

International cooperation and preparedness in responding to accidental or deliberate biological disasters: lessons and future directions

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Summary

Preparations for international cooperation in response to disease disasters at the regional or continental levels are poorly coordinated and cooperation is limited, although intergovernmental and international organisations have been advocating for years that emergency responses to infectious disease outbreaks should be planned for and prepared at the national level. National governments are responsible for contingency planning to protect the public; however, this responsibility needs to be broadened to encompass regional and international approaches. Little public domain information is available on international coordinated responses to the deliberate introduction of biological pathogens. Terrorist events in the early 21st Century have increased awareness of the risks, but solid commitment and internationally resourced initiatives are still lacking. The current avian influenza disaster has largely been addressed by the three global agencies: Food and Agriculture Organization (FAO), World Organisation for Animal Health (OIE) and World Health Organization (WHO), using the underlying precepts that shape the Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs). The GF-TADs offers a substantial base to improve regional epidemiological and environmental information, diagnostic networking, trend analysis and intervention against the important epidemic animal diseases. International prevention, preparedness and response require multidisciplinary teams working in an environment of intergovernmental cooperation that encompasses numerous ministries and agencies. This paper focuses on known international aspects of collaboration on emergency preparedness and addresses the FAO/OIE initiative to strengthen veterinary and public health systems involved in controlling and preventing serious health threats.

Keywords

Agroterrorism – Animal health – Bioterrorism – Biowarfare – Emergency preparedness – Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases – Food and Agriculture Organization – Transboundary animal diseases – Veterinary public health – World Health Organization – World Organisation for Animal Health (OIE).

Introduction

The international organisations continue to argue for emergency preparedness measures at the national level and, recently, have called for recognition of the crucial roles of regional organisations and economic trade blocks

in such preparations. Although many models have been established, guidelines have been provided, and manuals and protocols published or made available on line, the countries themselves must take responsibility for developing contingency plans, as there are no reliable generic blueprints that will address any individual

country's specific constraints, cultures, risks, geography, legislation and political structure, or climate (11, 13, 14, 15, 17, 22). Yet most nations around the globe neglect such forward thinking and fail to develop contingency plans and prepare for emergencies.

Zoonoses and most emerging human infectious diseases are likely to have an animal component in their transmission cycle. Response to an emergency therefore requires collaboration among those responsible for veterinary and human medical services and systems, but also among a much wider range of personnel (11, 26). Professionals who can bring critical skills include climatologists, ecologists, wildlife specialists, sociologists and anthropologists, security officials (police and armed forces), communication and information technologists, and financial administrators. In the case of deliberate releases of pathogens or pests, intelligence and police forces are likely to lead the attempts to find the culprits, but the technical and medical care response would still be the responsibility of the veterinary or public health officials. The urgent requirements of one agency must not obstruct the technical work of the others; thus there must be awareness of the various needs, and of the methods and strategies used. Joint contingency planning is essential, along with exercises to practise coordination measures.

The term 'agroterrorism' was coined some 12 years ago to highlight the vulnerability of agricultural production, stability and safety in the food and feed supply, and safe food distribution. Agroterrorism can be defined as the deliberate introduction of an animal or plant disease in order to disrupt agro-livestock production, cause economic damage, or generate fear (1, 12, 18, 19, 20, 24, 26, 36). This paper focuses on the known international factors affecting collaboration in the prevention of such immoral and wanton threats to agricultural-livestock production, and other multilateral aspects from which the animal-producing regions can learn.

Deliberate releases of pathogens

The effects of an agroterrorist assault on a country's agriculture production system and food chain could include a collapse of the economy, loss of confidence in government services, economic costs to individual or business capital and credit, and illness among the animal and possibly human populations (1, 5, 18, 20, 24, 36). If the food chain is adulterated, humans could be at risk in terms of food safety or public health. Colossal damage could be inflicted on a national economy if even the most limited of outbreaks were identified. To control even these small events, there must be an adequate infrastructure in

place for sub-national zoning measures of inspection, and for compartmentalising food or farm production systems and commodity distribution. If there is no adequate infrastructure to identify and then isolate outbreaks, the detection of a single case of disease could signal disaster.

