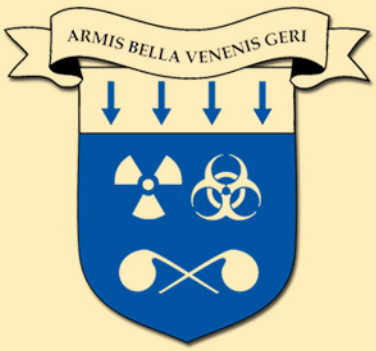
The Impact of Quarantine on Military Operations

Colonel Robert I. Miller, Colonel, USAF



US Air Force
Counterproliferation Center
Future Warfare Series
No. 31

31

THE IMPACT OF QUARANTINE ON MILITARY OPERATIONS

by

Robert I. Miller

The Counterproliferation Papers
Future Warfare Series No. 31
USAF Counterproliferation Center

Air University
Maxwell Air Force Base, Alabama

The Impact of Quarantine on Military Operations

Robert I. Miller

August 2005

The Counterproliferation Papers Series was established by the USAF Counterproliferation Center to provide information and analysis to assist the understanding of the U.S. national security policy-makers and USAF officers to help them better prepare to counter the threat from weapons of mass destruction. Copies of No. 31 and previous papers in this series are available from the USAF Counterproliferation Center, 325 Chennault Circle, Maxwell AFB AL 36112-6427. The fax number is (334) 953-7530; phone (334) 953-7538.

Counterproliferation Paper No. 31

USAF Counterproliferation Center

Air University

Maxwell Air Force Base, Alabama 36112-6427

The Internet address for the USAF Counterproliferation Center is:

http://www.au.af.mil/au/awc/awcgate/awc-cps.htm

Contents

Disclaimer

The views expressed in this publication are those of the author and do not reflect the official policy or position of the U.S. Government, Department of Defense, or the USAF Counterproliferation Center.

The Author

Dr. Robert I. Miller, Colonel, USAF, MC is the Commander of the 48th Medical Group at RAF Lakenheath in England. As Commander, he is responsible for the largest Air Force medical facility in Europe. The 48th Medical Group has primary responsibility for the force health protection and direct medical care of two major wings locally and the referral care of more than 35,000 American forces and associated personnel in the United Kingdom. Col Miller has a Masters Degree in Strategic Studies from the Air War College at Maxwell AFB, AL. He is board certified in both general pediatrics and developmental-behavioral pediatrics by the American Board of Pediatrics. He is also a Certified Physician Executive by the Certifying Commission in Medical Management.

The Impact of Quarantine on Military Operations

Robert I. Miller

I. Introduction

> *The single biggest threat to man's continued dominance on the planet is the virus.*
>
> –Joshua Lederberg, PhD, Nobel Laureate

The above quote precedes the opening battle scene in the 1995 Warner Brothers hit movie *Outbreak* which graphically depicts the problems the Department of Defense (DoD) may face in preventing a global meltdown secondary to the uncontrolled spread of a deadly biological agent. Although fictional, this technothriller was based in scientific possibility and used the highly virulent Ebola virus as the model for a rare killer virus from the jungles of Zaire, which mutated from a contact to airborne strain and ultimately took hold in a small California community. With no treatment or vaccine immediately available, the military was ordered to institute mandatory isolation and quarantine as the last hope of containing the virus.

The film provided a classic example of how terror and panic can result if quarantine is implemented inappropriately, whether secondary to an act of bioterrorism or in response to a naturally occurring infection that is spread by chance as occurred in *Outbreak*. The film's producer, Arnold Kopelson, stated that "the most frightening aspect of the story is the real potential of such a contagion developing in the real world at any given moment."[1] The recent Severe Acute Respiratory Syndrome (SARS) pandemic clearly substantiates this fear. In the Global War On Terrorism (GWOT), the threat goes beyond naturally occurring bacteria or viruses, and the military must be prepared to prevent a replay of the initial battle

scene from *Outbreak* where the field surgeon states, "men wounded in battle we can deal with, but this strange disease…thirty men dead yesterday…eighteen the day before…"[2] In dealing with an enemy that attacks at the microscopic level, an installation commander must understand that the contagion will not be stopped by the perimeter fence, and sustained operations are dependent on an aggressive, time-sensitive response. Ideally, immunizations and chemoprophylaxis for those exposed will be available assuming early identification of a known agent with treatment options, however, this may be unrealistic in certain settings. When this is not possible, quarantine is at the heart of an effective disease containment strategy in the war against bioterrorism providing the military with the best chance for preparedness and response against any biologic contagion.

As stated in the 2004 United States Air Force Counter-Chemical, Biological, Radiological, Nuclear, and High-yield Explosive (C-CBRNE) Master Plan, the Air Force must be able to survive, fight, and win in a CBRNE environment. Quarantine is an effective public health measure that can impact two of the five C-CBRNE pillars discussed in this document to include passive defense and consequence management.[3]

The goal of quarantine is to enable forces to survive, operate, and ultimately restore essential operations in a biological-contaminated environment, while maintaining disease containment. The importance of quarantine as a disease outbreak control measure is supported by recent historical experience, and much can be learned from a better understanding of the 2003 SARS pandemic. Mandatory quarantine also raises concerns about loss of civil liberties. It is beneficial to fully appreciate the legal issues and policy guidance that come into play in regards to bioterrorism preparedness and response.

The anthrax letters of 2001 provided the impetus for the Model State Emergency Health Powers Act that served as a key framework for states in reviewing their outdated quarantine laws, and these laws have been put to the test in multiple bioterrorism exercises throughout the United States. Although anthrax served as the trigger, it should be noted that quarantine of potentially exposed personnel is effective for diseases such as smallpox or plague that is spread from person to person, but it is not helpful for other diseases like anthrax that are not communicable. The DoD has also been active in updating guidance regarding quarantine implementation,

however, the operational implications for using quarantine or other restriction of movement measures are not well described.

The purpose of this paper is to fully define the role of quarantine as a battle-tested public health strategy and its potential impact on military operations in the United States Air Force (USAF). The primary emphasis will focus on how a commander can carry out effective operations while adhering to quarantine requirements during the initial 72-hour period following the realization of an outbreak. Quarantine may not be appropriate in all cases, however, this may not be clear until a definitive diagnosis is known, which takes time. Unfortunately, time is not on the side of a commander forced with making a decision on how best to respond to an emerging disease outbreak.

From a medical perspective, the initial 72-hour period was selected as a reasonable, conservative window for intervention based on recent bioterrorism exercises. This period of assessment will most likely precede arrival of additional support and formal identification of the involved agent, especially at an overseas installation. Actions taken during this critical period will determine if a commander has any hope of containing spread after a biologic attack. Disease containment challenges faced by a commander at an overseas installation are greater than in the Continental United States (CONUS) based on limited resources with a higher level of threat, so recommendations will focus on quarantine implementation in the overseas environment. That being said, many of the recommendations regarding timing of quarantine and sustainment options will be applicable regardless of the facility location or source of the biologic threat.

II. History of Quarantine

The formal practice of quarantine has a long history dating back to fourteenth century Italy when ships arriving in Venice from infected ports were required to sit at anchor for forty days before landing to protect coastal cities from plague epidemics.[4] United States history involving quarantine was sporadic and implementation was primarily at the state level until 1878 following the passage of Federal Quarantine Legislation by Congress secondary to yellow fever epidemics, although control still remained with state public health officials.[5] It was not until 1892 with the arrival of cholera that this law was reinterpreted to allow the federal government more authority in imposing quarantine, which resulted in questionable targeting of certain ethnic groups as occurred with Jewish immigrants in New York.[6] Quarantine boundaries were also enforced around Chinese residences and businesses in San Francisco in 1910 after the discovery of plague.[7]

The 1944 Public Health Service Act established the federal government's authority over quarantine.[8] Federal responsibility was transferred to what is now known as the Centers for Disease Control and Prevention (CDC) in 1967, and the Division of Global Migration and Quarantine now has authority to prevent interstate spread of disease or introduction of diseases from foreign countries as per U.S. Code 264 Title 42.[9] Communicable diseases for which federal isolation and quarantine are authorized are clarified in Executive Order 12452 and include cholera, diphtheria, infectious tuberculosis, plague, smallpox, yellow fever, and viral hemorrhagic fevers.[10] SARS was added to this list in April 2003 as per Executive Order 13295.[11]

In addition to quarantine, isolation is another option for imposing a restriction of movement. Isolation refers to separation of persons who have a specific infectious illness from those who are healthy to stop the spread of that illness.[12] In contrast, quarantine involves the separation and restriction of movement of persons who are not yet ill, but have been exposed to an infectious agent and therefore may become infectious.[13] Quarantine may be voluntary or compulsory and although implemented for the common good, it results in the restriction of some personal liberties.[14] Although isolation requirements are frequently straightforward

and accepted by society given the presence of active disease, differing opinions exist regarding appropriate use of quarantine secondary to concerns over loss of civil liberties. Quarantine of individuals is only effective for diseases that have the potential for communicability from person to person such as plague, smallpox, viral hemorrhagic fevers, influenza, and SARS.

