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Terrorism: Foot-and-Mouth Disease as an Option

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ABSTRACT

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This paper reviews the definitions, vulnerabilities, terrorist ends, way, and means strategies, potential repercussions, and the potential solutions needed to remedy the threat of terrorist introduction of Foot-and-Mouth Disease (FMD) into a United States animal population.

Most recently, the U.S. has not paid much attention to terrorist threats against agricultural targets despite their acknowledged vulnerability and strategic importance. Attitudes have changed however as both the public and private sector now acknowledge that the nation's crops, livestock, and food supply are susceptible to biological attack.

Potential scenarios for the intentional introduction of FMD into the United States cattle, swine, and sheep population are proposed. They are examples of agricultural biological terrorism aimed at the economic infrastructure of the United States. Actual outbreaks of Foot-and-Mouth Disease in Great Britain and Taiwan are models of what could happen if this occurred in this country.

Agricultural Bio-terrorism (ABT) is a significant security concern for the United States. A rapid assessment and coordinated response by local, state, federal and Department of Defense assets is critical to mitigate potential damage to the U.S. economy.

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TERRORISM: FOOT-AND-MOUTH DISEASE AS AN OPTION

This paper reviews a variety of topics that relate to terrorism in general and more specifically, addresses the use of Foot-and-Mouth (FMD) as an agricultural bio-terrorism weapon. This paper also includes the strategic perspectives of Sun Tzu and Carl von Clausewitz on terrorism, defines agricultural bio-terrorism, provides a general discussion on biological warfare, reviews its historical context, and looks at the current threat of Foot-and-Mouth disease. It further assesses the U.S. posture towards terrorism, acknowledges why FMD is useful as a weapon of terror, provides some FMD threat scenarios, and speculates on the potential economic impact to the U.S. Finally, it lists possible ways the U.S. can counter the FMD threat and provides recommendations for action. Overall, this paper discusses definitions, vulnerabilities, terrorist ends, way, and means strategies, and the repercussions of FMD. Its intent is to capture some solutions that may help reduce the potential threat of terrorist introduction of Foot-and-Mouth Disease (FMD) into a United States animal population.

The end of the Cold War provided the means for leakage of materials and knowledge related to Weapons of Mass Destruction (WMD) from the former Soviet Union. Many individuals, extremist groups, and rogue states are eager to acquire such capabilities. Currently initiatives are underway at all levels of the U.S. government to enhance domestic preparedness and to develop effective countermeasures for potential biological threats, FMD is just one of these.

Lieutenant General Hussein Kamel, Saddam Hussein's son-in-law and former Director of Iraq's Military Industrialization Corporation defected to Jordan in 1995 and revealed Iraq's small but deadly biological warfare program. The ensuing cat and mouse game the United Nations played with the Iraqis' program, demonstrated just how difficult it is for anyone to verify compliance with the 1972 Biological Weapons Convention. A segment of Saddam Hussein's development program dealt with agricultural biological weapons.

The catastrophic terrorist events of 11 September 2001 surprisingly demonstrated that terrorists are capable of greater levels of military sophistication in coordination with both overt and covert state sponsorship. The economic and political repercussions of these events are devastatingly wide spread. What resulted from the 11 September 2001 attacks within the U.S., is a sense of vulnerability. This prompted U.S. officials to sound the alarm about the prospect for further terrorist attacks, including those that could involve the use of all types of biological weapons. Most recently, the U.S. has not paid much attention to terrorist threats against agricultural targets, despite their acknowledged vulnerability and strategic importance.

Attitudes have changed somewhat, as both the public and private sector now acknowledge that the nation's crops, livestock, and food supply are susceptible to biological attack.

Some potential scenarios for the intentional introduction of FMD into the United States cattle, swine, and sheep population are proposed herein. They are examples of agricultural biological terrorism aimed at the economic infrastructure of the United States. Actual outbreaks of Foot-and-Mouth Disease in Great Britain and Taiwan are models of what could happen if an attack of this nature occurred in this country.

Agricultural Bio-terrorism (ABT) is a significant security concern for the United States. A rapid assessment and coordinated response by local, state, federal and Department of Defense assets is critical in mitigating potential damage to the U.S. economy. Terrorists can glean some theories and lessons learned from some of our most popular scholars who have written on war.

SUN TZU AND CLAUSEWITZ ON TERRORISM

It is widely believed that a terrorist organization's primary goal or end is to destroy the will of their enemy to fight. The terrorist's primary weapon is the destruction of people's will generated through fear. Terrorist leadership today has the ability to act within the full spectrum of military capabilities and competencies. Many leaders are educated, have had direct military or paramilitary training, and have studied the art of war. There are two well-known military strategists; each provides insights into potential terrorist actions, Sun Tzu and Carl von Clausewitz.

Sun Tzu's dissertation on the art of war still influences students of war after 2000 years. Terrorists have access to this information. Sun Tzu says, "by moral influence I mean that which causes the people to be in harmony with their leaders, so they will accompany them in life and unto death without fear of mortal peril."¹ One common denominator found among extremist groups, both inside and outside the U.S., is their common vision. Vision encompasses ideology, shared values, and purposeful coalitions and alliances. Terrorist leadership capitalizes on this common bond to influence group actions based on their goals and objectives.