Detection of such an agent in the agricultural sector could result in local and seasonal job losses, gluts or scarcities, increased storage requirements for unconsumed goods (or their total loss due to decomposition or non-marketability), market-chain food losses to service providers and loss of employment among transporters, with a ripple effect that would extend into the international market place. The burden of increased costs would be increased by the financial investment required to undertake disease-control measures: containment, eradication, surveillance and infection search, up-scaled diagnostics, compensation requirements, disinfection measures, environmentally sound disposal and long-term recovery. Economic losses would not only be felt in the husbandry, production, processing and marketing sectors, but are likely to be passed on to consumers through market adjustments. If agricultural damage were deliberately inflicted, the disruption of the market place would be likely to cause national or regional instability. However, the results would not necessarily be felt at the international level, thanks to demand-conscious brokers seeking other suppliers. There would be other producers of products and commodities that would fill the demand, and this would exacerbate economic problems in the affected countries that were attempting to recover their lost position in a competitive market place.

The Center for Nonproliferation Studies, located at the Monterey Institute of International Studies, maintains the 'database of incidents involving sub-national actors and chemical, biological, radiological, or nuclear materials', which lists 21 known incidents that could be classified as attacks against agricultural targets (21). Attacks against crops or animals are not new, and have been conducted both by nation-states and by subversive sub-state groups. At least nine countries had documented agricultural bioweapon programmes during some part of the 20th Century: Canada, France, Germany, Iraq, Japan, South Africa, the United Kingdom, United States of America (USA) and Russia (as well as Kazakhstan and Uzbekistan at the time when they were republics of the Union of Socialist Soviet Republics). Four other countries are believed to have or have had agricultural bioweapons programmes (Egypt, the Democratic People's Republic of Korea, Rhodesia [now Zimbabwe] and Syria) (21). Glanders caused by the bacterium *Burkholderia mallei* was used against horses and mules of the allied forces during the First World War, and again in Afghanistan in the 1980s; the bacterium causing anthrax, *Bacillus anthracis*, and rinderpest virus (Paramyxoviridae) were allegedly used during the Second World War in the Asian-Pacific theatre (21).

In the current environment of increased worldwide awareness, an outbreak of a disease in livestock would be investigated by the competent veterinary authority. Investigators would probably assume the event was due to natural causes or to a spread of disease that followed known epidemiological principles, and the investigation would be focused on confirming or eliminating a range of suspected causes (medically referred to as differential diagnosis, and more commonly as 'rule-out lists' or 'look-alike diseases'). Forensic medicine would not be seen as very important; outside the sphere of classical medical epidemiology, incident management would not prioritise measures to ensure the evidence was not disturbed, as would happen at a known crime scene. The call to undertake clinical or post-mortem examinations and further investigation is likely to come through the normal channels – owner, producer, private veterinarian – who would subsequently submit samples to a veterinary diagnostic centre (27). The 'crime scene' would certainly, though unknowingly, be interfered with, and a formal chain of custody of samples would not even be considered.

It is difficult to predict exactly when the suspicion may first arise of the intentional introduction of a pathogen or pest. Several factors are likely to come into play. One of the most important is the molecular characterisation of the agent, which would serve as a 'fingerprint' to answer the primary question of 'what' – the biological cause of the outbreak. While investigators must consider the possibility that there may be more than one agent acting in synergy or predisposing an affected host, the molecular fingerprint may also give some indication of the 'who' – the person or persons responsible. The other classical descriptive epidemiological questions of 'where' and 'when' remain essential, but the 'how' may become a very complex question to answer.

International organisations

International cooperation in addressing problems such as rinderpest (also known as cattle plague) – a transboundary veterinary problem – is probably best exemplified by the first signatory countries in 1924 to create the Office International des Épizooties (OIE), today known as the World Organisation for Animal Health. The OIE now has a membership of 167 nations.

