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Simultaneous detection of five bacterial bio-threat agents

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Suspension Arrays for Simultaneous Detection of Five Bacterial Biothreat Agents in Powder Samples

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Abstract We have developed novel Bio-Plex assays for simultaneous detection of *Bacillus anthracis, Yersinia pestis, Brucella spp., Francisella tularensis* and *Burkholderia pseudomallei.* Universal primers were used to amplify highly conserved region located within the 16S rRNA amplicon, followed by hybridized to pathogen specific probes for identification of these five organisms. The other assay is based on multiplex PCR to simultaneously amplify five species-specific pathogen identification targeted regions unique to individual pathogen. Both of the two arrays are validated to be flexible and sensitive for simultaneous detection of bioterrorism bacteria, However, universal primer PCR based array could not identify *Bacillus anthracis, Yersinia pestis, Brucella spp.* at the species level because of the high conservation of 16S rDNA of the same genus. The two suspension arrays can be utalized to detect *Bacillus anthracis* sterne spore and *Yersinia pestis* EV76 from mimic "write powder" samples, they also proved the suspension array system will be valuable tools for diagnosis of bacterial biothreat agents in environmental samples.

NOTE: You can read the full paper at the Newsletter's website –"CBRNE-CT Papers" section.

Book on countering bioterrorism presented

Source: http://www.mod.gov.rs/novi_eng.php?action=fullnews&id=3282

In the central military club the book "Biological weapons and new approaches in the fight against bioterrorism," published by the Media Center "ODBRANA"was presented today. The key speakers besides the authors, Lt. Col. prof. Vladan Radosavljevic and prof. dr. Goran Belojevic, were also Col prof. Zoran Popovi?, Head of the Military health Care Department and one of the reviewers, prof. Radenko Dimitrijevic who spoke about which is said to represent a significant contribution to the theory of the counter terrorism, as well as preventive medicine in general.

This, he said, represents a "logical synthesis of several research papers of authors, published in national and international publications," containing many new

terms, definitions, classifications, methods and models that shed light on the phenomenon of global bioterrorism and formulate new approaches to combat this phenomenon, directed against, first of all, civilians, and, as the authors pointed out, requires cooperation of both the military and civilian health care system, so that they can respond promptly to a global terrorist threat.

"Only constant monitoring and investment in clinical and preventive medicine and well-equipped system can cope with danger" as professor Belojevic stated today, an author of a book that is in competition for the prestigious City of Belgrade award in the field of science in 2011.

Bioterrorism: Still a Threat to the United States

By Leonard A. Cole

Source: http://www.ctc.usma.edu/posts/bioterrorism-still-a-threat-to-the-united-states

The tenth anniversary of the 9/11 attacks prompted reflections on the current status of the terrorism threat to the United States. One aspect of an assessment—the threat posed by biological weapons—is especially challenging because of the unique character of these weapons. A prime distinction is the fact that exposure to minute quantities of a biological agent may go unnoticed, yet ultimately be the cause of disease and death. The incubation period of a microbial agent can be days or weeks; unlike a bombing, knifing, or chemical dispersion, a bioattack might not be recognized until long after the agent's release. Accordingly, bioterrorism poses distinctive challenges for preparedness, protection, and response.

The use of a pathogen for hostile purposes became a consuming concern to the American people soon after 9/11. About a half-dozen letters containing anthrax spores were mailed to journalists and politicians beginning one week after the jetliner attacks. Four letters with spores and threat messages eventually were recovered. All were postmarked Trenton, New Jersey, which meant that they had been processed at the postal distribution center in nearby Hamilton. Two letters were postmarked September 18, one addressed to Tom Brokaw at NBC-TV and another to the editor of the New York Post. The other two letters were stamped October 9 and addressed to Senators Thomas Daschle and Patrick Leahy.

As people became infected in September, October and November, local responses revealed gaps in preparedness for a biological attack. For example, the first confirmation of an anthrax case was on October 4, more than two weeks after the initial letters were mailed. Retrospective assessments later indicated that by then nine people had already contracted the disease. Their illness previously had been misidentified because of faulty diagnoses or erroneous laboratory tests.[1] In the end, at least 22 people had become infected, five of whom died. Meanwhile, scores of buildings were belatedly found to be contaminated with spores that had leaked from the letters. At least 30,000 people who were deemed at risk required prophylactic antibiotics.[2] Millions more were fearful, many of them anxious about opening their own mail.

Since the anthrax attacks, the U.S. government has spent about $60 billion on biodefense. A large portion of those dollars has gone to biodefense research under the auspices of the National Institute of Allergy and Infectious Diseases (NIAID). The NIAID budget for biodefense research has grown from $200 million in 2001 to an annual average of $1.6 billion since 2004.

As a result, two central questions have emerged after 10 years of efforts. Is the United States safer from a bioattack now than at the time of

the anthrax attacks? Has the spending been worth it?

Key Questions, Discrepant Answers

Opinions on these questions differ. While concerned about the danger of backsliding, the authors of an article in Politico now felt "reassured about our preparedness" for a biological attack.[3] At the same time, an opposing assessment was emblazoned in the title of a New York Times Magazine cover story: "Ten Years After the Anthrax Attacks, We Are Still Not Ready."[4] A review of biodefense efforts during the past 10 years in Science magazine blandly acknowledged the obvious: "debate continues over how much safer the country is."[5]

The congressionally chartered Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism (WMD Commission) issued a report card in 2010 on efforts to address several of its previous recommendations. The administration's failure to "enhance the nation's capabilities for rapid response to prevent biological attacks from inflicting mass casualties" merited a grade of "F" (meaning that no action was taken on this recommendation). Almost as bad was the "D+" given for continuing inadequate oversight of high-containment laboratories.[6]

Reasonable arguments can be made to support varied views about these issues, and all conclusions bear a degree of subjectivity. Yet an assessment of several broad critical contentions can offer clarification. The criticisms are largely expressed in the form of five contentions.

Contention #1: Funding for biodefense has meant fewer dollars for other deserving areas such as public health infrastructure and basic science research.

In 2005, 758 microbiologists signed a letter to Elias Zerhouni, then director of the National Institutes of Health (NIH), objecting to the diversion of funds from public health research to biodefense projects. Zerhouni, joined by NIAID Director Anthony Fauci, rejected the letter's premise of "diversion." An assessment of disputed interpretations suggested that spending on biodefense benefited non-biodefense research as well, but the numbers were so "convoluted" that a clear determination was elusive.[7]

An analysis of the biodefense budget for fiscal year 2012 indicates that only 10% of the proposed $6.4 billion is dedicated exclusively to civilian biodefense. The other 90% is for projects with both biodefense and non-biodefense implications. The non-biodefense goals, according to analysts Crystal Franco and Tara Kirk Sell, include "advancing other areas of science, public health, healthcare, national security, or international security."[8] This tilt toward dual-track benefits has been reflected in past budgets as well. A report in Nature magazine indicated that of the $60 billion spent on biodefense in the past decade, only about $12 billion went for programs solely concerned with biodefense.[9] Therefore, non-biodefense research seems to have benefited substantially from biodefense projects.

Fiscal woes in recent years have in fact resulted in reduced resources for public health and related programs. Economic pressure threatens to shrink biodefense funding as it does funding for much else in the federal budget; however, it is not clear now, nor was it in the past, if fewer dollars for biodefense would necessarily translate into more for public health, basic research, or any other health-related programs.

Contention #2: The growing number of facilities for research on select agents (specified pathogens and toxins) has heightened chances of an accidental release.

Statistics alone make this assertion unassailable. The chances of something going wrong in any enterprise, assuming no change in operational security, increase with the size of the enterprise. As the number of research facilities increases, so does the chance of an accident. A continuing weakness is the lack of clarity about the number of high security laboratories.

In 1983, the Centers for Disease Control and Prevention (CDC) designated four levels of safety for laboratory work with biological agents. A Biosafety Level-1 (BSL-1) laboratory allows for work on relatively innocuous agents and a BSL-4 laboratory on the most dangerous. The two highest containment facilities, BSL-3 and BSL-4, require special security measures including restricted access, negative pressure to prevent air from flowing out of the room, and protective outerwear for operators.

BSL-4 laboratories require additional safeguards such as entry through multiple air-locked rooms and positive pressure outerwear with a segregated air supply.

A BSL-4 laboratory is required for work on agents that cause lethal disease for which there is little or no treatment (for example, smallpox and hemorrhagic fevers such as Ebola and Marburg). At present, there are 15 such U.S. facilities planned or in operation, triple the number operating in 2001.[10] Other dangerous agents, including the bacteria that cause anthrax and plague, are worked on in BSL-3 laboratories. The number of these laboratories has skyrocketed since 2001, although the actual figures are uncertain.

While an estimated 20 BSL-3 facilities were operating before the anthrax attacks, in the decade since the number has grown to between 200 and an astonishing 1,400 or more.[11] The huge discrepancy is attributable in part to varied methods of calculation. Some assessments have counted all BSL-3 laboratories in an institution as a single BSL-3 facility, while others have designated each laboratory as a separate entity. Furthermore, some laboratories with a BSL-3 designation may lack safety features found in others, such as double doors and a requirement that two persons must be present.

No national authority is now empowered to mandate a single system of counting or enforce standardization for laboratory security. This lapse is magnified by the fact that even the lowest estimated number of BSL-3 laboratories (200) represents a 10-fold increase in the past 10 years, and that safety precautions at some BSL-3 facilities are less rigorous than at others.

Contention #3: The growing number of investigators with knowledge about select agents has increased the chances that an unsavory scientist could launch a bioattack.

Along with more high containment facilities has come more scientists who handle select agents. Concern about dangerous individuals among them was heightened in 2008 when the FBI named Bruce Ivins as the perpetrator of the 2001 anthrax attacks. Ivins was a veteran scientist who for decades had worked on anthrax at the U.S. Army Medical Research Institute for Infectious Diseases (USAMRIID) in Fort Detrick, Maryland. Before charges could be brought he committed suicide, so his guilt or innocence could never be established in a court of law. Still, evidence of his aberrational behavior, including alcoholism, depression, and self-described bouts of paranoia, evidently went unnoticed by his superiors.

The Ivins case highlighted questions about the screening of workers with ready access to select agents. The number of those workers just prior to the anthrax attacks has been estimated at about 700. By 2008, however, the figure had climbed to more than 14,000.[12] As some have suggested, the greater numbers mean that "the odds of one of them turning out to be a bad apple has increased."[13] Ironically, Ivins was not a newly minted investigator, but a long-respected figure in the army's biodefense program.

Days after Ivins' death, a USAMRIID spokesperson acknowledged that officials may have been unaware of his problems because they relied in part on self-reporting.[14] In 2011, a mental health review panel concluded that "Dr. Ivins had a significant and lengthy history of psychological disturbance and diagnosable mental illness at the time he began working for USAMRIID in 1980."[15]

The Ivins case has raised concerns that other troubled or nefarious individuals might be working in U.S. laboratories. A recent government-sponsored forum on biosecurity called for periodic behavioral evaluations of personnel with access to select agents that include drug testing, searches for criminal history, and completion by selectees of a security questionnaire.[16]

Even while acknowledging the necessity of security measures, the right to privacy and freedom of scientific inquiry must be respected to the extent possible. In any case, behavioral monitoring can never provide absolute protection against the acts of a clever miscreant.

Contention #4: Money for biodefense has been misapplied or otherwise failed to produce desired results.

Project BioShield was established by congress in 2004 to acquire medical countermeasures against biological, chemical, and radiological agents. The 10-year, $5.6-billion program provided for stockpiling and distributing vaccines and other drugs that have not necessarily been tested for efficacy on humans. (Exposing people to

pathogens such as smallpox or anthrax to test a drug would be unethical.)

The first BioShield contract, for $877 million, was awarded in 2004 for the production of a new anthrax vaccine. The recipient, VaxGen, a small California biotech company, had not previously made a successful vaccine or drug; in fact, the year before, the company's planned HIV/AIDS vaccine had proved ineffective and was abandoned. By the end of 2006, its anthrax program was also failing. After trial deadlines went unmet because of the vaccine's instability, the Department of Health and Human Services terminated the contract.[17] The company received little of the BioShield allocation, although it had already been given nearly $100 million from the NIH for the anthrax project.

What went wrong? At the outset, critics questioned whether any small company could quickly produce large quantities of vaccine—75 million doses—as stipulated in the contract. Further, VaxGen's lack of success in the past could hardly have been a recommendation for a big contract for a new vaccine. The government's haste to show progress soon after the establishment of BioShield led it to take a big risk. Beyond the loss of time and money, the VaxGen failure was a public embarrassment. It became a symbol of ineptness early in the new program.

Other biosecurity programs have also drawn criticism, including a $534 billion surveillance project called BioWatch. This program included the placement of air samplers for detection of anthrax spores and other agents in more than 30 major U.S. cities. A committee convened by the National Academy of Sciences concluded in 2010 that the program was faced with "serious technical and operational challenges." Others flatly criticized its funding as wasted.[18]

Despite the criticisms, biodefense spending has also brought benefits. It has advanced understanding of how the immune system responds to viral vectors that are used to target cells. It helped fund reconstruction of the Spanish flu virus that killed tens of millions in 1918-1919. It has funded the Strategic National Stockpile, which within hours could provide supplies to a site of terrorism or disaster anywhere in the United States. (The stockpile includes antibiotics, vaccines, and other materials to cope with terrorist or other disaster events.)

Contention #5: The threat of bioterrorism has been exaggerated and does not warrant expanded support.

A 2011 assessment in Science magazine of the "biodefense boom" noted that critics questioned its justification, "especially because no new attacks have occurred."[19] If the validity of a threat depends primarily on when it was last actualized, the threat of a nuclear attack would be deemed negligible. After all, the last (and only) use of a nuclear weapon occurred nearly 70 years ago when the United States dropped two atomic bombs on Japan to end World War II. Iran's current quest for nuclear arms, and the West's alarmed reaction, demonstrates the thinness of the "when-last-used" prescription.

Yet even disregarding recency of occurrence, alleged exaggeration of the biothreat remains an issue. William Clark, a professor and chair emeritus of immunology at UCLA, has written that: "It is almost inconceivable that any terrorist organization we know of [could develop] a bioweapon capable of causing mass casualties on American soil."[20] Others have stated, more cynically, that the threat of bioterrorism "has been systematically and deliberately exaggerated."[21]

The WMD Commission holds a contrary view. After interviewing more than 250 government officials and non-governmental experts, the commission issued a report in December 2008. Its chilling conclusion found that a weapon of mass destruction will probably be used in a terrorist attack within five years, and that weapon will likely be a biological agent.[22] Despite skepticism by some about the commission's calculation, it nonetheless highlighted the particular concern afforded to the biological threat.

