

Negative impact of laws regarding biosecurity and bioterrorism on real diseases

N. Wurtz¹, M. P. Grobusch² and D. Raoult¹

1) URMITE, CNRS UMR 7278, IRD 198, Inserm 1095, Aix Marseille Université, Marseille, France and 2) Centre of Tropical Medicine and Travel Medicine, Department of Infectious Diseases, Academic Medical Centre, University of Amsterdam, Amsterdam, the Netherlands

Abstract

Research on highly pathogenic microorganisms in biosafety level 3 and 4 laboratories is very important for human public health, as it provides opportunities for the development of vaccines and novel therapeutics as well as diagnostic methods to prevent epidemics. However, in recent years, after the anthrax and World Trade Center attacks in 2001 in the USA, the threat of bioterrorism has grown for both the public and the authorities. As a result, technical and physical containment measures and biosafety and biosecurity practices have been implemented in laboratories handling these dangerous pathogens. Working with selected biological agents and toxins is now highly regulated, owing to their potential to pose a threat to public health and safety, despite the fact that the anthrax attack was found to be the result of a lack of security at a US Army laboratory. Thus, these added regulations have been associated with a large amount of fruitless investment. Herein, we describe the limitations of research in these facilities, and the multiple consequences of the increased regulations. These limitations have seriously negatively impacted on the number of collaborations, the size of research projects, and, more generally, scientific research on microbial pathogens. Clearly, the actual number of known victims and fatalities caused by the intentional use of microorganisms has been negligible as compared with those caused by naturally acquired human infections.

Keywords: Biosafety, biosafety laboratory, biosecurity, bioterrorism, infectious disease, laws, limitations, regulations, select agent and toxins

Article published online: 07 June 2014

Clin Microbiol Infect 2014; **20**: 507–515

Corresponding author: D. Raoult, URMITE, CNRS UMR 7278, IRD 198, Inserm 1095, Aix Marseille Université, Faculté de médecine la Timone, 27 Bd Jean Moulin, 13385 MARSEILLE Cedex 05, France
E-mail: didier.raoult@gmail.com

Introduction

Research on highly pathogenic microorganisms in biosafety level 3 and 4 laboratories is critical for human public health, as it provides opportunities for the development of vaccines and novel therapeutics as well as improved diagnostic methods to prevent epidemics and optimize care for individual patients. However, working with these pathogens requires precautions that guarantee the safety of humans and the environment, as they may be disseminated because of a laboratory accident, poor laboratory practices, or intentional removal and subsequent release (bioterrorism attack).

According to the CDC, a bioterrorism attack constitutes the deliberate release of viruses or bacteria used to cause illness or death in people, animals, or plants. The first documented use of microorganisms as a bioweapon occurred in 1346 at Caffa (now Feodosia in Ukraine) by the Mongols, who catapulted the bodies of plague victims over the city walls to infect the surrounding population and encourage disease spread [1,2]. Since then, many microorganisms have been proposed as bioterrorism agents, and several attempts have been noted. In 1972, the Geneva Convention related to the prohibition of the development, production and stockpiling of bacteriological (biological) and toxin weapons, and their destruction, was ratified (<http://treaties.un.org/doc/Publication/UNTS/Volume%201015/volume-1015-I-14860-English.pdf>). However, many

