Welcome to the lecture entitled “The Current Threat of Bioterrorism.”

In this section we will cover some more definitions, talk about the threat of bioterrorism versus the probability, and also give numerous examples and resources.

According to Title 22 of the U.S. code, the definition of “terrorism” is premeditated, politically motivated violence perpetrated against non-combatant targets and conducted by sub national groups or clandestine agents, usually intended to influence an audience. The important part of this definition is that they are non-combatant targets, as opposed to biological warfare.

There are numerous types of terrorism listed on this slide. Beginning with agroterrorism, or that directed against plants and agriculture; then an armed attack, followed by an attack with fire or fire producing agents. Next we have biological agents, which are the focus of our discussion today, followed by chemical agents, such as sarin or T2 mycotoxin; next, a conventional bomb; cyberterrorism, which is terrorism against the internet; a “dirty” bomb, which is a radiological bomb within a traditional bomb component; intentional hazardous material releases such as chemicals or other agents; and finally, a nuclear bomb.

The definition of “bioterrorism” is the use or threatened use of biological agents with the intention of promoting or spreading fear or intimidation. This intimidation is targeted either on an individual, a specific group, or the population as a whole, and can be for religious, political, ideological, financial, or personal purposes.
Finally, another definition, is that of a “biocrime”. This is an incident that involves the use of a biological agent. Many acts of terrorism can result in a biocrime and this term is often grouped together with bioterrorism. A biocrime is a criminal act with the use of a biological agent.

Let’s now discuss several examples of intentional attacks with biological agents.

There were related 2 events in 1978 that can be considered biocrimes. The first occurred with a man named Georgi Markov who had defected from Bulgaria and was working in London at a radio station. Mr. Markov one day was returning from lunch and was at a bus station, when he felt a sting in his thigh. When he looked over, he saw someone bending down to pick up an umbrella, who then walked away quickly and jumped into a taxi. After several hours, Georgi began to feel ill, by the next day was hospitalized, and within 4 days had died. Ironically he died on September 11. This event was publicized in the newspaper, and caught the attention of a man named Vladimir Kostov, who, 10 days earlier, had experienced a similar situation while standing at a metro station in Paris. They both had a similar weapon used against them. This was considered a Bulgarian and Russian Operation with many details still a mystery today.

What was extracted from Georgi Markov’s body is illustrated on the bottom of this slide. A hollow pellet, or bullet, with 2 holes drilled in it, contained ricin, and then had a wax seal to allow the ricin to stay within the pellet. Ricin is an agent that is produced from part of the waste when castor oil is made, and it can be highly poisonous if ingested. From Vladimir Kostov, when he turned himself into authorities after he read about Markov, was also extracted a ricin pellet. The difference between the two pellet instances was within Georgi, the wax seal had completely dissolved within the thigh muscle and all of the ricin had been released. However, with Vladimir, the bullet had lodged against his shoulder blade and had gone through a very thick sweater, so when they extracted it, one side of the wax seal was completely intact, and the other one, partially dissolved, which explains why he did not receive as severe an illness. The weapon used to fire this ricin pellet was thought to be an umbrella gun, which used a gas cylinder to propel the pellet through the skin (see the illustration on the top of the slide). This is similar technology that is used today in needleless injection systems.
Another example of a biocrime is the first known intentional attack in the U.S., and these were done by followers of the person in the center of the slide, known as Bhagwan Shree Rajneesh. This group of followers were in Oregon and in 1984, there was an election. This election, for the Rajhneeshees’ was politically motivated, and their idea was to make people sick so they could not go and vote and then they would win this election. As a result, their strategy was to go into 10 restaurants with salad bars and release an agent into the salad. The agent they used was *Salmonella typhimurium*. This biocrime resulted in 751 cases of gastrointestinal illness. Interestingly and very disturbingly, at the time, this was not considered suspicious of any type of biological attack. It wasn't until several years later that a nurse in the following known as Ma Anand Puja came forward and confessed to the Rajhneeshees’ being involved in this biocrime. They actually had a laboratory where they produced several agents, and the source of the culture was a company called the American Type Culture Company. This culture company, at the time, was one that you could call up and say “Could you please send me a pound of salmonella and a ¼ pound of anthrax?” And you could receive any culture you wanted. Today, as a result of 9/11 and anthrax attacks, it is very difficult to obtain such cultures of biological agents. Luckily, there were no fatalities as a result of this biocrime.