The commission's conclusion was influenced by the low cost of the 2001

anthrax attacks, the ease with which they were launched (via the mail), the fact that al-Qa`ida and other terrorist groups have sought to develop biological weapons, and the rapid advances in biotechnology that could be used to develop new and more deadly biological weapons.

In disputing the commission's judgments, a group of scientists at the Center for Arms Control and Non-Proliferation contended that the commission's threat assessments were speculative and relied on unjustified assumptions.[23] Yet the tide of concern about bioterrorism remains high, as reflected in U.S. funding levels and statements of support by numerous government officials.

Descriptions of possible bioterrorism scenarios are often hyperbolic, but they contain enough substance to warrant thoughtful programs for preparedness.

Conclusion

Despite missteps, the U.S. biodefense effort has resulted in substantial advances in understanding the biothreat, development and placement of new detection technologies, and expanded provision of countermeasures. The increased number of high security laboratories and their additional personnel do pose potential risks. Still, claims that these expansions have made the United States less safe overall seem overwrought. Moreover, recent measures to address security deficiencies, although belated, have helped mitigate them.

Enactment of pending legislation to implement recommendations of the WMD Commission would further rationalize the nation's biosecurity. The Weapons of Mass Destruction Prevention and Preparedness Act of 2009 would heighten laboratory security, provide for establishing uniform standards for handling select agents, and designate a single coordinator to oversee select agent programs.

Although these actions would be welcomed, determining if a laboratory, or the country, is secure "enough" will always be debatable. Security can never be absolute insofar as human enterprises are inevitably subject to accidents, miscalculation, and incomplete information.

To return to the two questions posed earlier about whether the United States is safer from a bioattack, and whether the spending has been worth it: the answer to the first question is yes, although with gaps yet to be filled; as for the second question, the results of research cannot be certain in advance, and expecting every dollar to produce a favorable result is unrealistic. Several investments in biosecurity have clearly provided benefits. Yet millions of dollars have undeniably been wasted on duplicated or ill-chosen projects, a condition that should be acknowledged and remediated.

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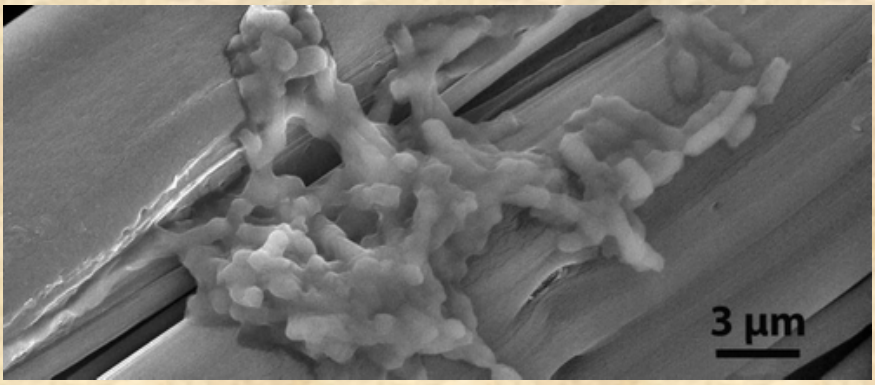
Killer silk kills anthrax, other microbes dead

Source:http://portal.acs.org/portal/acs/corg/content?_nfpb=true&_pageLabel=PP_ARTICLEMAIN&node_id=223&content_id=CNBP_029592&use_sec=true&sec_url_var=region1&__uuid=f498f216-0a27-4648-97fd-89a3aba856a1

A simple, inexpensive dip-and-dry treatment can convert ordinary silk into a fabric that kills disease-causing bacteria — even the armor-coated spores of microbes like anthrax — in minutes, scientists are reporting in the journal *ACS Applied Materials & Interfaces*. They describe a range of potential uses for this new killer silk, including make-shift curtains and other protective coatings that protect homes and other buildings in the event of a terrorist attack with anthrax.

An American Chemical Society release reports that Rajesh R. Naik and colleagues explain that in adverse conditions, bacteria of the Bacillus species, which includes anthrax, become dormant spores, enclosing themselves in a tough coating. These spores can survive heat, radiation, antibiotics and harsh environmental conditions, and some have sprung back to life after 250 million years. Certain chemicals — most popular among which are oxidizing

agents, including some chlorine compounds — can destroy bacterial spores, and they have been applied to fabrics like cotton, polyester, nylon and Kevlar. These treated fabrics are effective against many bacteria, but less so against spores. The researchers tried a similar coating on silk to see if it could perform better against these hardy microbes.



They developed a chlorinated form of silk, which involves soaking silk in a solution that includes a substance similar to household bleach and

letting it dry. Silk treated for just an hour killed essentially all of the E. coli bacteria tested on it within 10 minutes and did similarly well against spores of a close anthrax relative used as a stand-in. "Given the potent bactericidal and sporicidal activity of the chlorinated silk fabrics prepared in this study, silk-Cl materials may find use in a variety of applications," the authors say. Other applications, they add, include purifying water in humanitarian relief efforts and in filters or to mitigate the effects of toxic substances.

— Read more in Matthew B. Dickerson et al., "Sporicidal/Bactericidal Textiles via the Chlorination of Silk," ACS Applied Materials & Interfaces (21 February 2012)

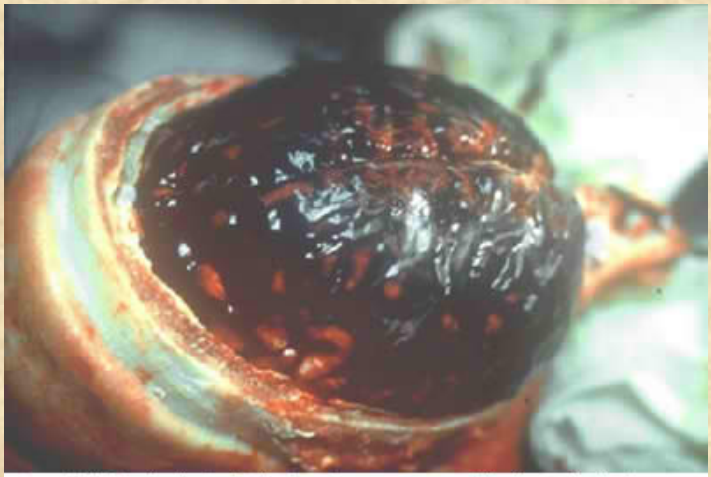
ABSTRACT
Bacterial spores, such as those of the *Bacillus* genus, are extremely resilient, being able to germinate into metabolically active cells after withstanding harsh environmental conditions or aggressive chemical treatments. The toughness of the bacterial spore in combination with the use of spores, such as those of *Bacillus anthracis*, as a biological warfare agent necessitates the development of new antimicrobial textiles. In this work, a route to the production of fabrics that kill bacterial spores and cells within minutes of exposure is described. Utilizing this facile process, unmodified silk cloth is reacted with a diluted bleach solution, rinsed with water, and dried. The chlorination of silk was explored under basic (pH 11) and slightly acidic (pH 5) conditions. Chloramine-silk textiles prepared in acidified bleach solutions were found to have superior breaking strength and higher oxidative Cl contents than those prepared under caustic conditions. Silk cloth chlorinated for ≥1 h at pH 5 was determined to induce >99.99996% reduction in the colony forming units of *Escherichia coli*, as well as *Bacillus thuringiensis* Al Hakam (*B. anthracis* simulant) spores and cells within 10 min of contact. The processing conditions presented for silk fabric in this study are highly expeditionary, allowing for the on-site production of protein-based antimicrobial materials from a variety of agriculturally produced feed-stocks.

Anthrax - From Russia with Love

By Michael C. Fishbein, MD
Source: http://www.medicinenet.com/script/main/art.asp?articlekey=18982

This article recounts the chilling, yet fascinating story of the deadliest outbreak of anthrax in recorded history. Anthrax is a bacterium (germ) that can cause a serious, sometimes fatal infection. Anthrax can be used as a weapon. In 2001, anthrax was spread through the mail in a powder. Twenty-two people were infected. The events that occurred in Sverdlovsk, Russia, in 1979 demonstrate what can happen when anthrax is released into the air.

The Outbreak



So-called "Cardinal's Cap", the classic appearance of the human brain in some fatal anthrax cases. Source: http://www.usafe.af.mil/direct/sg/anthrax/Pictures/anthrx22.jpg; accessed January 22, 2006.

This was the ninth day of the mysterious, fatal epidemic that struck Sverdlovsk in early April of 1979. Autopsies already had been performed on 37 victims who died of an unknown disease. Yet neither the clinicians nor the pathologists had identified the cause of the epidemic. Moreover, as you can imagine, the members of the pathology department were frustrated and overburdened with work. So, on this day, Dr. Faina Abramova, who had been chief of pathology at hospital #40, returned from retirement to help perform the autopsies. The first autopsy Dr.

Abramova performed was number 38 of the 42 ultimately performed by the local pathologists. The patient was a 43-year-old man who had had weakness and fever for two days. He was admitted to the hospital where he died four days later.

At the autopsy table, Dr. Abramova was struck by the crimson color of the membranes (meninges) covering the man's brain. In her description, she referred to this covering as the "cardinal's cap" because of its color and location. Astonishingly, she recognized this finding as characteristic of anthrax infection. (Few doctors have ever seen the disease anthrax.) In fact, her diagnosis was based on her recollection of a brain specimen from a patient with anthrax on display in a museum at her medical school.

The Cover-up

Although the epidemic was nine days old, there had been no word from the local authorities regarding the nature of the strange illness. When word finally got out that the epidemic was due to anthrax infection, the citizens promptly suspected that the source was military compound #19. Military compound #19 was a large facility that included many buildings, including apartment houses for about 5,000 people. It was located near the southern end of Sverdlovsk, a city of approximately 1.2 million at that time.

The military compound contained high-security facilities, including a factory that some people actually had thought was producing biological weapons. However, local and federal Russian authorities investigated and concluded that the epidemic was caused by the consumption of anthrax-contaminated meat. (Ingesting anthrax causes a rare form of the disease, called gastrointestinal anthrax.) This was the conclusion that was reported to the Russian people and the outside world at that time.

Articles in Soviet scientific journals then reported an outbreak of anthrax among livestock south of the city. The articles said that the citizens of Sverdlovsk ate anthrax-contaminated meat from these animals. The fact that the victims had chest findings characteristic of inhalation anthrax was not revealed. Additionally, the cover-up included confiscation by the KGB of the hospital and public health records of the epidemic. What's more, Dr. Abramova and her colleagues were asked to turn over all of their personal notes, official records, and specimens they collected from the autopsies they performed.

From the onset, foreign governments and scientists were suspicious about the official explanation for the fatal anthrax epidemic. There were numerous requests to allow independent scientists to investigate, but no one was allowed to go to Sverdlovsk. In this regard, it is important to know that the Russians had signed a treaty at the 1972 Biologic Weapons Convention banning biologic weapons research. The idea that the Russians had violated this treaty by producing anthrax fueled intense interest in the nature of the epidemic. Was the epidemic natural (for example, from contaminated meat), or did it result from an accident in a facility that was producing anthrax?

The Investigation

Finally, in 1992, after collapse of the Soviet Union, a group of scientists, including pathologists and epidemiologists, was allowed to visit Sverdlovsk to perform an on-site investigation. (Epidemiologists study the population and geographic characteristics of diseases.) The investigation was hampered, however, because, as mentioned above, the KGB had confiscated the hospital and public health records of the epidemic. The epidemiological studies, therefore, had to rely on administrative death records, visits to cemeteries, and interviews with family and friends of those who died.

Dr. David Walker, Chief of Pathology at the University of Texas in Galveston and a member of the visiting team, interviewed Dr. Abramova regarding her autopsy findings. Remarkably, Dr. Abramova and a few of her colleagues had hidden some of their personal notes, records from the autopsies they performed, microscopic slides from organs they examined, and even tissue samples preserved in formaldehyde. When Dr. Walker and

others examined all of this material, it became clear that the epidemic was due to inhalation anthrax, not from eating contaminated meat. Thus, in 1992, for the first time, the outside world had proof that the epidemic was due to inhalation anthrax. The significance of this fact is that an epidemic of inhalation anthrax can only occur by inhalation of anthrax spores that were produced in an aerosol form.

Equally remarkable was the detective work done by the members of the team who were trying to identify the source of the inhalation anthrax epidemic. They used a variety of resources:

- Old street maps (the name of the city of Sverdlovsk has been changed to Ekaterinburg)
- Satellite photos of Sverdlovsk
- Weather reports
- Information on the whereabouts of all the victims

From all of this, the investigators pieced together a convincing and chilling reconstruction of what actually happened in Sverdlovsk early in April of 1979.

Here's what they learned. All of the deaths occurred in individuals who lived or worked in a narrow corridor south of military compound #19. From interviews, it was determined that the earliest exposure to the anthrax was on Apr. 2, 1979. Weather reports indicated that on Apr. 2 the wind was blowing from north to south, almost all of the day. Records of livestock deaths around Sverdlovsk showed that six towns reported livestock deaths due to anthrax after Apr. 2, 1979. All six towns were in a narrow corridor south of the city.

The scientific evidence was overwhelming! The outbreak of anthrax in the citizens of Sverdlovsk and the livestock south of the city

was due to the wind-borne spread of an aerosol of anthrax spores. The source of the spores was military compound #19 and the escape of spores occurred on Apr. 2, 1979.

The Aftermath

In 1992, Russian president Boris Yeltsin was quoted as saying that the cause of the anthrax accident was "military developments" at compound #19. Thus, although he admitted that the anthrax came from an accident on the military compound, the Russian government released no other information. Theories on the nature of the accident include an explosion in a biological weapons factory on the military compound or workers at the factory forgetting to replace an exhaust system filter. To date, the exact nature of the accident and all of its ramifications, including the total number of victims, have not been disclosed.

However, we have still learned a number of important facts about anthrax as a result of this tragedy. For example, the incubation period (the time from exposure of people to the spores to the development of symptoms) ranged from one day to six weeks. The Sverdlovsk outbreak has also demonstrated some of the strengths and weaknesses of aerosolized anthrax as a biological weapon.

Strengths as a biological weapon include:

- A small amount of anthrax can kill many individuals.
- The spores can travel a significant distance. In Russia, they killed animals more than 30 miles away.