Sun Tzu emphasizes that all warfare is based on deception.² Terrorism is considered both a crime and as warfare depending on the location, situation, and magnitude of the act. Deception occurs when terrorists are able to assimilate sleeper cells of operatives into the societies they intend to attack. These sleeper operatives are nothing more than spies for use in a variety of missions. Sun Tzu says there are five types of spies: native, inside, doubled,

expendable, and living.³ As an example, we now believe that not all of Osama bin Laden's 11 September 2001 bombers knew that sacrifice of their lives would be required. They only found this out at the 11th hour. Sun Tzu's concept for spies fits the mold terrorist organizations and rogue states might follow for use of sleeper operatives. Sleeper operatives are expedient and expendable when accomplishing terrorist objectives. Sun Tzu confirms leaderships' foreknowledge of operatives' actions by his statement, "the sovereign must have full knowledge of the activities of the five sorts of agents."⁴ Bin Laden confirmed his foreknowledge of his sleeper operative's actions in a video released in December 2001. That he duped his men displays his disregard for those he leads and for life in general. His purpose seems Machiavellian in that people are only tools to be used as a means to justify an end.

Use of sleeper operatives for terrorist strategic purpose also fulfills Sun Tzu's prophecy that, "To subdue the enemy without fighting is the acme of skill."⁵ Unconventional asymmetric warfare is the predisposition of terrorist groups, because they are usually small and do not have the material or funds for large scale, head-on confrontations. Additionally, fierce intermittent attacks greatly contribute to the "fear factor" in destroying people's will as previously discussed.

The U.S. must manage its coalition partners and alliances carefully. Coalitions are extremely fragile because they are usually short term and politically charged in relation to the alliances found. Usually, the core purpose of alliances is for mutually supporting protection, which is sometimes in conflict with a coalition's external responsibilities and agreements. Sun Tzu says, "Next best is to disrupt alliances."⁶ In today's age, terrorists have the greater potential to disrupt coalitions rather than alliances, because of their fragile nature. Ever increasingly, we see conflict based upon religion rather than political ideology. Cases in point are: protestant versus catholic (Irish versus English); Muslim versus Christian (Serbs versus Croatians); Hindu versus Muslim; and Muslim versus Orthodox Jew (Palestinian versus Israeli). Out of all of these conflicts and actors, one potent fact should give you pause; it is the increasing number of fanatical extremist Muslims willing to commit suicide for their cause.

The attack on the U.S. of 11 September 2001 achieved the objective of creating fear. It convinced others to follow and give their lives for the sake of religious fanaticism by using and duping operatives to achieve that goal. The greatest mistake the terrorists made was to violate Sun Tzu's philosophy that, "the worst policy is to attack cities."⁷ This is because instead of destroying the will of the people on 11 September 2001, it galvanized public opinion. It also solidified the will of the people towards all terrorist groups, not just the one that perpetrated the criminal act.

No analysis of terrorism is complete without a look at some principles on war, from Carl von Clausewitz. Terrorism follows the guidance Clausewitz gives us that, "war is merely the continuation of policy by other means."⁸ War is an act or way to achieve political objectives. Even the seemingly irrational actions of Osama bin Laden's Al-Qaeda organizations bombing of the world trade center on September 11, 2001, had political overtones. The terrorist's objectives were to remove the United States from its perceived interference in middle-east affairs. The way to make this happen was to hit Americans where they live, at home, and at targets that symbolized U.S. national strength economically, militarily, and politically. The world trade center symbolized U.S. economic strength, the pentagon symbolized U.S. military strength, and the U.S. White House if bombing had succeeded, would have been a three-pronged assault on all sources of U.S. national power. Clearly, Al Qaeda selected their targets due to their political value, however U.S. security advisors did not anticipate all of them occurring simultaneously. As discussed previously in this narrative, even individual terrorists or groups study strategy and the art of war. It is never wise for a country like the U.S. to underestimate an adversary, take them for granted, or to assume they are intellectual paupers in the art of war. For many years the U.S. has known what its sources of strength are, conversely we should have taken a closer look at some "what if" scenarios for these centers of gravity.

The ultimate objective of a war of terrorism is, "an act of force to compel the enemy to do our will."⁹ Terrorist organizations are usually constrained by people, materiel, and monetary resources. An asymmetric attack in the form of foot-and-mouth disease may adversely affect American will, because of the fear it generates. The U.S. will view an attack of FMD on several different animal populations, as a direct attack on the U.S. economy. Its effect is insidious and the secondary and tertiary actions taken by our government would negatively affect our economic source of strength. Many businesses, markets, and exports would be devastated. The unsuspecting nature of this type of attack belies its surface potential. Resolve, retribution, and hostile feelings are certain when terrorists attack the U.S. by killing many people. An economic attack on an animal population allows terrorism to succeed by destroying sources of economic strength, diverts attention from one cause to another, generates fear, and may compel a change in U.S. will if the attacks are strategically planned.