Another group, called Aum Shinrikyo, was founded by Shoko Asahara and contained elements from 3 religions: Christianity, Hinduism and Buddhism, with many followers in Japan and worldwide. This group believed that nuclear Armageddon was inevitable, and only they would survive it.

Aum Shinrikyo was responsible for the 1995 Tokyo subway attacks with sarin, a chemical agent. On this slide, to the left, you can see the victims of this attack, which resulted 13 deaths and 5500 injuries. On the right is the leader of Aum Shinrikyo.

Aum Shinrikyo was also involved in laboratory work with biological agents for the purpose of bioterrorist activities. This included work with anthrax, botulism, and Q-fever. There is evidence that this group attempted to spray anthrax and botulism off of rooftops at least 3 times in Tokyo. Luckily, they were not sophisticated bioweaponeers, so the agents they produced did not result in widespread disease. When their arsenal was seized by authorities, it included botulinum toxin and an aircraft with spray tanks. Aum is also known to have sent followers to Africa during the Ebola outbreak to secure cultures of that agent to use in future bioterrorism attacks.
This slide shows pictures taken during the attempts of Aum to spray botulism and anthrax from Tokyo rooftops.

In October 2001, the first inhalational anthrax case in the United States since 1976 was identified in a media company worker in Florida. A national investigation was initiated to identify additional cases and determine possible exposures to *Bacillus anthracis*. Surveillance was enhanced through health-care facilities, laboratories, and other means to identify cases, which were defined as clinically compatible illness with laboratory-confirmed *B. anthracis* infection. From October 4 to November 20, 2001, 22 cases of anthrax (11 inhalational, 11 cutaneous) were identified; 5 of the inhalational cases were fatal. Twenty (91%) case-patients were either mail handlers or were exposed to worksites where contaminated mail was processed or received. *B. anthracis* isolates from four powder-containing envelopes, 17 specimens from patients, and 106 environmental samples were indistinguishable by molecular subtyping. Illness and death occurred not only at targeted worksites, but also along the path of mail and in other settings. *Despite the suicide of a suspected scientist at Ft. Detrick, there is still debate over the definitive identity of the suspected sender-this is an unresolved case*. The anthrax attack is an example of a covert threat. It is also one from which many clinical examples can be learned for health care professionals to be able to identify future anthrax cases. If you are interested in more information regarding the epidemiological work-up, see the reference listed on this slide.

One might ask “why use biological agents?”. The reasons are numerous, and they are all listed on this slide. First, it can be a relatively cheap and simple weapon. These agents can be very infectious via the aerosol route, and some of them, such as anthrax and botulism, in the spore form, are very stable in the environment. If populations are susceptible to this agent, it also makes it attractive as an agent of bioterrorism. If the intent is to do it secretly, then the guilty can often escape to ‘fight another day’ since many of these diseases take a few days to incubate. There can be high morbidity and mortality from biological agents and there is very high transmissibility of several agents including smallpox, plague and viral hemorrhagic fevers. Finally, the number 1 reason to use a biological agent is because it is difficult to diagnose and/or treat when these have not been routinely seen in the U.S.
So one might ask, “is there a threat of bioterrorism?” and the answer is yes, for 2 reasons. As long as there are pathogens, or biological agents that can do harm, and angry people, those intent on doing harm, there is a threat.

However, when we talk about the probability of a threat, there is not a scientific formula to determine that, so what is used are threat alerts. There are those whose job entails specifically assessing the threat of terrorism, including bioterrorist attacks against the U.S. This requires the use of intelligence and information regarding threat alerts to determine the threat probability.

Previously, the United States Department of Homeland Security Advisory System (HSAS) used the color-coded scale on the left, to indicate terrorism threat levels. The new system is entitled the National Terrorism Advisory System, or NTAS. It is believed that this new system will more effectively communicate information about terrorist threats. Please note that this system includes more than bioterrorist threats. An “Imminent Threat Alert” warns of a credible, specific and impending terrorist threat against the United States. An “Elevated Threat Alert” warns of a credible terrorist threat against the United States. There is also a “Sunset Provision”, involving an individual threat issued for a specific time period and automatically expires. It may be extended if new information becomes available or if the threat evolves. The new system disseminates information through various media, including a Department of Homeland Security blog, Twitter stream, facebook page, and RSS feed. See Required Readings #2 & 3 for more information on this threat advisory system.