Weaknesses as a biological weapon include:

- The effectiveness of aerosolized anthrax will depend on such atmospheric conditions as wind speed and direction. For example, if the wind had been blowing north, toward the center of the city, many more individuals would have been infected.
- While 5,000 people who lived on the compound and 70,000 who lived south of the compound could have been infected, only about 100 died of the infection, even with this presumably weapons-grade anthrax.
- Since the deaths occurred over weeks, once anthrax is detected, there probably will be time to treat the majority of people exposed. A number of antibiotics are available that can be used to prevent the disease

after exposure, or to treat the disease if infection occurs. There is a vaccine available to prevent anthrax, but it is not available to the general public yet.

Another significant consequence of the Sverdlovsk accident is that it led the U.S. Department of Defense to initiate intense research on the use of anthrax as a biological weapon. In addition, the U.S. Centers for Disease Control and Prevention (CDC) have been working with state and local health authorities to prepare for a bioterrorist attack using Anthrax (see CDC Emergency Preparedness and Response website for details). Nevertheless, most of the knowledge we have about anthrax as a biological weapon was generated as a result of the outbreak that began in Sverdlovsk, Russia, on Apr. 2, 1979. We could have learned more, however, if the Russians had been candid about the accident from the beginning. In the words of the investigators and the heroic Russian pathologists: "The tragedy of these deaths is compounded by the conditions of secrecy that have impeded elucidation of many facts that potentially would be useful in the future diagnosis and treatment of inhalation anthrax."

For additional information about Anthrax, please read Dr. Fishbein's Doctor's View, Anthrax, Then and Now.

Acknowledgements
The information in this article comes from a lecture by Dr. David H. Walker at a specialty conference on infectious disease pathology presented at the United States and Canadian Academy of Pathology meeting held on Mar. 16, 1994, and from two publications in scientific journals:

✓ Abramova FA et al. Pathology of inhalational anthrax in 42 cases from the Sverdlovsk outbreak of 1979. Proceedings of the National Academy of Science, Volume 90, pages 2291-2294, March, 1993.
✓ Meselson M et al. The Sverdlovsk anthrax outbreak of 1979. Science, Volume 266, pages 1202-1208, Nov. 18, 1994.

Two RNA-based therapeutic candidates for Ebola, Marburg viruses

Source: http://www.homelandsecuritynewswire.com/dr20120323-two-rnabased-therapeutic-candidates-for-ebola-marburg-viruses

Bothell, Washington-based AVI BioPharma, Inc., a developer of RNA-based therapeutics, the other day announced that it initiated dosing in two Phase 1 clinical studies for AVI-6002 and AVI-6003, its lead drug candidates being evaluated for the treatment of Ebola virus and Marburg virus, respectively. AVI is developing AVI-6002 and AVI-6003 under a competitively awarded contract for up to $291 million from the U.S. Department of Defense through the Joint Project Manager Transformational Medical Technologies (JPM-TMT) program. Both candidates utilize AVI's advanced and proprietary PMOplus(tm) chemistry.

"These are the first drug candidates employing our PMOplus chemistry to be evaluated in humans, and they are the first AVI programs to enter the clinic based on our prior studies supported by the JPM-TMT program," said Chris Garabedian, president and CEO of AVI BioPharma. "Additionally, we look forward to new and continued opportunities to earn further government support through JPM-TMT."

Each Phase 1 study will be randomized, double-blind, placebo-controlled and involve single escalating doses of AVI-6002 or AVI-6003 to assess the safety, tolerability and pharmacokinetics of each drug candidate in healthy adult volunteers. In each study, five volunteers will be enrolled in one of six cohorts for a total of up to 30 volunteers. The cohorts will include four volunteers who receive the therapeutic, and one who will receive a placebo.

Preclinical studies of AVI-6002 and AVI-6003 have been a collaborative effort between AVI and scientists at the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID), the U.S. Department of Defense's (DOD) lead medical research laboratory for biological defense. All preclinical studies were conducted at USAMRIID, which has

the DOD's only Biosafety Level 4 (BSL4), or maximum containment capability, and is essential for studying the Ebola and Marburg viruses.
The company notes that data from preclinical studies published in *Nature Medicine* demonstrate that AVI-6002 and AVI-6003 provide post-exposure efficacy in non-human primates against Ebola and Marburg viruses, respectively. In multiple studies evaluating treatment of Ebola virus-infected primates with AVI-6002 and treatment of Marburg-infected primates with AVI-6003, USAMRIID scientists have observed up to 80 percent survival and 100 percent survival, respectively, when the viruses were inoculated at 1000 times the lethal dose within the confines of a BSL4 laboratory, compared to control groups where both viruses were universally lethal.
Ebola hemorrhagic fever is a severe and often fatal disease in humans. The disease was first recognized in 1976 and is one of two members of a family of RNA viruses called Filoviridae. The disease is generally understood to be endemic to parts of Africa. Onset of illness from Ebola virus is abrupt with symptoms that include fever, headache, muscle ache, vomiting and stomach pain. Internal and external bleeding may also be observed in some patients. There are currently no treatments for Ebola virus infection beyond supportive care.
Marburg hemorrhagic fever is another severe and potentially fatal disease in humans first recognized in 1967. It is also caused by an RNA virus of the filovirus family and is understood to be endemic to Africa. Onset of the disease is often sudden, and the symptoms include fever, chills, nausea, vomiting, chest pain and diarrhea. Increasingly severe symptoms may also include massive hemorrhaging and multiple organ dysfunctions. There are currently no treatments for Marburg virus infection beyond supportive care.

Louisville mail carriers train to protect lives in bioterrorism response program

Source:http://www.whas11.com/news/Louisville-mail-carriers-train-to-protect-lives-in-bio-terrorist-response-program-143716606.html

Louisville mail carriers are prepared to help save lives in case of a bio-terrorism attack.
The city is taking part in a new program that would have mail carriers deliver life-saving medications to residents after an anthrax attack.
Many of us rely on letter carriers like Jose Rivera to get our mail at home, but usually what we appreciate is the convenience.
However Jose is one of 322 Louisville postal workers who has volunteered to use those deliveries to help protect us from the effects of bioterrorism threat.
"If I can save people's lives that's satisfaction for me," Jose Rivera, bioterrorism response volunteer, said.
Today the mayor signed an agreement where postal letter carriers will deliver life-saving medications door-to-door in the event of an anthrax attack. The plan is to have the Doxyclycline delivered to all urban and rural areas within two days.
"We know if we get the medication to them within that 48 hour time period, the risk of illness and the risk of death from the exposure is significantly decreased," LaQuandra Nesbitt, Director of Public Health in Louisville, said.
The volunteers have been preparing for a year under protocols by the U.S. Department of Health and Human Services.
"The training was really in depth, they want to make sure it gets deep in our mind what we're supposed to do, what time we're supposed to be at a certain location and start distributing these protective measures for the public", Rivera said.

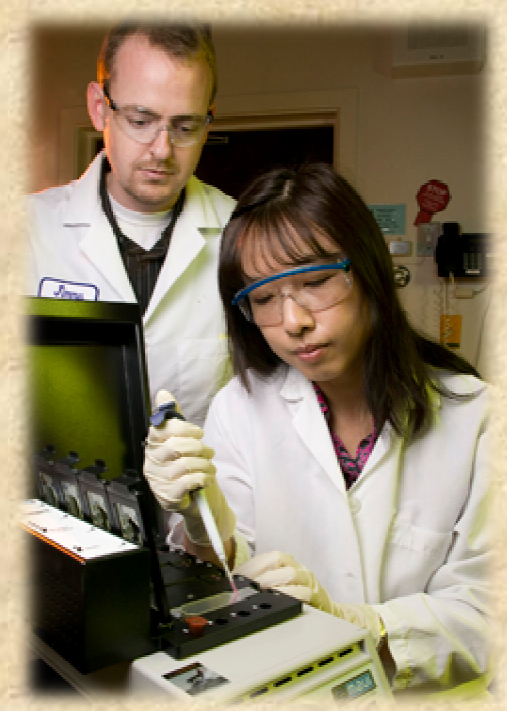
At a time when most people would be panicked and looking to their own well-being, these volunteers will be looking to yours. Besides bringing medicine, for some, letter carriers could be the only source of information about what's happening and how to stay safe from a bio-terrorism attack.
Rivera said he's a resource for many people along his route, but especially the Spanish peakers who ask him mail and postal-related questions.
"I'll relate to them what's happening so they can tell the other Spanish speakers…," Rivera said.

For this ex-military man, the working at the forefront of the bio-terrorist response program is just another way to serve his country.
Louisville is one of only two cities in the country participating in this pilot program. But the Department of Health and Human Services says it will be a nationwide model.
Mayor Greg Fischer says this plan is not in response to a specific threat, it's simply a precaution, just like you'd take for a tornado or earthquake.

Detection technology detects viruses, pathogens within 24 hours

Source: http://www.homelandsecuritynewswire.com/srdetect20120326-detection-technology-detects-viruses-pathogens-within-24-hours

Lawrence Livermore National Laboratory (LLNL) has licensed its microbial detection array technology to a St. Louis, Missouri-based company, MOgene LC, a supplier of DNA microarrays and instruments.
Known formally as the Lawrence Livermore Microbial Detection Array (LLMDA), the technology could enable food safety professionals, law enforcement, medical professionals, and others to detect within twenty-four hours any virus or bacteria that has been sequenced and included among the array's probes.



An LLNL release reports that developed between October 2007 and February 2008, the LLMDA detects viruses and bacteria with the use of 388,000 probes that fit in a checkerboard pattern in the middle of a one-inch wide, 3-inch long glass slide.
The current operational version of the LLMDA contains probes that can detect more than 2,200 viruses and more than 900 bacteria.

The LLMDA provides researchers with the capability of detecting pathogens over the entire range of known viruses and bacteria. Current multiplex polymerase chain reaction (PCR) techniques can at most offer detection from among fifty organisms in one test.
The Livermore team plans to update probes on the array with new sequences of bacteria, viruses and other microorganisms from GenBank and other public databases about once per year, in addition to using sequences obtained from collaborators for their probes.
LLNL's current collaborators include the University of California, San Francisco; the Blood Systems Research Institute; the University of Texas Medical Branch (Galveston); the Statens Serum Institut of Copenhagen, Denmark; the University of California, Davis; Imigene; the U.S. Food & Drug Administration; the Centers for Disease Control and Prevention; the Naval Medical Research Center; and the Marine Mammal Center of Sausalito, Calif.

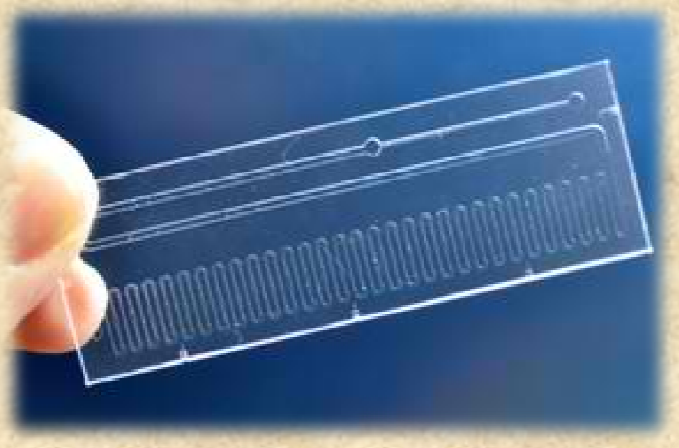
The release notes that a computer scientist and the team's leader, Tom Slezak came up with the idea for the LLMDA in 2003. Slezak is one of ten LLNL researchers named in February as a Laboratory Distinguished Member of the Technical Staff. His team includes biologist Crystal Jaing, who leads the microarray lab work and manages the collaborations; bioinformaticist Shea Gardner, who designed the array; biostatistician Kevin McLoughlin, who designed the analysis software; and James Thissen, who performs the microarray experiments.

MOgene has been in the genomics service business since 2004 and has worked with many pharmaceutical and agricultural businesses, along with universities, around the world.

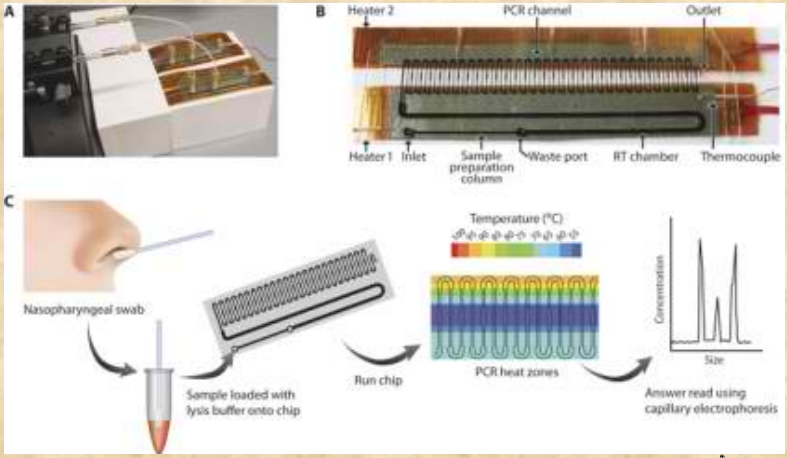
Rapid, low-cost, point-of-care flu detection demonstrated

Source:

The novel H1N1 flu pandemic in 2009 underscored weaknesses in methods widely used to diagnose the flu, from frequent false negatives to long wait times for results. Now a



4-year, National Institutes of Health-funded study of 146 patients with flu-like symptoms spearheaded by Associate Professor Catherine Klapperich (BME, MSE) has validated a prototype rapid, low-cost, accurate, point-of-care device that promises a better standard of care.



A: Two of the microfluidic chips running in parallel on lab bench. B: Close-up of one of the chips filled with blue dye to show the channel architecture. C: Schematic of the overall process flow from patient sample collection to chip loading to thermal amplification to readout of DNA concentration.

Once optimized and deployed in the clinic, the new device could provide clinicians with an effective tool to quickly diagnose both seasonal and pandemic strains of influenza, and thus limit the spread of infection.

The study's research — published its findings in the 22 March online edition of *PLoS ONE*.

A Boston University College of Engineering release reports that to produce a faster, cheaper, highly accurate flu diagnostic test that could be run at the point of care, the researchers miniaturized an expensive, 3-hour, lab-scale diagnostic test — known as RT-PCR and now considered the gold standard in flu detection — into a single-use microfluidic chip.

