

Atlantic Storm

A simulated bioterrorist attack demonstrated the weakness of international public health and security systems when dealing with a sudden outbreak of highly infectious diseases

Daniel S. Hamilton & Bradley T. Smith

On 14 January 2005, ten heads of government from Europe and North America and the Director General of the World Health Organization (WHO; Geneva, Switzerland) were scheduled to meet for a 'Transatlantic Security Summit' in Washington, DC, USA, to discuss the threat of international terrorism. On the eve of the meeting, news broke that citizens from several European countries appeared to have become ill with smallpox; shortly thereafter suspected smallpox cases appeared in the USA. Although the assembled leaders did not know it at the time, a radical terrorist group had obtained seed strains of *Variola major*—the virus causing smallpox—and deliberately released the virus in a number of main transport hubs and sites of commerce throughout Europe and North America. On 14 January, the heads of states who gathered in Washington were confronted with one of the worst nightmares imaginable: the use of contagious and deadly disease as a weapon.

Luckily, the real world has been spared such an attack—this scenario was a simulated exercise with the aim of assessing how the international community would react to such a rapidly evolving public health emergency. The *Atlantic Storm* exercise was designed to provoke imagination and to prompt action by making the reality of a deliberately caused epidemic more vivid (Smith *et al.*, 2005). The exercise underscores our shared responsibility to prevent, prepare for and respond to such a threat at an international level, as the lessons learned from it are relevant to all large-scale, destabilizing epidemics of infectious disease—be they natural or intentional. *Atlantic Storm* vividly illustrates that preparedness matters: heads of state cannot be expected to create the necessary emergency response systems in

the midst of an international health and security crisis. Instead, medical, public health, security, diplomatic and emergency response systems must be adapted for this new threat, and critical resources—such as medicines and vaccines—must be produced and stockpiled to prepare for a biological attack or for an emerging pandemic.

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Atlantic Storm was a ministerial-level exercise simulating a series of bioterrorist attacks on the transatlantic community (Figs 1,2). The exercise was designed, organized and convened by a team from the Center for Biosecurity of the University of Pittsburgh Medical Center (PA, USA), the Center for Transatlantic Relations at the Paul H. Nitze School of Advanced International Studies of Johns Hopkins University (Washington, DC, USA), and the Transatlantic Biosecurity Network, a group of medical, public health and security experts from Europe and North America. We challenged the summit principals, all of whom were current or former senior government officials (Table 1), to address important strategic issues, such as attaining situational awareness in the wake of a terrorist attack, coping with limited medical resources, deciding how to manage the movement of people across borders, and communicating with their citizens. The main lesson learned from the exercise—the need to reinforce international health security—is especially timely now, given the rapid spread of Asian bird flu

to Western Europe and the looming threat of a global influenza pandemic.

The *Atlantic Storm* scenario used the best available medical and epidemiological data on smallpox to build a conservative version of an outbreak (the design and assumptions of the exercise are described in detail at www.atlantic-storm.org). The main goal of *Atlantic Storm* was not to model the epidemiology of a smallpox outbreak or to test the operational response plans of nations, but rather to illuminate strategic challenges to the international community's ability to respond collectively to a bioterrorist attack or any other large-scale epidemic. In fact, a number of other infectious diseases—such as flu, *Ebola* or anthrax—could have been chosen for the exercise.

Unless we forge new health security alliances, the emergence of a pandemic causing massive death and suffering, or an attack of mass lethality, is not a matter of 'if', but 'when'. Just as *Atlantic Storm* began, the scientific journal *Nature* published a paper describing a new technology that allows the rapid and accurate synthesis of long DNA segments using standard laboratory chemicals (Tian *et al.*, 2004). In October 2005, scientists at the Centers for Disease Control and Prevention (Atlanta, GA, USA) published the reconstruction of the 'Spanish' influenza virus, which killed at least 25 million people during the winter of 1918/19 (Tumpey *et al.*, 2005). These and other discoveries provide researchers with better tools and knowledge to develop new medicines and vaccines against infectious diseases. However, they also make the synthesis and modification of viruses and bacteria for criminal purposes more likely. Hundreds of biological laboratories around