As mentioned previously, there is not a formula to determine probability, but there are questions that can be asked to be able to assess how real the threat of bioterrorism is from any one group or country. The person in this slide is Major General Parker, who used to work at the Camp Detrick Biological Weapons Program and now runs a program called DREAMS. This stands for U.S. Army Disaster Relief and Emergency Medical Services. Major Parker spoke at USF, and he presented with a list of questions that are very useful in determining the threat of bioterrorism.
Let’s go through these questions, which comprise the next 2 slides. Does the group, person, country, have a biological agent to being with? Are they doing research with that agent? It is very important to know the characteristics of that agent, e.g., highly transmissible, highly fatal, easily disseminated, etc. And is the work being produced in greater than what would be considered a research quantity? Bioweaponeers, or persons who work to produce bioweapons, use several terms in their processes. These include milling, coating, and clumping the agent to make it more desirable to be released in different systems. Once this happens, do we know if a group, or agent, or country has a delivery system, be it weapons, or aerosol. Are they doing their work in a tactical, secretive or clandestine manner? As we saw in the first part of our lecture, many countries have used dispersal testing in remote areas. We would want to know if any group was testing agents in a dispersed manner to see how they might spread.

Continuing the questions, we would want to know, if any agent has been loaded onto a weapons system such as a warhead or missile. Has it been tested? Very important to know, is there a motive against a group to use this agent? What is the psychological profile of the leader or policy of the country that might use this agent? Is there a history of this agent being used or produced by this group? Now, on the other side, when thinking about using a biological agent, you would want to know if the targets you intend to use it on have a mitigation or a way to decrease its damage be that an antibiotic, a treatment, a vaccine, etc. And how good is that mitigation? Is that mitigation so good that it deters that agent from being used? Those are all very important questions to be used to determine how real the threat of a particular biological agent is.

This is a slide of over 17 countries known to have conducted either biological weapons production or research.

This slide represents the disclosure made in 1995, by Iraq, to the United Nations, for their production and weaponization of very large amounts of botulism toxin, anthrax spores, and aflatoxin.
Slide 25

North Korea

R & D Efforts:
• Anthrax
• Botulinum toxin
• Hemorrhagic Fever
• Smallpox
• Tuberculosis
• Typhus
• Typhoid
• Yellow Fever
• Cholera

This slide represents all of the agents known to be produced in either research or development efforts for weaponization by North Korea.

Slide 26

Biopreparat: The Defectors

Vladimir Pasechnik
1989

Ken Alibek
1992

Porton Down-U.K.

U.S.

http://www.declarepeace.org.uk/captain/murder_inc/site/pics/pasechnik.jpg

http://www.himbat.ru/gallery/albums/userpics/10002/alibek.jpg

http://www.bbc.co.uk/history/worldwars/coldwar/images/pox_ken_alibek.jpg

Much of the information that we have about the Biopreparat program was obtained from defectors, most notably, the 2 on this slide. First we begin with the one on the left, Vladimir Pasechnik, who defected from the Soviet Union in 1989 to Porton Down in the United Kingdom. He assisted with their biological defense program until 2001 when he died. Ken Alibek defected in 1992 from the Soviet Union’s Biopreparat and came to our country where he assists in our biological defense program. He also is the author of the book “Biohazard”. Source for book cover:
http://2.bp.blogspot.com/_2jHIgpEmDFE/TRSFQIAclVI/AAAAAAAAAzM/N2O_L7Mqcyo/s1600/Biohazard+Book+Cover.jpg

Slide 27

Types of Threats

Overt
• Announced
• May be for publicity
• May be to inflict harm
• May be hoax

Covert
• Unannounced
• Intended to cause mass casualties before detected
• Health care providers may not initially recognize

When talking about the type of threat of terrorism, be it bioterrorism, or chemical terrorism, there are really 2 types. The first is overt and the 2nd is covert. The **overt** threat is one that is announced, and in announcing this threat, it may be a hoax, or it may be to purposefully inflict harm. It also may be done for publicity purposes. On the other hand, a **covert** type of threat would be unannounced, with its purpose to cause mass casualties before it is detected. In a covert threat, a health care provider may not initially recognize a particular agent. Thus, it is very important to educate health care workers about the different biological agents and chemical agents that could potentially be used against our citizens.