Clausewitz notes that two different motives make men fight one another: "hostile feelings and hostile intentions."¹⁰ Terrorist acts and even U.S. responses to terrorism, find their origins couched within these terms. Many individuals, groups, and nations view the U.S. as being hegemonic and enviable by the sources of power it controls. U.S. ideology and religion

are playing a larger role in the world's view of us as a hegemonic hyper-power. These facts precipitate only hatred on a variety of levels. On the individual level, it is easy to see the disparity between the haves (west) and the have-nots (3rd world). Does poverty create terrorism? If hostile feelings generate a feeling of powerlessness, Clausewitz would say, yes. At the group and state level however, hostile feelings and hostile intentions generates fear of the unknown. Just the perception of losing of power or a way of life is sometimes enough to start a revolution. Revolutions do not necessarily have borders anymore. Neither is ideology or class status the primary concerns. It is all about obtaining and maintaining power and reducing the power of the powerful. Establishment of a good working definition of ABT is required to explore this topic more deeply. The possibility of bio-terrorism requires policy makers to ask questions that involve a deeper understanding of bio-terrorism in general. Before asking this question, definitions are introduced that will provide a sound basis for understanding the issues at hand.

WHAT IS AGRICULTURAL BIOLOGICAL WARFARE (BIO-TERRORISM)?

There is much written on the use of biological weapons as tools of mass destruction, also known as, weapons of mass destruction (WMD). Warfare in which disease-producing microorganisms, or organic biocides are used to destroy livestock, crops, or human life is biological warfare.¹¹ Agriculture refers to the science, art, and business of cultivating the soil, producing crops, and raising livestock.¹² Terrorism is the systematic use of terror, violence, and intimidation to achieve an end.¹³ The definition of biologic warfare is the use of disease to harm or kill an adversary's military forces, population, food, or livestock.¹⁴ Any use of biological material that adversely affects soil, crops, or livestock to create terror, violence, and intimidation to achieve an end is – Agricultural Bio-terrorism. The use of FMD for terrorist purposes is particularly suited for this definition. FMD is also a disease that one finds occurs naturally, similar to anthrax. Its use as an agricultural bio-terrorism weapon is easy to employ and harder to prove in terms of intent, even if a large outbreak occurred and it was thought to be deliberate. A look at some historical perspectives on FMD, reveals its true threat to the U.S.

HISTORICAL CONTEXT AND THE THREAT OF FOOT-AND-MOUTH DISEASE

Agricultural sites within the U.S. are generally unprotected. In testimony before the Senate Armed Services Committee in October 1999, Kansas State University President Jon Wefald characterized crops and animals as “soft” targets, not just, because there is no security around the nation's wheat fields and cow pastures, but also due to the nature of the terrorist act involved.¹⁵ The idea and use of Agricultural Bio-terrorism is not a new one. Centuries ago

warring factions used dead animals to foul the water holes of their enemies, thereby denying them the resources needed to fight battles and campaigns. Some historians believe that Germany during World War II, infected horses and cattle with Glanders and anthrax before Germans shipped them to America's allies.¹⁶ Beginning in the late 1930's, Japan, Britain, the U.S., France, and Russia conducted biological disease research aimed at destroying humans, crops, and animals. The Germans contemplated non-lethal warfare when they considered introducing a destructive beetle into British potato crops; by the Japanese, who considered using cereal rust spores to infect U.S. crops; and by the U.S., who worked on crop diseases that would destroy the Japanese rice industry. By 1969, President Nixon renounced all U.S. offensive research efforts in this area.

More recently, evidence uncovered by the United Nations Special Commission (UNSCOM) found that Iraqi efforts to develop anti-crop biological weapons was highlighted for the first time in 1995...UNSCOM characterized Iraqi research into plant pathogens as an attempt to acquire an economic weapon against neighboring states.¹⁷ World crimes against humanity come in many forms. Today we see extremist groups and rogue states more often than not centered in the middle east and third world countries, who are willing to kill entire populations and even themselves for their right-wing religious beliefs. If one is willing to annihilate himself and everyone else for a cause then where will it end? When the destruction of everyone and everything is complete? Then who wins? The real threat to any state faced with ABT is the potential economic collapse of a locality, region, or even the entire country. How can this occur from FMD? The infection of a large number of cattle could threaten our very existence, not just our pocketbooks. The meat industry would be devastated. Each associated market, like trucking, meat packinghouses, wholesalers, retailers, tallow markets, leather markets, and exports, would have trouble or even complete disaster. Other secondary businesses and manufacturers like restaurants, shoes, clothing, automobile, fuel, and animal food manufacturers could crash. The cascading economic effect of a large outbreak of FMD is unimaginable. Just the dropping of two towers in New York City led the U.S. government to bail out an industry that began to fail only 2 weeks after the occurrence. We will not know the full scope of how many businesses failed or jobs were lost from this event. We still do not know and 6 months have passed since the event occurred.

If there was a severe limitation in the U.S. meat supply and consumers had to shift from meat to other forms of food, a greater demand for those alternative food sources would cause prices to rise due to their limited availability. Only those who could pay would be able to eat. This might have the potential to cause starvation and even famine in certain localities and

regions within the U.S. Consider what would happen if a terrorist group used two or three wheat, corn, or soybean crop diseases intended to decimate the remaining alternate food supply and over time you would have a secondary effect of thousands to hundreds of thousands of deaths from starvation. All this caused by non-lethal livestock and crop destroying diseases. A nation's capability to wage war and be engaged in world affairs lies in its inherent health and economic prosperity. The potential threat posed by FMD and associated crop diseases is that it would cause a nation to look inward rather than outward. A nation consumed with its own problems always chooses to focus inward versus outward, and therefore has the potential to lose share in the world exchange of ideas. Terrorism has achieved its ends when they prove they have the ability to cause a world leader to withdraw from world affairs; it gives terrorism standing in the world court of public opinion because of the capabilities it displays. The U.S. has no option but to remain engaged in the face of terrorism.