About the size of a standard microscope slide, the integrated chip consists of a column at the top that extracts RNA from signature proteins in the sample associated with the influenza A virus; a middle chamber that converts the RNA into DNA; and a climate-controlled lower channel used to replicate the DNA in sufficient quantities so it can be detected by an external reader.

Working with two types of nasal specimens, the researchers used the

chip to produce results that matched the high accuracy and relatively fast turn-around time of the lab-scale method.

"We wanted to show that our technique was feasible on real-world samples prepared on the chip," said Klapperich. "Making each chip single-use decreases the possibility of cross-contamination between specimens, and the chip's small size makes it a good candidate for true point-of-care testing."

The microfluidic chip also proved far more effective than other commonly used flu diagnostic tests including viral culture, a lab procedure requiring up to a week to produce results; rapid immunoassays, which work like pregnancy tests but were only 40 percent reliable in detecting the presence of a flu virus in this study; and direct fluorescent antigen testing (DFA), a more accurate but labor-intensive process in which medical personnel prepare and interpret samples stained with fluorescent antibodies.

"The new test represents a major improvement over viral culture in terms of turn-around time, over rapid immunoassay tests in terms of sensitivity (ability to detect the virus from minimal sample material) and over DFA and RT-PCR in terms of ease of use and portability," Klapperich observed.

Ultimately seeking to enable clinicians to use their microfluidic chips for frontline flu virus detection, the researchers next plan to optimize their method so that it can produce results in a third less time (an hour) with chips that cost half as much to make (five dollars). In addition, they are exploring ways to develop a lower cost external reader that's no bigger than a clinical digital thermometer.

— Read more in Qingqing Cao et al., "Microfluidic Chip for Molecular Amplification of Influenza A RNA in Human Respiratory Specimens," PLoS *ONE 7, no. 3 (22 March 2012): e33176*

ABSTRACT

A rapid, low cost, accurate point-of-care (POC) device to detect influenza virus is needed for effective treatment and control of both seasonal and pandemic strains. We developed a single-use microfluidic chip that integrates solid phase extraction (SPE) and molecular amplification via a reverse transcription polymerase chain reaction (RT-PCR) to amplify influenza virus type A RNA. We demonstrated the ability of the chip to amplify influenza A RNA in human nasopharyngeal aspirate (NPA) and nasopharyngeal swab (NPS) specimens collected at two clinical sites from 2008–2010. The microfluidic test was dramatically more sensitive than two currently used rapid immunoassays and had high specificity that was essentially equivalent to the rapid assays and direct fluorescent antigen (DFA) testing. We report 96% *(CI 89%,99%)* sensitivity and 100% *(CI 95%,100%)* specificity compared to conventional (bench top) RT-PCR based on the testing of n = 146 specimens (positive predictive value = 100%*(CI 94%,100%)* and negative predictive value = 96%*(CI 88%,98%)*). These results compare well with DFA performed on samples taken during the same time period (98% *(CI 91%,100%)* sensitivity and 96%*(CI 86%,99%)* specificity compared to our gold standard testing). Rapid immunoassay tests on samples taken during the enrollment period were less reliable (49%*(CI 38%,61%)* sensitivity and 98%*(CI 98%,100%)* specificity). The microfluidic test extracted and amplified influenza A RNA directly from clinical specimens with viral loads down to 10^3 copies/ml in 3 h or less. The new test represents a major improvement over viral culture in terms of turn around time, over rapid immunoassay tests in terms of sensitivity, and over bench top RT-PCR and DFA in terms of ease of use and portability.

Anthrax antidotes in 114 million US homes get FDA scrutiny

Source: http://www.stripes.com/news/us/anthrax-antidotes-in-114-million-us-homes-get-fda-scrutiny-1.173476

Making anthrax-antidote kits available to the 114 million households in the U.S. in case of a bioterrorism attack might lead to misuse of the medicines and stir public fears, regulatory advisers said.

"People may infer an anthrax attack is imminent," Thomas Moore, chairman of a Food and Drug Administration advisory committee, said Monday after a meeting on the subject. "It may have an adverse impact on doxycycline,"

the antibiotic that was hoarded after the Sept. 11, 2001, terror attacks.

The FDA met with panels of scientists and academics to consider whether kits containing a 10-day supply of doxycycline should be available for all Americans to store in their homes in preparation for a bioterrorism attack. A branch of the Health and Human Services Department said it wants to start with 10 million first responders and their families before expanding it to the rest of the population.

"The public looks at the system as 'There you go again, crying wolf,' " Diane Cappelletty, an associate professor of pharmacy practice at the University of Toledo College of Pharmacy, told the committee during the meeting.

Consumers could misuse the so-called medkits by taking them for reasons other than an anthrax attack, and that could exacerbate antibiotic resistance, the advisers said. A test run in 2007 with about 4,200 households in the St. Louis area showed instances of misuse, including one person who took the doxycycline during an emergency declared for a snow storm, and two others who used the tablets to treat sore throats.

"I can't help but be reminded of the decades-old, fallout-shelter craze," Marcus Reidenberg, a panelist and professor of public health at Weill Cornell Medical College in New York, told the FDA committee. "It's assuming that everyone in the U.S. knows we have doxycycline and no one in any organization that might want to attack the U.S. doesn't."

Through Wednesday, the FDA also will hear arguments for the wider availability of ciprofloxacin and Johnson & Johnson's Levaquin to treat a terrorist-initiated outbreak of pneumonic plague, according to documents on the FDA's website. The disease is the most serious of three forms of plague that occurs when the bacteria infects the lungs, and can be spread through coughing and contaminated articles.

The FDA would require more studies for an anthrax medkit like those conducted for over-the-counter drugs to ensure consumers understand the product, Barbara Cohen, an analyst at the agency's office of drug evaluation, told the advisers.

Only potassium iodide is available for home storage for similar threats, George Korch, a senior science adviser in the Health and Human Services office of the assistant secretary for preparedness and response, said during the meeting. Potassium iodide tablets combat exposure to radioactive iodine and are available on the Internet, according to the FDA.

The government stores "tens of millions" of 60-day courses of treatments in case of simultaneous attacks to dispense after an event, Korch said.

National leaders first brought up the notion of household medkits in 2005, four years after five people died from anthrax found in letters. Expanding the products to the rest of the population was put on hiatus because of concern for misuse and antibiotic resistance. President Obama resurrected the idea in 2009 when he instructed the government to plan for a biological attack, Korch said.

Home kits could relieve the burden on community dispensing centers, which are unlikely to be able to meet a two-day deadline to hand out drugs to prevent people from getting sick from anthrax, a potentially deadly infection spread by inhalation of spores. The response time to a biological attack is critical, the Homeland Security Department's Susan Coller- Monarez, told the committee.

"The production and dissemination of a biological agent is something the government may not be ready for, despite its best efforts, to intervene in its earliest stages," said Coller-Monarez, who runs the threat characterization and attribution branch of the chemical and biological defense division of the Homeland Security Department.

The Postal Service is already authorized to deliver medkits to homes in the event of an anthrax attack under programs in Minneapolis and Louisville, Ky., that will expand to Boston, Philadelphia and San Diego. The program being discussed this week would let people obtain kits from pharmacies whenever they see fit.

FDA backing is needed before a date for rolling out the kits can be set. The Health and Human Services Department's Biomedical Advanced Research and Development Authority, BARDA, must partner with a pharmaceutical company to guide medkit through the FDA approval process before a date for rolling out the kits could be set. Companies that make versions of doxycycline drugs include Pfizer and Impax Laboratories.

The government has tested these waters before with a study in 2007 in which the Centers for Disease Control and Prevention gave 4,182

households in the St. Louis area anthrax medkits. At the end of the study, 4,076 households were available for follow-up; 130 of those did not return their medkits.
Most who didn't return them lost the products or threw them away while four households used them and five refused to return them, according to the report from the bioterrorism agency.
The Institute of Medicine, which advises the nation on health matters, recommended against broad home storage of medkits because of the potential for misuse.
Doxycycline works by preventing the growth or spread of bacteria.

Preparing for Infectious Diseases at the 2012 Summer Olympic Games

Source: http://www.exchangemagazine.com/morningpost/2012/week14/Wednesday/12040409.htm

Less than four months ahead of this year's Summer Olympics in London, the 22nd European Congress of Clinical Microbiology and Infectious Diseases (22nd ECCMID)—the world's largest conference on infectious diseases—will feature a final-day symposium focusing on mass gatherings health. Currently the subject of a six-article Series in The Lancet Infectious Diseases, which is co-sponsoring the symposium, the multidisciplinary speciality traces its origins to the study of the annual Hajj pilgrimage to Mecca.
"Mass gatherings health goes beyond the scope of typical public health provision," says Lancet Infectious Diseases Editor John McConnell. "Mass gatherings are events such as religious occasions, music festivals, or sports events that attract enough people to exceed the capacity of routine health and public safety measures. Managing such events requires providing for all eventualities from infectious disease outbreaks to security against terrorist attacks."
Indeed, when some three million visitors converge on London in late July, they'll bring with them organisms from every corner of the globe. And while an infectious outbreak is unlikely, say experts, prevention is paramount as authorities prepare for the big event.
Dr. Brian McCloskey, London director of the UK's Health Protection Agency (HPA) and a co-author of an article in The Lancet Infectious Diseases Series--"Infectious disease surveillance and modelling across geographic and scientific specialties"—will lead off the symposium with a talk on the HPA's strategic risk-assessment process aimed at monitoring national and international health risks.
Dr. Kamran Khan of the University of Toronto will outline the conceptual analysis used to assist UK authorities in prioritising which global outbreaks warrant closer attention and in identifying the most effective public health measures to mitigate risk. Khan's work integrates global airline transportation modelling of populations travelling to London at the time of year when the Olympic Games are scheduled with global epidemic intelligence from infectious disease surveillance systems.
That analysis was facilitated by novel technologies like Bio.Diaspora, which uses worldwide patterns of air travel to anticipate the spread of infectious diseases, and HealthMap, an online surveillance tool capable of overcoming some of the limitations of traditional surveillance systems, including delays in reporting and poor sensitivity.
In the lead up to the 2010 Winter Olympics in Vancouver, Khan and colleagues determined that the vast majority of expected visitors originated from just 25 cities. That intelligence allowed Canadian authorities to focus real-time surveillance and monitoring of potential disease threats on those cities before, during, and immediately after the Games, thereby helping to protect both the local population and those to which visitors return.
"Cooperation between national, regional and international partners is essential to the management of health threats, especially for surveillance after an event," says Dr. Phillipe Gautret, an infectious diseases expert at North University Hospital in Marseille, France who will give a talk at the symposium on the prevention and control of infectious diseases at mass gatherings. A co-author on the

second paper in The Lancet Infectious Diseases Series—"Global perspectives for prevention of infectious diseases associated with mass gatherings" --Gautret adds that though MGs pose a complex challenge," they also provide "an untapped opportunity for host countries to promote global health diplomacy and to model ideal public health behaviours,"

Saudi Arabia offers a good example of mass gatherings' positive potential. As described in the first paper in the Series—"Lessons learnt from the management of the Hajj pilgrimage could help strengthen global health security"--decades of hosting the Hajj, the world's largest annual MG, has equipped the country with a wealth of unique expertise. According to lead author Dr. Ziad Memish of the Saudi Ministry of Health, who will give a talk on the subject at the symposium, that expertise could help other communities and countries better prepare for, and respond to, mass gatherings' multifaceted challenges.

"Saudi Arabia's experience of Hajj medicine contains rapidly developing public health solutions to several global challenges," says Memish, who was part of the successful effort to avert large outbreaks of H1N1 influenza at the Hajj in 2009. "Multiagency and multinational approaches to public health challenges are likely to become major factors in the specialty of global health diplomacy, engaging societies globally, and drawing the west a little closer to the east."

While UK authorities have seen their own share of mass gatherings, including major music festivals and sporting events, the Olympic and Paralympic Games represent "an unusual challenge," says McConnell, and one that underscores the need for greater research in the area of mass gatherings health. "We hope that this Series will be among the foundations on which the emerging specialty is built."

Handheld plasma flashlight rids skin of notorious pathogens

Source: http://www.iop.org/news/12/apr/page_54993.html

A group of Chinese and Australian scientists have developed a handheld, battery-powered plasma-producing device that can rid skin of bacteria in an instant.

The device could be used in ambulance emergency calls, natural disaster sites, military combat operations and many other instances where treatment is required in remote locations.

The plasma flashlight, presented today, 5 April, in IOP Publishing's *Journal of Physics D: Applied Physics* is driven by a 12 V battery and doesn't require any external generator or wall power; it also doesn't require any external gas feed or handling system.

In the experiment, the plasma flashlight effectively inactivated a thick biofilm of one of the most antibiotic- and heat-resistant bacteria, *Enterococcus faecalis* – a bacterium which often infects the root canals during dental treatments.

The biofilms were created by incubating the bacteria for seven days. The biofilms were around 25 micrometres thick and consisted of 17 different layers of bacteria. Each one was treated for five minutes with the plasma flashlight and then analysed to see how much of the bacteria survived.

Results showed that the plasma not only inactivated the top layer of cells, but penetrated deep into the very bottom of the layers to kill the bacteria.

Co-author of the study, Professor Kostya (Ken) Ostrikov, from the Plasma Nanoscience Centre Australia, CSIRO Materials Science and

Engineering, said: "The bacteria form thick biofilms, which makes them enormously resistant against inactivation which is extremely difficult to implement. High temperatures are commonly used but they would obviously burn our skin.

"In this study we chose an extreme example to demonstrate that the plasma flashlight can be very effective even at room temperature.

For individual bacteria, the inactivation time could be just tens of seconds."

Plasma – the fourth state of matter in addition to solids, liquids and gases – has previously shown its worth in the medical industry by effectively killing bacteria and viruses on the surface of the skin and in water.

Although the exact mechanism behind the anti-bacterial effect of plasma is largely unknown, it is thought that reactions between the plasma and the air surrounding it create a cocktail of reactive species that are similar to the ones found in our own immune system.

The researchers ran an analysis to see what species were present in the plasma and found that highly-reactive nitrogen- and oxygen-related species dominated the results. Ultraviolet radiation has also been theorised as a reason behind plasma's success; however, this was shown to be low in the jet created by the plasma flashlight, adding to the safety aspect of the device.

The **temperature of the plume of plasma in the experiments was between 20-23^{0}C,** which is very close to room temperature and therefore prevents any damage to the skin. The device itself is fitted with resistors to stop it heating up and making it safe to touch.

