco's international airport is smaller than Los Angeles International, it is also a large entry point for passengers and air cargo.

Second, the introductions have occurred in bunches: year-long periods of time when up to four insects would appear followed by lulls of several years before another wave. It's a pattern that would be consistent with a villain making periodic trips to Australia to gather pests. Paine identifies four distinct periods of multiple species arriving: 1983-84 saw three; 1990-91 saw two; another four arrived in 1994-95; followed by three in 1998-99. The clusters then peter out with a single species in 2000, one in 2003, and two more in 2008.

Grouping the pests by their native range in Australia shows those in each cluster could all have come from the same east coast state, conceivably facilitating easier collection. Pests in the first cluster all occur together in Queensland, pests in the second in New South Wales and South Australia, pests in the third across all three of those states, while pests in the fourth bunch occur together only in New South Wales.

There are other patterns too. The blue gum and the red gum, the two eucalyptus species regarded as invasive, are particularly susceptible to the pests. Indicating the introductions are from Australia, most of the pests also seem to appear in California first before spreading to eucalyptus in other parts of the world. Seven are found only in the two locations.

The most obvious suspect—the nursery trade—which could allow immature pests to hitch a ride on eucalyptus plants, Paine thinks unlikely. What eucalyptus California's nurseries sell is home grown and no new varieties or cultivars have been introduced for many years. "As far as we can tell, the nurseries have stopped importing eucalyptus. If they are moving stuff in it is as seed," he explains.

Furthermore, asks Paine, why, if the movement of the pests was accidental, has it so disproportionately brought in enemies of the eucalyptus? (Of seventeen

Australian pests to have become established in California since 1980, fourteen are specific to eucalyptus.) And where are the natural predators of the pests that might be expected to arrive with them? (Of the sixteen eucalyptus pests only two of their predators have arrived on their own.) And why haven't any eucalyptus pests arrived from elsewhere? (While no Californian insects attack eucalyptus, species native to South America and Asia have colonized the eucalyptus that grows there.) The introductions "don't seem to fit a random pattern," says Paine.

He isn't sure who might have done it or how but Paine thinks it would have taken somebody who knows their stuff. "I don't know if they would need to be an entomologist but they would need to be skilful," he says. Asked why he has never gone to the police, Paine sighs. There are no leads on who might be the culprit, and in any case, the evidence is circumstantial. "I can't prove anything," stresses Paine.

Other scientists are sceptical. "I know there are people out there that really dislike eucalyptus but just think what it would take to do it on purpose," says Ritter. "You would have to go to Australia, find the pests, bring them here, and then release them in a way that they have the potential to continue on." It is also a "dumb way" to control the tree, he adds. Other than the borer, a killer, most of the pests merely make the trees sickly. "I just don't see compelling evidence," he concludes.

Ted Center, an entomologist at the U.S. Department of Agriculture's Invasive Plant Research Laboratory in Fort Lauderdale, Florida agrees. Globalization has ratcheted up the chances of importing pests and diseases from everywhere. Furthermore, he says, there are now more direct flights between Los Angeles and Australia than ever before, and pests entering the cargo holds of passenger planes need only survive fourteen or fifteen hours in order to reach California. Other destinations where eucalyptus occurs receive fewer flights or are less directly accessible, requiring connections. "In my opinion, the [*Journal of Economic Entomology*] paper is far too speculative," he says.

Jacqueline Fletcher, an expert in crop biosecurity and director of the National Institute for Microbial Forensics & Food and Agricultural Biosecurity (Oklahoma State University), has recently been working on how to help farmers distinguish between intentional and accidental introduction of plant diseases. She isn't necessarily convinced that there was intentional introduction, but she praises Paine for at least being prepared to raise the possibility. She identifies a tendency she refers to as "suspicion inertia." "We tend to think of everything as just being natural—even an unfamiliar set of symptoms—and it is rare for someone to take the perspective that it might not be."

Paine understands the scepticism. "We can't demonstrate it conclusively from the data so the response from most people in the academic world is we need more," he says. But, he notes, the conclusions haven't been hastily or carelessly drawn. "We started wondering about it after the fourth or fifth introduction. It finally took sixteen that we could get enough of a pattern," he says.

A genetic analysis matching the pests in California to specific populations in Australia could make the pattern stronger, but it still wouldn't be concrete evidence, says Paine. "Without someone standing up [and claiming responsibility], we can never know for sure."

Should the Trees Be Saved?

The case also raises a wider question: whether unintentional or sabotage, should eucalyptus be saved from the pests at all, given how damaging the trees themselves can be? What if the pests are actually the good guys?

Florida may be on the other side of the country, but it too has a problem with an Australian invasive weed. Melaleuca or paperbark (*Melaleuca quinquenervia*) causes extensive environmental damage in the Everglades by clogging waterways. Yet in stark contrast to California's efforts to save its own problematic Australian, Florida's approach is to use biological control to manage it. Thus far three insect species have been introduced and are successfully targeting the melaleuca.

The irony of California's biological control program to save an invasive weed isn't lost on Doug Johnson, executive director of the Cal-IPC. "It does seem a little surreal that you have some people working to get rid of eucalyptus and others working to save eucalyptus," he says.

It's an issue that has been raised with Paine. Some weed biological control experts have suggested bringing in pests might actually be a good idea, he says. The question comes up at

public meetings, he adds. Many people want to know where they can get the controls to save their trees. But others want to know why the university is putting resources towards protecting the trees—or even how to rear and redistribute the pests.

The reasons California is saving an invasive weed aren't straightforward. There are invasive plants in California where it is hard to find anything positive about them, says Johnson, but "in any given situation there may be more benefit to keeping eucalyptus than removing it." Many people like big trees of any type and have grown up seeing eucalyptus as part of the landscape. It also has ecological uses; for example, monarch butterflies roost in it. The approach has been to manage it locally on a case-by-case basis—often to great controversy—rather than to use biocontrol.

But there has never been a proper debate to weigh the advantages and disadvantages of Paine's work or whether it is the best way forward for the state as a whole. An ornamental tree that neither falls under the remit of forestry nor agricultural agencies, it's an orphan problem with an interesting research angle that Paine set about trying to solve mostly on his own, without oversight. It is in the university's remit to try and help solve such problems. "It is part of our responsibility," explains Paine.

That riles people like Jake Sigg, the conservation chair of the San Francisco-based Yerba Buena chapter of the California Native Plant Society, a non-profit dedicated to protecting California's native plants. "I think the university ought not to be going ahead with this research without considering all of the ramifications and hearing from all parties," he says. "This is a serious public policy question. Someone ought to be considering it rather than just having the researchers importing the bugs and going ahead."

It would be a "useful discussion" to have, agrees Paine, but he also points out that—as far as he is aware—there is no forum for doing that. "We have to go through a series of permitting processes to introduce something but nobody says, 'No, you can't bring this in because you are protecting a potentially invasive plant'," he explains. And he notes values do change: what at one point might be considered a rational policy decision made by an informed public, a decade later may seem to have been short sighted.

But ultimately, admits Paine, his work is driven by his own belief that the trees are worth saving. In hindsight there are doubtless places where blue gums should never have been planted, he says, but you can't go back in time. In his pragmatic view, the focus must be on the problem at hand: "You protect the resource that you have." And the trees, which dominate the urban landscape and provide amenity, need help.

"Is it worth allowing millions of trees to die because there is the potential that some of them can be a pest?," he asks. That's exactly the value judgement both the researchers—and perhaps bioterrorists—are making.