These concerns about a real ABT threat rest on three main pillars: a few actual cases of contamination and hoaxes are linked to terrorist groups, consensus within the agricultural community that the sector is vulnerable, and the importance of agriculture to the U.S. economy and the nation's overall security.¹⁸ The threat is real and the U.S. has heightened its awareness since 11 September 2001 by centering on countering the threat.

Some say that Foot-and-Mouth disease is the new low-tech weapon of mass destruction, available at virtually zero cost, capable of mass production, and transportable without detection in a container the size of a fountain pen. Foot-and-Mouth is an ideal low-level terrorist weapon, capable of creating economic catastrophe, ruining international image, and lowering morale without killing people.¹⁹ How the U.S. controls the quality of its exports, controls how the international community views the U.S. How we react to our internal problem of controlling the FMD virus within our borders, impacts our international exports. If the U.S. does not control and alleviate the fear factor, then our exports will suffer even when we have control of the virus. Government needs to ask two questions, "How will the terrorists use this medium of terror and what are the possible scenarios"?

AGRICULTURAL BIO-TERRORISM – FOOT-AND-MOUTH DISEASE

Agricultural Biological terrorism is a potential means by which any terrorist organization can attack the United States. Foot-and-mouth disease is one method to employ by these means. FMD is an acute, highly contagious degenerative but usually nonfatal viral disease of cattle, and other cloven-hoofed animals, that is characterized by fever and the eruption of vesicles around the mouth and hoofs.²⁰ Pigs, sheep, goats, and buffalo are some of the other

animals affected by this disease. Many affected animals recover, but the disease leaves them debilitated. FMD causes severe losses in the production of meat and milk.²¹ Foot-and-Mouth is prevalent in the following localities: the Middle East, Africa, South America, and many Asian countries with the exclusion of Australasia, Japan, Indonesia, and Korea. Due to the many world locations mentioned, it makes it very easy for terrorists to gather infectious material for transfer and use as a weapon.

Many animal growing, slaughter, and distribution centers are regionally located within the United States. Farmers typically raise similar animals in the same geographical area for suitability and access to markets reasons. An attack on the U.S. with FMD used as a bio-weapon, is a real asymmetrical threat that would be desirable to a terrorist for the following reasons: it is cheap, it is spread easily, it is extremely contagious among certain groups of animals, it does not react the same way in humans, and the economic impact would be devastating. FMD is generally, transferred between animals by contact between susceptible and infected animals. An infected animal has a large amount of aerosol virus in their exhaled air, which can infect other animals via the respiratory or oral routes.²² U.S. political and military policies are general in specification. Government policies do however cover the full spectrum of conflict management and response, including terrorism.

U.S. POLITICAL AND MILITARY POSTURE TOWARDS TERRORISM

The U.S. documents its political, economic, and military strategy in a group of publications, which taken in combination, describes our national strategy towards the world of which terrorism is but a subset. Typically, these publications should have a hierarchy between them and if everything in the system worked, as it should, policies would be time phased by order of precedence. This is usually not the case; in reality, theory and actuality are never in synchronization. When the U.S. elects a new president, he usually issues a National Security Policy (NSS). This NSS then influences the National Military Strategy (NMS), the military's guide for carrying out the goals established by the NSS. The Chairman of the Joint Chiefs of Staff (CJCS) issues the NMS. Following the NMS is a Quadrennial Defense Review Report (QDR) conducted to review the military's capabilities in carrying out its assigned mission. The Secretary of Defense issues this document. The CJCS issues his vision for how the services will work together to meet the requirements of the NMS in a Joint Vision. The current vision is entitled Joint Vision 2020 (JV2020). Additionally from the political side, the Department of State issues a document called the Patterns of Global Terrorism to identify groups that are threats to the U.S.

The primary reason for the preceding paragraph is to show how our national policy is out of synchronization in its various components. As of the writing of this paper, we have a NSS written in December 2000 not issued by the current President. The NMS was issued in 1997, a Joint Vision issued in 2000, the Patterns of Global Terrorism issued in April 2001, and the QDR issued in September 2001.