Slide 28

Possible Delivery Systems

• Point source delivery
• Upwind line delivery (e.g. crop duster)
• Human carrier ("Outbreak")

It’s also important to differentiate the possible delivery systems of a biological agent. The first is a point source delivery, and the picture that corresponds with that type of delivery is a stamp. This is to illustrate that this is the type of delivery for the anthrax attacks in 2001 in the US. The 2nd type of delivery is an upwind line delivery, such that as would occur from a crop duster or other aerosol type device. A 3rd type of delivery system would be a human carrier. In this situation, the person would be infected with a disease that would be intended to transmit to others. When looking at the 3 types, probably the human carrier would be the least effective because it would have to be an extremely infectious agent and that carrier would have to infect a large amount of people.
This slide shows the relationship between the size of an aerosol and its infectivity. The ideal aerosol to be used as an infectious agent contains a population of 2-3 micron particulates with one or more organisms. As you can see, the smaller the agent, the lower in the respiratory tract that it can travel. The lower in the respiratory tract that an agent can infect a person, the more severe a disease results. Thus, the maximum human respiratory infection is with a particle in the 1-5 micron size. Experts consider that the most probable route of transmission for a bioterrorist agent will be by the aerosol route.

It is very important that public health workers and health care providers be aware of the clues of a covert biological incident. The first would be a very high infection rate. With a high level of global communication that we have today it would be possible to detect a high infection rate, and tools of syndromic surveillance would enable us to do that after a largely populated event such as the Super Bowl. A 2nd clue of a biological incident would be a cluster of illnesses in a location that had attended a common event. The 3rd clue would be having an agent in an unusual geography or location. For example, if you had a case of pneumonic plague in NYC, where that is not an endemic disease, that would be considered a clue. The 4th clue would be an unusual number of dead animals in an area, and this was one of the clues to tip off veterinarians about the beginning of the West Nile outbreak in our country. Another clue would be a lower attack rate in those protected from a particular agent. So let's say there were cases of smallpox and fewer cases occurred in those that had been vaccinated than in those who had not. Previously healthy persons suddenly becoming acutely ill was the clue that alerted people to the anthrax attacks of 2001.

There are some questions and concerns regarding a bioterrorism attack threat. One of the concerns about bioterrorism relates to the question: where did the scientists from Biopreparat go after the breakdown of that country? With upwards of 70,000, there are concerns that some of them may have gone to rogue nations and are assisting with bioterrorism activities there. Another area of concern is where can or have bioterrorists gotten the agents that they need? A very good example happened several years ago in West Palm Beach where a married couple were infected with botulism and ended up on ventilators in the hospital. This was traced back to a clinic where they received botox. However, the botox they received was not the intramuscular form that is usually used for cosmetic purposes, but a research grade form that had been obtained from a research facility out west. Thus, access to biological agents is a concern. As always, the ease of access to information, on the internet and in the media, for those who might want to do harm, can be problematic.
### Slide 32

**Lessons Learned**

- BW charges difficult to substantiate
- No major battles won
- Risks to users & unintended victims
- Capabilities in several countries
- Prudent to be prepared
- Current & future threats?

So we are coming to the close of our 2 lectures, and we’ve covered a lot of information. We’ve also learned several lessons. First, throughout history, it’s very difficult to substantiate the use of BW. Thankfully, no major battles have utilized BW. When using BW there are risks to not only those using it, but to unintended victims. We do know that the capabilities for BW research and development exists in several countries. So it is prudent to be prepared knowing the clues of a biological incident and the treatment that healthcare workers need to provide. We’ve talked about the current threat, and we’ve used this information in assessing the future threats. It’s also very important to point out the difference between BW and bioterrorism.

### Slide 33

**Resources**

- [www.bt.usf.edu](http://www.bt.usf.edu)
- [http://emergency.cdc.gov/bioterrorism/](http://emergency.cdc.gov/bioterrorism/)
- [www.ready.gov](http://www.ready.gov)

There are several websites with resources on this slide. The University of South Florida’s Center for Biological Defense has a section on its website entitled “Links”. This contains an extensive list of resources on this topic. The Centers for Disease Control & Prevention has several different areas that cover emergency preparedness and bioterrorism agents. “Ready.gov” is for the public and it covers the business, the home, and a section on kids to help kids prepare for the threat of bioterrorism. This concludes the lecture on “The Current Threat of Bioterrorism”.