III. SARS

> *The kinds of things we are doing for SARS we can anticipate we are going to do again and again.*
>
> –Dr. Julie L. Geberding[15]

Dr. Geberding, Director of the CDC, made the above statement about SARS while testifying before the Senate Committee on Health, Education, Labor and Pensions on April 29, 2003.[16] SARS was responsible for the first pandemic of the twenty-first century after quietly emerging in China's Guangdong Province in November 2002 and dramatically spreading to 27 countries on five continents in 2003.[17] On March 12, 2003, the World Health Organization (WHO) issued a historic global alert for this previously unknown deadly disease which resulted in aggressive containment efforts that brought an end to the pandemic in July 2003, but not until more than 8,000 cases and 780 deaths had been reported to WHO.[18]

There are many positive, basic public health lessons to be learned from SARS. Measures of surveillance, infection control, isolation, and quarantine were directly responsible for bringing this new deadly disease under control. Quarantine was implemented on an unprecedented scale in China, Canada, Hong Kong, Singapore, Taiwan, and Vietnam, resulting in numerous challenges for public health officials and policy makers given the broad impact of this strategy.[19] Quarantine was not a complete success in all jurisdictions secondary to a questionable implementation strategy in China and Taiwan, but these cases were the exceptions. It is from these experiences that the military can gain valuable insight regarding the use of quarantine in response to possible bioterrorism or other public health emergencies and its impact on military operations.

Epidemiology & Clinical Features of SARS

The causative agent behind SARS, a new coronavirus (SARS-CoV), was successfully identified only weeks after WHO's global alert was announced.[20] Human-to-human spread is the predominant mode of

transmission of SARS, primarily involving the respiratory route via direct or indirect contact of mucous membranes (eyes, nose, or mouth) with infectious droplets.[21] The virus has an insidious onset with an incubation period of 4 to 7 days, which occasionally may be as long as 14 days before the appearance of symptoms.[22] The non-specific clinical presentation of SARS makes it difficult to distinguish from routine upper respiratory infections. Although laboratory tests can be helpful in ultimately confirming a diagnosis, they do not reliably detect infection early in the illness. This is due to the fact that antibody, which is responsible for a positive test result, is detectable only after the first week of illness.[23] The viral load in an infected patient is initially low and reaches a peak during the second week of illness.[24] This explains why no transmission has occurred from patients who have yet to develop symptoms and why most cases of transmission have occurred with severe, hospitalized patients who have a high viral load.[25]

This also explains why it was possible for an apparently healthy person to travel by air almost anywhere in the world after being exposed. The average number of secondary cases resulting from each case was estimated to be two to four, however, "super-spreading" occurred from a few infected person who were responsible for a disproportionate number of transmissions.[26] For example, one patient in China was responsible for infecting 100 people on January 31, 2002, during a Chinese New Year celebration, 56 staff members during two subsequent hospitalizations, and 19 family members.[27] Although specific quarantine orders varied by country, large numbers of healthy people with an exposure history were placed in quarantine for up to 14 days given the known epidemiologic history of the disease and the limitations of laboratory testing. The length of quarantine was based on the estimated incubation period, which is different for every disease, and the maximal incubation period for SARS was 14 days. This action was supported given that in the absence of a vaccine, effective drugs or natural immunity, the only available public health strategies to limit the impact of SARS involved rapid identification of infected person and implementation of control measures to include isolation and quarantine.[28]

Quarantine & SARS

Because little was known about the actual risk of transmission when the WHO issued its global health alert in March 2003, the actual methods used to implement quarantine against SARS varied by country. Options exist for setting up quarantine locations, and multiple strategies were attempted during the outbreak. Quarantine of definitive contact cases such as household or family members was the most intuitive and resulted in "home isolation" whereby contacts were urged to remain at home for a 10 to 14-day period with telephone follow-up by public health workers in several countries.[29] "Work quarantine" was commonly used for health care workers who had an exposure history without adequate protection allowing staff to continue working in the facility as long as they remained well.[30] In situations where exposure history was less certain such as public locations where large numbers of people gathered, a variety of responses were attempted. At the extreme end of the spectrum, China used highly restrictive measures to include cordoning off of villages and restriction of travel, including the closure of public transit.[31] Countries at the other end of the spectrum used "snow days" as a quarantine strategy, which involved closure of schools, childcare centers, and other public buildings for a defined period of time.[32]

The use of quarantine for SARS also raised some difficult questions involving the law and protection of civil rights. Once again, isolation is more straightforward resulting in the confinement of ill individuals with a communicable disease. Quarantine is more complicated and the purpose is not to immediately stop all transmission of infection, since this would be unrealistic for most countries and nearly impossible given the severity of the measures that would be needed for such a goal.[33] Even on a military installation with a higher degree of local control, this is a difficult challenge realizing the need to respect state laws or those of the host nation in an overseas environment. The purpose of quarantine is to reduce the incidence of new cases, resulting in an expectation that the number of infected individuals will peak, decline, and then reach zero if effective.[34] Ideally, quarantine rules of engagement are based on scientific information regarding the disease in question, which unfortunately was not initially possible with SARS.

IV. SARS - International Lessons Learned

Although it is generally accepted that isolation and quarantine resulted in the ability to contain and control the SARS pandemic, the experience was different for every involved jurisdiction based on their underlying political environment, legal, and public health systems, health care infrastructure, law enforcement, and ancillary support capability. The following review will discuss highlights from the SARS pandemic and key lessons learned from China, Canada, Hong Kong, Singapore, Taiwan, and Vietnam.

China

The SARS pandemic began quietly in China's Guangdong Province in November 2002 when 305 individuals were diagnosed with "atypical pneumonia" resulting in five deaths.[35] It is of scientific interest that the virus is believed to have originated in wild game animals sold in a Guangdong Province open market, and SARS-CoV "crossed the species barrier" from animals to humans.[36] These initial cases were not recognized as an emerging health threat and were not reported to local public health officials until January 21, 2003, or to the WHO until February 11, 2003.[37] This delay in reporting combined with travel of infected individuals allowed "SARS to spread rapidly around the world, largely because persons infected with the SARS-associated coronavirus traveled on aircraft to distant cities."[38] According to WHO, there were reported cases of SARS in nearly every province and autonomous region in China by July 14, 2003.[39] WHO publicly challenged China's limited reporting of SARS cases throughout Beijing in April 2003, which was an unprecedented move by WHO.[40] This action did result in greater cooperation in the months to come.

It is unclear how well prepared the public health system in China was to manage a disease outbreak in 2002, however significant positive changes did occur the following spring. After April 2003, agencies within the Communist Chinese government "had declared war on SARS," and their Ministry of Health approved the listing of SARS as an infectious disease on April 8, 2003.[41] This was significant since there was no prior

requirement to report anything dealing with SARS under the standing WHO treaty. The Chinese implemented strict isolation and quarantine programs with a 14-day requirement that were viewed by some as creating "virtual prisons" and resulted in questions from Chinese legal scholars about the legality of some measures taken by the Ministry of Health.[42] Provisions authorized the quarantining of entire villages with police empowered to enforce orders. A 10-year prison term was also approved for those who refused to comply with isolation or quarantine.[43] It is unclear how often law enforcement was actually needed to enforce compliance.