Zoë Corbyn *is a freelance science journalist based in San Francisco. Her work appears regularly in Nature, the Times Higher Education and the Guardian.*

New rapid diagnostic test for pathogens, contaminants developed

Source:http://www.homelandsecuritynewswire.com/dr20120720-new-rapid-diagnostic-test-for-pathogens-contaminants-developed

Using nanoscale materials, researchers at the University of Georgia have developed a single-step method rapidly and accurately to detect viruses, bacteria, and chemical contaminants.

In a series of studies, the scientists were able to detect compounds such as lactic acid and the protein albumin in highly diluted samples and in mixtures that included dyes and other chemicals. Their results suggest that the same system could be used to detect pathogens and contaminants in biological mixtures such as food, blood, saliva and urine.

"The results are unambiguous and quickly give you a high degree of specificity," said senior author Yiping Zhao, professor of physics in the UGA Franklin College of Arts and Sciences and director of the university's Nanoscale Science and Engineering Center.

A University of Georgia release reports that Zhao and his co-authors — doctoral students Jing Chen and Justin Abell and professor Yao-wen Huang of the UGA College of Agricultural and Environmental Sciences — used nanotechnology to combine two well-known techniques and create their new diagnostic test. Their results appear in the early online edition of the journal *Lab on a Chip* and were recently presented at the SPIE Defense, Security and Sensing conference.

The first component of their two-in-one system uses a technique known as surface enhanced Raman spectroscopy, or SERS, which measures the change in frequency of a laser as it scatters off a compound. Every compound displays a series of distinctive changes in frequency, or Raman shifts, that are as unique as a fingerprint. The signal produced by Raman scattering is inherently weak, but Zhao and his colleagues have arrayed silver nanorods 1,000 times finer than the width of a human hair at a precise angle to significantly amplify the signal. In previous studies with Ralph Tripp in the UGA College of Veterinary Medicine and chemist Richard Dluhy in the Franklin College, they demonstrated that the use of SERS with silver nanorods could identify viruses such as HIV and RSV isolated from infected cells.

"In a clinical setting, the sample that you obtain from patients typically contains bacteria or viruses as well as a lot of fluid—as in blood, urine or saliva — that contains biological agents that interfere with the signal you're trying to detect," Zhao said. "To develop a diagnostic that could be used at the point of care, we needed a way to separate those agents."

Once again, the scientists turned to nanotechnology to create a next-generation diagnostic test. Using traditional thin layer chromatography, or TLC, scientists blot a drop of sample onto a porous surface. They then apply a solvent such as methanol to the sample, and the sample components separate based on how strongly they're attracted to the solvent and the surface.

Study co-author Justin Abell, a doctoral student in the UGA College of Engineering, explained that TLC typically requires a large sample volume because the compound of interest soaks into the surface in addition to moving along it, like a stain on a rug. The silver nanorod surface that the researchers use, in contrast, allows them to use a miniscule amount of sample in a technique known as ultra-thin layer chromatography.

"In our case, the nanorods are acting as the detection medium but also as the separation medium," Abell said, "so it's a two-in-one system."

To test their method, the researchers used mixtures of dyes, the organic chemical melamine, lactic acid and the protein albumin. In each case, they were able to directly identify the compounds of interest, even in samples diluted to concentrations below 182 nanograms per milliliter-roughly 200 billionths of a gram in a fifth of a teaspoon. And while the detection of viruses using techniques such as polymerase chain reaction can take days or even weeks and requires fluorescent labels, the on-chip method developed by the UGA researchers yields results in less than an hour without the use of molecular labels.

The researchers are currently testing their technique with biological samples from Tripp's lab that contain viruses, and Zhao said preliminary results are promising. He adds that while his team is focused on health and food safety applications, SERS and ultra-thin layer chromatography can be used to detect compounds of all types — everything from forensic materials at a crime scene to environmental pollutants. His team also is working with colleagues across campus to create an online encyclopedia that would allow technicians to identify viruses, bacteria, biomarkers and pharmaceuticals based on their distinctive Raman shifts.

"Every compound has a unique SERS spectrum," Zhao said, "so this is a very robust technology whose applications are practically endless."

The research was supported by the U.S. Department of Agriculture, the National Science Foundation and the UGA College of Agricultural and Environmental Sciences.

— Read more in Jing Chen et al., "On-Chip Ultra-Thin Layer Chromatography and Surface Enhanced Raman Spectroscopy," Lab on a Chip (24 April 2012)

Scientists Reveal How Your Afternoon Tea Can Protect You in a Terrorist Attack

Source: http://www.medicaldaily.com/news/20120720/10996/tea-terrorism-ricin-poison-anthrax-terrorist-attack.htm#pEgs40FmOI8K7U7x.99

A simple cup of tea could be the next secret weapon against terrorism, scientists have revealed.

Scientists discovered that a chemical found in tea could deactivate ricin, an extremely poisonous ingredient used in past wars and multiple deadly terrorist attacks.

Scientists discovered that a chemical found in tea could deactivate ricin, an extremely poisonous ingredient used in past wars and multiple deadly terrorist attacks.

"Our new findings suggest that if the security services want to counter the threat of ricin, they may find the answer in their morning cup of tea," Professor Les Baillie of Cardiff University's School of Pharmacy and Pharmaceutical Sciences said, according to *Wales Online*.

Ricin earned its notorious reputation as a deadly bioweapon in WWI when it was being considered by the U.S. military to be used either as a toxic dust or as a bullet or shrapnel coating. Even a tiny dose of ricin, which comes from the castor oil bean that has been used as a medicinal laxative for centuries, can kill a person within two to three days.

However, researchers have found that a chemical polyphenol found in tea called Epigallocatechin gallate can neutralize the deadly effects of ricin.

Ricin was famously used to assassinate a Bulgarian dissident writer Georgi Markov as he was waiting for a bus on Waterloo Bridge in London when a suspected KGB agent injected him with ricin using a poison-tipped umbrella.

The UK team found that polyphenols in black tea were able to kill bacillus anthracis, the organism which causes anthrax and was used in the 2001 US anthrax mail attacks.

"These toxins, such as ricin, have been shown to have been used by nasty people, and nasty countries, to do nasty things," Baillie said, according to *Wales Online*. "With a number of overseas guests arriving in the UK for the Olympics, we think this research could encourage them to drink tea - our national drink - but also naturally encourage their resistance to potentially damaging toxins."

ONCE UPON A TIME…

Once upon a time it was a doctor. One day, on his way from his home town to a neighboring town for his own business he met Plague entering.

He stopped and asked her: "What are you doing here again?" And Plague replied: "It is my turn". "And how many you are going to kill this time?" doctor asked. "Just a few! No more than 1000" Plague said.

After one week, the doctor returned in his town knowing the tragedy that stoked his fellow citizens. At the entrance of the city he met Plague leaving. "You lied to me" he said. "You promised to kill no more than 1000 and 5000 died." She replied: "I did not lie. I killed 1000. The remaining 4000 were **killed by anxiety and fear!**"

New U.S. biodedfense R&D network launched

Source: http://www.homelandsecuritynewswire.com/dr20120724-new-u-s-biodedfense-r-d-network-launched

On Monday, Texas A&M System dedicated a new research center which is part of a national network of centers aiming to develop strategies and products to counter bioterrorism, chemical and radiological attacks on the United States, and better strategies to deal with pandemics.