Fig 1 | Participants of the *Atlantic Storm* exercise during discussions. Clockwise: Barbara McDougall, Eric Chevallier, Madeleine Albright, Gro Harlem Brundtland, Jan Eliasson, Jerzy Buzek, and Klaas de Vries. © Kaveh/www.sardari.com

the world already have the technical capacity to synthesize or manipulate small viruses such as polio or flu. Smallpox, with its genome of approximately 200 kb, is technically more challenging, but within the next few years, technology will undoubtedly advance to the stage where the synthesis of *Variola major*—based on sequence information freely available on the worldwide web—will be possible. The age of engineered biological weapons is neither science fiction nor suspense thriller—it is here today (Hamilton & O'Toole, 2005).

There is also evidence that various non-state groups are actively seeking to acquire or develop biological weapons (Petro & Relman, 2003), and, with the rise of new terrorist networks, it is becoming more likely that such weapons would be used. The question is, how can we shift the advantage away from potential mass murderers and towards public health systems? It is certainly possible, but it requires the will and the imagination to take actions that go beyond piecemeal extensions of current policies. The international community must plan for coordinated responses to bioterrorist attacks

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and epidemics. Such plans should include strategic and operational details commensurate with those conducted by large international security organizations for more traditional—for example, military—threats. Plans should also include a review of the roles and relevance of these organizations so as to better respond to such threats.

The first step is to recognize that the threat of biological weapons requires a more holistic approach than just stockpiling vaccines or training more doctors. It means integrating public health and national security communities with a focus on cooperation across borders to supplement traditional security and its emphasis on territorial defence (Dalgaard-Nielsen & Hamilton, 2005). “For someone who has been around in the security and defense fields in its traditional sense for many years, this was quite a surprising and breathtaking exercise...This is something I think a very small minority of politicians in Europe are aware of,” commented Werner Hoyer, who played the German Chancellor in *Atlantic Storm*, after the conclusion of the exercise.

Many of the senior participants of *Atlantic Storm* concluded that key multilateral frameworks, such as the North Atlantic Treaty Organization (NATO) and the European Union (EU), are limited in their ability to cope with the unique challenge posed by a

deliberate spread of an infectious disease. Would such an attack, which threatened a nation's health rather than its territory, warrant a collective response under NATO's mutual defence clause or the EU's solidarity clause? What might such a response entail, and is either institution equipped for such action? During *Atlantic Storm*, the relevance of traditional security organizations to respond to health threats was raised when Turkey called on NATO to invoke its Article 5 mutual defence clause and asked NATO members to provide smallpox vaccines to contain the outbreak in Istanbul. “I can understand why Turkey has asked for the activation of Article 5 of NATO, Turkey not being yet inside [the] European Union. The problem, of course, is that it is not necessarily a military response that we should give. We should give a political response to Turkey for the moment,” responded the Italian Prime Minister, who was played by Stefano Silvestri.

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For decades, NATO and other security alliances have planned their response to all kinds of military crises. Planning with that degree of rigour and strategic and operational detail is also needed to cope with potential biological threats of international consequence. Such transatlantic cooperation is also at the core of many non-proliferation programmes, such as the US Department of Defense's Cooperative Threat Reduction Program or the G8 Global Partnership. These programmes seek to reduce the threat posed by weapons of mass destruction (WMD) by detecting, deterring and interdicting illegal trafficking in such items; improving the physical security of facilities and WMD materials; destroying chemical weapons agents; preventing radiological contamination by decommissioned Russian nuclear submarines; and providing former WMD programme personnel with a decent living so they will not seek to profit from selling their knowledge to terrorist organizations or states trying to acquire WMD. However, biosecurity has often been an orphan of such programmes and must be given both higher priority and more resources commensurate to the challenge (Lindstrom, 2004; Dalgaard-Nielsen & Hamilton 2005). “We live in a time of new

threats... What we now see is that health and security go together, so we have to combine them, and I think the lesson we should draw from this... is that we don't have the organizational structures to deal with the new threats," commented Jan Eliasson, who acted as the Swedish Prime Minister in *Atlantic Storm*. Similarly, Sir Nigel Broomfield (Fig 3), who played the British Prime Minister, said after the exercise, "we have a globalized economy and globalized society, but we don't yet have globalized effective institutions to deal with the questions that come out of the globalization process."