By June 30, 173 persons were isolated and quarantined in 18 districts, four hospitals were isolated, seven residential communities, and seven construction sites were totally isolated. The isolation and quarantine program was a success, although questions remain regarding excessive tactics. China implemented a successful SARS case reporting system linked with the CDC of China and the Ministry of Health which is still in effect, and the government allocated 11 billion yuan to establish a public health emergency treatment system.[44] It should also be noted that in Chinese, there is no word for quarantine; it is all "isolation."[45] However, the functional application was the same.

Canada

The first SARS cases appeared in Canada a week before WHO issued it global warning on March 12, 2003, allowing the disease to spread throughout Toronto for days secondary to inter-hospital transfers of patients who hadn't been diagnosed.[46] As one of the hardest hit countries by SARS, Canada followed only China, Hong Kong, and Taiwan in probable SARS cases. The index case was eventually traced to a 78-year old woman who returned home to Toronto on February 23, 2003, after visiting relatives in Hong Kong.[47] There were 438 cases in two provinces, Ontario and British Columbia, before the SARS provincial emergency was lifted on May 17.[48] Unfortunately for Canada, a second phase of the SARS outbreak began on May 23 leading to concerns over decentralized control of the Canadian public health system with authority delegated to 13 different provinces.[49] SARS was subsequently added to the list of diseases under the federal public health authority on June 12, 2003.[50]

The government of Ontario was quick to initiate a quarantine and isolation strategy on March 25, 2003, ultimately resulting in the quarantine of 30,000 people in Toronto.[51] As was noted in other countries, healthcare workers were at high risk. In fact, health care workers accounted for over 40% of all patients in Toronto. Four hospitals were designated as SARS facilities, and a "Code Orange" status was implemented resulting in the suspension of non-essential services in all Ontario hospitals after the second outbreak.[52] A large number of physicians were placed in quarantine as many public health facilities became increasingly conservative with application. This resulted in numerous articles in the press and literature written by physicians expressing concerns about the imposed quarantine process from a personal perspective.[53, 54, 55, 56]

The painful lesson learned was that "one patient's unprotected transfer (son of the index case) would prove the worst "miss" of the early efforts to control the SARS outbreak."[57] If airborne infection precautions had been taken to prevent transmission through respiratory droplets, the outcome would have been different. Home and workplace quarantine was successfully used in Toronto with high levels of compliance. Only 27 cases required a written order mandating quarantine. High voluntary cooperation was felt to be a direct result of actions taken by the federal and provincial governments to encourage compliance, such as providing special employment insurance coverage and expediting benefit payments. Although successful with quarantine, the decentralized public health response with SARS left many feeling that "Canada is not adequately prepared to deal with a true pandemic."[58]

Hong Kong

The initial case of SARS in Hong Kong was traced to a physician who had been treating patients for atypical pneumonia in Guangzhou, China, and stayed in Hong Kong's Metropole Hotel in March 2003.[59] He infected 7 people from the hotel and 100 hospital workers following his admission to Prince of Wales Hospital.[60, 61] Another significant outbreak occurred in the Amoy Gardens apartment complex. One hundred thirty residents diagnosed with SARS and 241 placed in quarantine were linked to a visitor to the complex who had previously received treatment at Prince of Wales Hospital.[62] The government successfully implemented a

10-day home quarantine program in addition to creating isolation camps outside the city of Hong Kong as an alternative for these residents.[63] Hong Kong International Airport is one of the busiest in the world and all passengers were required to complete health declarations in addition to having temperature screens complemented by the use of infrared devices to detect fever.[64] Success of the public health initiatives in Hong Kong were attributed to a strong public education program, adequate central funding of programs, establishment of multi-disciplinary response teams, and the threat of force for quarantine non-compliance. Similar to the experience in Toronto, support for quarantine efforts was enhanced by new laws that obligated employers to make reasonable efforts to protect the health and safety of employees and to ensure job security of those who complied with quarantine requirements.[65]

Singapore

Singapore had their initial cases of SARS on March 14, 2003, following the admission of six patients to Tan Tock Seng Hospital with atypical pneumonia.[66] Three index cases were identified as "super-spreaders" and all had stayed at the Metropole Hotel in Hong Kong when the SARS-infected person was a guest.[67, 68] Singapore received positive global attention for their comprehensive and supportive approach to dealing with SARS, which was greatly facilitated by it existing public health structure and legal system.[69]

On March 24, 2003, the Ministry of Health used its power under the Infectious Disease Act to initiate a 10-day home quarantine program for probable and suspected cases.[70] A commercial firm was hired to serve quarantine orders and install electronic cameras in homes of those in quarantine to ensure continuous contact and monitoring of twice daily temperature checks.[71] Quarantined persons could also choose to stay at government facilities at a reasonable cost, and non-compliance with quarantine orders was enforced by the threat of imprisonment. A unique outreach feature was a dedicated SARS television channel in addition to a Quarantine Order Allowance Scheme to help defray costs of home quarantine.[72]

As in other countries, transmission in healthcare facilities was a major dilemma. In fact, 75% of their 238 cases were linked to hospitals and

nursing homes, which triggered a 14-day home quarantine program for those recovering from SARS after discharge.[73] The four-pronged approach implemented by the Ministry of Education (Contain, Safeguard, Screen, and Isolate) proved effective, and the most successful government actions during the outbreak were the containment of hospital infections using a designated SARS hospital for all infected patients and prevention of community infections as per the Director of Medical Services.[74] WHO removed Singapore from its list of SARS-affected areas on May 31, 2003.[75]

Taiwan

The first suspected case of SARS in Taiwan (Republic of China) was a businessman who traveled to the Guangdong province of China in February 2003 having returned through Hong Kong to be hospitalized two weeks later in Taiwan.[76] Taiwan was in a unique predicament given that they had been excluded from WHO since 1972 when China refused to recognize their government, however, support was available during the SARS outbreak from the United States CDC.[77] Initially, Taiwan refused to conduct health screenings at immigration checkpoints and quarantine measures were limited. This changed dramatically after April 28, and two levels of quarantine were established, A and B.

These levels were unique to Taiwan and were defined as follows: a stringent, mandatory 10-day quarantine was imposed on anyone arriving from a SARS-infected area (*Level B quarantine*) in addition to a requirement for all arriving passengers to wear masks and complete temperature checks.[78, 79] People who had been in close contact with a SARS patient were quarantined for 10-14 days (*Level A quarantine*).[80] By the end of the epidemic, 131,132 persons had been placed in quarantine, which included 50,319 close contacts of SARS patients and 80,813 travelers from WHO-designated SARS-affected areas.[81] Compliance was good with only 286 (0.2%) violators of quarantine, and probable SARS was diagnosed in 112 (0.2%) people in Level A, but only 21 (0.03%) people were diagnosed in Level B.[82]

Once again, healthcare workers were at highest risk of becoming infected with SARS, and two hospitals were placed in a 14-day quarantine which resulted in significant negative publicity based on poor planning and support for those in quarantine.[83] Enforcement of Taiwan's SARS

regulations took a political toll based on allegations of slow response resulting in the resignation of both the Minister of Health and the Director of Taiwan's CDC.[84] Once initiated, concerns arose regarding an excessive response based on Taiwan's two levels of quarantine. A report completed by the United States CDC questioned Taiwan's quarantine implementation strategy and stated, "more study is needed to determine whether the logistics and cost of quarantine warrants its use."[85] These concerns were specific to the country of Taiwan.