signatory countries (including the Soviet Union and Iraq) continued research on and production of biological agents. For example, in 1979, it was found that the Russians had continued their studies on *Bacillus anthracis*, as revealed by an anthrax epidemic that resulted in 64 deaths in the city of Sverdlovsk (now Ekaterinburg). This incident occurred on a military facility, and resulted from an accidental release of anthrax spores [3]. Finally, a series of anthrax attacks occurred in the USA in 2001 [4,5], in which letters containing anthrax spores were mailed to several news media offices and two Democratic party senators, killing five people and infecting 17 others. Some observers were first tempted to link the attacks to al-Qaeda, although, on the basis of genomic analyses, investigators turned to an American microbiologist named Bruce Edwards Ivins. Dr Ivins was a principal investigator of a military laboratory at Fort Detrick (Maryland) that specialized in biological weapons; in particular, this laboratory contributed to the development of anthrax vaccines. Ivins had a history of mental health problems and was facing a difficult time professionally in 2001, because an anthrax vaccine that he was working on was failing [6]. It is of note that both of these accidents (in Russia and the USA) occurred at military institutes studying military biological weapons and/or microorganisms involved in bioterrorism. Subsequently, all countries working on these 'difficult' bacteria were penalized because of the mismanagement in these facilities. In particular, it has become increasingly difficult to work on plague and tularaemia, diseases that kill people naturally, unlike the 'bioterrorism attacks', which were actually caused by poor military management. Moreover, in recent years, the public has become increasingly concerned with the threat of bioterrorism. Indeed, the bioterrorism threat has been largely exaggerated by the media, fuelling unsubstantiated fear that is out of proportion to the actual threat. To illustrate this fact, according to the Information Web of Knowledge database, there are 6852 publications with the keyword 'bioterrorism' and 73 609 citations from 1995 to the present. During the same period, five people died following a false 'bioterrorism attack', which corresponds to a ratio of 1370 publications per death! For example, in France, no single case of bioterrorism has ever been identified. As previously described for some viral respiratory infections [7], the numbers of publications generated is disproportionate to the public health problem. By contrast, for example, tuberculosis kills c. 1.4 million people worldwide each year [8], and the emerging epidemic Beijing clone, which caused at least 13% of the tuberculosis deaths (180 000), led to 856 publications, giving a total of 1596 citations through 2013 [7] and a ratio of 0.0047 publications per death!

It goes without saying that the scientific community must alert the public of emerging infections and the risks associated

with infectious agents. However, the reactions must remain proportional to the number of cases and deaths, as this has a significant impact on governments and international agencies and the strategic decisions implemented.

Both the anthrax attacks and the World Trade Center attack in September 2001 have led to significant increases in US government funding for biological warfare research and preparedness.

More than 180 pathogens have been reported as potential agents for bioterrorism (Table 1). The CDC has classified these agents into three different categories according to their infectiousness, virulence, public perception, impact, and cost and sophistication of countermeasures [9]. Category A includes the most dangerous microorganisms that can be easily disseminated or transmitted from person to person, facultatively resulting in high mortality, with potential impacts in terms of public health. These pathogens may cause public panic and social disruption, and require specific actions for public health preparedness. Category B includes agents that are moderately easy to disseminate, cause moderate morbidity and low mortality, and require enhancement of diagnostic capacities and specific surveillance. Category C includes emerging infectious agents that could be engineered for mass dissemination in the future because of their availability and ease of production and dissemination, as well as their potential to cause high rates of morbidity and mortality and to have a major health impact. After 2001, a broader system of controls related to the possession, use and transfer of select agents was established, including imprisonment and fines. Biological select agents and toxins (BSATs) are defined by the US Department of Health and Human Services and the US Department of Agriculture in accordance with the CDC. These BSATs are considered to be pathogens or biological toxins that have the potential to pose a severe threat to public, animal or plant health, and are divided into three categories: (i) US Department of Health and Human Services select agents and toxins affecting humans; (ii) US Department of Agriculture select agents and toxins affecting agriculture; and (iii) overlap select agents and toxins affecting both (http://www.selectagents.gov/resources/List_of_Select_Agents_and_Toxins_2013-09-10.pdf).

The real fear of bioterrorism started after 2001, when hijacked aircraft were used as missiles, and the anthrax attacks followed in the wake of these events. These bioterrorism events, unlike others before them and irrespective of their actual very limited size, had a global impact and changed the perception of the public. Moreover, bioterrorism has been sensationalized by the media, and the perceived threat is now far greater than the real threat. Because we have not yet suffered a mass biological warfare event, the proposed bioterrorism scenarios can be challenged and, indeed, seem

Download English Version:

<https://daneshyari.com/en/article/6130547>

Download Persian Version:

<https://daneshyari.com/article/6130547>

[Daneshyari.com](https://daneshyari.com)