In June, the Texas A&M System, a system which includes eleven universities and 120,000 students, won a large federal contract to become a major national hub of vaccine production and bioterror preparedness. The contract, announced by U.S. Department of Health and Human Services secretary Kathleen Sebelius, calls for the creation of a Center for Innovation in Advanced Development and Manufacturing. The center is expected to last twenty-five years and likely is worth $1.5 billion to $2 billion. The centers – the Texas A&M center is part of 5-center network, which will also have facilities in Maryland and North Carolina — are part of a federal plan to improve preparedness that is being led by the U.S. Biomedical Advanced Research and Development Authority.

The AP reports that the research network aims to develop "rapid, nimble and flexible approaches" to come up with vaccines against pandemic influenza; devise accelerated methods to develop those vaccines to commercial licensure; develop treatments for chemical, biological, radiological, and nuclear threats; and train "the next generation of professionals" to sustain the nation's capability in those areas.

"This is a problem solving endeavor," Brett Giroir, vice chancellor for strategic initiatives of the Texas A&M University System, told AP. "These are not minimal problems. These are big important problems for the country. And we're going to bring everybody to the table we can … to solve the problems and protect public health."

A Texas A&M release reports that the three new centers will be receiving funding to build or renovate facilities to develop and manufacture medical countermeasures, such as vaccines and medicines used in an emergency. The center, as a public-private partnership, aims to enhance the U.S. emergency preparedness against emerging infectious diseases, including pandemic influenza and chemical, biological, radiological, and nuclear threats.

Texas A&M does not have a long history with human vaccines, so the choice of the Texas school was puzzling to some. Robin Robinson, the director of the new center, says that Texas A&M created a consortium with several pharmaceutical companies, including GlaxoSmithKline and Lonza, and innovative local companies, including Caliber Biotherapeutics, to provide a team that can make vaccines quickly in a public health emergency and help companies in need to develop and manufacture their vaccines on a routine basis.

Robinson points out that had the 2009 H1N1 pandemic been more severe, for example, then the center would have executed contingency plans that included medical countermeasures and other social distancing mitigation measures. The contingent medical countermeasure plans included manufacturing and usage of flu vaccines formulated with adjuvants. This dose-sparing technology provides a way to extend a limited vaccine supply to more people. Additionally, contingencies included the distribution of the unused stockpile of flu antiviral drugs to treat patients.

Robinson emphasizes that the new centers, all based in the United States, will produce and make available pandemic flu vaccines sooner than in 2009 due to newer vaccine and flexible manufacturing technologies. Nearly 90 percent of the pandemic vaccine needs will be provided domestically, utilizing these new centers and current flu vaccine manufacturers in the United States.

Robinson, in response to a question about whether people should be more concerned about deliberate biological attacks or naturally occurring disease outbreaks, said that Mother Nature is always cooking up new pathogens, as exemplified by the H1N1 pandemic of 2009 and the SARS epidemic in 2003. Biological, chemical, and radiological threats continue to be concerns to us today.

Robinson came to HHS in 2004 to establish a Manhattan Project-like program for biological

countermeasures. He says that when the centers are actually making vaccines and helping other companies, then he will take a breath.
Asked which is the better movie, "28 Days Later" or "Outbreak," Robinson said: '"The Andromeda Strain' was a very good movie that depicted more realistically the evolution of an unknown pathogen and how humankind would deal with the spread of a new infectious disease."
"Research is very important," Robinson said. "It is the lifeblood of what we do in America. Here this center has to do more than research. It has to produce. And that's a real dilemma one has going forward, when there is a real attack on America, be it Mother Nature or other terrorists. And you have to it and have to do it now."

Greece: Cutaneous anthrax case

Source: http://www.tsantiri.gr/ellada/larisa-proto-pistopiimeno-%C2%ABkrousma-anthraka%C2%BB-se-ktinotrofo.html

The first case of cutaneous anthrax in a sheep breeder who carried the dead body of a sheep from his flock, has been recorded in the area of Larissa (Tsapournia Elassonaw area). More than 700 animals will be vaccinated. The area has been quarantined. In the same area, more than 7.000 sheeps vaccinated against anthrax in 2006 (Livadi Elassonas area). The patient submitted to specialized therapy and currently in recovery phase.

Bio-Terrorism: Neurological Context

Source: http://www.ukessays.co.uk/essays/terrorism/bio-terrorism.php

In the recent years, we have been hearing of events of terrorism attacks, mail-borne biological agents' exposure and war which have caused an increase in awareness of these attacks in all parts of the world including the most developed nations like USA and Canada. Scientists, physicians and the relevant health care officials play a vital role in the identification of potential attacks and curbing them (Han & Zunt, 2003). Early and timely recognition of bioterrorism related illnesses through preparedness is quite essential for neurologist as it has been discovered lately that, bio-terror agents affect the nervous system either directly or indirectly. Nearly all bioterrorism agents result to neurological manifestations, and therefore require expert diagnosis and treatment by neurologists. It is true that there is no terrorist threat which fosters more horror than biological attack. This is even more worsened by the fact that little is understood about this type of terrorism and even more less understanding of the neurological involvement exists.
Neurology is one of the most vital concerns in bioterrorism. Center of Disease Control (CDC) has listed biological Agents based on their harmfulness or lethalness. Of those listed as the most critical biological agents or Category A biological agents, tularemia, anthrax, encephalitis, plague, small pox, brucellosis, botulism and Venezuelan fall in this category. All these diseases affect the nervous system in one way or the other resulting to neurological manifestations (Han & Zunt, 2003). In fact, the Centers of Disease Control in conjunction with various governments have embarked in the implementation of bioterrorism response programs and the necessary preparedness strategies including surveillance, detection, planning and response with nerves system in mind. More than any other medical specialist, neurologists are in a position to raise alarm in case of any attack and should therefore be conversant with clinical syndromes and manifestations caused by biological agents used in terrorism.
Critical biological agent like anthrax usually presents itself as hemorrhagic meningitis in severe cases and has a high mortality rate (Dennis et al., 2003). A disease like small pox although it first presents itself as a febrile illness together with a simple rash, it ends up as meningoencephalitis with severe damage to the brain. Other disease like botulism presents itself main mainly with neurological symptoms. Consequently, most vaccines administered against these biological attack agents trigger neurological side effects. A good example is

encephalitis which results from small pox vaccine or optic neuritis resulting from an anthrax vaccination (Judith et al., 2002). Neurologists are therefore forced to treat neurological complications of the disease as well as the vaccine.

Biological agents which do not trigger neurological involvement or manifestations are often more easier to treat, curb or prevent. Most of category B agents do not trigger neurological involvement. Agents like Vibrio cholera, Ricin, E coli, and Q fever have known antidotes ot treatment which normally works effectively. They also don't persist in the population for extended period of time and have a lower death rate as compared to the Category A agents. These agents are not widely used by terrorists because of their mildness in display of the attacks.

As bioterrorists attack are becoming clearer, it has become evident that neurology is of paramount concern of should be focused on with unswerving search for further knowledge (Judith et al., 2002). In the building of each nations defense against bioterrorism, all aspects of the neurological implications need to be put in to consideration as it is not only involved in detection of the threats and diagnosis of the diseases involved but also in treatment and identification of potential bioterrorist attacks.

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Ebola in Uganda

(As of 29 July 2012)

Source: http://www.who.int/csr/don/2012_07_29/en/index.html

The Ministry of Health (MoH) of Uganda has notified WHO of an outbreak of Ebola haemorrhagic fever in Kibaale district in the western part of the country.