Vietnam

The Vietnam French Hospital of Hanoi reported a case of an "unusual influenza-like virus" to the WHO on February 28 in a Chinese-American businessman who had come from southern China.[86] Dr. Carlos Urbani, a WHO infectious disease specialist, responded and promptly alerted the Vietnamese government of the disease and eventually coined the term "Severe Acute Respiratory Syndrome."[87] Unfortunately, Dr. Urbani would die from the previously unknown pathogen in a matter of weeks. The SARS epidemic in Vietnam was primarily hospital-based and all cases were traced to the initial index case. Of the first 60 patients with SARS, more than half were health care workers, all deaths involved doctors and nurses, and most of the staff made the decision to quarantine themselves to protect their families and community.[88]

Vietnam was the first country to contain the spread of SARS and be declared SARS-free by WHO. Positive outcomes were attributed to Vietnam's decision to deal with the outbreak openly and decisively, although with limited resources compared to other SARS-infected countries.[89] Stringent restrictions on entry or travel across the border into China proved critical, and Vietnam maintained control of border entry points with temperature screenings and infrared thermal imagers even after WHO declared them SARS-free.[90] Travel in or out of the country was not allowed if fever was present, and quarantine was mandated for these travelers.[91] Throughout the SARS outbreak, the Vietnamese central government presented an image of continued cooperation between all key departments and maintained close cooperation with WHO. To minimize the burden of SARS and encourage medical treatment, the government announced that SARS treatment would be free of charge for citizens and

foreigners alike.[92] Although a Communist country with limited resources, Vietnam's success with implementing a strategy of early detection, isolation, and quarantine was most impressive to the industrialized world.

Summary

Several key points for military commanders should be highlighted from the international lessons learned regarding quarantine and SARS. First and foremost is the understanding that the most severe biologic event a commander may encounter is a previously unknown disease with human-to-human transmission, primarily involving the respiratory route. Although agents like smallpox would also have serious implications, response plans have already been developed and treatment options exist. A new disease like SARS or a genetically-altered agent that may be used by a bioterrorist requires additional planning for this worst-case scenario. Quarantine needs to be part of the strategy as was shown with SARS.

Second, delay in implementing quarantine can have devastating effects that result in loss of situational control as occurred in China. Decisive actions must be taken and coordinated up the chain of command prior to a commander having all the answers. This includes notification of key organizations such as the CDC or WHO. Third, healthcare workers are at highest risk of becoming exposed or infected prior to identification of the outbreak, which may result in the need for quarantine of entire medical facilities.

Fourth, cooperation between support agencies is critical to educate the community, encourage medical identification and treatment, increase patient compliance, enforce requirements when needed, and obtain overall buy-in from the public. This begins with leadership and can be spread throughout the organization following comprehensive planning to ensure a coordinated response. Fifth, broad legal and policy challenges exist in responding to an infectious disease outbreak, and guidance is needed to orchestrate a prompt and effective response. This should be addressed prior to a crisis.

Sixth, the quarantine implementation plan chosen by leadership should provide the best opportunity to contain the disease without enforcing excessive or unrealistic restrictions on a community as occurred in China and Taiwan. Finally, each disease is unique requiring an

understanding of its epidemiology to ultimately develop a definitive treatment strategy, however the initial response prior to identification of the infectious agent should be non-specific and cover a worst-case scenario. This lesson was emphasized by the Canadian experience with SARS.

V. Quarantine Laws

The challenge of protecting the public's health without unnecessarily infringing on personal rights and freedoms begins with an understanding of federal and state laws regarding restriction of movement. States have the primary responsibility for protecting the public health of citizens per the 10th Amendment of the U.S. Constitution.[93]

Significant variability exists between states regarding local laws and regulations for quarantine, which has created some confusion with the potential for fifty different rules of engagement. Each state's inherent "police power" provides the opportunity for quarantine to be enforced to safeguard the health, safety, and welfare of its citizens. The governor may call upon the state's National Guard to support implementation of a quarantine.

The federal military could also support civilian law enforcement as authorized by the Stafford Act following a request for DoD resources by the state governor. The military is not authorized to enforce quarantine outside of a U.S.-based military installation as regulated by the *Posse Comitatus Act* and DoD Directive 5525.5, *DoD Cooperation with Civilian Law Enforcement Officials*.[94] An enforcement role is possible as an exception to *Posse Comitatus*, but requires authorization by the President using Insurrection Act powers or Constitutional Authorities.[95]

If quarantine was required on a military installation in the United States, the installation commander would be responsible for ongoing military operations and enforcement of quarantine. In the event of a biological attack on a military installation in the United States, parallel lines of command would exist as per Air Force Doctrine Document 2-1.8, *Counter NBC Operations*, with the installation commander in charge of military operations and the Federal Bureau of Investigation (FBI) having control of the crime scene.[96] The CDC would also play a prominent role to prevent the transmission and spread of a communicable disease within the U.S. as covered in U.S. Code Title 42 and Executive Order 12452.[97]

Model State Emergency Health Powers Act

When the anthrax letters surfaced in October 2001, state quarantine laws were exposed as being antiquated with many unchanged from their original versions and most pre-dating the 1960's Civil Rights Act.[98] In response to a request from the Bush administration, James Hodge from Johns Hopkins University and Lawrence Gostin from Georgetown University's Center for Law and the Public's Health drafted model legislation, the Model State Emergency Health Powers Act (MSEHPA), to protect the public's health in an era of bioterrorism.[99] The MSEHPA facilitated the detection, management, and containment of public health emergencies at the state level while safeguarding personal and proprietary interests.[100]

This document covered bioterrorism in addition to natural epidemics and was derived from existing federal and state laws, lessons learned from recent exercises such as TOPOFF and Dark Winter, and a meeting of experts in public health, emergency management and national security in April 2001.[101] Article VI, sections 604 and 605, stipulated legal and procedural considerations during isolation and quarantine. The MSEHPA "permits public health authorities to physically examine or test individuals as necessary to diagnose or treat illness, vaccinate or treat individuals to prevent or ameliorate an infectious disease, and isolate or quarantine an individual to prevent or limit the transmission of a contagious disease."[102] It was recommended for states to make changes to their existing health codes using this modern statutory framework of public health powers to better prepare for public health emergencies.

The MSEHPA has received criticism over the perceived loss of civil liberties resulting from many of the provisions of the act. In regards to quarantine, the authority of public health officials to enforce a quarantine has been criticized as being based on an inappropriate concern that neither physicians nor citizens are likely to cooperate with public health officials in the event of a bioterrorism attack.[103] The TOPOFF and Dark Winter exercises used to develop the MSEHPA were also felt to be unreasonable given the high level of voluntary cooperation on the part of the public after the September 11, 2001, terrorist attacks and anthrax letters.[104] If a quarantine law is needed, it was suggested that it should be a federal law, not a state law since bioterrorism is a matter of national security.[105]

Critics complained that MSEHPA was a dangerous proposal that sacrificed civil liberties for an effective public health response to a bioterrorist attack.

In actuality, the MSEHPA subsequently obtained wide support in the U.S. because it was drafted as an improvement over many existing state laws that did not provide standards or procedures for the exercise of power in response to a public health emergency. The lessons learned from the recent SARS epidemic also bring into question the concerns raised regarding cooperation, further supporting the MSEPHA. The Act has been introduced in whole or part through bills or resolutions in forty-four states, the District of Columbia, and the Northern Mariannas Islands.[106] Thirty-three states have passed bills or resolutions that include provisions from or closely related to the Act.[107] Unfortunately, significant variability still exists between states regarding the Act's provisions and commanders need to have a good understanding of the local rules of engagement before supporting quarantine operations outside of a military installation.

VI. Quarantine Policy

> *The epidemic is seldom mentioned and most Americans have apparently forgotten it. This is not surprising. The human mind always tries to expunge the intolerable from memory.*
>
> –H.L. Mencken[108]

The critic and author H.L Mencken wrote the above statement in 1956 as a survivor of the 1918 "Spanish influenza" pandemic, which took the lives of 675,000 Americans and 25 million worldwide in a few tragic months. The Spanish influenza pandemic claimed more lives than did fighting in World War I, and valuable lessons from public health officials who waffled with quarantine decisions and initially denied the danger have been almost forgotten.[109] The 1918 influenza pandemic was the last time that the United States (U.S.) instituted a large-scale quarantine, and Department of Defense (DoD) leadership has little familiarity with quarantine procedures, requirements, and implications.[110] Although no document is specific only to quarantine, guidance has recently been created to address restriction of movement in response to a disease outbreak.