"**The device can be easily made and costs less than 100 US dollars to produce**. Of course, some miniaturisation and engineering design may be needed to make it more appealing and ready for commercialisation," Ostrikov continued.

The device was created by an international team of researchers from Huazhong University of Science and Technology, CSIRO Materials Science and Engineering, The University of Sydney and the City University of Hong Kong.

— Read more in X Pei et al., "Inactivation of a 25.5 μm Enterococcus faecalis biofilm by a room-temperature, battery-operated, handheld air plasma jet," Journal of Physics D: Applied Physics 45, no. 16 (4 April 2012)

Emergence of medicine for mass gatherings: lessons from the Hajj

By Prof Ziad A Memish MD a b, Gwen M Stephens MD a c, Prof Robert Steffen MD d e, Qanta A Ahmed MD f

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Source: http://www.thelancet.com/journals/laninf/article/PIIS1473-3099%2811%2970337-1/fulltext

Summary

Although definitions of mass gatherings (MG) vary greatly, they consist of large numbers of people attending an event at a specific site for a finite time. Examples of MGs include World Youth Day, the summer and winter Olympics, rock concerts, and political rallies. Some of the largest MGs are spiritual in nature. Among all MGs, the public health issues, associated with the Hajj (an annual pilgrimage to Mecca, Saudi Arabia) is clearly the best reported—probably because of its international or even intercontinental implications in terms of the spread of infectious disease. Hajj routinely attracts 2·5 million Muslims for worship. WHO's global health initiatives have converged with Saudi Arabia's efforts to ensure the wellbeing of pilgrims, contain infectious diseases, and reinforce global health security through the management of the Hajj. Both initiatives emphasise the importance of MG health policies guided by sound evidence and based on experience and the timeliness of calls for a new academic science-based specialty of MG medicine.

Introduction

Definitions of mass gatherings (MGs) vary greatly, with some sources specifying any gathering to be an MG when more than 1000 individuals attend, whereas others require the attendance of as many as 25 000 people to qualify.1, 2 Irrespective of the definition, MGs represent large numbers of people attending an event that is focused at specific sites for a finite time. These gatherings might be planned or unplanned and recurrent or sporadic. Examples of MGs include World Youth Day, the summer and winter Olympics, rock concerts, and political rallies. MGs pose many challenges, such as crowd management, security, and emergency preparedness. Stampedes and crush injuries are common, the result of inevitable crowding. Outdoor events are associated with complications of exposure, dehydration, sunburn, and heat exhaustion. Other health hazards arise from lack of food hygiene, inadequate waste management, and poor sanitation. Violence is unpredictable and difficult to mitigate whether the MG is a political rally or a sporting competition. With few exceptions, however, the rates of morbidity and mortality resulting from these hazards are rarely increased outside the event. Global MGs, however, can lead to global hazards. Mitigation of risks requires expertise outside the specialty of acute care medicine, event planning, and venue engineering.

For centuries, Muslim pilgrims have converged in Mecca, Saudi Arabia, for the Hajj (figure 1) to participate in a series of sacred rituals that define Islam. With about 1·6 billion Muslims and the obligation on believers to attend Hajj at least once in their lifetimes, this event has become the largest annually recurring MG in the world, with attendance reaching more than 2·5 million in 2009 despite warnings about pandemic influenza. Pilgrims come from more than 183 countries, leading to enormous diversity in terms of ethnic origin and socioeconomic status. Men, women, and children of all ages attend Hajj together; however, a disproportionate number of people will be middle aged or older before they can afford the journey. Comorbidities are common. The public health implications of the Hajj are huge—nearly 200 000 pilgrims arrive from low-income countries, many will have had little, if any, pre-Hajj health care, added to which are the extremes of climate and crowding, rugged terrain, mingling of populations from around the world, and migration into the country of livestock, butchers, and abattoir workers.

The Hajj in the 19th century

The Hajj in the 21st century

Pilgrims encircling the Ka'aba, the main mosque in Mecca, Saudi Arabia, during the Hajj. Part A is courtesy of Saudi Ministry of Health.

Saudi Arabia's safety and security policies for Hajj attendees are well developed after decades of planning the annual event. Lessons learned have led to comprehensive programmes that are continually revised and coordinated by government sectors. Public health has involved global partners for decades. Far from being the only MG that affects global health, the Hajj is a useful model to understand the nature of risk management and the benefits of international collaboration and cooperation.

Development of MGs

Pilgrimage is central to many belief systems and also appeals to mankind's recurring desire to be homo viator—a universal figure common to many cultures and civilisations, who wanders in search of spiritual enlightenment. In Hellenic civilisation, Delphi—home to Pythia the Oracle—was long a focus for pilgrimage.3 Ancient tribal populations such as the Huichol of western Mexico, the Lunda of central Africa, and the Shona people of southwest Africa all included pilgrimage in their cultures.4 Institutionalised pilgrimage came to prominence with the advent of world religions. Buddhism invites pilgrimage to Nepal, the birthplace of Siddharta. Hindus journey to Benares

in India, and followers of Judaism to Jerusalem. Christendom has a complex history of pilgrimages through the ages including the modern era. Until the advent of modern air travel, the journey was associated with the greatest risks. A review of the historical data for the Hajj shows these dangers:
"…the oscillatory movement of the camel produces miscarriages, followed frequently by haemorrhage and death of the infant and mother. The caravan however cannot stop, and it is impossible to nurse efficiently while the (journey) continues. If any portion of the caravan stopped it would certainly be attacked…"5

Religious MGs

Kumbh Mela is a huge Hindu pilgrimage held at various locations along the river Ganges according to the zodiac positions of the sun, moon, and Jupiter. Purification rites involve bathing in the Ganges and are believed to interrupt the cycle of reincarnation. The highest holy days arise every 144 years, but the normal Kumbh Mela is celebrated every 3 years, and often attract thousands of non-Hindu enthusiasts. This is the largest human gathering, so large that in 2001 movements of the amassed individuals could be seen from space.6, 7 The Ardh Kumbh Mela in 2007 attracted 70 million pilgrims over 45 days in Allahabad; on the most auspicious day of the festival, more than 5 million participated.8 Celebrations are accompanied by singing, religious readings, and ritual feeding of holy men and the poor. Managing rival sects is a recurring challenge. Administrators overseeing the event have to negotiate bathing schedules. Clashes have resulted in deaths—eg, in 2010, a vehicle carrying members of the Juna sect struck several people, setting off a stampede.9 In 1954, a stampede killed 500 people.10
The festival probably contributed to the 1817—24 Asiatic cholera pandemic. Pilgrims are believed to have carried the bacteria from an endemic area in the lower Ganges to populations in the upper Ganges, from there to Kolkata and Mumbai, and across the subcontinent. British soldiers and sailors took it home to Europe and then to the far east.11 The epidemic ended abruptly in 1824 after a very cold winter. Although cholera returned to the Kumbh Mela in 1892, authorities of the Hardiwar Improvement Society reacted to contain the outbreak.12 Diarrhoeal diseases, including cholera, continue to be a risk at the gathering despite rapid monitoring and prompt public health interventions.13
Another pilgrimage with a focus on water and religious rites is to Lourdes, France. This village in the Pyrenees attracts more than 5 million Catholics and other enthusiasts every year. Their destination is a shrine and nearby spring where a young village girl witnessed apparitions of the Virgin Mary in the mid 1800s. Drinking and bathing in Lourdes' water is believed to ensure health and cure disease, and is featured at the Water Walk where religious stations are situated and water is available for drinking or bottling. Spring water is also routed to a series of bathing stalls used by more than 350 000 pilgrims every year.14 Although health issues have not been associated with Lourdes' waters, the French writer Emile Zola visited the spring in 1891 and provided a graphic description of the baths at the time:
"And the water was not exactly inviting. The Grotto Fathers were afraid that the output of the spring would be insufficient, so in those days they had the water in the pools changed just twice a day. As some hundred patients passed through the same water, you can imagine what a horrible slop it was at the end. There was everything in it: threads of blood, sloughed-off skin, scabs, bits of cloth and bandage, an abominable soup of ills…the miracle was that anyone emerged alive from this human slime."15
Stampedes and fires continue to be major causes of death and injury at MGs—eg, the Sabarimala in Kerala, India, and the Feast of the Black Nazarene in Manila, Philippines. Inaccessible for 300 years after their construction, Hindu temples of Sabarimala in Kerala's Western Ghat Mountains have become increasingly popular despite the location and winter openings. With the increasing crowd sizes, tragedies have occurred. In 1952, 66 pilgrims burned to death when sheds containing fireworks caught fire, and more than 52 perished in 1999 when a hillside collapsed under the weight of 200 000 assembled worshipers triggering a stampede.16 More than 50 million attended the most recent rites in January, 2011, uneventful until the last day when a motor vehicle accident caused a panic that triggered a stampede, killing 104 people.17, 18 Although authorities offered compensation packages, they could not quell unprecedented public criticism of Kerala authorities and the national government.17
Manila's Feast of the Black Nazarene has fared a little better after religious leaders and municipal authorities joined forces to change the route of the annual Jan 9 procession after two deaths in 2008, and many stampedes and injuries caused by fireworks and trauma over the years. The authorities responsible for the MG also recruited thousands of volunteers to

manage the crowds. These changes and the addition of an information campaign have helped calm crowds and reduce injuries. Despite an estimated attendance of 7—8 million in 2011, no deaths or serious injuries were reported.19

Life events and iconic and political figures

Weddings and funerals can be attended by millions of people. An estimated 1 million people gathered for the largest ever event in London, UK, the wedding of Catherine Middleton and Prince William, Duke of Cambridge. Funerals of iconic figures, typically religious leaders and political champions trigger spontaneous MGs (table).20 More than 1 million mourners gathered in Paris, France, for François-Marie Arouet de Voltaire's funeral in 1798, a huge number in view of France's population of barely 30 million at the time, and the arduous nature of overland journeys. The funeral of the Ayatollah Khomeini in 1989 drew an estimated 6—12 million people in Tehran, Iran. 5 million mourners attended the funerals of Gamal Abdel Nasser and Abdel Halim Hafez in Cairo, Egypt, in the 1970s. Deaths of two assassinated US presidents Abraham Lincoln and John Kennedy drew crowds of millions of people along cortege routes. Pope John Paul II's funeral lasted an entire week in April, 2005. More than 4 million people gathered in Rome, Italy, from all over the world. Similarly, the funeral cortege of the Princess of Wales attracted crowds of more than 1 million along its 6·5 km journey within days of her death.

Table
Largest peaceful mass gatherings[20]

	Type of event	Location	Year	Number of people (millions)
World Expo	Fair	Shanghai, China	2010	73
Kumbh Mela	Religious	Allahabad, India	2007	60–70
Kumbh Mela	Religious	Haridwar, India	2010	50
Hindu temple pilgrimage	Religious	Sabarimala, Kerala, India	Annual	5–50
Arba'een, Imam Hussein's shrine	Religious	Karbala, Iraq	Annual	9–60
Funeral of C N Annadurai	Political	Tamil Nadu, India	1969	15
Funeral of Ayatollah Khomeini	Political and religious	Tehran, Iran	1989	6–12
Feast of the Black Nazarene	Religious	Manila, Philippines	2011 (annual)	8
25th anniversary of El Shaddai	Religious	Manila, Philippines	2003	7
World Youth Day and Pope's visit	Religious	Manila, Philippines	1995	5
Welcome to Ayatollah Khomeini	Political and religious	Tehran, Iran	1979	5
Funeral of Gamel Abdel Nasser	Political	Cairo, Egypt	1970	5
Removal of President Hosni Mubarak	Political	Cairo, Egypt	2011	5
Funeral of Abdel Halim Hafez	Cultural	Cairo, Egypt	1977	4
Funeral of Umm Kulthum	Cultural	Cairo, Egypt	1975	4
Funeral of Pope John Paul II	Religious	Rome, Italy	2005	2–4
Antiwar rally (invasion of Iraq)	Political	Rome, Italy	2003	3
Celebration of Red Sox victory	Sports	Boston, MA, USA	2004	3
Defense of workers' rights	Political	Rome, Italy	2002	2–3
Hajj	Religious	Mecca, Saudi Arabia	Annual	2–3
Closing mass, World Youth Day	Religious	Rome, Italy	2000	2·7
Beatification of Pope John Paul II	Religious	Krakow, Poland	2002	2·5
Gay Pride parade	Political	Sao Paolo, Brazil	2006	2·5
Stanley Cup parade	Sports	Philadelphia, PA, USA	1974	2
Republic protests	Political	Izmir, Turkey	2007	2
Champion Fédération Internationale de Football Association World Cup	Sports	Madrid, Spain	2010	2
Attukai Temple (women)	Religious	Trivandrum, Kerala, India	2007	2
Bicentennial of May Revolution	Cultural	Buenos Aires, Argentina	2010	2

Political assemblies and protests

Protests during the Arab Spring in 2011 drew millions of largely peaceful protesters to central locations of Tunis, Tunisia, and then Cairo, Egypt. More than 5 million were present when the departure of Egypt's President Hosni Mubarak was announced in February, 2011. Other MGs include political protests of the antiwar movement during the Vietnam War. 1968 was marked by massive student marches in major European, Asian, and Latin American capitals. Chicago, IL, USA, had a particularly violent succession of MGs that became riots after the assassination of the civil rights leader Martin Luther King and again a few months later during antiwar protests at the Democratic National Convention. By contrast, European marches in protest of the US-led invasion of Iraq were larger and more peaceful. More than 3 million attended the largest march in Rome in 2003 (figure 2).

The 2003 Rome protest against the Iraq war was peaceful, but violence can mar mass gatherings

In 1999, antiglobalisation protesters assembled in Seattle, WA, USA, ahead of a scheduled World Trade Organization meeting. Along with international anticorporate interests and assorted domestic supporters, they successfully occupied Seattle's downtown core and the convention centre. Violence increased during the 5 days, culminating in a full-scale riot after anarchists joined in and police responded with tear gas and rubber bullets. The Battle in Seattle as it came to be known, caused damages that were estimated at more than US$3 billion. Despite the violence and very large crowds, estimated to be hundreds of thousands of people, no deaths or serious injuries were reported. Political events of a less controversial nature also attract large crowds—eg, the inauguration of President Elect Barack Obama in 2008 attracted more than 1 million spectators who gathered in Washington, DC, USA, for hours in freezing January temperatures (figure 3).