A total of 20 cases, including 14 deaths have been reported since the beginning of July 2012. The index case was identified in a family from Nyanswiga village, Nyamarunda sub-county of Kibaale district, where nine of the deaths were recorded. The deceased include a clinical officer who attended to a patient, and her four month-old child. Nine of the 14 deaths have occurred in a single household.

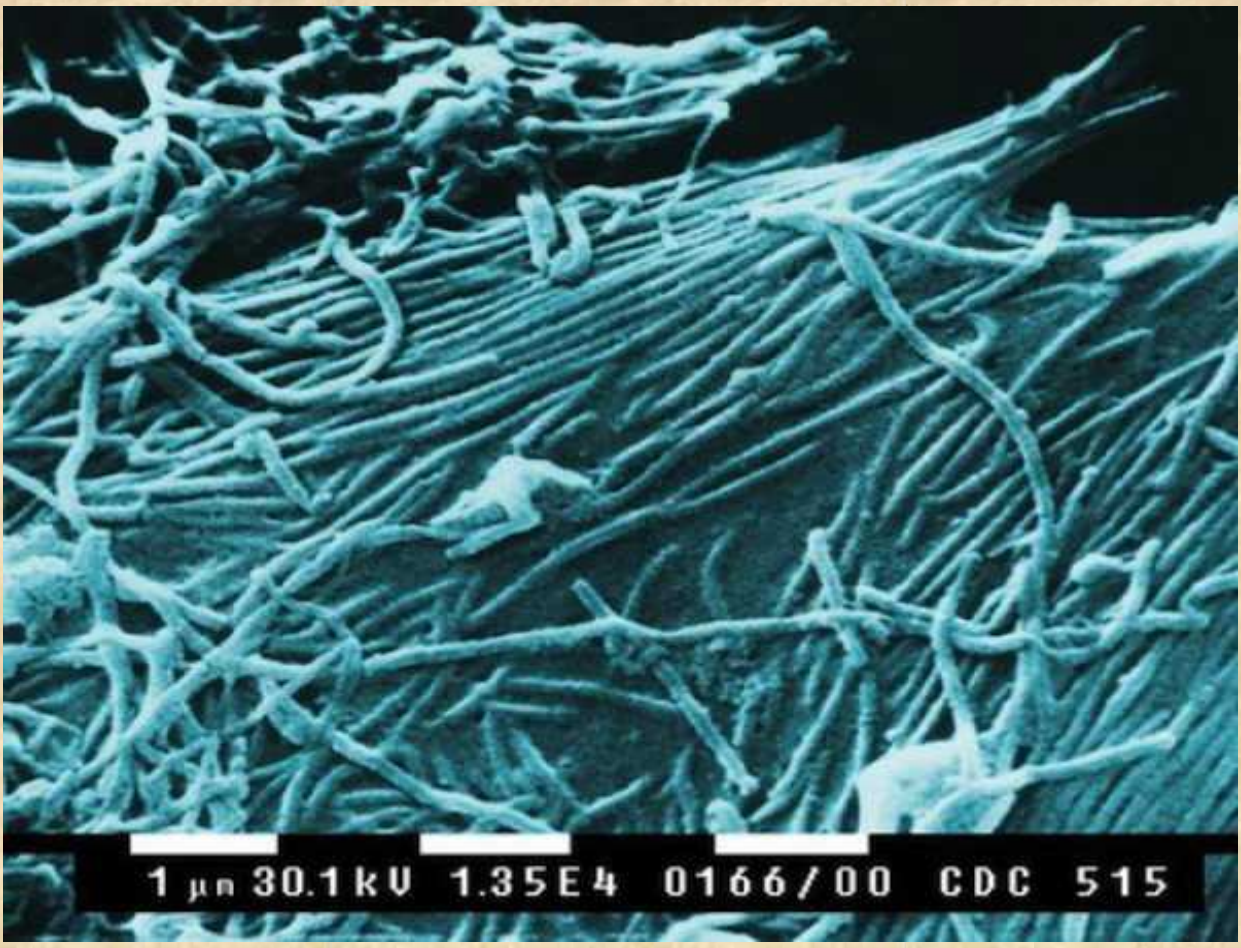
Laboratory confirmation was done by the Uganda Virus Research Institute in Entebbe.

Currently, two patients are hospitalized and are in stable condition. The first is a 38 year-old female who attended to her sister, the clinical officer who died. She was admitted to the hospital on 26 July 2012. The second is a 30 year-old female who participated in conducting the burial of the index case. She was admitted to the hospital on 23 July 2012.

Both cases were admitted to hospital with fever, vomiting, diarrhoea and abdominal pain. Neither of the cases has so far shown bleeding, a symptom that often appears in viral haemorrhagic fever patients.

The MoH is working with stakeholders and partners to control the outbreak. Response plans at the national and district levels are being finalised. A national task force coordinated by the MoH has been re-activated at the MOH headquarters and holds daily meetings. In Kibaale a district task force has been formed to better coordinate field response. The neighbouring districts have been put on high alert about the outbreak and to step up surveillance.

A team of experts from MoH, WHO and Centers for Disease Control and Prevention (CDC) is in Kibaale to support the response operations. All possible contacts that were exposed to the suspected and confirmed cases since 6 July 2012 are being identified for active follow up. The necessary supplies and logistics required for supportive management of patients are being mobilized. Kibaale hospital has established a temporary isolation ward for suspected, probable and confirmed cases. Médecins Sans Frontières (MSF), Holland, has mobilized necessary requirements for setting up isolation centre at the hospital. The MoH and Mulago Hospital have mobilized some staff to manage the isolation centre but more are urgently needed.



The MoH has advised the public to take measures to avert the spread of the disease and to report any suspected patient to the nearest health unit.
WHO does not recommend that any travel or trade restrictions are applied to Uganda.

DARPA demonstrates quick vaccine development for hypothetical pandemic

Source: http://www.homelandsecuritynewswire.com/dr20120730-darpa-demonstrates-quick-vaccine-development-for-hypothetical-pandemic

U.S.military forces are the front line of U.S. national security, but as a globally deployed force they are also on the front line of any new pathogen-based health threat that may emerge. As overall human activity pushes ever further into previously undeveloped territory, the likelihood of exposure to new pandemic diseases increases. The 2009 Army Posture Statement, cites a World Health Organization (WHO) estimate of between 20 and 50 percent of the world's population being affected if a pandemic were to emerge. WHO forecasts "it may be six to nine months before a vaccine for a pandemic virus strain

becomes available." In a separate report on pandemic influenza, the WHO describes several challenges to producing sufficient volumes of vaccine using current, egg-based protein-production technology, including the likelihood that two doses per person could be required due to the absence of pre-existing immunity.

In short, the potential for a pandemic exists and current technological limitations on defensive measures put the health and readiness of U.S. military forces at risk. A technological solution to increase the speed and adaptability of vaccine production is urgently needed to match the broad biological threat.

DARPA says that its Blue Angel program seeks to demonstrate a flexible and agile capability for the Department of Defense rapidly to react to and neutralize any natural or intentional pandemic disease. Building on a previous DARPA program, Accelerated Manufacture of Pharmaceuticals, Blue Angel targets new ways of producing large amounts of high-quality, vaccine-grade protein in less than three months in response to emerging and novel biological threats. One of the research avenues explores plant-made proteins for candidate vaccine production.