This means that nations should not only strengthen national plans to respond to international crises caused by biological weapons, but also coordinate these plans with their neighbours and main political partners. This became apparent when the participants of *Atlantic Storm* learned about the wide range in smallpox vaccine stockpiles. Although some countries had enough to vaccinate their entire population, others had only enough of the vaccine for one percent of their citizens, or even less. "When I saw the list [of vaccine stocks], that was a shock to me, how little prepared many countries are, even rich Western countries," said Klaas de Vries, who played the Dutch Prime Minister.

There are no accepted benchmarks to estimate a country's ability to handle a potential pandemic or bioterrorist attack, but it is clear that some countries have made significant investments, whereas others have made none. What *Atlantic Storm* illustrated—as do many real-world crises, such as SARS or avian influenza—is that it is in the explicit interest of any nation to ensure that there are as few 'weak links' as possible in the international community's ability to mount an effective public health response. The developed countries are only as strong as the world's weakest public health system—even the health systems in many advanced countries like the USA are largely unprepared for an intentional attack using infectious disease (Trust for America's Health, 2004).

More effective international planning also means achieving greater consensus on science. In *Atlantic Storm*, participants were stunned when they realized that many problems they had assumed could be resolved by straightforward research were in fact complicated issues—about which scientists from different countries and organizations disagreed. The key players concluded that political decisions would ultimately need to



Fig 2 | Participants of the *Atlantic Storm* exercise. Front: Madeleine Albright. From left to right: Stefano Silvestri, Barbara McDougall, Jerzy Buzek and Erika Mann. © Kaveh/www.sardari.com

be made for these issues. "Scientists have different opinions, and we must make a political decision on this," said the Prime Minister of Poland, who was played by Jerzy Buzek, during a discussion on whether existing vaccines can be safely diluted to produce additional doses (Frey *et al*, 2002; Gouvras, 2004; NIH, 2002; Talbot *et al*, 2004).

During *Atlantic Storm*, leaders eventually turned to the WHO for help. But the WHO is woefully underfunded and understaffed for dealing with such a crisis. As Gro Harlem Brundtland (Fig 4), former WHO Director General, commented after the exercise, "the budget of the WHO has very considerable limitations. It's like a middle-sized hospital in England in total resources." Although the WHO scientists and health officials are highly capable, dedicated and hard-working, *Atlantic Storm* showed that even experienced politicians have unrealistic ideas of what the WHO would be able to deliver in a crisis, given its budgetary, political and organizational

limits. "If leaders at this level are realizing that you have a crisis and that you need the WHO...they also will [have to] support, with extra budgetary resources, what's necessary," Brundtland concluded.

The 2004/2005 WHO budget for bioterrorism preparedness is estimated to be only US\$6.3 million. The entire 2004/2005 WHO biennial budget is US\$2.8 billion, 70% of which comes from voluntary donations by nations, international organizations, non-government organizations and private sources (WHO, 2004, 2005a). This is an impossible situation for an organization that will most likely be the world's first line of defence against an emerging epidemic and it raises questions about the WHO's capacity and flexibility to respond rapidly to epidemics in multiple locations around the world. The new International Health Regulations, approved in early 2005 (WHO, 2005b), may help bolster the WHO's clout internationally, but its resources are still severely limited.