Crowds gathered in subzero temperatures to watch Barack Obama's inauguration in 2009

Celebrations, sports events, and music concerts

Since the second half of the 20th century, international sporting events such as the Olympics and Fédération Internationale de Football Association World Cup have attracted global audiences largely because of affordable air travel. Global attendance is associated with a risk of imported disease. Vancouver, BC, Canada, had a measles outbreak during the winter Olympics of 2010 (figure 4). The infection spread to remote areas of British Columbia in weeks, causing substantial morbidity among its indigenous peoples.21 Occasionally, the athletes themselves transmit infections. An outbreak of chicken pox occurred among members of the Maldives volleyball squad at Doha's Asian Games in 2006 and was successfully managed by use of quarantine, antiviral drugs, and vaccine.22 International organisers of the Olympics have paid close attention to security risks after 11 Israeli athletes and coaches died in a gunfight with terrorists at the Olympics in Munich, Germany, in 1972. One bystander was killed as a result of a bomb explosion at Atlanta's Olympic Park, GA, USA, in 1996.23, 24

Vancouver was struck by an outbreak of measles during the 2010 Winter Olympics

Violent sports fans are as old as history. In 532, the Nika riots in Constantinople pitted rival charioteer factions and athletes against each other and Emperor Justinian. During the 1 month insurrection that ensued, half the city was destroyed and more than 30 000 people died.25 Although sports violence continues to be a risk during matches between rival teams, the massive crowds, crowds in motion, and immovable barriers cause the greatest loss of lives. The worst sports riot in history occurred in South America during a 1964 football playoff game between Peru and Argentina when fans responded in protest after a controversial decision to annul a goal by Peru. Police responded by throwing teargas canisters into the grandstand. More than 500 fans were injured and another 318 died. Most were crushed trying to escape the locked stadium, others died from teargas asphyxiation. The disaster in Hillsborough, UK, in 1989 was the worst stadium tragedy in British history. 96 fans died and another 766 were injured as crowds surged into the stadium crushing others in front who were pinned against fences. Many of the deaths resulted from compressive asphyxia while standing. Ineffective crowd control and poorly designed venues have also resulted in deaths at music festivals, most recently in 2010 during the Love Parade in Duisburg, Germany, in which 21 people were crushed to death and 500 were injured as a result of a stampede in a narrow tunnel. Occasionally, MGs cause structural stresses that threaten safety and security. In 1987, the 50th anniversary of the Golden Gate Bridge, San Francisco, CA, USA, was celebrated by closing it to vehicular traffic. Though not catastrophic, the suspension cables had the greatest load factor ever when 500 000 pedestrians crowded onto the deck, flattening its centre span.26

The Hajj

Although the Hajj was undertaken in the Middle East before the arrival of Islam, the movements and rituals of pilgrims today have not changed since the Prophet Mohammad inaugurated the Islamic Hajj in his lifetime.27 It has been recorded in Arabic literature known as Adab Al Rihla. Persian literature records Hajj in the Safarnameh (travel letter). At the core of Islamic belief is trust and this trust has been best exemplified by the risks Muslims take when travelling. The Muslim individual must trust in his Maker and, in ancient times, in the benevolence of strangers who would host him on his perilous journey to Mecca. Nowadays, as a result of the dissemination of Islam across the world, Hajj removes national, cultural, and social boundaries between diverse people like no other event.

Imperial powers and 19th century Hajj

Hajj has been the focus of public health initiatives for centuries, as shown in contemporary medical reports.28—37 During the 19th century, the Hajj attracted the interest of European powers, particularly the maritime travel to the Hajj, which dominated until the arrival of air travel. Colonial powers at the time were suspicious of political Islam, which was referred to as wahabism. Direct engagement in Hajj-related affairs was seen as too intrusive by politically savvy imperialists who recognised the sanctity of this little understood religious pilgrimage. Instead, supervision, albeit displaced, and management of Hajj were gradual processes, including surveillance, regulation, secure passage through the Red Sea and protection of British littoral interests, and eventually formal organisational processes, which would quickly become central to these hidden concerns. Imperial organisations linked cholera morbus, a non-epidemic diarrhoea, to Hajj, allowing a public health industry to develop that used health concerns to control immigration, pilgrim passports, proof of sufficient funds to allow return travel, maritime regulation, and vessel quarantine procedures.

By the mid 19th century, most of the Muslim populations using maritime travel for Hajj were from the Malay Peninsula and Indian subcontinent. About 2000 pilgrims travelled from the Malay Peninsula and between 5000 and 7000 arrived from the Indian subcontinent. Although there are few reliable data, the total number of pilgrims was estimated to be 10 000.38

"According to the Turko-Egyptian Sanitary Commissioners at Mecca, the number of Mohammedan pilgrims collected in and about the Holy City…amounted to two hundred thousand persons; composed of natives of Turkey, India, Egypt, Morocco, Arabia, Syria, Persia, Java etc." 29

Most travellers came in small vessels of 100—300 tons under different international aegis. Departures were concentrated around Singapore, Calcutta and Madras in India, Aceh in Indonesia, and other regional cities. Most pilgrims then, like today, disembarked in Jeddah, though some would land on southern Arabian coastal ports and then make a land journey through Yemen to Hijaz. Well into the 20th century, the conditions of passage were often appallingly cramped and unsanitary.34 Many people died along the route from infection and dehydration. 83 pilgrims died on board a maritime vessel, which had embarked from Jeddah with 520 pilgrims en route home to Singapore.34

"When she drew abreast of the watcher she proved to be a pilgrim ship; the afternoon being hot, the travellers had all crowded to the port side to catch what little wind was stirring. Their numbers were so great that they appeared to cover all the deck space, while the ship was unable to right herself from the list…"34

Efforts to manage Hajj were initiated by Dutch-Indonesian authorities, not for wholly altruistic reasons. The Dutch had established an association between returning pilgrims and societal unrest, so they introduced heavily surcharged passports as a way of restricting the number of travellers to Mecca. The ruling empires focused on health issues and justified inspections of Hajj sites for compliance with contemporary public health directives, often focusing on quarantine as a means of protection at a time when many international arrivals, including maritime travellers, were reaching Mecca. Their inspections were disappointing—the Annual Sanitary Commission visited the sites of Hajj and noted that the focus was not on prevention, but rather on the easy option of quarantine.37

When cholera was reported at Hagar's Well within the holy mosque in Mecca, the British Consul at Jeddah requested a scientific assessment. Samples were analysed at the Royal College of Chemistry in the South Kensington Museum, London, UK, and compared with those of London sewage, which was a source of cholera at that time. Recommendations after their alarming findings were sent to the Secretary of State for India who reported the well to be infected with the bacterium.35, 36

Similarly, entrepôt cholérique (cholera reservoir) was noted when authorities visited pilgrims from India intending to do the Hajj. These pilgrims were routinely detained on the island of Camaran as a quarantine station in the Red Sea to restrict the ingress of cholera into the holy sites.37, 38 Pilgrims were detained for 5—10 days without adequate provisions or clean water. The long exposure to sun, however, was thought to be beneficial for elimination of infection. After quarantine, pilgrims were often permitted into the site. Results of later studies showed a link between the pilgrims quarantined on Camaran with a series of eight subsequent outbreaks. The conclusions drawn from a review of these events at an international public health meeting at the International Sanitary Conference of Paris, France, 1895, were that the "Turkish possession of Camaran remains the greatest hindrance to the abolition of cholera at Mecca".37

Infection was a frequent feature of the Hajj in the 19th and 20th centuries, not unexpected since infectious disease medicine became better elucidated and the fascination with the developing specialty increased. Epidemics of smallpox occurred in Iraq and Sudan between October, 1928, and April, 1929. A small epidemic of plague occurred in upper Egypt and a larger one in Morocco (161 cases).34 653 cases of typhus were reported in Egypt and 32 in Palestine during the same period.34 These findings led to some strong recommendations that are still relevant:

"The yearly pilgrimage will remain a danger to all the countries from which pilgrims are drawn as long as the conditions of transport and accommodation remain…as at present. Efficient reorganization of the pilgrimage in every direction is needed and should be facilitated by the governments of the large number of the countries involved."34

By the early 20th century, non-Muslim European powers were heavily engaged in the management of the Hajj and would remain so until modern Saudi Arabia came into existence and acquired financial independence through petrochemical wealth. The comparison of Hajj in the imperial era with the modern Hajj shows the absence of Muslim public health experts or authorities in managing this pilgrimage.39, 40 This absence would gradually change and with the arrival of Ibn Saud's modern kingdom and its investments in Hajj. From this point, Muslims would solely administer the modern Hajj in its entirety.41, 42

Modern Hajj

The Islamic calendar is a lunar calendar, so the date of the Hajj moves forward by 10—11 days every year, presenting planners with additional challenges of health risks that are associated with seasonal variation. Temperature fluctuations in Mecca might be extreme depending on the time of year; daytime highs can be 40°C and higher, and night-time temperatures occasionally fall to 10°C. Hajj can coincide with the northern hemisphere's influenza season, as in 2009, increasing public health risks.43—47 Attendance in 2009 was not blunted despite official recommendations encouraging pregnant women, and elderly and very young people to stay at home.48 More than 2·5 million people attended, including 1·6 million foreign citizens, 753 000 of whom did not have valid Hajj permits.49 To put the event in its local context, the influx of pilgrims is so great that it trebles the resident population of Mecca, which is normally 1·4 million.

Access to the Hajj for pilgrims has changed greatly with air travel gradually replacing maritime and overland travel. In the past decade, the breakdown includes about 92% of pilgrims arriving by air, 1% making the maritime journey, and 7% travelling over land.50 Although a few pilgrims will arrive at Medina's international airport, Jeddah remains the major port of entry for all travellers as it has been for centuries. Increasing numbers of people attending the modern Hajj led to a 1980 decision by Saudi aviation authorities to partition Jeddah's King Abdulaziz International Airport and create a separate south terminal to serve all pilgrims. Now two-thirds completed, the terminal's capacity is 80 000 travellers at any time. When completed, its final capacity will be greater than 30 million passengers per year. Important new features include health-screening systems, customs, and immigrations security. Each of its 18 hubs receives pilgrim flights; all hubs have two examination rooms. The terminal also features large holding areas that allow efficient reviews of selected arrivals in segregated parts of the terminal. This permits verification of the immunisation status and administration of any prophylactic drugs and vaccines according to set protocols.

The overall design of the terminal permits visitors arriving without required visas and health records to be managed outside the main flow of pilgrims who continue through the facility to join assigned groups or agents who are responsible for coordinating details of travel and

housing. These regulated services will also escort their charges through the Hajj site. In Islam, Umrah is a shorter pilgrimage to Mecca. Although not compulsory, Umrah draws an additional 5 million pilgrims per year to the country; Jeddah's airport plays a major part throughout the year, controlling access and enforcing health protocols. Groups exiting the country and returning home are also monitored, allowing comparative studies between the two populations. At various times of the year, but most intensely during the Hajj season, public health teams, both stationary and mobile, use mobile devices to monitor inbound and outbound populations. Protocols are based on regularly reviewed case definitions. Gathered data are sent to centralised databases for real-time analysis. Many diseases are monitored during a Hajj season. Those given specific attention every year include both mild and severe respiratory diseases, food poisoning and gastroenteritis syndromes, haemorrhagic fevers, and meningococcal diseases. Reports of all diseases, but particularly those with immediate effect worldwide—severe acute respiratory syndrome (SARS), influenza, cholera, yellow fever, polio, plague, meningitis, and viral haemorrhagic syndromes—are expedited to WHO epidemiologists who work closely with Saudi authorities to analyse information and coordinate a response. The airport is also equipped with clinics for management of medical problems.

Rites of the Hajj

Humility, faith, and unity are emphasised throughout the Hajj. The pilgrims wear simple clothing, women and men comingle, women are enjoined not to cover their faces, children and adults of all ages are included, and families journey together. On arrival in Mecca, Hajj pilgrims do a series of synchronised acts based on events in the lives of Ibrahim (Abraham), his wife Hajra (Hagar), and their son Ishmael. Each pilgrim does an initial circumambulation (tawaf) around the central Ka'aba seven times. When completed, the pilgrim leaves for Arafat, about 22 km east of Mecca. Hajj culminates in Arafat on the Day of Standing, when all 2·5—3·0 million visitors stand and supplicate together on the mountain. Mount Arafat is believed to be the site of Mohammad's last sermon to his followers. Many people attempt to pray at the summit believing prayers there are the most blessed. On the way to Arafat, the pilgrims make overnight stops for prayers and contemplation in Mina. Leaving Arafat, the pilgrims return to Muzdaliffah, where stones are gathered; on the way to Mina, they stop at Jamarat bridge to throw stones at the pillars that are effigies of Satan. When the pilgrimage is complete, the new Hajjee (pilgrim who has completed the Hajj) makes an animal sacrifice thanking Allah for accepting his Hajj. This is often a proxy sacrifice because the Saudi Government has established modern abattoirs that are staffed by professionals who will do this on behalf of the pilgrims. Meat is then distributed to the poor, family, and friends. The final farewell is undertaken with another seven circuits around the Ka'aba. Muslim men on completion of a successful Hajj shave their heads. After completion of the Hajj, most pilgrims exit the country at Jeddah airport, which has congestion so great that the telecommunications infrastructure has to be constantly updated to allow sufficient capacity. A smaller number of pilgrims will visit the holy mosque in Medina. Some will also visit tourist sites in the Hijaz and the old city of Jeddah.

Hajj culture

Because all Hajj pilgrims travel as part of small informal groups, there is order in what could otherwise be chaos. Groups take their shepherding of individual pilgrims seriously, with easily identified group leaders who carry placards and flags and lead the entire group through the rituals without losing stragglers, infirm individuals, or temporarily distracted people. Further, this flexibility safeguards Hajj at the most pressured points, which could otherwise become treacherous. Despite this flexibility, Hajj stampedes have been recurring events, most notably at the Jamarat site.42

According to Islam, only adults should undertake the Hajj. The age at which Hajj is undertaken varies according to culture. Some nationalities seem to undertake Hajj at a uniformly young age (eg, Indonesian and Malaysian), whereas other nationalities defer Hajj until the late phase of life as a precursor to preparing for death. There might also be differences in sex distribution. Malaysia for instance has had a female dominated Hajj attendance for more than three decades.42

In keeping with the Islamic spirit of compassion, Muslims are enjoined to undertake Hajj only when adequately healthy. Despite this strong scriptural admonition, many Muslims insist on Hajj even when wheelchair bound. Special accommodations for wheelchairs are provided at the holy mosque despite the tremendous crowd densities. These channels are wide enough to admit wheelchairs and one person pushing the wheelchair and are divided into two lanes (one

for each direction). Pilgrims who are not well are provided transport by the Ministry of Health ambulance to Hajj sites as needed so they can complete their pilgrimage.