Three international organisations are directly involved in human and animal health: the Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO), and the World Organisation for Animal Health. None of the three organisations currently have mandates to intervene, police, give opinions or assist in bioterrorism or agroterrorism events. However, during the May 2002 55th World Health Assembly held in

Geneva, a resolution entitled 'Global public health response to natural occurrence, accidental release or deliberate use of biological and chemical agents or radionuclear material that affect health' was adopted (37, 38). Under this resolution, the WHO established, under the leadership of the Communicable Disease, Surveillance and Response team, a series of initiatives addressing issues of the intentional release of pathogens; the aim was to improve international and national emergency preparedness to counter specific diseases and intoxications. In addition, the Global Outbreak Alert and Response Network (GOARN) was established to tap into the expertise of partner institutions and individuals and support the WHO's Alert and Response Operations group (ARO). The four areas under implementation are:

- a) international preparedness – where the objective is to respond to the Member States' requests for technical assistance to national programmes of chemical and biological weapon preparedness and response, and training
- b) global alert and response – which is to provide the 192 Member States with a framework for monitoring conditions that may require international alerts on threats and developing the ability to make field assessments with GOARN experts that would make effective containment possible
- c) national preparedness – which combines parallel work with international preparedness plans and coordinates guidance for national laboratories and epidemiology units and training by the United Nations (UN) Disease Management and Training Programme
- d) preparedness for 11 selected diseases and intoxications.

Of the 11 threats mentioned in (d), five are considered to be potential biological weapons (anthrax, botulism, plague, tularaemia and smallpox), but all are zoonotic agents (37).

At a WHO-organised meeting held at Lyon, France, in February 2005 on biological laboratory safety and biological laboratory security, Interpol, the International Criminal Police Organization, explained their role in investigating criminal acts of pathogen introduction, while highlighting their reliance on technical international inputs for understanding mechanisms of transmission risks and implications. A newly established unit funded by the Alfred P. Sloan Foundation is to focus on bioterrorism: that is, to raise awareness of the threat, develop police training programmes, strengthen efforts to enforce existing legislation, promote the development of new legislation, and encourage inter-agency cooperation in combating bioterrorism (16). The presence of FAO and OIE at the meeting provided an opportunity to share knowledge of the dangers and implications of agroterrorist threats.

The Codex Alimentarius Commission (Codex) was established in 1962 by FAO and WHO to develop international standards to protect the health of consumers and to help ensure fair practice in the food trade. With the establishment of the World Trade Organization (WTO) and its international trade agreements, the importance of the Codex increased substantially. The Codex became the reference organisation for international food safety standards under the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement) (43). To date, the Codex has not addressed specific actions or provided agenda items to protect food security or food safety in the event of the deliberate introduction of a pathogen or adulteration of the food supply. There are, however, several guidance documents developed by the Codex Committee on Food Import and Export Inspection and Certification Systems that can orient countries in food security and safety programmes. Specific areas that are covered include:

- design, operation, assessment and accreditation of food import and export inspection and certification systems
- food import control systems
- the exchange of information in food control emergency situations.

Other issues are currently being studied; they include:

- working principles for risk analysis
- traceability guidelines for the tracking of food products
- principles and guidelines on microbiological risk management.

All of these are relevant to food safety issues and possible adulteration (35, 43).

The Interim Commission on Phytosanitary Measures, which sets international standards for phytosanitary measures, oversees the International Plant Protection Convention (IPPC) (10).

The IPPC is a multilateral treaty for cooperation in plant protection that had its beginnings with the agreement by 12 countries to regulatory measures for grapevines under the Phylloxera Convention of Berne in 1881. This convention represented the first efforts at formalising international cooperation in plant protection and led to the recognition of the need to address other plant pests and enlist cooperation among all countries.

At present the convention covers a wide range of issues to secure cooperative action to prevent and control the spread and introduction of agricultural plant pests. The main tasks of the IPPC are standard setting, information exchange and technical assistance; as such it works in

parallel with the OIE, which is primarily responsible in the realm of animal health, while there are also substantial contributions from FAO's resources on animal production and health, food, feed safety, and the array of collaborating and reference laboratories. As of 2 September 2005, there were 139 signatory parties to IPPC.