Moreover, some issues cannot be addressed even by a stronger WHO. For example, during a global outbreak, who would decide which countries should receive scarce vaccines or medicines? This is a life-or-death decision beyond the brief of any international organization. *Atlantic Storm* participants hoped that the WHO could serve as an independent 'honest broker' for such politically and highly sensitive

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Table 1 | Participants in the *Atlantic Storm* simulation

Character	Played by
Prime Minister of Canada	Barbara McDougall, former Foreign Minister of Canada
President of the European Commission	Erika Mann, Member of the European Parliament
Chancellor of the Federal Republic of Germany	Werner Hoyer, former Deputy Minister of Foreign Affairs of Germany
President of France	Bernard Kouchner, former Minister of Health of France
Prime Minister of Italy	Stefano Silvestri, President of the Istituto Affari Internazionale and former Deputy Minister of Defense of Italy
Prime Minister of the Netherlands	Klaas de Vries, former Minister of the Interior of the Netherlands
Prime Minister of Poland	Jerzy Buzek, former Prime Minister of Poland
Prime Minister of Sweden	Jan Eliasson, former Deputy Minister of Foreign Affairs of Sweden
President of the United States	Madeleine Albright, former Secretary of State of the USA
Prime Minister of the United Kingdom	Sir Nigel Broomfield, former Ambassador of the UK to Germany
Director General of the WHO	Gro Harlem Brundtland, former Prime Minister of Norway and former Director General of the WHO
Executive Secretary of the Summit	Eric Chavellier, Professor at the Institut d'Etudes Politiques de Paris and the French Ecole Nationale d'Administration

decisions. However, in reality, these decisions will likely be made by the nations that control the medical resources and not by the WHO or any other international agency. The fact that national leaders view the protection of their citizens as their primary responsibility would weigh heavily on decisions to share scarce resources with other nations.

The challenge of distributing limited supplies of medical resources is also illustrated by the fact that EU nations have—in reality—decided against a shared stockpile of smallpox vaccine because of this very issue: the difficulty of allocating it to multiple member states in an emergency (Gouvras, 2004; Sundelius & Grönvall, 2004). If the EU—nations that are so closely aligned that most share the same currency—is unable to agree on how to share a security asset as critical as the smallpox vaccine, the prospects for broader international sharing mechanisms appear bleak. The USA and the EU should work with the international community to augment the capacity of the WHO to respond to the health and medical consequences of biological attacks or pandemics.

The very real prospect of bioterrorism requires new approaches not only by doctors, scientists and public health authorities, but also by national security communities (Ostfield, 2004). The traditional concepts of deterrence and dissuasion to prevent a nuclear war must be tailored to the

threat of asymmetric warfare by state or non-state groups. Deterrence is unlikely to have the same role in managing the threat of bioweapons compared with managing the apocalyptic threat of a nuclear exchange between the former Soviet Union and the USA. Dissuasion can therefore become an effective complement to deterrence (Lutes, 2004; Pilat, 2004; Sagan, 2004). Whereas deterrence focuses on stopping identifiable adversaries from using their existing capabilities, dissuasion aims to stop potential adversaries from developing such capabilities. In the early days of the Cold War, deterrence was a rather hazy concept. Over the course of four decades, however, it acquired a role of central importance by underpinning a series of specific policy responses intended to convince opponents that aggressive actions would result in such unacceptable damage that would outweigh any likely benefit of their action. Further development of the concept of dissuasion could become equally important today—but only if it receives the same political and financial backing as deterrence.

These concepts require not only trust among partners, but also active cooperation embedded in new diplomatic approaches. For instance, how should arms-control treaties that are geared to states be adapted to non-state bodies? The global legal regime focuses on the activities of states, not sub-national groups or individuals. It is weak

in monitoring and verification, and often fails to deal adequately with the significant differences between the types of weapons lumped together under the term 'weapons of mass destruction'. Conversely, recent history offers many examples of successful diplomacy to diminish the threat by nuclear weapons—Belarus, Kazakhstan, Ukraine, Argentina, Brazil and South Africa were all persuaded to abandon their nuclear weapons activities within the past 15 years. In earlier decades, Germany, Japan, South Korea and Turkey were also dissuaded from developing nuclear weaponry by integrating these countries in international alliances (Carter, 2004). The question is how such efforts can be adapted to today's more complex challenges.