"Vaccinating susceptible populations during the initial stage of a pandemic is critical to containment," said Dr. Alan Magill, DARPA program manager. "We're looking at plant-based solutions to vaccine production as a more rapid and efficient alternative to the standard egg-based technologies and the research is very promising."

In a recent milestone development under Blue Angel, researchers at Medicago Inc. produced more than ten million doses (as defined in an animal model) of an H1N1 influenza vaccine candidate based on virus-like particles (VLP) in one month. Production adhered to Phase 1 appropriate current good manufacturing practices. The work was part of a "rapid fire" test that ran from 25 March 2012 to 24 April 2012, at a facility in Durham, North Carolina. A third-party laboratory tested the production lots to confirm the immunogenicity of the vaccine candidate. Testing confirmed that a single dose of the H1N1 VLP influenza vaccine candidate induced protective levels of hemagglutinin antibodies in an animal model when combined with a standard aluminum adjuvant. The equivalent dose required to protect humans from natural disease can only be determined by future, prospective clinical trials.

"The results we've achieved here with plant-based production of vaccines represent both significant increase in scale and decrease in time-to-production over previous production capabilities in the same time period. The plant-made community is now better positioned to continue development and target FDA approval of candidate vaccines," Magill said. "Once the FDA has approved a plant-made vaccine candidate, the shorter production times of plant-made pharmaceuticals should allow DoD to be much better prepared to face whatever pandemic next emerges."

Deadly E. coli strain decoded

Source: http://www.homelandsecuritynewswire.com/dr20120727-deadly-e-coli-strain-decoded

The secret to the deadly 2011 E. coli outbreak in Germany has been decoded, thanks to research conducted at Michigan State University.

The deadliest E. coli outbreak ever, which caused fifty-four deaths and sickened more than 3,800 people, was traced to a particularly virulent strain that researchers had never seen in an outbreak before. In the current issue of the academic journal *PLoS* ONE, a team of researchers led by Shannon Manning, MSU molecular biologist and epidemiologist, suggests a way to potentially tame the killer bacteria.

A Michigan State University release reports that the strain, E. coli O104:H4, shares some characteristics as other deadly E. coli bacteria, but its combination is novel. Researchers haven't determined the mechanism it uses to cause disease, although Manning and her team were able to find the strain's Achilles heel —its biofilm.

By focusing on the bacteria's biofilm, the grouping of many E. coli bacteria that stick to a cell's surface and grow encased in a self-produced protective coat, Manning and colleagues were able to determine why it was so deadly. When the bacterium found in Germany forms a biofilm, it begins to make more toxic genes like the Shiga toxin.

Increased production of the Shiga toxin is the probable culprit that contributed to so many incidents of kidney damage and death during the 2011 outbreak, Manning said.

"What made the German outbreak so different is that many victims suffering from kidney failure were adults," she said. "Rather than attacking adults, other types of E. coli that produce Shiga toxins typically damage kidneys of children under 10."

The release notes that in addition, the incubation period was considerably longer among individuals infected with the German outbreak strain compared to individuals infected with E. coli O157, a similar bacterium that can also cause illness and death. Manning believes this is because the German strain needs a longer period of time to form a biofilm, whereas biofilms are not important for O157 infections.

"Our research demonstrates that biofilm formation is critical for toxin production and kidney damage," she said. "If we can block the bacteria from forming a stable biofilm, then it is likely that we can prevent future E. coli O104:H4 infections."

The next phase of Manning's research is already focusing on creating mutant strains in an effort to prevent the bacterium from forming a biofilm. This would prevent the disease completely since the conditions would not be favorable for bacterial growth.

Chris Waters, MSU assistant professor of microbiology and molecular genetics, and scientists from the University of Michigan and the Michigan Department of Community Health contributed to the research.

Manning's research was funded in part by the National Institutes of Health (U19AI090872), the U.S. Department of Agriculture, and MSU AgBioResearch.

— Read more in Rim Al Safadi et al., "Correlation between In Vivo Biofilm Formation and Virulence Gene Expression in Escherichia coli O104:H4," PLoS *ONE 7. no. 7 (25 July 2012)*

Full paper at: http://news.msu.edu/media/documents/2012/07/f6da7a05-8c53-406b-9309-9b682af19549.pdf

Bad news: avian influenza virus can now infect mammals

Source: http://www.homelandsecuritynewswire.com/dr20120801-bad-news-avian-influenza-virus-can-now-infect-mammals

A novel avian influenza virus has acquired the ability to infect aquatic mammals and was responsible for an outbreak of fatal pneumonia that recently struck harbor seals in New England, according to scientists at the Center for Infection & Immunity (CII) at the Mailman School of Public Health, the National Oceanic and

Atmospheric Association, New England Aquarium, USGS National Wildlife Health Center, SeaWorld, and EcoHealth Alliance.

This research is published in *mBio* (and see this *New York Times* article about the study).

A Columbia University's Mailman School of Public Health release reports that wildlife officials first became concerned in September 2011, when seals with severe pneumonia and skin lesions suddenly appeared along the coastline from southern Maine to northern Massachusetts. Most were infants (less than six months old), and a total of 162 dead or moribund seals were recovered over the next three months.

Pathogen screening was conducted in a subset of afflicted seals, using sensitive diagnostic tools developed at CII. A new strain of avian H3N8 influenza virus was identified as a culprit.

"When initial tests revealed an avian influenza virus, we asked the obvious question: how did this virus jump from birds to seals?" says Simon Anthony, D.Phil, postdoctoral research scientist at CII and the lead author of the study.

Based on full genome sequencing and phylogenetic analysis, seal H3N8 descended from an avian strain that has been circulating in North American waterfowl since 2002, which implies recent transmission from wild birds to seals.

Accordingly, seal H3N8 has acquired the ability to bind sialic acid receptors that are commonly found in the mammalian respiratory tract. Mutations in the HA and PB2 genes — required for cell entry and replication, respectively – suggest enhanced virulence and transmission in mammals, but these putative attributes require further investigation. Given these findings along with the long history of the spread of avian influenza to humans — most notably H1N1 and H5N1 — seal H3N8 could pose a threat to public health.

"Our findings reinforce the importance of wildlife surveillance in predicting and preventing pandemics," says W. Ian Lipkin, MD, director of the Center for Infection and Immunity and John Snow Professor of Epidemiology, at the Mailman School. "HIV/AIDS, SARS, West Nile, Nipah and influenza are all examples of emerging infectious diseases that originated in animals. Any outbreak of disease in domestic animals or wildlife, while an immediate threat to wildlife conservation, must also be considered potentially hazardous to humans."