Clearly in terms of addressing terrorism, the QDR and State Department's Patterns of Global Terrorism 2000, give the greatest clues to the actual U.S. strategy towards terrorism. The QDR addresses the military's objective of assessing vulnerabilities based on capabilities rather than on threats. Previously, assessments were threat based and focused on where an adversary might be or where a war might occur versus looking at all actors, individuals, groups, states, and alliances that can muster the capability to fight and inflict damage on U.S. interests. It is within this context of assessing vulnerabilities that U.S. defense strategy attempts to assure allies and friends, dissuade future military competition, deter threats and coercion against U.S. interests, and if deterrence fails, decisively defeating the enemy.²³ The U.S. has developed these objectives to encompass every contingency. The objectives include terrorism, even though the objectives do not specifically speak about terrorism. The real shift comes in the form of primarily focusing on states to looking at all actors; this includes looking at individuals, groups, states, and alliances with equal determination. The U.S. has always looked at these actors, but has never put the emphasis it needed on all actors. The preface of the QDR makes it clear that a new war has begun where the victims of the 11 September 2001 bombing of the world trade center were in its words, "they died as victims of war" and "not from traditional armies waging traditional campaigns, but from the brutal, faceless weapons of terror."²⁴ The U.S. State department on the other hand clearly defines terrorism as a threat and publishes its research in the Patterns of Global Terrorism.

There are four basic policy objectives of the U.S. towards terrorism as of September 11, 2001. They are to: make no concession to terrorists and strike no deals; bring terrorists to justice for their crimes; isolate and apply pressure on states that sponsor terrorism to force them to change their behavior; and bolster the counter-terrorist capabilities of those countries that work with the U.S. and require assistance.²⁵ The U.S. recognizes terrorism as an international problem. It does not however address how it will handle terrorist actions that involve chemical, biological, radiological, nuclear, or high explosive (CBRNE) in its policy by other than saying it will bring them to justice. In the year 2000, international terrorist attacks took the following toll: 557 facilities struck, 423 attacks, 1,196 total casualties, and 405 dead.²⁶ The year 2001 will show that violence has increased to well over 3000 dead in the U.S. alone. Where is terrorism

going and what is the potential impact on the U.S.? Terrorists have objectives and there is a purpose for their actions, even though at times these actions seem to be indiscriminate. Sun Tzu reflects this revelation in the previous discussion. We must ask the questions, “if the terrorists can kill so many, impact our economy so significantly, and continuously get media coverage for their cause, then what is next?” The next terrorist event will not be small, because if it is, it will seem insignificant. The only alternatives a terrorist has are to improve on the devastation and terror caused on 11 September 2001, by using CBRNE in a way that will cause an equally or significantly greater devastating effect. This intended effect could be the non-lethal use of a biological virus to destroy the U.S. economy. This ambition is an enabler for foot-and-mouth disease use in asymmetrical attacks on the U.S. economy.

The NSS clearly delineates that U.S. policy towards new threats requires defense of the homeland against weapons of mass destruction (WMD) i.e., CBRNE, and that terrorism has taken on new importance.²⁷ Additionally, the NSS specifies some clear actions the U.S. will take in response to terrorism. In response to a terrorist act, we will use our consequence management efforts to mitigate injury and damage.²⁸ We will also work to prevent and respond to terrorism by intelligence collection by breaking up cells, limiting the movement, planning, and organization of terrorists.²⁹ This policy’s appreciation is not lost to the government, but is to the public at large because of its unknowns. The State Department identifies 43 active international terrorist groups, their area of operation, strength, and activities.³⁰ The NMS identifies military policy and the potentiality of asymmetric threats. The three primary threats are terrorism, the use of WMD, and information warfare.³¹ As early as 1997, the military identified these risks and their potential to threaten the U.S. homeland. Additionally, in JV2020 the military knows that asymmetric methods and objectives of an adversary are often far more important than the relative technological imbalance, and the psychological impact of an attack might far outweigh the actual physical damage inflicted.³² The psychological impact of a biological attack on our food source by foot-and-mouth disease would in fact, outweigh the physical damage it inflicts. It will create an ongoing nervousness in the population at large in anticipation of further attacks. Terrorist use of FMD would be extremely hard to prove and would probably provoke little fear of reprisal for the perpetrator, since no direct human deaths would occur. Time is also on the side of the terrorist. Use of FMD as a weapon gives the perpetrator plenty of time to go or be somewhere else when the viral reaction occurs. It is not like using a bomb or conducting a chemical attack that is immediate. FMD use is insidious and pervasive. Countries have been using bio-terrorism for years and their preparations and reactions are varied. What if rogue States believed it was in their interest to provide monetary support to terrorists? Terrorists

might convince these rogue states to provide capabilities or resources that are not easily obtainable.

WHY FOOT-AND-MOUTH AS AN AGRO BIO-TERROR WEAPON?

Terrorist goals vary greatly by the ends they intend to create. Many terrorists do not want to sacrifice their lives in order to perform an act of terror using biological weapons. There is little open source evidence available that proves foreign terrorists use biological weapons for their purposes; although many believe, various groups are creating this capability. Even rogue states with a biological weapon capability are reluctant to use the weapon due to its unpredictability. Traditionally, biological weapons of mass destruction have deterred others who also possess the potential to use them. There is no documented proactive use of weaponized biological agents in the twenty-first century by any state actor. Terrorist use of FMD would assure that a great economic toll would result by the wide variety of markets affected, although there would be virtually no fear of human death by this action.