During the Uruguay Round (1986 to 1994) of the General Agreement on Tariffs and Trade, which covers international trade in goods, the need became clear for enforceable guidelines for preventing the transmission of diseases, while discouraging unjustified restrictions in international trade. After the establishment in 1994 of the WTO and the signing of the SPS Agreement, the OIE became responsible for the oversight of and guidance on trade issues and animal diseases. The OIE publishes guidelines such as the *Terrestrial Animal Health Code* (42), the *Aquatic Animal Health Code* (41), the *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals* (40) and the *Manual of Diagnostic Tests for Aquatic Animals* (39).

Yet neither FAO nor the OIE have received a mandate from their governing bodies to act in the event of a deliberate release of a biological agent, develop confidence-building measures, undertake inspections or perform risk analyses. Nor, considering their existing missions and portfolios, do they have the necessary resources to fund a dedicated staff capable of developing intervention or prevention plans on the complex issues of food security and food safety in relation to the intentional adulteration of food production or processing, or to implement the proper investigative methods. As said above, the people responsible for responding in the initial stages of an outbreak would probably not suspect a deliberate attack. Both FAO and the OIE, however, have within their staff experienced individuals who understand the agroterrorism issues and can mobilise support from numerous reference laboratories, collaborating centres and a list of recognised experts who, if asked, would contribute sound technical services and judgement (27).

As of December 2004, the number of state parties to the 1972 Biological Weapons Convention (BWC) was 169, of which 153 had ratified the Convention, while 16 had signed but had not yet ratified it through their national government bodies; an additional 25 countries had observer status but had yet to sign or ratify (2, 32, 33). It is a daunting task to obtain effective and improved compliance with the Convention, for which legally binding instruments are lacking. As stated eloquently in a Federation of American Scientists document:

'An effective mechanism for investigating alleged use of biological and toxin weapons will not only enhance compliance with the BWC by deterring use, but will also assure States Parties that any suspicious incident occurring on their territory will be investigated at their request. It will

also offer a means by which countries wrongly suspected of violation can demonstrate their compliance, and it will discourage unfounded and destabilising accusations' (9).

At present, the mechanisms for inquiry and inspection are unstructured; there is no funding to prepare for the alleged use of a biological (or chemical or radiological) weapon, nor any authority over governments to ensure compliance with the treaty. The General Assembly of the UN (Resolution 42/37 C, 1987, and Resolution 43/74 A, 1988) has authorised the Secretary General 'to compile and maintain lists of qualified experts provided by Member States whose services could be made available at short notice to undertake such investigations, and of laboratories with the capability to undertake testing for the presence of agents the use of which is prohibited' (2, 32, 33). However, there is discontent within some of the signatory state parties, who argue that the current system should be re-evaluated. Specifically there is a call for:

- a more formal mechanism of inspection and compliance measures
- greater balance in the issues surrounding the listed expertise with regard to global representation or political governing structures
- measures to address the problem that the present system, in the event of an investigation, has no legally binding consequences for the state party in question.

There is little evidence of official international or multilateral cooperation in the public domain. Several international conventions and treaties have been signed by member states, and these exemplify the nearest approach to international and multilateral cooperation (examples are the BWC, which has 169 signatory party states, and the IPPC with 139). Yet these conventions are not effective in terms of ensuring and assuring compliance. Though treaties and conventions essentially operate at the national (ratification) and international (agreement) governing levels, the current reality is that the one unifying characteristic of the recent terrorist events has been their non-nationalistic ideology. Attacks have been mounted by sub-state groupings, often on a trans-national scale; to demonstrate that any particular state party or country is responsible for such actions is difficult, and may be impossible.