— Read more in S. J. Anthony et al., "Emergence of Fatal Avian Influenza in New England Harbor Seals," mBio 3, no. 4 (31 July 2012)

Asymptomatic Rabies

By Amesh A. Adalja, MD, FACP
Source: http://www.upmc-biosecurity.org/

The rabies virus has a case fatality rate close to 100%, the highest of all pathogens known to infect humans. Before survival was demonstrated in a few patients treated with the Milwaukee protocol[1] regimen of sedatives and antivirals, clinical disease caused by rabies was invariably fatal. However, susceptibility to the virus varies among mammalian species-foxes are highly susceptible while bats have seroprevalence rates that can reach 50%. In humans, abortive infections do not generally occur. For the most part, unvaccinated people do not have antibody titers. Rare exceptions are found among just a few groups that have a low seroprevalence rate (hunters, trappers, and residents of a Peruvian community affected by an outbreak in 1990).[2] The results of a recently published study that quantified and characterized rabies seroprevalence rates in an endemic region of Peru provide important new insights into the pathophysiology of rabies and point to new directions in research.[2]

Seropositive Individuals Identified

In 2010, the researchers interviewed 92 residents of Truenococha and Santa Marta, 2 Peruvian communities in which rabies-carrying vampire bats are highly prevalent. They performed serological testing on 63 subjects. Of those surveyed, 54% reported being bitten by a bat. Risk factors for bat exposure included younger age, larger household size, and ownership of pets and/or livestock.[2]
Of the 63 sera samples tested, 9 had rabies-neutralizing antibody titers. All 9 of those subjects reported bat exposure, and one had been vaccinated. Positive titers were associated with older age but did not vary by gender.[2]

New Directions for Research

The authors suggest several possible explanations for the seroprevalence rate they observed: 1) genetic basis for resistance to productive infection; 2) virus exposure without replication; 3) small infectious dose; and 4) salivary cofactors that may induce immune response following bites. Cross reaction with similar viruses was not thought to be a factor.[2]
The discovery of asymptomatic rabies that provokes antibody formation advances our understanding of this disease, and further characterization of the seropositive will provide greater understanding of rabies pathophysiology. Future studies might aim to uncover the degree of protection the antibodies confer, their durability, and the mechanism of induction in the absence of clinical disease. Further along, identification of the genetics of immunity could lead to new treatment modalities.

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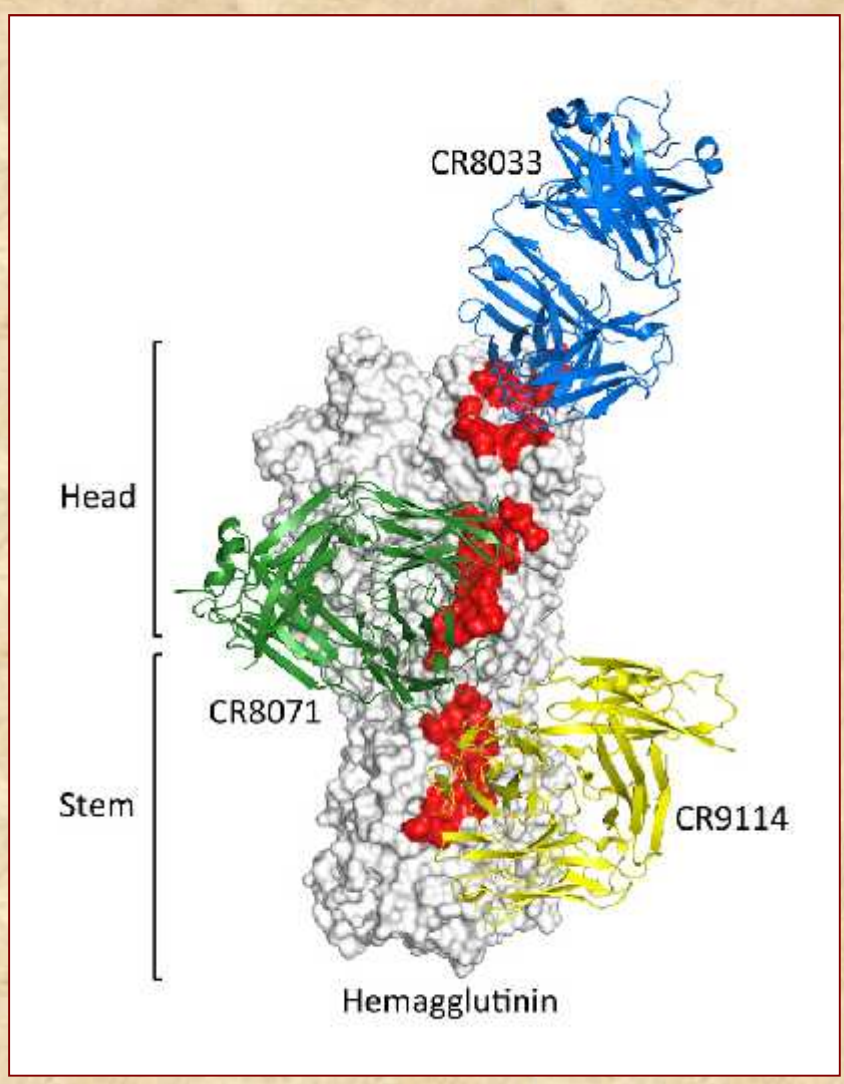
Researchers move a step closer toward universal flu vaccine and therapies

Source:http://www.homelandsecuritynewswire.com/dr20120810-researchers-move-a-step-closer-toward-universal-flu-vaccine-and-therapies

A team led by scientists at the Scripps Research Institute and Crucell Vaccine Institute in the Netherlands describes three human antibodies that provide broad protection against Influenza B virus strains. The same team had previously reported finding broadly neutralizing antibodies against Influenza A strains.
The isolation of the new broadly neutralizing antibodies, which was reported the journal *Science*'s advance online edition, *Science*

Express, on 9 August, paves the way for researchers to develop a universal antibody-based flu therapy for use in severe infections or



to protect hospital staff during an outbreak. A Scripps Research Institute release reports that importantly, these antibodies may provide key clues to the design of an active universal flu vaccine — designed to protect long-term against flu viruses, not just against the current season's strains.

"To develop a truly universal flu vaccine or therapy, one needs to be able to provide protection against influenza A and influenza B viruses, and with this report we now have broadly neutralizing antibodies against both," said Ian A. Wilson, the Hansen Professor of Structural Biology at Scripps Research, who was senior investigator for the new study with Crucell's Jaap Goudsmit and Robert Friesen.

One of the newly discovered antibodies will be of special interest to flu researchers, because it appears to protect against essentially all influenza B and influenza A strains. "It's the only one in the world that we know of that has been found to do this," said Wilson.

Influenza B viruses are considered less dangerous than Influenza A viruses, and have been less intensively studied because they have less capacity to mutate into deadly pandemic strains. Influenza B viruses, however, account for a significant part of the annual flu illness burden in humans.

Three human antibodies provide broad protection against Influenza B virus strains. (Image courtesy of the Wilson lab, The Scripps Research Institute)

To find broadly protective antibodies against Influenza B, the team at Crucell generated a large collection of flu antibodies from the immune cells of volunteers who had been given a seasonal flu vaccine. The researchers then screened this collection for antibodies that could bind to a wide variety of influenza B strains.

The release notes that three of the antibodies they found in this manner — CR8033, CR8071, and CR9114 — protected mice against normally lethal doses of the two major influenza B strains. CR9114 also protected mice against influenza A viruses, including the H1N1 subtype that killed about 17,000 people in a 2009 pandemic. The fact that these antibodies protected against a variety of flu strains suggested they mark functionally important sites, or "epitopes," on the virus that are relatively unchanging (conserved) from one flu strain to the next.

Wilson's team at Scripps Research characterized the newly discovered antibodies' binding sites on influenza viruses using electron microscopy and X-ray crystallography techniques. They found that CR8033 binds to a highly conserved epitope — a functionally important site — on the "head" of the hemagglutinin protein, a structure that studs the outer coat of flu viruses and allows the viruses to stick to vulnerable cells. CR8071 binds to the base of the hemagglutinin head. Most antibodies that bind to the hemagglutinin head and neutralize influenza do so by blocking the virus's attachment to host cells.