There are three basic groupings of fatal diseases having potential for bio-terrorist use. These groupings are: animal diseases, human diseases, and zoonoses. Animal diseases include: African swine fever, Foot-and-Mouth, Fowl plague, Newcastle, and Rinderpest. Human diseases include: Smallpox, Cholera, and Shigellosis. Zoonoses are a larger group of controllable diseases that are not highly contagious, even though they can fatally affect both animal and human subjects. These include: Anthrax, Brucellosis, Coccidiomycosis, EEE/VEE/WEE, Ebola/Marburg, Histoplasmosis, Melioidosis, Glanders, Plague, Psittacosis, Q Fever, and Tularemia. Animal diseases are particularly desirable as a terrorist weapon because they are predisposed only to certain animal sectors and will not typically jump to humans. There is virtually no real use for animal diseases other than research and as a weapon of terror. It is very hard to measure the intent to use a foreign animal disease agent such as FMD. The environment provides easy access to the disease. Research and development is not a requirement in spreading this disease, one needs minimal preparation before taking provocative action. Due to the highly contagious nature of FMD, no production effort is required before spreading the disease. One only needs to find infected animals. No weaponization of the disease is required to make it more effective as in the case of anthrax spore usage. A potentially high economic impact is obtainable in conjunction with actual infections and hoax methodologies. Previously unreported or previously regionally eradicated infectious diseases to which livestock populations are susceptible, cases or outbreaks of which may occur as a result of transfer of etiologic agent by animals, humans or fomites plus intent equals TERRORISM.³³

How a terrorist would employ FMD is essential in developing potential threat scenarios. The next section attempts to provide some answers and identifies some possible methods of employment.

TERRORIST MEANS – FMD THREAT SCENARIOS

The ability of individuals, groups, or states intending to inflict FMD ABT on U.S. interests could be quite simple. It is easy for anyone who wants to obtain infectious materials of this variety. They could gather infectious material by a visit to a farm where an outbreak occurred or could visit a region of the world where the disease is endemic. The delivery means for distributing the disease does not have to be very sophisticated. Professor Corrie Brown, Head of the Veterinary Pathology Department at the University of Georgia, argued that a terrorist could target large animal populations by dropping contaminated feces into a feeding trough, or by inserting disease-containing fluids into a facility's air intake valve.³⁴

Professor Malcolm Dando, of the Bradford University's Department of Peace Studies said, "Foot-and-mouth is one of the obvious agents you would use if you wanted to attack a country's animal stock...the natural outbreak we have just seen was bad enough, so you can imagine what someone could achieve if the virus was spread deliberately, how easy it would be to do and how difficult it would be to tackle."³⁵

The Federal Bureau of Investigation has identified the largest domestic threat to be the "lone wolf" terrorist-an individual who operates alone.³⁶ It would be easiest for a single individual masquerading in the appropriate guise to spread FMD. A group does not blend in well and attracts too much attention in rural areas, although a group touring at a cattle production location or state fair could inflict significant damage without detection. The National Pork Producers council decided to cancel the 2001 World Pork Expo over concerns that foreign visitors could spread the virus at the show.³⁷ In the preceding scenario, the virus spreads to every animal farm in the region that attended the local fair or expo.

Global travel by humans can also carry the Foot-and-Mouth virus, in the food they carry (declared or not), and on the clothes they wear.³⁸ Vehicles, tools and clothing worn by animal handlers can also transport the FMD virus. Once the virus spreads to animals each infected cow, pig, or sheep have the potential to breath out thousands of virus particles that can become airborne, carried by the wind, and spread as far as 100 kilometers. The possibility of infection increases every time exchange students from Europe come to visit farms in the U.S. Even an unknowing, innocent person could unintentionally spread a virus during one of these visits. How far do we go in prevention and identification? Do we have the technology to look for

viral contamination in new and inexpensive ways? One company, *Tetracore Inc.*, has also developed a PCR based assay for Foot-and-Mouth Disease, in which the 3D-RNA polymerase gene can be amplified and detected within an hour.³⁹ This portable assay can detect all seven types of FMD. This test is extremely beneficial for use with sheep because it is hard to diagnose the disease in them as compared to other animals. The test is also good for early diagnosis when symptoms may not be prevalent in the tested population.

Another scenario would be a member of the terrorist group travels to a country where the FMD virus is endemic and widely available to obtain scabs or fluid from infected animals. Terrorist then infects a small herd of pigs to incubate the virus. Samples are collected and buffered at a pH between 6.5 and 11 to maintain viability and are placed in containers to aerosolize the virus. The terrorist member then travels to various livestock centers, fairs, and expos in the U. S. during summer months and sprays the virus into cattle, swine, and sheep pens and trucks. Bought, sold and traded animals are transported to farms and packing houses located throughout the region. After the exposed animals have gone, the contaminated pens and grounds will infect the next group of animals that enter them, and the cycle will continue until area decontamination occurs. When one company owns a large number of animals, frequent and rapid interstate movement occurs. This movement can spread infection across many states before clinical signs are manifest in the source herd.⁴⁰

The greatest threat of ABT is the new ability of scientists to genetically alter viral materials. Are we losing control of our agricultural biology? If we do, this could open an immense door to the unknown. Where is the recombinant DNA (rDNA) genetic engineering paradigm in general leading humanity? The downside of pursuing this trajectory is that we may not be able to control the outcomes or we may not be able to react quickly enough to outcomes designed to attack our country. One country that has faced potential bio-terrorism is England. Some say the outbreaks of FMD are natural and others say they are a result of terrorist acts.