DoD/Federal Policy

Present policy on quarantine implementation in DoD was drafted following the SARS outbreak of 2003 and is contained in DoDD 6200.3, *Emergency Health Powers on Military Installations*. The release of this document on May 12, 2003, recognized the essential need "to protect installations, facilities, and personnel in the event of a public health emergency due to biological warfare, or terrorism, or other public health emergency communicable disease epidemic."[111] DoDD 6200.3 empowers commanders to declare public health emergencies and impose quarantine on installations under their command. It also requires that every military commander designate a Public Health Emergency Officer (PHEO), who shall be a senior health professions military officer or DoD civilian equivalent, and the PHEO will identify, investigate, and control disease

outbreaks.[112] In regards to quarantine, the PHEO plays a key role as a consultant to the installation commander providing medical recommendations that may result in special powers being exercised to prevent the spread of communicable disease. DoDD 6200.3 also authorizes the Director of the CDC "to establish a quarantine to prevent the spread of communicable diseases into the United States, from State to State, or, in time of war, affecting military and other national defense personnel, and to support State quarantines."[113]

Additional disease specific guidance regarding quarantine and isolation can be found in Annex C of the *DoD Smallpox Response Plan* and the recently issued memorandum titled *DoD Guidance for Pandemic Influenza Planning and Response.* The CDC also provides disease specific quarantine guidance for SARS in the *SARS Response Plan, Supplement D: Community Containment Measures, Including Non-Hospital Isolation and Quarantine* and smallpox in the *Smallpox Response Plan and Guidelines, Guide C: Infection Control Measures for Healthcare and Community Settings and Quarantine Guidelines.* Although the latter two documents were prepared for civilian public health officials, the information is equally pertinent to military officials.

USAF Policy

A review of Air Force Doctrine revealed minimal additional guidance on establishing quarantine in response to a biological attack.[114] AFI 10-2501, *Full Spectrum Threat Response (FSTR) Planning and Operations,* briefly mentions quarantine and AFI 48-105, *Surveillance, Prevention, and Control of Diseases and Conditions of Public Health or Military Significance,* is being updated to include guidance from DoDD 6200.3.[115] A new AFI 10-2603, *Commanders' Guide to Emergency Health Powers on Military Installations,* is being drafted and will implement key provisions contained in DoDD 6200.3. Overall, guidance for installation commanders involving operational implications for implementing restriction of movement measures is still limited.

VII. Lessons Learned from Bioterrorism Exercises

Multiple bioterrorism exercises have been conducted in the U.S. both prior to and following September 11, 2001, and many have provided helpful input regarding future use of quarantine in response to a public health emergency. A recurrent theme in all exercises was that a biological attack is a unique form of terrorism given its inherent insidious onset where the first evidence of attack may not be appreciated until days later once patients present to medical facilities with non-specific symptoms. Time lost in sorting out that an attack or disease outbreak has even occurred and in implementing a restriction of movement when appropriate places increased emphasis on the need for planning and exercising such events. Sound planning, guidance, exercising, and leadership are the critical factors.

TOPOFF

Operation TOPOFF (Top Officials) has been conducted twice, and the first exercise was particularly instructive regarding use of quarantine. The original TOPOFF occurred in May 2000 and involved a pneumonic plague outbreak in Denver, Colorado. Of note, Colorado's bioterrorism and pandemic influenza response law was not enacted to prepare for the exercise, but proved extremely useful and led to the recommendation that other state health agencies review their statutory authority to adequately prepare for a similar event.[116]

In this exercise, a *Yersinia pestis* aerosol had been covertly released three days earlier at the city's center for performing arts and led to 3,700 cases of plague with 950 deaths and 780 secondary cases by day three of the exercise.[117] Isolation became impossible during this exercise due to overwhelming numbers presenting to local hospitals, ultimately resulting in an executive order by the governor quarantining all persons in metropolitan Denver in their homes. However, it quickly became clear that quarantining two million people is not an easy task and was unlikely to be successful given limitations involving enforcement and the logistics of carrying out this monumental task without additional manpower. The key lesson learned was that equal effort must be given to controlling the

spread of disease compared to the treatment of ill persons or the demand for health-care services will not diminish.[118] This exercise also brought problematic issues of leadership and decision-making to the forefront with delays resulting in the inability to contain a highly contagious disease outbreak in a large urban community. This is highlighted in the following comment from one observer: "Containing the epidemic did not receive high enough priority. No amount of incoming federal resources could stop the epidemic without a priority on containment."[119]

Dark Winter

Dark Winter was an exercise that occurred in June 2001, involved 12 high-level government and military participants who portrayed members of the National Security Council, and simulated a covert smallpox attack on the United States.[120] The tabletop exercise involved three simultaneous attacks infecting 3,000 people in separate shopping malls in Oklahoma City, Philadelphia, and Atlanta. In regards to quarantine, it was recommended, but the potential implications were clearly not understood and tension developed between state and federal authorities regarding decision control over disease containment measures.[121] The inability to enforce travel restrictions was ultimately appreciated. This led to the understanding that leaders must gain the trust and sustained cooperation of the American people if spread of the contagious disease was going to be controlled. The projected outcome of this exercise was 3 million cases of smallpox and approximately 1 million deaths.[122]

Sooner Spring

A third exercise of note involving quarantine was Oklahoma's Sooner Spring bioterrorism exercise, which occurred in April 2002. This involved four operational exercises in different cities throughout the state to include smallpox in Tulsa and Oklahoma City, pneumonic plague in McAlester, and botulism in Lawton.[123] Similar lessons were observed to include limitations involving quarantine enforcement and sustainment in addition to the need for thorough quarantine implementation planning to realistically impose restrictions of movement.[124] Participants discussed

the option of varying gradations of quarantine ranging from voluntary travel restrictions to in-hospital enforced isolation as a possible solution to balance limited resources with a desire to maintain a more "normal" life for residents within the cordon.[125] Another critical issue was the decision to declare quarantine prior to CDC confirmation of disease, which will be an issue for military commanders who may not have immediate access to such resources, especially if stationed outside the continental United States.

USAF Exercises

Research efforts are also ongoing within the Air Force with training and exercise programs that involve restriction of movement in response to a bioterrorism event. The operational impacts of implementing quarantine were initially tested during exercises at Ramstein Air Base, Germany, in July 2003.[126] These exercises involved anthrax and smallpox scenarios, and provided preliminary insights into how biological attacks might affect operations. Additional operational research is ongoing at Kunsan Air Base, Republic of Korea (ROK).[127] Results from these efforts are forthcoming.

VIII. Military Operations and Quarantine

Although all installation commanders will have the same desire to maintain full operational capability in the event of a public health emergency requiring quarantine, the challenges will be different based on whether the installation is located within or outside the continental United States. In general, legal guidance will be more straightforward with quicker access to key ancillary support agencies such as the CDC for those stationed within the continental United States. It will be critical to have a thorough understanding of state laws and to exercise local emergency response plans since any event on a military installation will have implications for the local community given the presence of a civilian workforce and the fact that a biologic agent is not limited by the fence surrounding an installation. Unfortunately, legal issues involving implementation of quarantine outside the continental U.S. becomes significantly more complicated.

At overseas installations, U.S. military personnel and civilian employees of the DoD are covered by international agreements known as Status of Forces Agreements (SOFAs) between the U.S. Government and allied nations.[128] DoDD 6200.3 states that implementation of restriction of movement at overseas U.S. installations is dependent on "local conditions, and requirements of treaties and agreements, and other arrangements with foreign governments and allied forces." The Headquarters Air Force Judge Advocate (AF/JA) conducted an informal review of DoDD 6200.3 and concluded that the AF would need the consent and cooperation of the host-nation to implement the directive.[129] Multiple concerns have been raised regarding implementation of a quarantine to include coordination with local officials to declare a public health emergency, access to facilities used by host nation forces and their civilian components, gathering and sharing of information that impacts privacy laws, and coordination with local security forces to enforce quarantine and secure the installation.[130] These are just some of the critical issues which require the establishment of local agreements between the installation and the local authorities in order to implement a quarantine in the event of a public health emergency.