For effective national protection, more international outreach and investment is required. At the same time, domestic preparedness operations should be planned and practised, and a transparent system of compliance agreed upon. Under a more ideal system, international staff should be available to provide international liaison, technical support, and the services required for rapid and effective deployment of multidisciplinary investigation teams – including veterinarians, physicians,

epidemiologists, microbiologists – that can augment local expertise (that is, the local practitioners) and, if necessary, provide leadership. This international support group should similarly be able to secure on demand the services of additional individuals and institutes with a record of the necessary expertise (geospatial analysis, wildlife, markets, ethnomedicine and meteorology, for instance). In these interventions, the international team should be capable of controlling activities in the field and liaising with local and central government authorities.

The Federal Association of American Scientists recognises the added value of the WHO, FAO and the OIE:

'a protocol to the BWC should strengthen the reporting expectation by incorporating a legally-binding requirement to report unusual outbreaks, and [this protocol] should specify that the reports should be directed to an appropriate international health organisation rather than to an arms control organisation. Reporting of human, animal, and plant outbreaks should be required; examples of appropriate international health organisations would include the WHO, the FAO, and the OIE' (9).

A national approach with international outreach

Perhaps the country with the greatest awareness (or fear) of the agroterrorist threat is the USA, a country highly dependent on its agricultural production to meet its national needs, and one that has a vast and powerful agro-livestock industrial export portfolio (1, 5, 6, 18, 21, 24, 25, 28, 29). Though the focus of this paper is on international cooperation, most references to cooperation in gathering intelligence about and preventing – and recovering from – an agroterrorist event are examples of national and intergovernmental activities, or between government and industry (e.g. the creation of the Department of Homeland Security, or the independent Aon Corporation's establishment in the USA of the 2005 Agroterrorism Assembly, which met in Sacramento in August 2005). The Department of Homeland Security in the USA, established only in 2003, is one country's attempt to ensure oversight and administration over critical agencies and government services that are mandated to ensure national security and safety, including specific components of the agriculture and livestock sectors.

The US Congress introduced a bill in March 2005, referred by the Subcommittee on Europe and Emerging Threats to the House of Representatives, that was designed to foster cross-border cooperation in Northern Europe via the Northern Europe Initiative. The bill was an attempt to develop inter-regional cooperation within the conceptual

and operational framework of US policy, extending cooperative measures outside the national boundary of the USA. The initiative focused on developing a regional cooperation network in several important areas, including public health. In addition, 2005 saw the enactment of the US Agricultural Security Assistance Act concerning agricultural safety measures, which defined the measures that the country should undertake to improve coordination with international organisations (28).

A regional approach with international application

In Europe, a specific committee was formed to develop a programme through the European Commission Task Force on Bioterrorism (BICHAT), which utilises the expertise of employees within the European Commission, third-party countries and the WHO. The aims of the programme are:

a) to develop a mechanism in relation to attacks with biological and chemical agents for information exchange, consultation and coordinated management activities on emerging issues

b) to identify European expertise that would be readily available to detect and identify the use of chemical and biological weapons in the early stages of any terrorist attack

c) to create a stockpile of medical supplies, a database of health services, and an emergency unit able to deploy its health personnel and dispense medical care and medicines rapidly in the case of such attacks

d) to establish:

- ethical guidelines to standardise the activities of health professionals

- regulations to coordinate a European response, and to facilitate contacts and exchange of information with developing countries and international organisations (3, 6).

In a series of directives, the European Union (EU) identified the key role of a well-articulated emergency preparedness system, which should be able to differentiate cases of disease emergence due to deliberate dissemination of biological agents from other clinical occurrences of disease, whether unusual or commonly encountered (6, 7, 8). The European effort would:

- expand and reinforce the epidemiological systems of surveillance already in existence as well as the diagnostic capacities of microbiology laboratories

- develop and adopt standardised procedures of intervention

- provide common guidelines on disease and emergency management.

The final outcome of these proposals and directives was the creation in July 2003 of the European Centre for Disease Prevention and Control (<http://www.ecdc.eu.int/>), analogous to the Public Health Service's Centres for Disease Control and Prevention in the USA (4). The latter is part of the Department of Health and Human Services in the USA, but has on its staff, among others, professionals representing the agricultural, veterinary and military sectors.