FMD IN ENGLAND

The cost of FMD to the British has been astounding in 2000/2001 alone. Most believe these outbreaks to be natural. Others however believe the British have been victims of ABT. Over 4 billion pounds had been lost from the Gross British Product (GBP).⁴¹ The GBP is the measure of their economy and this figure was less than some other previous estimates. Other nations such as Britain have asked questions such as: if nuclear weapons and space technology dominate global defense thinking, what is left for the smaller and rogue nations without access to them? Are we naive enough to believe that recent advances in microbiology

and genomic biology will be restricted to use by civilians. The answer to this question is no. Governments and individuals both seek low-cost, high payoff, military use items as an answer to power. With the threat of frozen funds or impounded funds by Governments working in concert against terrorism, terrorist and rogue states would opt for the lowest cost, highest payoff solution to achieve their objectives. States and individuals are recognizing that low cost alternatives to nuclear weapons and space technologies are in biological and chemical weapon solutions. We have seen this in the Serin gas attack that occurred in a Japanese subway. The second and third order effects of FMD have adversely affected agricultural businesses, tourism, and the wider economy in the East of England. Affected are diverse parts of the economy that include village shops, pubs, and the horse racing industry. The population will feel the residual effects for several years. How do these actions relate to a potential attack in the U.S.? What are the potential economic impacts to the U.S.?

ECONOMIC IMPACT

U.S. agriculture is a \$1 trillion industry, generates some 22 million jobs and \$140 billion in annual exports, and comprises about fifteen percent of the Gross National Product.⁴² "It would not take a great deal of imagination to see what organized crime or a hostile country could do with such a biological agent if it wanted to ruin the economic security of a country - and the economy is one of the main ways we measure a country's stability these days."⁴³

Millions of tons a year is the measure for trade in meat products across the globe. Tracing the source of every gram of flesh is all but impossible after an outbreak of Foot-and-Mouth.⁴⁴ Calculating what the economic impact FMD would have in the United States on the cattle population alone, is difficult. Estimated costs range from \$2 billion to \$24 billion.⁴⁵ Others say the U.S. beef industry alone, constitutes about a 54 billion dollar a year business.⁴⁶

Roger Olson, state veterinarian for the Maryland Department of Agriculture, was cited as saying that he wants to prepare for an outbreak of the highly contagious foot-and-mouth disease, which could damage the state's \$11 billion-a-year farming industry, and he proposed conducting a drill the same day a top federal official said the chances are "quite great" the disease -- which has devastated British livestock -- will surface in the United States.⁴⁷

Rapid control of FMD incursions is required to protect the long-term health and profitability of U.S. animal agriculture. Control usually means eradication in the U.S. Eradication presents significant short-term costs for industry and government. In addition to eradication costs, the most immediate and severe consequences of a FMD occurrence in the United States is the loss of export markets. U.S. animal agriculture is dependent on exports.

Most long-term strategic plans call for an increasing amount of goods sold abroad within the cattle, swine, and sheep industries. Increased profitability for industries, results from increases in the U.S. global market share for goods and services they sell. As the total production percentage destined for export grows, greater is the potential for a domestic FMD outbreak to adversely impact exports. Other countries will not allow the importation of animals or animal products that pose a risk to their industries. In 1997, the total value of exported U.S. animals and animal products exceeded \$7 billion: \$2.3 billion in poultry, \$1 billion in pork, and \$2.6 billion in cattle and cattle products.⁴⁸

Statistics provided by the U.S. Department of Agriculture indicate the U.S. is the world's third highest producer, second highest importer, third highest exporter, and third highest consumer of pork. Japan, Mexico, and Canada are the top three importers of U.S. pork. In calendar year 2000, these imports totaled about 1 billion dollars. No other countries came close to this dollar figure. We can see what the potential impact would be if FMD was passed unintentionally to these countries. The dollar impact would be incalculable. Second and third order affects have the potential to negatively influence our friends and ally's, as well as our own nation. Beef, veal, variety meats, buffalo, tallow, hides, and skins are other examples of U.S. exports. These exports are once again in the billions of dollars. Many countries import these items. Economic globalization has made the world a smaller place. It has connected the world by making economies interdependent. The effect of an attack on the U.S. is in fact an attack on the nations that routinely do business with us in these areas. A FMD outbreak might not create wholesale starvation in the U.S., but could set in motion negative events for nations teetering on the brink of starvation who rely on our exports for food.

Clearly, it can be seen that potential economic catastrophe lies on the horizon if we fail to consider and plan for this type of threat. Costs of prevention could be astronomical if left unchecked. Any governmental intervention by regulation or taxation will ultimately pass costs to consumers. Prevention costs need to be balanced by the potential costs from an attack. The U.S. currently has plans to counter the threat, but coordination between state and federal levels is the weakest link. States perform most of the planning, since they are typically the first responders.