DoDD 6200.3 states that commanders have "special authority" during a declared public health emergency to initiate restriction of movement measures over military and non-military persons present on an installation. This is important based on two recent cases, which revealed the limitations of a commander's authority to enforce restriction of movement prior to DoDD 6200.3. The first occurred with U.S. Forces Korea in Seoul following the September 11, 2001, attacks and involved the inability of the commander to compel civilians and contractors to remain on base in compliance with an imposed curfew during certain hours without receiving overtime pay for those hours.[131]

The second case involved DoD teachers. They could not be prevented from traveling to China during the SARS outbreak to prevent exposure to the highly contagious disease based on labor laws that prevented such actions.[132] The present requirement for a commander to exercise "special powers" is to declare a public health emergency and report this action up the chain of command to the Secretary of Defense.[133] The concern with this requirement is the delay that may occur in activating a quarantine based on the indecision of whether an outbreak has truly occurred, which is all the more challenging at an overseas installation where confirmatory laboratory analysis of patient samples may take days in the best possible scenario. The SARS experience highlights this valid concern as the lesson learned with this previously unknown disease was that delay in instituting restriction of movement and quarantine can have devastating effects that are exponential when dealing with most contagious diseases with worldwide implications.

IX. Recommendations for Commanders

In the fight against bioterrorism, a commander must understand that he is facing two enemies, the terrorist and the biologic agent. The latter, which can only be seen at the microscopic level, is the more lethal opponent with the added advantage of insidious, widespread infiltration before an attack is even identified. Although sensors are being used to help with early detection, the most likely way a commander will first be aware of an outbreak on the installation is when patients arrive at the local medical facility for help. This leads to the initial challenge facing commanders, determining when to announce a public health emergency and whether quarantine is indicated. The recommendation is to initiate a "preemptive" action based on the perceived level of risk.

#1. Initiate preemptive quarantine at the first indication of a possible biologic attack to maximize the probability of disease containment.

Multiple scenarios are possible for a biologic weapons attack given the option of an overt versus a covert attack using one or multiple agents. In addition, the advent of genetic engineering has increased the likelihood of a terrorist using a biologic agent that has been altered to be resistant to known treatment or vaccination.[134] A public health emergency may also be secondary to a natural disease outbreak of a known or new disease as occurred with SARS, but once again, this will frequently be unclear during the initial 72 hours after declaration of an emergency. With limited laboratory options for an overseas facility, it will take greater than 72 hours before confirmatory laboratory information is available, and a commander cannot afford to wait on definitive results before making a decision.

This initial recommendation is based on three key issues regarding quarantine. First, indecision can result in loss of containment, as was the case in many of the bioterrorism exercises completed in the U.S. and in the real-world experience with SARS. Second, with Air Force's mastery of "rapid global mobility" comes the potential for global spread as was clearly demonstrated with SARS. Finally, public fear of the unknown that can occur with restriction of movement can be as dangerous as the disease in question. Therefore a set strategy of preemptive quarantine that has

been exercised and accepted by a military community can limit the potential for panic and enhance cooperation.

This strategy also requires clarification of the commander's authority in declaring quarantine for an overseas installation, which will be different for each country as per the SOFAs. Although less confusing in CONUS, there are still issues to be clarified with state emergency response teams that must be exercised prior to the actual declaration of a public health emergency. The proposed plan would be to prepare for the worst-case scenario of a highly contagious biologic agent with airborne spread, and then back off restrictions after the initial 72 hours once more information is available about the disease in question.

Such a strategy would be appropriate for diseases such as plague, smallpox, viral hemorrhagic fevers like Ebola, and SARS, but once again, this recommendation is based on the likely scenario of not having a definitive diagnosis during the initial 72 hours. This is similar to a football team which has designed and practiced the first several offensive series, and has the opportunity to alter the game plan at half time once more information is available about the opponent. Although it is true that mandatory quarantine should not be enacted by a commander without legal consultation and appropriate planning to include security capabilities, public affairs plans, and basic supply issues, this process should be completed and exercised at every military installation in preparation for an attack. The multidisciplinary response required for a successful quarantine strategy leads to the second recommendation.

#2. Ensure total military community support and involvement with quarantine planning and response.

Although key players involve those designated in DoDD 6200.3 to include the PHEO and other critical medical personnel, effective implementation of quarantine requires much more than a coordinated medical response. As demonstrated in multiple exercises and the SARS pandemic, one of the greatest challenges involves enforcement of quarantine regulations, which primarily falls upon security forces personnel in the overseas setting. As previously noted, standing policy to secure installations, maintain quarantine areas, and enforce restricted movement of civilians who work on the facility requires clarification with local officials. Pubic affairs and the communications squadron will also

play key roles in disseminating approved information to the community, which needs to be ongoing and readily available throughout the quarantine period. Timely release of information from leadership and easy access to personnel with answers to questions from the "worried well" were keys to success during the SARS pandemic. Services staff will be critical to ensure that lodging and food are available to those affected by restricted movement, with emphasis given to dependents in home-based quarantine. Mortuary affairs will play an important role in management of the deceased with the added burden of disease containment given the infectious potential of human remains. Legal will have a prominent position not only in providing advice to the commander to ensure SOFAs with host nations are being met with implementation of restriction of movement policies, but in responding to individuals who contest the reason for their quarantine. Operations will be needed to handle air traffic while focusing on disease containment as additional manpower and supplies are brought to the installation and select individuals will ultimately be allowed to leave as will be discussed below. The entire installation will be stressed in a quarantine setting for this initial 72-hour period, and continued sustainment will only be possible with additional support and supplies.

#3. Establish an alternate medical facility for the triage and treatment of all patients based on the expected contamination of the primary facility.

Emphasis on early identification of a biologic attack frequently falls upon junior medical personnel who are challenged with potentially diagnosing and responding to conditions they have only read about in textbooks. That being said, the impact one astute provider can make should be highlighted in training as early recognition will save lives. Consultants in infectious disease and access to national laboratories will not be readily available at overseas facilities, thus placing increased pressure on providers challenged with making a timely diagnosis with limited or possibly conflicting information. Given this setting, it is reasonable to expect that the medical facility will need to be quarantined because a majority of staff may have already been exposed to the biologic agent once recognized, as was the case with SARS. In fact, exercises have shown that patients with initial symptoms similar to a routine upper

respiratory infection or the "flu" may present for care 2 to 3 days before the outbreak is identified, but significant spread has already occurred at this point. The PHEO will play a key role in helping the commander decide which staff have been potentially exposed based on work history and need to remain in the primary medical facility compared to those who can safely work in the alternate facility. Presenting symptoms will obviously vary based on the disease in question. The medical facility, regardless of the size, should be used to support those patients who have been diagnosed and require isolation. Respiratory spread precautions to prevent transmission through airborne droplets should be the standard until further information is available. This will require use of facemasks, respirators, and airborne infection control isolation rooms, in addition to gloves, gowns, and good hand washing.

By moving select staff who do not require quarantine to an alternate facility, resources can now be used to safely support the installation with the expectation that a significant number of "worried well" patients will be presenting for care in addition to those with disease. Staffing and supply limitations will be the primary challenge in the alternative facility until additional resources become available. All patients should be triaged into one of three categories for simplicity. First, those suspected of having active disease needing isolation, which needs to occur away from the alternate facility and may be best accomplished at the medical facility. Second, those at high risk who may have been exposed and require quarantine. This group will include the "worried well" if they meet pre-established criteria. Third, will be all others. Clarifying what criteria will be used to justify need for quarantine should be quickly established with the help of the PHEO, and this strategy will be unique to the disease process that is occurring. A facility that might be considered for patients requiring quarantine could be billeting given the need for ongoing care and feeding in a centralized location. Routine patients from the third group should be appropriately treated at the alternate facility with the goal of limiting exposure from patients requiring isolation or quarantine. Maximal emphasis should be given to preventing contamination of staff in the alternate facility by strict enforcement of infection control precautions.

Additional challenges for medical personnel will include transportation of acutely ill patients who require isolation from wherever they are diagnosed using dedicated vehicles and staff to limit spread of

disease. Visits may also need to be arranged for those patients in home-based quarantine settings to monitor status and provide ongoing assessment for a change in status. Life skills staff will be challenged to provide mental health support to the masses, realizing that the "worried well" in addition to those stressed by quarantine and isolation will need continuous support. Finally, public health personnel will be tasked with the burden of investigating cases for sources of infection and help define the distribution of illness. Given that a majority of medical staff may require quarantine themselves based on exposure to index cases who presented prior to declaration of the public heath emergency, one of the immediate needs will be additional medical staff and supplies to include face masks and respirators to maintain respiratory isolation precautions. The goal will be to provide support for the initial 72 hours until additional resources arrive.