In its original proposal submitted to the European Parliament, the programme of the Environment, Public Health and Consumer Policy Committee for 2001 to 2006 stated:

'Achieving the overall aim and the general objectives of the Programme requires effective co-operation of the Member States and dialogue with all key partners such as non-governmental organisations. Institutions, associations, organisations and bodies in the health field are encouraged to submit projects for implementing specific priorities, defined on an annual basis by the Commission' (30).

The European public health programme and international cooperation builds on experience acquired in the international context, and puts particular stress upon the importance of cooperation with international organisations such as the WHO. In most of these proposals and initiatives, FAO and the OIE are not mentioned, leaving the agricultural-livestock sector financially and politically unprotected.

Global and trans-Atlantic partnerships to confront terrorism have existed for much of the 20th Century, and events occurring early in the 21st Century have increased society's awareness of potential threats to agricultural and food security. However, there is still a lack of solid, focused and well-resourced initiatives. The North Atlantic Treaty Organization (NATO), though originally created as a military pact in the aftermath of the Second World War, has established the Programme for Security Through Science, which offered support in 2005 for international collaboration on priority issues such as 'Defence Against Terrorism' and 'Countering Other Threats to Security' (23). This approach and other proposals from specific countries or institutions should be encouraged, when they apply to threats against the agriculture and livestock sectors.

The New Defence Agenda (NDA) was established as a neutral platform to discuss NATO and EU security policies. The NDA's Bioterrorism Reporting Group and the Chemical and Biological Arms Control Institute proposed a system for the United States and Europe to cooperate to counter bioterrorism (5). The paper highlights the

solidarity after the events in New York and Washington in September 2001, and the strain in transatlantic relations related to pre- and post-war Iraq. The failure to find weapons of mass destruction in Iraq, and the failings of the reported and publicised intelligence on both sides of the Atlantic, further alienated governments and peoples, but the perceived reality of such a weapon threat has not diminished. With advances in biotechnology and increasing global access to information, the potential for abuse of science and conventional weapons proliferation are central security issues which must be addressed by the transatlantic relationship and the international community as a whole.

In January 2005, in a transatlantic international exercise named Atlantic Storm, a fictitious scenario depicted a summit meeting of transatlantic leaders being forced to respond to a smallpox bioterrorist attack (5, 29). The transatlantic leaders were played by current and former officials from several countries and organisations (particularly NATO allies and EU representatives). The exercise was designed to extract decisions and stimulate discussions among the representatives on a series of bioterrorism preparedness and response issues. The tensions created during the exercise revealed the difficult decisions to be made about 'domestic politics and international relations, the challenge of controlling the movement of people across borders, and an international shortage of critical resources'. The exercise showed 'that existing international organisations – such as NATO, the EU, or the UN – are not well suited to respond to the challenges posed by a bioterrorist attack of this scope and complexity' (34).

The post-exercise analysis of another emergency exercise, Global Mercury (31), reinforced the lessons of Atlantic Storm. The analysis emphasised that the international community was inadequately prepared and unable to respond effectively to attacks by Class A biological warfare agents. Such agents use pathogens that are dangerous to human health and can be easily disseminated or transmitted from person to person; they cause a high mortality, have a potential for major public health impact, and may trigger public panic and social disruption. In an agricultural-livestock setting, such parallel disease-causing pathogens would probably be the same diseases that FAO's Emergency Prevention System programme addresses. Special action is required to prepare an effective response to protect the public in the event of such an attack.

Four major lessons could be learnt from the Atlantic Storm and Global Mercury exercises (5, 29, 31):

- 'the difficulties involved with international exchange of information during an emergency'
- the lack of 'international perspectives' in national smallpox plans

- the need for a common terminology to describe the magnitude and extent of a public health emergency
- the need for 'robust and reliable communication systems' to be tested on a regular basis.