Because of the Islamic belief that death during the Hajj has a beneficial outcome in the afterlife, a few sick pilgrims attend, hoping for death during the Hajj. Public health and religious officials do much to dissuade this belief, which is often tenacious. This cultural belief system affects care providers at Hajj, all of whom are Muslims (non-Muslims are not permitted to enter the holy sites). Anecdotally, this belief affects resuscitation efforts of those in cardiac arrest, which once initiated (if the patient reaches the emergency rescue services in time) are unlikely to be pursued if not immediately successful. A do-not-resuscitate status is often requested by pilgrims who can speak for themselves.51

Hajj itself has several qualities that aid public health security.52 Attendees must practise specific behaviours for their Hajj to be considered valid, and these requirements are strict and closely adhered to by both clerical and community leaders. Crime is strictly forbidden at Hajj and the risk of violent altercation is reduced because of the weapon-free, drug-free, and alcohol-free environment.42 Tobacco intake is also banned, curtailing the risk of inadvertent fire hazards. By contrast with some other MGs, sexual relations are not allowed during Hajj and male and female pilgrims are accommodated separately even when travelling as families, eliminating the risk of sexually transmitted disease.

This observant, penitent, and sober crowd engrossed in worship is thus likely to remain cooperative and coherent if sudden events demand rapid cooperation with authorities. Insurrection, rioting, disinhibited behaviour, or hooliganism of any kind does not arise even in these extraordinarily massive crowds. Pilgrims are urged to safeguard themselves or others at all times, aiding the infirm and assisting the fallen, behaviours that symbolise peaceful Islamic societies that enhance the public health security. The spirit of cooperation is central to a successful acceptance of the Hajj by Allah in the Islamic belief system and reduces the potential risk of disastrous events in such massive crowds.

Planning for the Hajj

Saudi Arabia's responsibility for the Hajj has affected the country's advanced health-care infrastructure and its multinational approach to public health. Although other jurisdictions have administered the Hajj, Saudi Arabia has invested in it. Within the immediate vicinity of the Hajj, there are 141 primary health-care centres and 24 hospitals with a total capacity of 4964 beds including 547 beds for critical care. The latest emergency management medical systems were installed in 136 health-care centres and staffed with 17 609 specialised personnel. More than 15 000 doctors and nurses provide services, all at no charge. This event requires the planning and coordination of all government sectors; as one Hajj ends, planning for the next begins. Infection and prevention strategies are reviewed, assessed, and revised every year. Coordination and planning requires the efforts of 24 supervising committees, all reporting to the Minister of Health. The preventive medicine committee oversees all key public health and preventive matters during the Hajj and supervises staff working at all ports of entry. Public health teams distributed throughout the Hajj site are the operational eyes and ears of the policy planners.

Sharing experience through global health diplomacy

In hosting the modern Hajj, Saudi Arabia has weathered a 20th century world war, global outbreaks due to newly emerging disease (including SARS and meningococcal meningitis W135), and regional conflicts. In this time, the country has acquired a unique, resilient expertise concerning Hajj-related public health. Important observations that are relevant to public health planners everywhere are part of this experience. One of the best examples of such cross-cultural translation has been in the preparation for Barack Obama's Presidential Inauguration and crowd management informed by the Hajj experience.

Yet the process of exchanging expertise is possibly even more instructive. Collaborative work on this scale shows the increasingly important global health diplomacy in which the Muslim world has an enormous part to play. First articulated by the US Health and Human Services Secretary Tommy Thompson, global health diplomacy usually includes the provision of a service by one nation to another.6 The USA's rebuilding of maternity hospitals in Afghanistan or the deployment of the ship *USS Comfort* to serve as a site for temporary clinics in Vietnamese coastal waters are two recent examples.53

As they struggled with the best responses to the global threat of pandemic influenza A H1N1, which coincided with the Hajj in 2009, colleagues at the US Centers for Disease Control and Prevention and the Saudi Ministry of Health worked together to deploy one of the largest real-

time mobile databasing systems, which was designed to detect disease in real time at any MG. Senator John Kerry discussed precisely this joint effort in a speech in Doha at the 2010 US-Islamic World Forum.54, 55 This international collaboration was realised only through both intense personal dedication and the confidence the agencies had in their people. Such collaboration strongly resonates with President Obama's renewed hopes for US engagement with the Muslim world, as articulated in his speech in Cairo, Egypt, in June, 2009.54

People who collaborate, write, and disseminate information internationally have long been aware of the latent value of such informal, positive exchange. In the flat world of medical academia, individuals have immediate and palpable effects. Fostering such professional dialogues are everyday (albeit unseen) acts of global health diplomacy. When investigators and physicians work in a shared space, unfettered by the global geopolitics, global health diplomacy becomes alive and vibrant. Hajj medicine, as part of the emerging specialty of MG medicine, provides an extraordinary platform.

Saudi Arabia's experience in international service through public health is substantial and is promoting the emergence of the formalised specialty of MG medicine. Hajj continues to provide insights into advanced and complex public health challenges, which are unlocked through collaborative exchange.56 Disease and suffering remain universal, even in the 21st century. Solving these challenges is relevant to humanity everywhere. Islamic scholars have long referred to Hajj as a metaphor for ideal societal behaviour.42 At the centre of these ideals is a unifying theme: collaboration.

Saudi Arabia's experience of Hajj medicine contains rapidly developing public health solutions to several global challenges. Multiagency and multinational approaches to public health challenges are likely to become major factors in the specialty of global health diplomacy, engaging societies globally, and drawing the west a little closer to the east.

Conclusions

In view of the global public health threats that might originate from MGs, medicine relevant to MGs has become an essential specialised, interdisciplinary branch of public health, particularly hybridised with global health response, travel medicine, and emergency or disaster planning.52 Agencies outside the realm of public health should be closely involved in MG medicine. In the operation and management of an MG, several sectors—health care, security, and public communications—need to know how to interface with public health services and resources quickly and effectively. Involving public health experts with the broader civic planning for any MG helps with parallel transparency in needs and expectations, ensuring that public health considerations are factored into the entire planning process instead of intruding too late in development, relegating public health security concerns to little more than ineffective afterthought. Delayed entry of these actors into the planning process can debilitate or completely disable adequate responses to potential diseases during MGs. Experts must educate civic planners about the values of early collaborative approaches to MGs for these reasons.

Conventional concepts of disease and crowd control do not adequately address the complexity of MGs. The need for MG health policies that are guided by sound evidence but anchored in experience shows the importance of calls for a new academic medical and science-based discipline. MGs have been associated with death and destruction—catastrophic stampedes, collapse of venues, crowd violence, and damage to political and commercial infrastructure, but little is known about the threats from MGs to the global health security. WHO has worked closely with international agencies to address such risks.57—59 MGs pose complex challenges that require a broad expertise and Saudi Arabia has the experience and infrastructure to provide unique expertise with respect to MGs.

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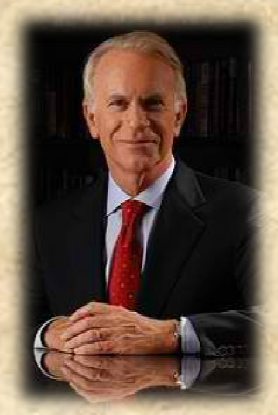
U.S. unprepared for bioterrorism attack

Source:http://www.bioprepwatch.com/us_bioterror_policy/expert-u-s-unprepared-for-bioterrorism-attack/323620/

A recent essay published in Forbes magazine supports the contention that the United States remains woefully unprepared, if not uninterested, in the chances that it will face an attack using biological weapons.



James Glassman, a former undersecretary of state for public affairs and public diplomacy and the founder of the George W. Bush Institute, said that the United States remains vulnerable to an attack that could potentially kill hundreds of thousands of people because it lacks a means of producing needed medical

countermeasures, according to Forbes.
Three years ago, a Congressional commission concluded that there is 50 percent chance that there will be an attack using a weapon of mass destruction somewhere in the world by 2013. The Commission on the Prevention of WMD Proliferation and Terrorism declared that the weapon used would more likely be biological than nuclear.
Regardless, Glassman said that the public has heard little about bioterrorism since the anthrax attacks in 2001, despite the considerable risk.
"Terrorists could spray Bacillus anthracis from crop-dusters over football stadiums," Glassman wrote, Forbes reports. "Or they could send intentionally infected fanatics out to spread the smallpox virus through a crowded city, doing far more damage than a brigade of suicide bombers."
Glassman pointed to last October's Bio-Response Report Card study, issued last year by the Bipartisan WMD Terrorism Research Center, as proof that the country needs to do more to confront the threat of bioterrorism. The report card gave the United States a "D" grade for its detection and diagnosis capability and for the availability of medical countermeasures.
Glassman said that larger biopharmaceutical firms have done little to develop countermeasures, but small firms have filled the gap with mixed success.
"Today, largely because of these small firms, we currently have enough drugs to limit the impact of a small-to-medium attack using anthrax or similar pathogens, but we would probably be helpless against an attack using mutant strains," Glassman said, according to Forbes. "Here is the challenge: Unless the U.S. government makes a clear, long-term commitment to the development and purchase of medical countermeasures to bioterrorism, the companies that produce and develop these medicines will not be able to continue to make them. The market is limited, the liability risk is high, and the firms have to make long-term investments that now seem highly dubious without more certainty from the federal government."

Anthrax Kits in U.S. Homes

Source: http://www.businessweek.com/news/2012-04-02/home-stockpiles-of-anthrax-kits-not-the-best-idea-fda-says

Making anthrax-antidote kits available to the 114 million households in the U.S. in case of a bioterrorism attack may lead to misuse of the medicines and stir up public fears, regulatory advisers said.
"People may infer an anthrax attack is imminent," Thomas Moore, chairman of a Food and Drug Administration advisory committee, said in an interview yesterday after a meeting on the subject. "It may have an adverse impact on doxycycline," the antibiotic that was hoarded after the Sept. 11, 2001, terror attacks, he said.
The FDA met with panels of scientists and academics to consider whether kits containing a 10-day supply of doxycycline should be available for all Americans to store in their homes in preparation for a bioterrorism attack. A branch of the Health and Human Services Department said it wants to start with 10 million first responders and their families before expanding it to the rest of the population.
"The public just looks at the system as there you go again crying wolf," Diane Cappelletty, an associate professor of pharmacy practice at the University of Toledo College of Pharmacy, told the committee during the meeting.
Consumers could misuse the so-called medkits by taking them for reasons other than an anthrax attack, a move that may exacerbate antibiotic resistance, the advisers said. A test run in 2007 with about 4,200 households in the St. Louis area showed some instances of misuse, including one person who took the doxycycline during an emergency declared for a snow storm, and two others who used the tablets to treat sore throats.

Fallout Shelter Craze

"I can't help but be reminded of the decades old fallout shelter craze," Marcus Reidenberg, a panelist and professor of public health at Weill Cornell Medical College in New York, told the FDA committee. "It's assuming that everyone in the U.S. knows we have doxycycline and no one in any organization that might want to attack the U.S. doesn't."
The FDA today and April 4 also will hear arguments for the wider availability of ciprofloxacin and

Johnson & Johnson's Levaquin to treat any terrorist-initiated outbreak of pneumonic plague, according to documents on the FDA's website. The disease is the most serious of three forms of plague that occurs when the bacteria infects the lungs, and can be spread from person to person through coughing and contaminated articles.

The FDA would require more studies for an anthrax medkit like those conducted for over-the-counter drugs to ensure consumers understand the product correctly, Barbara Cohen, a social science analyst at the agency's office of drug evaluation, told the advisers.

Response Time

Only potassium iodide is available for home storage for similar threats, George Korch, a senior science adviser in the Health and Human Services office of the assistant secretary for preparedness and response, said during the meeting. Potassium iodide tablets

combat exposure to radioactive iodine and are available on the Internet, according to the FDA.

The government stores "tens of millions" of 60-day courses of treatments in case of simultaneous attacks to dispense after an event, Korch said.

National leaders first brought up the notion of household medkits in 2005, four years after five people died from anthrax found in letters. Expanding the products to the rest of the population was put on hiatus because of concern for misuse and antibiotic resistance. President Barack Obama resurrected the idea in 2009 when he instructed the government to plan for a biological attack, Korch said.

Home kits could relieve the burden on community dispensing centers, which are unlikely to be able to meet a two-day deadline to hand out drugs to prevent people from getting sick from anthrax, a potentially deadly infection spread by inhalation of spores. The response time to a biological attack is critical, the Homeland Security Department's Susan Coller- Monarez, told the committee.

Ready to Act

"The production and dissemination of a biological agent is something the government may not be ready for, despite its best efforts, to intervene in its earliest stages," said Coller-Monarez, who runs the threat characterization and attribution branch of the chemical and biological defense division of the Homeland Security Department.

The U.S. Postal Service is already authorized to deliver medkits to homes in the event of an anthrax attack under programs in Minneapolis and Louisville, Kentucky, that will expand to Boston, Philadelphia and San Diego. The program being discussed this week would let people obtain kits from pharmacies whenever they see fit.

FDA backing is needed before a date for rolling out the kits can be set. The Health and Human Services Department's Biomedical Advanced Research and Development Authority, BARDA, must partner with a pharmaceutical company to guide medkit through the FDA approval process before a date for rolling out the kits could be set. Companies that make versions of doxycycline drugs include Pfizer Inc. and Impax Laboratories Inc.

Sore Throats, Snowstorm

The government has tested these waters before with a study in 2007 in which the Centers for Disease Control and Prevention gave 4,182 households in the St. Louis area anthrax medkits. At the end of the study, 4,076 households were available for follow-up, 130 of those did not return their medkits.

Most who didn't return them lost the products or threw them away while four households used them and five refused to return them, according to the report from the bioterrorism

agency. One elderly woman took the doxycycline during an emergency declared for a snow storm, two used the tablets to treat sore throats and one declined to specify the use, Linda Neff, a senior epidemiologist in the CDC's office of public health preparedness and response, said during the FDA meeting.

The kits used in the study were made by Ivax Corp., which Teva Pharmaceutical Industries Ltd. bought in 2006.

The Institute of Medicine, which advises the nation on health matters, recommended against broad home storage of medkits because of the potential for misuse.

Doxycycline works by preventing the growth or spread of bacteria.