U.S. COUNTER THREAT RESPONSE

There are many Federal policies and contingency plans in place to prepare for and respond to biological terrorist attacks. A series of Presidential directives with implementing guidance defines U.S. Government policies for combating terrorism. Crisis management and

consequence management are the two categories of Government response to terrorism and would be the response to ABT. Crisis management is proactive in its purpose to stop terrorist attacks, arrest terrorists, and gather evidence for criminal prosecution. The Department of Justice (DoJ) has primary responsibility and leads the U.S. crisis management effort through the Federal Bureau of Investigation (FBI). The DoJ and the FBI on-scene commander will coordinate with all federal agencies and departments during crisis management. Consequence management, on the other hand is primarily a reactive activity and primary responsibility is with state and local authorities. The Federal Emergency Management Agency (FEMA) leads the consequence management effort for the federal government. Consequence management includes efforts to provide emergency medical services, evacuation of dangerous areas, and restoration of governmental services.

The nature of the incident will determine whether or not, crisis and consequence management activities may overlap or run concurrently during emergency responses. Contingency plans are available to the Federal government to operate under in case of a biological terrorist incident. The U.S. Government Interagency Domestic Terrorism Concept of Operations Plan establishes conceptual guidelines for assessing and monitoring a developing threat, notifying appropriate agencies concerning the nature of the threat, and deploying necessary advisory and technical resources to assist the lead federal agency in facilitating interdepartmental coordination of crisis and consequence management activities.⁴⁹ FEMA would coordinate all national disaster activities when the President declares a federal emergency. There is a generic disaster contingency plan called the Federal Response Plan (FRP) to use by FEMA for this situation. The FRP has an annex to use specifically for situations resulting from acts of terrorism. The FRP annex outlines the roles that federal agencies need to take during consequence management activities in response to terrorist attacks. The plan provides planning assumptions, policies, concepts of operation, organizational structures, and specific assignment of responsibilities to key departments and agencies.

Most recently, the U.S. senate has proposed senate bill, S1546 entitled the Bio-security for Agriculture Act, which proposes funding of \$1.1 billion in 2002 and \$271 million per year for the next 10 years after that.

RECOMMENDATIONS

Efforts must be centered on improving overall coordination between the federal government, state, and local authorities in the areas of command and control, planning and operations, resource management and logistics, communication, exercises, carcass handling

capabilities, public health surveillance, detection and risk assessment, protective equipment and training, medical and veterinary coordination, vaccination, and isolation procedures.

Vaccination will be the ultimate key to prevention. The cost of vaccination will be less expensive in the end, compared to the potential economic damage that could occur if an outbreak happens. An improved vaccine for foot-and-mouth disease is at least three years off so the United States would likely fight the virus in the same way that Britain has. U.S. scientists are bracing for the possible arrival of the livestock infection that has gripped Europe.⁵⁰

Review policies, procedures, and overall inspection program that examines international travelers and their ability to carry the FMD virus in the food they bring and the clothes they wear to the U.S.

Adequately fund and prepare our first responders, the field veterinarians and plant disease experts to react to the farmer's needs and respond to FMD occurrences. They need to be able to accomplish expeditious field genetic analysis on suspect pathogens. The U.S. needs quarantine facilities and field methods to reduce the spread of the disease and provide a means to study the infected populations.

Identify and categorize the intelligence means needed to collect information on potential threat pathogens. This includes the need for increased security and awareness at the facilities that have detection and protection programs like those at Plum Island, New York and Ames, Iowa. This includes the need to upgrade some of the Department of Agriculture facilities from a Biological Level Three (BL3) capability to Biological Level 4 (BL4).

CONCLUSION

The U.S. should view any attack on animal populations during crisis, conflict, or peace as a probable bio-terrorist act. If the U.S. is to avoid an ABT "Pearl Harbor," it needs to take seriously the possibility of an attack on the susceptible U.S. animal populations. Our nation's leaders must reduce U.S. vulnerability and ensure that consequences related to a surprise attack on U.S. meat producing animal populations are limited in their effects.

The U.S. is economically very dependent on production, import, and export of animal food and clothing products. The U.S. is one of the leading nations in each of these three areas, yet the threat to the U.S. and its allies does not command the attention it merits from the departments and agencies of the U.S. Government charged with national security responsibilities. Consequently, evaluation of the threat to the U.S. economy via animal populations currently lacks priority in the competition for intelligence collection and analytic resources. Failure to develop a credible threat analysis could have serious consequences for

the U.S. It could leave the U.S. vulnerable to surprises in our homeland and could result in deferred decisions on developing protection measures due to the lack of a validated, well-understood threat. If the U.S. offers an inviting target, it may well pay the price of attack. Warning signs of an inviting target are as simple as “access” to FMD susceptible animal populations. Today our farms, fairs, and shows are too open to anyone who might be a threat. The signs of vulnerability are not always so clear and therefore are not always recognized. Hostile actions against animal populations can reasonably be confused with natural phenomena. Such ambiguity and uncertainty could be fatal to the successful management of a crisis or resolution of a conflict. They could lead to forbearance when action is needed or to hasty action when more or better information would give rise to a broader and more effective set of response options.

Recent history shows the U.S. did not set a high enough priority on terrorist warning signs and that it resisted change until an external, improbable event forced them to take action. The question is whether the U.S. will be wise enough to act responsibly and soon enough to reduce its vulnerability to ABT in general and specifically in the form of FMD. It should be our hope that an agricultural pearl harbor will not occur or be the event required to galvanize the nation and cause the Government to act in the face of this terrible threat.

WORD COUNT= 7997

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