The importance of these exercises, though they were not specific agricultural-livestock scenarios, does highlight the need for investment and serious planning and practising at the international cooperative level to control such emergencies. Among the aspects that FAO and the OIE emphasised as being of great concern are:

- the social disruption that would follow an outbreak of disease, including the loss of confidence in food quality and availability
- the effectiveness of responses by government and relevant international and regional organisations
- the inadequacy of information available at the local level
- the environmental impact associated with controlling problems related to agriculture.

Desk-top and field exercises are required in this sector as well, since contamination of the food supply and its sources would constitute a public health emergency.

The BICHAT has listed 25 actions that would be necessary to respond to a bioterrorism event, grouped under four specific objectives:

- a) To set up an alert and information exchange mechanism, coordinated by the Health Security Committee, to be responsible for exchanging information on health-related threats, on preparedness and response plans, and the development of crisis management strategies.
- b) To create a mechanism for rapid detection and identification of pathogens and chemical agents that might be used in an attack, in line with Decision 2119/98/EC of 24 September 1998 on the surveillance and control of communicable diseases. A list of biological agents likely to be used in bioterrorism has already prioritised these agents on the basis of criteria such as infectiousness, virulence, persistence in the environment and ease of spread. Council Regulation 1334/2000 also lists biological and chemical agents linked to export control arrangements, and the ability of regulators to detect and identify the agents.
- c) To create a database on stockpiles for medicine, medicine formulation facilities, and all available health service providers in the event of an attack.
- d) To prepare and disseminate guidelines and regulations on mechanisms for response, especially coordinating the EU response, and to establish procedures for links with other countries and international organisations (3, 7, 8).

While it is notable that concerns about a terrorist event aimed at the agricultural or livestock production sector are omitted, much can be learnt from priority setting and the proposals to make better use of the established links between member countries, regional bodies and international organisations; these lessons can be applied to the food-producing sectors.

Emergency preparedness plans to counter the possible introduction of a transboundary animal disease are essential. Once developed, these plans must be tested through simulation exercises to identify deficiencies and gaps. The author is aware of over 50 such simulation exercises that have been performed in various countries around the world in recent years. Despite this work at the national level, however, there is little evidence of a regional collaborative approach.

The NAFTA region is a partial exception to this general weakness. In November 2000, Canada, the USA and Mexico participated in 'Tripartite Exercise 2000', where a simulated outbreak of foot and mouth disease (FMD) was used to test existing emergency disease response plans. The exercise demonstrated that a multinational crisis would pose serious, large-scale challenges in terms of communications, logistics and infrastructure. In this special scenario, the fictitious FMD epidemic started in Texas, spreading geographically into Mexico and through animal transport into Canada because of trilateral open-border policies. The USA and Mexico conducted a follow-up FMD exercise in May 2003, and another was preformed by the USA and Canada in March 2005.

The author is not aware of other multilateral exercises at such a detailed level or with the participation of all national Chief Veterinary Officers of the countries concerned. However, there have been numerous international capacity-building exercises where participants from several countries (usually neighbours) simulated fictitious field outbreaks and undertook follow-up epidemiological and disease containment training for several days. Such training is important and welcome, but is often undertaken only at the official veterinary level; ideally, training should also involve other stakeholders, including high-ranking decision-makers (as in Atlantic Storm), so as to increase the value of such exercises and integrate official action with increased financial resources and contributions from the private commercial sector.

A way forward

The FAO/OIE initiative Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs) is designed to safeguard the worlds' animal health and production through concerted international

action to control animal (and zoonotic pathogens) at source (11, 27). Both FAO and the OIE have considerable experience in international cooperation and providing technical assistance in organising preparations and contingency plans for the prevention and control of transboundary animal diseases, using a regional approach with other partners. (Examples of such work include measures to control rinderpest through the Global Rinderpest Eradication Programme, and the New World Screwworm in North Africa, the Programme Against African Trypanosomiasis, Caribbean Amblyomma Programme, classical swine fever in the Americas, FMD in South-East Asia, FMD in Europe, and the highly pathogenic avian influenza in Asia.)