"The unique thing about these two antibodies is that they neutralize flu viruses chiefly by preventing virus particles from exiting infected cells," said Nick Laursen, a research associate in Wilson's laboratory who was a lead author of the study.

Antibody CR9114 turned out to bind to a site on the hemagglutinin stem. "It prevents the hemagglutinin protein from undergoing the shape-change needed for the virus to fuse to the outer membrane of a host cell," said Cyrille Dreyfus, a Wilson lab research associate who also was a lead author of the study. "This appears to be a real weak point of the virus, because this epitope is highly conserved among influenza A subtypes as well as influenza B."

Wilson notes that in a study published in 2009 his laboratory determined the structure of another Crucell antibody that broadly neutralizes influenza A viruses by binding to essentially the same site on the hemagglutinin stem — but in a subtly different way, so that it fails to get a grip on influenza B viruses, too. "With some tweaking of that antibody's binding domains, we might have been able to get a broader effect like CR9114's," Wilson said.

The viral epitope to which CR9114 binds will now be studied extensively by researchers as a target for vaccines and therapies, because it is the only one found so far that is broadly vulnerable to neutralization on both influenza A and B viruses.

The release also notes that, remarkably, CR9114 performed poorly against influenza B viruses in initial lab-dish tests known as microneutralization assays, which test the ability of an antibody to protect cells from viral infection. Yet CR9114 was clearly effective under more realistic conditions in mice, even at low doses. Because it attacks the stem rather than the head of flu virus hemagglutinins, CR9114 also failed to show effects in a widely used test known as the hemagglutinin-inhibition assay.

"As we move towards design of a universal flu vaccine, we need to find more inclusive assays to screen for antibodies such as CR9114, which may be highly effective but have novel mechanisms for neutralization that cannot be detected by the current methods used in influenza vaccine development," Goudsmit said.

— Read more in Cyrille Dreyfus et al., "Highly Conserved Protective Epitopes on Influenza B Viruses," Science (9 August 2012)

Greece – West Nile virus

Source: http://www.promedmail.org

In Greece, 3 people died in July and August [2012], as a result of being bitten by mosquitoes carrying the West Nile fever virus. According to Greek health care services 44 others are also infected. Most cases were reported in the suburbs east and south of Athens and in the north, near the town of Naoussa.

"The number of people infected may be even higher," said Dr GiorgosTagaris. "The patients complain of slight ailments such as cranial or joint pain, or show no symptoms."

The inhabitants of the regions concerned were advised to protect themselves against insect bites.

The West Nile virus is largely widespread, particularly in Africa, Asia and North America. More more cases have also been recorded in southern and eastern Europe.

According to the German Robert Koch Institute, about 20 per cent of patients infected develop a feverish flu-like illness, while one in 150 may incur more severe disease, including meningitis.

Uganda – Ebola Hemorrhagic Fever

Latest update: Tue 7 Aug 2012

Source: http://www.monitor.co.ug/News/National/3+more+Ebola+cases+detected/-/688334/1472870/-/12lgvn0/-/index.html

- Admissions; 36 people have so far been admitted on suspicion of having the virus. Contact cases; 398 people are suspected to have got into contact with Ebola patients but of these, 295 have so far been followed.

- To be discharged; 29 patients who were admitted on suspicion of Ebola and tested negative will be discharged from Kagadi hospital.
- More detected cases; 3 more people tested positive for ebolavirus infection.

More Ebola haemorrhagic fever cases detected

A total of 3 more people had by yesterday tested positive of the ebolavirus infection and were admitted to Kagadi Hospital, raising the number of confirmed cases to 13. Of these, 6 are still admitted, 3 have since died while 4 have recovered since the Ebola virus epidemic was declared.

The disease has so far claimed 16 lives inclusive of the 13 that died before the epidemic was officially declared. Health officials in Kibaale District said they had discharged 7 patients, 3 of whom are inmates who were admitted on suspicion of suffering from ebolavirus infection. "They have been given a resettlement package to help them re-unite with their families and live better lives," Mr Stephen Mfashingabo, the vice chairperson of the District Ebola Task Force, said. They are some of the 29 patients who tested negative of ebolavirus infection and are being released gradually from hospital. They are also accompanied by counsellors to re-unite them with their respective families.

Earlier on, Dr Dan Kyamanywa, the Kibaale District health officer, said those that had tested positive were already on treatment, while those that tested negative were being examined to ensure that they regain enough strength before they are discharged. "The 3 new patients that tested positive have been put on treatment and are being closely monitored. 29 suspected cases have tested negative and are currently being screened by our officials to see who is in good shape to go back home," Mr Kyamanywa said. He added that ebolavirus infection contacts had increased from 353 by Sunday to 398 yesterday with medics following up 295 cases.

However, Asuman Lukwago, the permanent secretary in the Ministry of Health, told the Daily Monitor that he was not aware of any new positive cases. "The information I have extends up to yesterday night (5 Aug 2012). There is no new case of ebolavirus infection. In case of any new cases, we shall officially communicate."

Levaquin Approved For Treating Plague, USA

Source: http://www.medicalnewstoday.com/articles/244764.php

Levaquin (levofloxacin) has been approved by the FDA for the **treatment and prevention of the plague**. Levofloxacin is a synthetic antibiotic of the fluoroquinolones drug class; it is currently used for the treatment of severe bacterial infection, or infections for which other antibiotics have not worked.

Levaquin is produced and marketed by Janssen Pharmaceuticals Inc., a Johnson & Johnson company.

The FDA has also approved Levaquin to lower the chances of contracting the plague after exposure to *Yersinia pestis*.

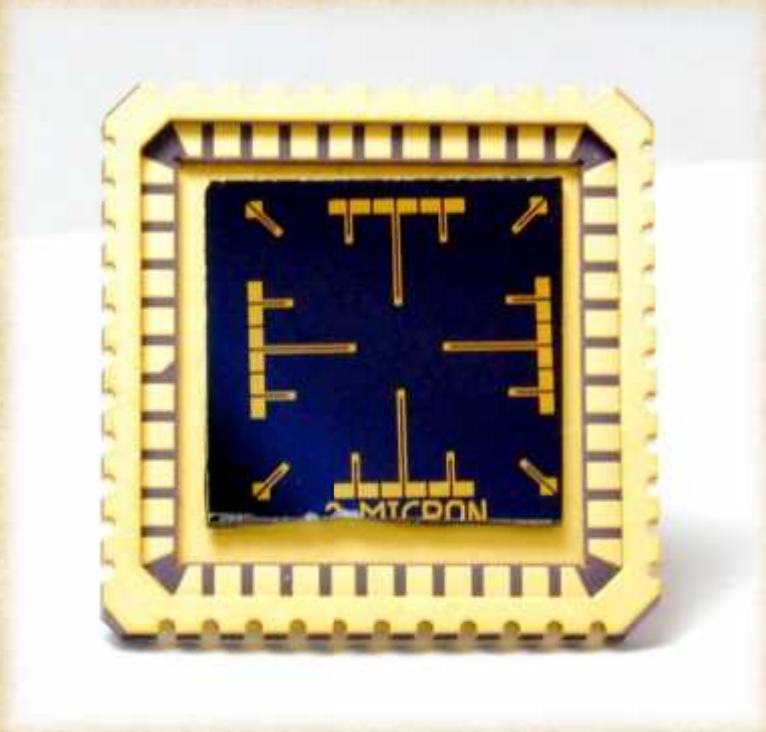
Electronic nose detects airborne toxins down to the parts per billion level

Source: http://www.homelandsecuritynewswire.com/dr20120823-electronic-nose-detects-airborne-toxins-down-to-the-parts-per-billion-level

Research by Nosang Myung, a professor at the University of California, Riverside, Bourns College of Engineering, has enabled a Riverside company to develop an "electronic nose" prototype that can detect small quantities of harmful airborne substances.