Nodding Disease: Origins Of Strange Illness In Africa Remain Unexplained

By Katherine Harmon

Source: http://blogs.scientificamerican.com/observations/2012/04/12/nodding-disease-origins-remain-unexplained/?WT.mc_id=SA_syn_HuffPo

A strange illness has been killing thousands of young people each year, and recently it has started claiming even more victims in Africa.

Called nodding disease, it usually strikes children at the age of 4 or 5 years and starts with occasional bouts of uncontrolled nodding. As the disease progresses through adolescence, the nodding often buds into full-blown epileptic seizures, and victims loose developmental ground, often becoming unable to care for themselves, communicate or even avoid simple accidental death by drowning or burning.

Since it was first described in 1962 in Tanzania, the frequently fatal disease has been blamed, variously, on viruses, pesticides, fungi, vitamin deficiency, monkey meat and parasites. A new special report, published online April 12 in *Science*, details the more recent outbreaks of the condition in South Sudan and northern Uganda and helps to refine the list of possible causes.

"We have a long list of things that are not

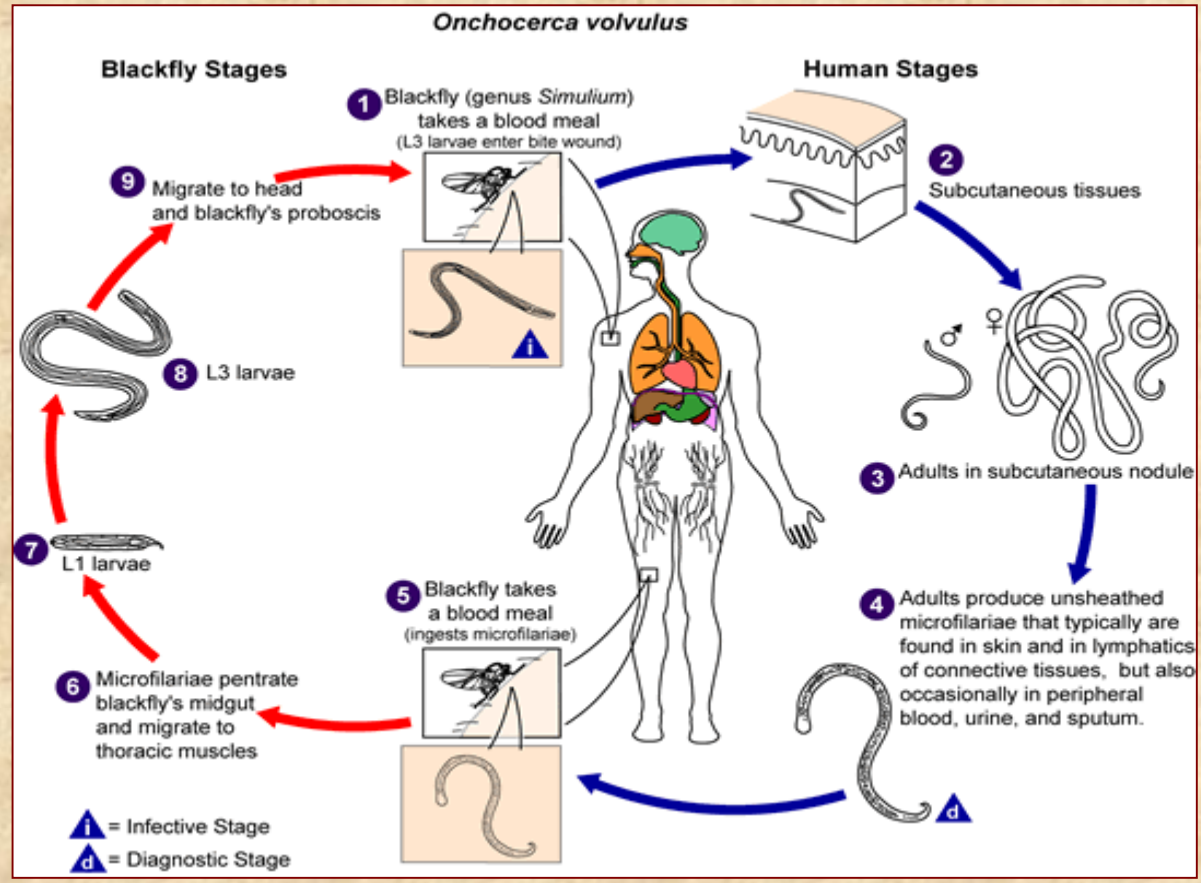
causing nodding disease," Scott Dowell, director of the division of global disease detection and emergency response at the U.S. Centers for Disease Control and Prevention, told Reuters earlier this year.

Dowell and his team have made many trips to Uganda to further investigate this strange syndrome. They used EEGs and MRIs to study the brains of patients while they were going through a head-nodding bout. "Something is badly wrong with the brains of these kids, and it's physiological," he told *Science*. But these tools did not lead them to a definite answer, although most viruses, prion disease (from eating monkey meat), fungi and pesticides seem to be losing steam as likely explanations.

The researchers haven't yet ruled out a vitamin B-6 deficiency. Some people with a particular genetic mutation that reduces B-6 uptake have severe epilepsy. Although kids with nodding syndrome didn't have

the lowest levels of B-6, the CDC team is planning to include supplements as part of a forthcoming clinical trial that is also slated to test out anti-seizure medications.

Another possible cause is the parasite ***Onchocerca volvulus***, a worm that also causes river blindness disease (also known as onchocerciasis). "The puzzling thing is that [the worm] is widespread, but nodding is not," Dowell told *Science*. The disease also seems to occasionally be present where the parasite is not. A 2008 study found, for example, that out of 51 patients with head nodding (some with just nodding, others with more advanced seizures), 43 had traces of *O. volvulus* in their bodies, but none of them had evidence of it in their spinal or brain fluid. And a 2010 study found that of 300 people in Tanzania, more severe *O. volvulus* infections did not mean a higher risk for epilepsy.



Nevertheless, some researchers are still intrigued by this parasitic worm as a possible cause of the condition. "I am convinced that somehow it is connected," Andrea Winkler, a neurologist at the Technical University of Munich and who worked on both the 2008 and 2010 studies, told *Science*.

The ultimate answer might lie multiple factors. "Epilepsy is very often multi-factorial," Michel Boussinesq, of the University of Montpellier, told *Science*. "Onchocerciasis could be a related factor but not sufficient to provoke the condition." Kids who are already vitamin deficient or suffering from other conditions could be rendered more vulnerable to the parasite's attacks.

Dowell's team is still obtaining samples from patients and healthy kids to test for vitamin levels as well as other potential environmental exposures. And they are currently in the process of getting approval to begin the first, 80-child round of clinical trials.

Katherine Harmon is an associate editor for Scientific American covering health, medicine and life sciences.

Insider: H5N1 studies publication vote biased, unbalanced

Source: http://www.homelandsecuritynewswire.com/dr20120415-insider-h5n1-studies-publication-vote-biased-unbalanced

In late March, the National Science Advisory Board for Biosecurity (NSABB) reversed its earlier recommendation, made in December 2011, against full publication of two studies describing lab-modified H5N1 viruses with increased transmissibility in mammals; the recommendation was based on fears that the findings would help terrorist design effective bioweapons; a NSABB board member says that the March reversal of the December recommendation was the result of a bias toward finding a solution that was more about getting the government out of the current dilemma than about a careful risk-benefit analysis.

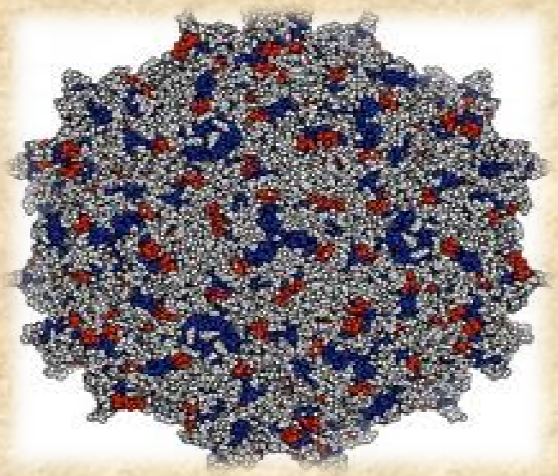
CIDRAP News, the publication of the University of Minnesota's Center for Infectious Disease Research and Policy (CIDRAP), reports that a member of the National Science Advisory Board for Biosecurity (NSABB), in a leaked letter (the letter was posted on the *Science* magazine site – also see *Science*'s 13 April article, "A Flawed Flu Papers Process?"), has charged that federal officials planned the board's meeting in late March in a way designed to lead the board to reverse its earlier recommendation against full publication of two studies describing lab-modified H5N1 viruses with increased transmissibility in mammals.

The letter was written by board member Michael T. Osterholm, Ph.D., MPH, director of CIDRAP.

Osterholm argues that the National Institutes of Health (NIH) officials who planned the meeting set up the board to change its earlier recommendation and thereby "kick the can down the road" concerning the science policy issues at stake. He said he was expressing only his own views.

The board was concerned with possible misuse of the findings – especially by terrorists. As a result, the NSABB recommended in December that the details of studies led by Ron Fouchier, Ph.D., of Erasmus Medical Center in the Netherlands (his study was scheduled for publication in *Science*), and Yoshihiro Kawaoka, DVM, Ph.D., of the University of Wisconsin (whose paper was to be published by *Nature*), should be withheld from publication.

After the authors provided new information



about their findings, the NSABB was reconvened on 29 and 30 March. *CIDRAP News* notes that at that point the board voted 12 to 6 to recommend that the full details of Fouchier's study should be published. The panel was unanimous in recommending full publication of Kawaoka's paper (see "NSABB reverses recommendation on H5N1 studies," *CIDRAP News*, 30 March 2012). The studies are expected to be published in *Science* and *Nature*, respectively.

Osterholm addressed his 6-page letter to Amy P. Patterson, MD, NIH associate director for science policy. In addition, according to the letter, he shared it with the rest of the NSABB and with other NIH staff members who support the board's work. He said he voted for full publication of the Kawaoka paper but voted against the publication of Fouchier's study.

"I believe that the agenda and speakers for the March 29 and 30th NSABB meeting as determined by the OBA [NIH Office of Biotechnology Activities] was designed to produce the outcome that occurred,"

More efficient bioterrorism response plan

Source: http://www.homelandsecuritynewswire.com/dr20120415-more-efficient-bioterrorism-response-plan

In the event of a bioterror attack on a building (think: the 2011 anthrax attack on the offices of two Democratic Senators, Tom Daschle of South Dakota and Patrick Leahy of Vermont), the current approach to decontamination is to clean up the building until no pathogens can be detected; researchers suggest, however, that whether or not pathogens are found depends greatly upon how extensively the buildings are tested

Dealing with the threat of bioterrorism is just one of the many issues facing emergency preparedness agencies in the post-9/11 world. Researchers in Drexel University's College of Engineering are helping to answer important questions that will shape the way responders handle bioterrorism threats in the future. Most recently, research from Drexel's Department of Civil, Architectural and Environmental Engineering offered findings that will advise the timing of reoccupying a building where there has been a bioterrorism attack.

A Drexel University release reports that Dr. Charles Haas and Dr. Patrick Gurian, professors in the College of Engineering, along with doctoral students Tao Hong and Yin Huang, recently co-authored a *PLoS One* article entitled "Prioritizing Risks and Uncertainties from Intentional Release of Selected Category A Pathogens." The article offers an efficient method for responders to assess risk from pathogens, such as anthrax and smallpox, following the decontamination process and assess the risk of sending people back into it.

"Bioterrorism continues to be a potential area of terrorist activity," Gurian said. "Past bioterrorism attacks in the United States revealed that the U.S. lacked guidelines for a quick response to bioterrorism agents."

The current approach to decontamination is to clean up the building until no pathogens can be detected. The researchers suggest, however, that whether or not pathogens are found depends greatly upon how extensively the buildings are tested. What Haas and Gurian's team aimed for was a more efficient way to determine when it is safe for people to return to a contaminated building.

The release notes that the group developed a mathematical formula to calculate the level of sampling and testing necessary effectively to mitigate a health risk in returning to the building. This could help speed the re-occupancy of buildings that do not present substantial residual risks, while allowing resources to be focused on those areas where significant residual risk is present.

"To ensure that sampling efforts are sufficient to achieve targeted levels of human health protection requires a way to link residual contamination to human health risk," Gurian said. "It is this link between environmental concentrations and human health risk that is provided by this paper."

The formulae devised by the researchers takes into account various environmental aspects such as ventilation rate, re-aerosolization rate, frequency with which occupants touch contaminated surfaces, and concentration of pathogen, as well as the type of biological agent used in the attack. The end result is a framework of testing that offers a threshold number of negative samples necessary to statistically suggest that the building has been decontaminated.

— Read more in Tao Hong et al., "Prioritizing Risks and Uncertainties from Intentional Release of Selected Category A Pathogens," PLoS ONE 7, no. 3 (6 March 2012)

ABSTRACT

This paper synthesizes available information on five Category A pathogens (*Bacillus anthracis*, *Yersinia pestis*, *Francisella tularensis*, *Variola major* and Lassa) to develop quantitative guidelines for how environmental pathogen concentrations may be related to human health risk in an indoor environment. An integrated model of environmental transport and human health exposure to biological pathogens is constructed which 1) includes the effects of environmental attenuation, 2) considers fomite contact exposure as well as inhalational exposure, and 3) includes an uncertainty analysis to identify key input uncertainties, which may inform future research directions. The findings provide a framework for developing the many different environmental standards that are needed for making risk-informed response decisions, such as when prophylactic antibiotics should be distributed, and whether or not a

contaminated area should be cleaned up. The approach is based on the assumption of uniform mixing in environmental compartments and is thus applicable to areas sufficiently removed in time and space from the initial release that mixing has produced relatively uniform concentrations. Results indicate that when pathogens are released into the air, risk from inhalation is the main component of the overall risk, while risk from ingestion (dermal contact for *B. anthracis*) is the main component of the overall risk when pathogens are present on surfaces. Concentrations sampled from untracked floor, walls and the filter of heating ventilation and air conditioning (HVAC) system are proposed as indicators of previous exposure risk, while samples taken from touched surfaces are proposed as indicators of future risk if the building is reoccupied. A Monte Carlo uncertainty analysis is conducted and input-output correlations used to identify important parameter uncertainties. An approach is proposed for integrating these quantitative assessments of parameter uncertainty with broader, qualitative considerations to identify future research priorities.