#4. Consider a full spectrum of options during quarantine planning.

There is a misunderstanding that only one type of quarantine exists, that being compulsory. Although this may be appropriate for mission essential personnel in operations and medical positions, other options exist for the rest of the community. Mandatory "work quarantine" will be needed for mission essential personnel who ideally should not leave their buildings for the initial 72 hours. This will result in logistical concerns regarding care and feeding issues, and this needs to be planned for in advance. As occurred during SARS, implementation of quarantine was flexible in regards to the public with voluntary home-based and work quarantine. Passive and active monitoring of people in a voluntary quarantine setting will need to be arranged with support from medical staff to ensure ongoing support using minimal manpower requirements. Other options include "snow days" which involves closure of schools, day care facilities, and other public gathering places and implementation of curfew to restrict movement of vehicles except in emergency settings. The commander will need to seek legal counsel to clarify options to restrict movement of civilian personnel going off base, but a closed facility will be necessary for the initial 72-hour period and contingency lodging should be planned. Another key lesson from SARS was that 100% quarantine was not needed for success, but this should not limit the degree of

planning for this strategy. Installation support for this initiative will be directly related to the effort given to planning and community education.

#5. Contain spread of biologic agents when moving people and protect aircraft for long-term use.

Another challenge in dealing with a bioterrorist attack at an overseas installation will involve continuing the flow of forces in and out of country via airlift while maintaining disease containment and protecting aircraft for long-term use. A plan proposed by Bruce Bennett of RAND involves a "transload concept" whereby potentially contaminated aircraft leaving the overseas facility fly to a pre-established transload base where passengers and cargo are temporarily quarantined until cleared for travel back to the U.S. in a clean aircraft.[135] Disease containment is the goal. Those patients in isolation with confirmed disease should not be moved from the overseas installation, and those in quarantine should also not be moved initially until cleared from quarantine. This will not be an issue during the initial 72 hours as the entire installation will be in quarantine for this period. Remains of the deceased should not leave the country during the initial 72 hours, and legal involvement may be needed to clarify future options to include keeping remains in country, cremation, or transport via sealed containers. People ultimately cleared for travel should go through a staged quarantine at the transload base prior to return to a repatriation location in the U.S. for an additional quarantine period.[136] Maximal efforts should be made to prevent the spread of disease at airfields, and aircrew should be closely monitored for symptoms that would require quarantine. Overall, airfields will require the highest degree of restricted access to limit movement of people and supplies until they have been decontaminated and cleared for travel. Decontamination standards will need to be established for aircraft leaving the potentially exposed airfield. The standards will be different from those required for chemical agents, since decontamination may not be necessary or effective for a specific biologic agent following identification. The emphasis during the initial 72-hour period will involve inbound manpower and supplies to support the quarantine operation.

#6. Relax quarantine restrictions after the initial 72 hours once a diagnosis is confirmed and disease-specific measures can be implemented.

It is assumed that additional support will be available after a 72-hour period, which will hopefully result in confirmation of a diagnosis. Significant information is available through the CDC for quarantine and treatment options based on a specific biologic agent, but this will be of little use until the disease is identified. The decision of when to stop a quarantine is of equal importance to initiation, but this will generally be a decision made in a more controlled setting with maximal resources and information. It is possible with a new disease that quarantine recommendations may be unclear for some time as was initially the case with SARS, however, the final decision of when to relax quarantine restrictions should cover a worst-case scenario. This will occur after the initial 72-hour period.

In summary, these recommendations are made focusing on quarantine implementation to contain a disease in the overseas environment, and how a commander can carry out effective operations while adhering to quarantine requirements during the initial 72-hour period following exposure to a biological agent.

X. Conclusion

Quarantine is an effective public health measure that may be the best and last option for disease containment, especially when the diagnosis has not been established or no treatment plan exists for a given disease. The decision process for an installation commander must be different than in a civilian setting if the goal is to maintain operational capability. The focus must be on the initial 72 hours since the ramifications of a delay in action could be devastating to successful mission accomplishment and may result in unintentional global spread of disease. Given the inherent "fog of war," it may not be clear whether an outbreak has occurred, however, early use of quarantine implementing the full spectrum of options gives a commander the best opportunity for disease containment while maintaining operational capability.

This strategy is not dependent on the source or type of biologic agent encountered, but should be equally effective for a terrorist attack or a natural disease outbreak. This approach is based on the logic that it is better to establish a few days of potentially unnecessary quarantine based on a worst-case scenario and subsequently be proven wrong, than to delay and allow the spread of a deadly disease through inaction. A policy of "preemptive quarantine" whereby maximal restrictions are initially implemented and are gradually scaled back as the fog lifts and more information is known about the potential outbreak will provide the best opportunity for mission success. This will only be effective if policies are in place and exercised prior to an event, and the community is well educated on the process to minimize fear and encourage compliance through faith in leadership. Restrictions of movement can be quickly modified and ideally limited or discontinued once more information is available and the disease is identified, however, this process takes time. Once again, this approach would be unique to a military installation and would be most applicable for a facility outside of the continental United States, which does not have the benefit of the many resources now available through the Department of Homeland Security and state emergency planning initiatives.

The dangers of a bioterrorism have become a realistic concern for most Americans following the attacks of September 11, 2001. Federal,

state, and DoD authorities have appropriately developed and updated policies and regulations to implement life-saving measures such as quarantine in the event of a public health emergency, however, work remains to be completed. Although civil liberties may be impacted with quarantine, these actions are justified given the potential ramifications of a deadly biologic agent attack. Surveillance, infection control, isolation, and most importantly, quarantine to contain and control a disease outbreak will be the key to success, and the Air Force has much to learn involving the successful implementation of quarantine given the broad impact of this strategy. We must never forget the harsh lessons from past epidemics, no matter how painful the memories may be. Further study is indicated to clarify the impact of quarantine on military operations and help guide the development of future policy.

Notes

1. Wolfgang Petersen, *Outbreak*, Hollywood, CA: Warner Brothers, 1995.

2. Ibid.

3. United States Air Force Counter-Chemical, Biological, Radiological, Nuclear, and High-yield Explosive (C-CBRNE) Master Plan, *Headquarters, USAF*, 30 June 2004, 14.

4. "History of Quarantine," *CDC – Division of Global Migration and Quarantine*, On-line, Internet, 14 September 2004, available from http://www.cdc.gov/ncidod/dq/history.htm.

5. Ibid.

6. Mike Mitka, "SARS thrusts quarantine into the limelight," *JAMA*, 290, no. 13 (1 October 2003): 1697.

7. Ibid.

8. Ibid.

9. "Facts about Isolation and Quarantine," *CDC – Division of Global Migration and Quarantine*, On-line, Internet, 14 September 2004, available from http://www.cdc.gov/ncidod/dq.

10. Executive Order 12452, "Revised List of Quarantinable Communicable Diseases," 22 December 1983.

11. Ibid.

12. "History of Quarantine," *CDC – Division of Global Migration and Quarantine.*

13. Ibid.

14. CDC Public Health Guidance for Community-Level Preparedness and Response to SARS Version 2, *Supplement D: Community Containment Measures, Including Non-Hospital Isolation and Quarantine*, 8 January 2004, 4.

15. Quoted in Mark A. Rothstein, et al, *Quarantine and Isolation: Lessons Learned From SARS*, A Report to the Centers for Disease Control and Prevention (November 2003), 16.

16. Ibid.

17. Joseph S.M. Peiris, M.D., et al, "The Severe Acute Respiratory Syndrome," *New England Journal of Medicine* 349, no. 25 (18 December 2003): 2431.

18. CDC Public Health Guidance for Community-Level Preparedness and Response to SARS Version 2, *Core Document,* 8 January 2004, 4.

19. Rothstein, 5-6.

20. World Health Organization, *Alert, verification and public health management of SARS in the post-outbreak period,* 14 August 2003, 1.