The absence of available medical countermeasures, such as medicines, vaccines and diagnostic tests, the inadequacies of health information systems, and the lack of efficient distribution systems for medicines and vaccines, will limit most nations' capacities to deal with large-scale epidemics. Much more can—and should—be done now to build up these resources and give international leaders more options when they are faced with a large-scale bioterrorist attack or a natural pandemic.

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During the exercise, the Chancellor of Germany, played by Werner Hoyer, stated "It is not the idea to secure borders in the sense of making them tight. The idea must be to make crossing borders safe. Otherwise, we are going to destroy our economies within a few weeks." Indeed, leaders would be far less inclined to pursue drastic actions if there were ready supplies of vaccine or medicine and if there were effective systems to get them to the people who need them. But there is currently a critical lack of new medicines and vaccines for all infectious diseases, not just for those that could be used as weapons (Enserink, 2004; Infectious Diseases Society of America, 2004; Spellberg *et al*, 2004).

On the basis of the results of *Atlantic Storm*, we recommend that more national and international investments in medical

research and public health should be directed towards four key areas. First, the international community needs to create the capacity to develop and produce tens or hundreds of millions of doses of vaccines and medicines with short notice. As described above, *Atlantic Storm* participants were stunned when they realized that many NATO and EU members—not to mention their poorer neighbours—did not have enough smallpox vaccine for their populations. The lack of sufficient vaccine stocks and the severely limited capacity to produce new vaccines eliminated many strategic options that they could have used to respond to the epidemic, forcing them to consider measures such as closing borders and implementing large-scale quarantine with severe economic, social and political repercussions. This lack of vaccine stocks and production capacity is not specific to smallpox; investment in the development of medicine and vaccines for virtually all infectious diseases has been declining for decades.

Today, many nations are stockpiling vaccines and medicines for specific biological threats. But, given the vast array of potential biosecurity threats, the long-term answer is a stronger focus on drug design and manufacture so we can develop whatever is needed at short notice. A comprehensive effort to render nations immune to mass lethality caused by infectious disease must include an international 'rapid reaction' capacity to produce and deliver vaccines and medicines against the plagues that can destabilize economies, disrupt societies and kill millions.

Second, the international community should build sophisticated information systems to provide leaders with enough situational information to make decisions and direct resources in response to a bioattack. In *Atlantic Storm*, participants were provided with far more situational information than they would have had in a real crisis. They were given the locations and numbers of reported smallpox cases in almost real time, and they were constantly updated as the situation changed. If this had been a real bioattack or epidemic affecting cities in multiple countries, government officials would have had a great deal of trouble getting even this basic information. This would not only hold true for national leaders, but also for political, scientific and health decision-makers at all levels of the emergency response system. Furthermore, this uncertainty would persist for weeks as the epidemic evolved, which is in contrast to many traditional 'lights and

sirens' security crises—such as the terrorist attacks in New York and Washington on 11 September 2001, the Madrid train bombings on 11 March 2004, and the London attacks on 7 July 2005—in which it may take only hours or a few days to understand what has happened on the ground.

In most countries, the hospitals, health departments, emergency management agencies, local and regional political leaders and national government agencies are not optimally organized to communicate with each other about the location and number of victims; to request national vaccine, medicine or equipment assets; or to plan for the distribution of key resources. Information technology tools and platforms could be designed to share such information and, if these systems are built correctly, they will also improve the routine functioning of hospitals. Moreover, given the early international ramifications of a bioattack as demonstrated by *Atlantic Storm*, these systems must include appropriate procedures for sharing this information between nations.