A University of California, Riverside release reports that Nano Engineered Applications, Inc., an Innovation Economy Corporation company, has completed the prototype which is based on intellectual property licensed from the University of California. The device has potential applications in homeland security (warning systems for bio-terrorism), agriculture (detecting pesticide levels), industrial sites (detecting gas

leaks, combustion emissions), and the military (detecting chemical warfare agents).



"This is a really important step," Myung said. "The prototype clearly shows that our research at the university has applications in industry."

Steve Abbott, president of Nano Engineered Applications, which is designing the product and expects to begin selling it within a year, said the company is now focused on writing software related to the device and working to make it smaller.

At present, it is about four inches by seven inches. The goal is to make it the size of a credit card. At that size, a multi-channel sensor would be able to detect up to eight toxins. A single-channel sensor device could be the size of a fingernail.

Nano Engineered Applications is now looking to collaborate with companies that could bring the production version to market, Abbott said. He believes the product will initially be commercialized on the industrial side for monitoring such things as gas and toxin leaks, and emissions.

The release notes that the key to the prototype is the nanosensor array that Myung started developing eight years ago. It uses functionalized carbon nanotubes, which are 100,000 times finer than human hair, to detect airborne toxins down to the parts per billion level.

The prototype also includes a computer chip, USB ports, and temperature and humidity sensors.

Version 2 of the prototype, due out in thirty days, will integrate a GPS device and a Bluetooth unit to sync it with a smart phone. The development team is evaluating if adding Wi-Fi capabilities will add value.

The unit is designed to be incorporated in three basic platforms: a handheld device, a wearable device and in a smart phone. Different platforms will be used depending on the application.

For example, a handheld unit could be used for environmental monitoring, such as a gas spill. A wearable unit could be used for a children's asthma study in which the researcher wants to monitor air quality. A smart phone unit could be used by public safety officials to detect a potentially harmful airborne agent.

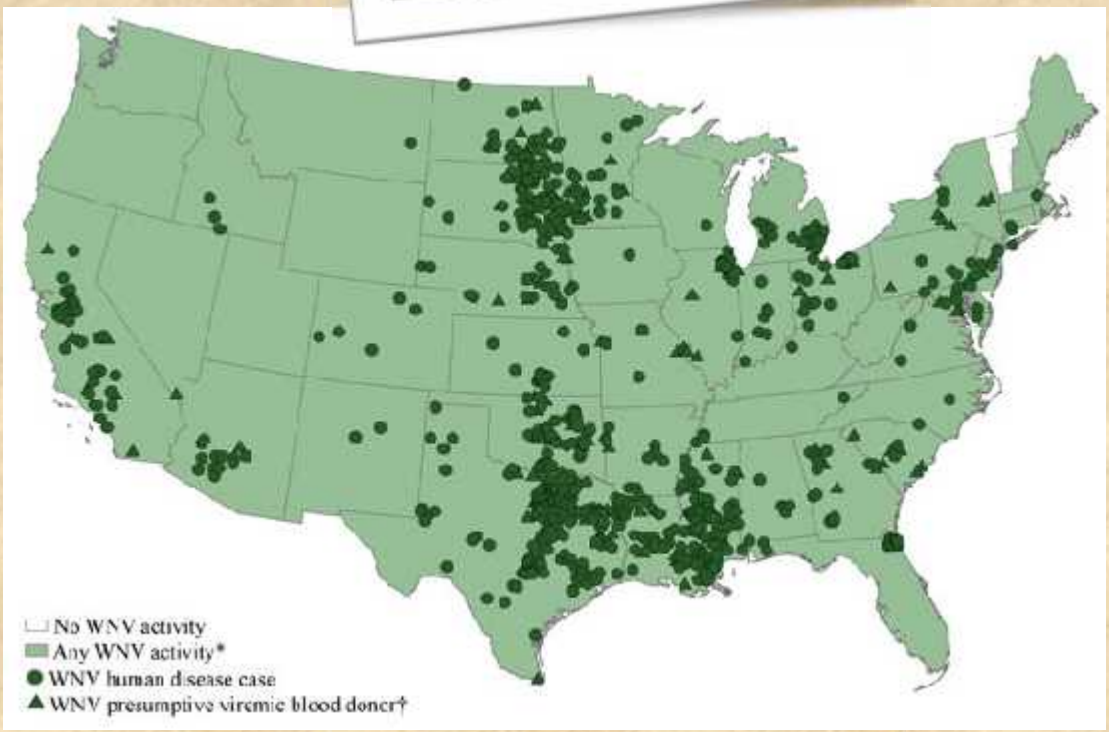
In the past year, Nano Engineered Applications has provided financial support to Myung's research. Of that, a portion went toward naming Myung's lab the Innovation Economy Corporation Laboratory.

CDC says West Nile virus outbreak worst in years

Source: http://www.homelandsecuritynewswire.com/dr20120823-cdc-says-west-nile-virus-outbreak-worst-in-years

The Center for Disease Control (CDC) says that last year's mild winter and a wet spring have contributed to the worst West Nile virus (WNV) outbreak since its initial detection in 1999.

According to the CDC, as of 14 August, at least 693 cases that have been reported across the United States, including twenty-eight deaths. The earliest reported case this year was in Monmouth County, New Jersey on 24 July, which was the earliest case since the first known case in 1999. So far this summer the virus has been located in thirty-two different states.



The *Examiner* reports that the WNV is a seasonal virus detected in the summer and throughout the fall. The virus is spread by the bite of a mosquito and cannot be spread from person to person.

The CDC warns that people with a weak immune system, such as young adolescents and senior citizens, are at a much higher risk to contract a severe form of the virus.

The latest case was William Mueller, who was the president of the Village of Lombard, a suburb in Chicago. Mueller, 76, died from complications due to the Virus.

In the past the CDC has greatly expanded its Division of Vector-Borne Diseases (DVBD) to focus on the increase of bacterial and viral infections carried by mosquitoes as well as ticks and fleas. This type of disease is the hardest to control because they can travel through animals and pets, who can pass it on to humans.

The CDC describes the DVBD as one of the world's foremost centers of research for preventing and controlling vector-borne viruses and bacteria. The *Examiner* notes that DVBD, more than any other division of CDC, is responsible with mitigating risk, providing emergency continuity-of-operations, and tests for all major infectious bioterrorism agents.

CDC and DHS have collaborated on identifying pathogens terrorists might use as biological weapons. Bioterrorism experts typically focus on anthrax, botulism, Ebola, plague, or smallpox as the most likely bioterror agents. The CDC list is longer, and includes Venezuelan, western, and eastern equine encephalitis viruses, Q fever, RMSF, and epidemic typhus as potential bioterror agents which are "moderately easy to disseminate."

There have been ads around the country informing people of the WNV and how to prevent it, including wearing long sleeve clothes at night,

using mosquito repellent if you work or are outdoors most of the day, and buying citronella candles for parties and outdoor events.

DomPrep Journal

Source: http:// www.DomesticPreparedness.com

DomPrep Journal

EVENTS

The Medical Component Of Mass Gatherings

The Good Health and Geographic Factors Involved

"Apparently, protecting our way of life has now become our way of life."