21. Poh Lian Lim M.D., et al, "Laboratory-Acquired Sever Acute Respiratory Syndrome," *New England Journal of Medicine* 350, no. 17 (22 April 2004): 1746.

22. Donald E. Low, M.D. and Allison McGeer, M.D., "SARS – One Year Later," *New England Journal of Medicine* 349, no. 25 (18 December 2003): 2381.

23. Peiris, 2436.

24. Low, 2381.

25. Ibid.

26. Peiris, 2432.

27. Rothstein, 67.

28. CDC Public Health Guidance for Community-Level Preparedness and Response to SARS Version 2, *Core Document,* 8 January 2004, 6.

29. Rothstein, 23.

30. Ibid., 24.

31. Ibid.

32. Ibid.

33. Rothstein, 25.

34. Ibid.

35. World Health Organization, *Consensus Document on the Epidemiology of Severe Acute Respiratory Syndrome (SARS),* 16-17 May 2003, 13.

36. Peiris, 2432.

37. Ibid.

38. Sonja J. Olsen et al, "Transmission of the Severe Acute Respiratory Syndrome on Aircraft," *New England Journal of Medicine* 349, no. 25 (18 December 2003): 2416-2422.

39. Rothstein, 66.

40. Ibid.

41. Ibid., 68.

42. Jen Lin-Liu, "Chinese Students Coped with the Isolation of Quarantine," *The Chronicle of Higher Education* 49, no. 45 (18 July 2003): 33.

43. Rothstein, 70.

44. Ibid., 76.

45. Ibid.

46. Elena Cherney and Mark Heinzl, "New Virus Caught Toronto Off Guard – Doctors Race to Get Handle on Illness, Which Landed Before Global Health Alert," *The Wall Street Journal*, 8 April 2003.

47. Rothstein, 44.

48. Ibid.

49. Ibid.

50. Ibid., 53.

51. Ibid., 54.

52. Ibid., 55.

53. Dahlia Chiche, "A quarantine diary: a doctor finds the experience of being quarantined far harder than she anticipated," *Medical Post* 39, no. 27 *(*15 July 2003): 37.

54. Rua Mercier, "Reflections while under SARS quarantine," *Journal of the Canadian Association of Emergency Physicians* 5, no. 4 (July 2003): 235.

55. Terry Murray, "MD's Illness have her a unique view of SARS," *Medical Post* 39, no. 19 *(*13 May 2003): 5.

56. Celia Milne, "SARS: A strange time to be a doctor," *Medical Post* 39, no. 15 *(*15 April 2003): 1.

57. Cherney, 8.

58. Rothstein, 59.

59. Ibid., 77.

60. Ibid.

61. Nelson Lee M.D., et al, "A Major Outbreak of Severe Acute Respiratory Syndrome in Hong Kong," *New England Journal of Medicine* 348, no. 20 (15 May 2003): 1986.

62. Rothstein, 77.

63. Ibid., 80.

64. Ibid., 81.

65. Ibid., 84.

66. Rothstein, 85.

67. Ibid.

68. Lt Col Gregory Chan, "Dealing with an Emerging Infectious Disease: Lessons Learnt from the SARS Outbreak in Singapore," PACOM Conference, September 2004.

69. Rothstein, 85.

70. Ibid., 89.

71. Ibid.

72. Ibid., 90.

73. Chan, "Dealing with an Emerging Infectious Disease: Lessons Learnt from the SARS Outbreak in Singapore."

74. Rothstein, 91-92.

75. Ibid., 95.

76. Rothstein, 97.

77. Ibid.

78. Ibid., 101.

79. M.L. Lee, et al, "Use of quarantine to prevent transmission of severe acute respiratory syndrome-Taiwan, 2003," *JAMA* 290, no. 8 (27 August 2003): 1021.

80. Ibid.

81. Ibid.

82. Ibid., 1022.

83. Antonio Regalado, "The SARS Outbreak: Hospital Lockdown in Taiwan Appears to have Backfired – Virus has Spread Rapidly, Prompting U.S. Warning; Days of Boredom, Terror," *Wall Street Journal*, 2 May 2003.

84. Rothstein, 105.

85. Ibid.

86. Brigg Reilley, M.P.H., et al, "SARS and Carlo Urbani," *New England Journal of Medicine* 348, no. 20 (15 May 2003): 1951.

87. Rothstein, 107.

88. Reilley, 1951.

89. Rothstein, 107.

90. Ibid., 113.

91. Ibid.

92. Ibid., 116.

93. Lieutenant Colonel Stephanie Stephens, "Legal Issues in Consequence Management," lecture, Determined Promise 03, October 2004.

94. Commander's C-CBRNE Resource, 11.

95. Stephens, "Legal Issues in Consequence Management."

96. Commander's C-CBRNE Resource, 11.

97. Ibid.

98. Elinor Levy and Mark Fischetti, *The New Killer Diseases* (New York: Crown Publishers, 2003), 23.

99. Ibid.

100. Lawrence Gostin et al., "The Model State Emergency Health Powers Act," *JAMA,* 7 August 2002, 625.

101. Ibid., 623.

102. Ibid., 626.

103. George Annas, "Bioterrorism, Public Health, and Civil Liberties," *NEJM,* 25 April 2002, 1340.

104. Ibid.

105. Ibid., 1341.

106. The Center for Law & the Public's Health, "Model State Public Health Laws," On-line, Internet, 2004, available from http://www.publichealthlaw.net/Tresources/ Modellaws.htm.

107. Ibid.

108. Lynette Iezzoni, *Influenza 1918 – The Worst Epidemic in American History* (New York: TV Books, 1999), 17.

109. Ibid.

110. Commander's C-CBRNE Resource, AF/XOS-FC, *Bio-Defense State of Knowledge - Restriction of Movement*, November 2004, 7.

111. Dod Directive (DoDD) 6200.3, Emergency Health Powers on Military Installations, 12 May 2003, 1.

112. Commander's C-CBRNE Resource, 9.

113. Dod Directive (DoDD) 6200.3, 3.

114. Commander's C-CBRNE Resource, 4.

115. Ibid.

116. Richard Hoffman and Jane Norton, "Lessons Learned from a Full-Scale Bioterrorism Exercise," *CDC Emerging Infectious Diseases*, On-line, Internet, Nov-Dec 2000, available from http://www.cdc.gov/ncidod/eid/vol6no6/hoffman.htm.

117. Ibid.

118. Ibid.

119. Donald Henderson, Thomas Inglesby, and Tara O'Toole, "A Plague on Your City: Observations from TOPOFF," *Clinical Infectious Diseases*, 29 January 2001, 440.

120. Tara O'Toole, Michael Mair, and Thomas Inglesby, "Shining Light on Dark Winter," *Clinical Infectious Diseases*, 19 February 2002, 972.

121. Ibid., 980.

122. Ibid., 978.

123. *Sooner Spring Final Report, Validating Oklahoma Bioterrorism Planning*- Oklahoma City, OK, 12 April 2002, 3.

124. Ibid., 6.

125. Ibid., 7.

126. Commander's C-CBRNE Resource, 19.

127. Ibid.

128. Ibid., 12.

129. Ibid.

130. Ibid.

131. Ibid., 13.

132. Ibid.

133. Ibid.

134. Ken Alibek, *Biohazard* (New York, NY: Random House, 1999).

135. Bruce Bennet, "Maintaining Force Flow Despite BW Threats," unpublished lecture, RAND, September 2004.

136. Ibid.

USAF Counterproliferation Center

The USAF Counterproliferation Center was established in 1999 to provide education and research to the present and future leaders of the USAF, to assist them in their activities to counter the threats posed by adversaries equipped with weapons of mass destruction

Barry R. Schneider, Director
USAF Counterproliferation Center
325 Chennault Circle
Maxwell AFB AL 36112-6427

Email: Barry.Schneider@maxwell.af.mil

Jo Ann Eddy, Associate Editor
The Counterproliferation Papers

Email: JoAnn.Eddy@maxwell.af.mil

(334) 953-7538 (DSN 493-7538)

The Counterproliferation Papers, Future Warfare Series

Providing Research and Education on
WMD Threats and Responses for the US Air Force

USAF Counterproliferation Center
Maxwell Air Force Base, Alabama