Third, the international community needs to develop and widely disseminate rapid, point-of-care diagnostic technologies that allow doctors and nurses to easily identify victims of bioterror attacks. There are promising technologies under development, but government investments in these are often lacking, and there is no strategic effort yet to drive their costs and simplicity to a point where hospitals or doctors' offices could use them for both routine and emergency practice.

Fourth, the international community needs to develop the systems necessary to deliver vaccines and drugs rapidly to citizens in the event of a large-scale bioattack or a naturally occurring pandemic (Lien *et al*, 2005). Such systems could make the difference between a community coping with a crisis and a community fragmenting while fighting over scarce resources. But few cities or states in the USA appear to be capable of rapidly distributing vital medical resources (Trust for America's Health, 2004), and we suspect the same is true in most other nations.

The world is facing a growing challenge posed by a combination of the increasing scientific knowledge on deadly pathogens, the development of new technologies in the biosciences, and the easy accessibility of this information and technology to anyone who wants it. These challenges require a holistic strategy that



Fig 3 | Sir Nigel Broomfield, former Ambassador of the UK to Germany. © Kaveh/www.sardari.com



Fig 4 | Gro Harlem Brundtland, former Prime Minister of Norway and former Director General of the World Health Organization. © Kaveh/www.sardari.com

reaches far beyond existing policies to deal with the threat posed by weapons of mass destruction. The question now is how to integrate public health and national security communities in ways that allow us to deal with such an unprecedented challenge.

Atlantic Storm demonstrated that when faced with an unfolding epidemic and the resulting uncertainty, even experienced international leaders have limited options and stark choices to make under today's conditions. Preparation is therefore essential: the exercise made it clear that much more can be done to improve biosecurity for both intentional and natural epidemics. Transatlantic and international initiatives to enhance biosecurity—such as the Global Health Security Action Group, the European Commission's Health Security Committee, the recently announced International Partnership on Avian and Pandemic Influenza—are beginning to gain prominence, but more work is needed. The

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nations of the Atlantic Community should lead this effort and include as many partners as possible.

We need a multilayered, comprehensive effort that seeks to render nations essentially immune to mass lethality and other destabilizing effects caused by the most serious biological threats. While no single tool holds the key to success, a variety of approaches could complement and reinforce each other. The core challenge in addressing bioterrorism—as is also true for naturally occurring epidemics—is to control and minimize the devastation of disease, thereby diminishing any ‘reward’ that could result from an intentional attack and perhaps eliminating the incentive to stage one.

Given the appropriate concern around the world about avian flu and the potential for a human flu pandemic, imagine the impact on international affairs if a thinking enemy wielded the virus. If the transatlantic community regarded biological weapons as one of the most grave and urgent challenges to international security—and if we were to respond with the level of resources and intellectual firepower that the free world brought to defeating Communism—then we could, in our generation, eliminate bioweapons as agents of mass lethality. Along the way we would, inevitably, also make profound discoveries about pathogenic microbes and the human response to infection, which could significantly reduce or even eliminate the death and suffering caused by the naturally occurring infectious diseases that kill 1,500 people every hour and cause half the premature deaths in the developing world (WHO, 1999).

We can create the capacity to eliminate large epidemics of infectious disease in our lifetimes. We can enhance our security as we enhance our health. But we must first choose to take on this task—the post-9/11 equivalent of putting a man on the moon. It can happen. But it will require imagination, commitment and leadership.

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Daniel S. Hamilton is Director of the Center for Transatlantic Relations at the Paul H. Nitze School of Advanced International Studies, Johns Hopkins University, and was the co-sponsor of *Atlantic Storm*. He has served as Deputy Assistant Secretary of State and Associate Director of the Policy Planning Staff. Photo: © Kaveh/www.sardari.com. E-mail: dhamilton@jhu.edu



Bradley T. Smith is a molecular biologist and policy analyst, and served as Project Director for *Atlantic Storm*. He is an Associate at the Center for Biosecurity of the University of Pittsburgh Medical Center and an Assistant Professor at the University of Pittsburgh School of Medicine. E-mail: bsmith@upmc-biosecurity.org

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