Along with rinderpest control and eradication in Asia and Africa, one of the longest regional approaches for disease control is the Pan-American Health Organization's work on FMD in South America (which has continued for over 50 years). Another example is the successful European Commission for FMD Control, whose Secretariat is hosted by FAO. Generic models of ways to develop preparedness and contingency plans, which include explanatory notes, rationale, structure and conceptual coordination features, have been published and could be useful references for countries or agencies that see gaps within their veterinary or public health systems (13, 14, 15).

Global or regional contingency plans for veterinary or public health disasters per se do not exist. Perhaps the largest exception is unfolding at the time of writing: the outbreaks of highly pathogenic avian influenza type A/H5N1 in Asia and parts of Europe, and of other pathotypes elsewhere. The world community is concerned that the circulating avian influenza viruses may reassort with human or other mammalian viruses, undergo mutations or otherwise adapt to humans, and prompt a human influenza pandemic that might cause millions of human fatalities and social disruption across all continents; in the worst scenario, medical systems would be unable to cope with the high case loads and huge demands for hospital care, while many medical and support staff would be absent from the workplace because they were ill, taking care of infected family members, or frightened of being exposed to infection.

Beginning in late August 2005, the UN called upon select agencies to develop coordinated plans for strategic interventions throughout its system and in all parts of the world. FAO, the OIE and WHO have been providing assistance to control and prevent outbreaks, and to establish networks at the national, regional and global levels since the crisis first came to international attention in January 2004. However, these concerns have only recently been raised at the highest levels of the UN system, and given sufficient priority that now emergency coordination may well be handled from the UN Headquarters in

New York. The UN Development Group and Humanitarian Agency Standing Committee is seeking technical advice from the leading three health organisations in preventing, preparing and responding to pandemic (human) influenza.

However, key stakeholders and developers for preparedness and strategic response include a broad range of other international and regional bodies who would be involved at different phases of the theoretical pandemic. These bodies include:

- political structures (the UN General Assembly and Association of South-East Asian Nations)
- development institutions (the UN Development Programme, United Nations International Children's Emergency Fund)
- national agencies and organisations for international development and assistance, including non-government organisations
- economic institutions (e.g. the World Bank, International Monetary Fund, Islamic Development Bank)
- partnership governing bodies (the European Commission)
- logistic support agencies (the UN Humanitarian Air Service, UN Peacekeeping Operations, NATO, International Red Cross and Red Crescent)
- private foundations and government donation coordinators
- real-time communications and public media agents.

All the institutions and agencies described need to recognise – and probably do – that ultimate success is measured at the local level in terms of health, livelihood, rehabilitation and opportunities for a promising future.

Another important factor that must be incorporated further into the GF-TADs is the need for immediate access to a logistical apparatus to contain outbreaks of geoeconomic importance. In this realm much can be learned from other UN agencies, such as the High Commission of Refugees, the World Food Programme, and Office for the Coordination of Humanitarian Affairs, and the European Community Humanitarian Office (ECHO) Humanitarian Aid (European Commission). The OIE and FAO are currently making progress in this field as they have begun participating closer with the WHO's ARO group, GOARN, and the WHO Global Influenza Programme.

From a global point of view, the major epidemic diseases of livestock occur most often in the developing world, jeopardising local and regional production of healthy animals, and posing the risk of infection spreading to disease-free countries. Yet even in areas afflicted by religious animosities, political disenchantment, economic

strife and poverty, the occurrence of these pathogens can be controlled and the lives of millions, even billions, of people improved. If the necessary financial resources are provided and focused on the problem, the disease-causing agents can be constrained, reducing the risks that pathogens will spread to areas far from their endemic occurrence.

The GF-TADs initiative does not directly address the discontent that may incite organised groups or disaffected individuals to obtain or isolate, weaponise, and release a pathogen that affects livestock, wildlife or human health. The initiative does, however, move in the direction of limiting endemic or sylvatic diseases through:

- use of advanced epidemiological tools
- promotion of international information exchange
- monitoring of suspect disease events through verification and validation procedures (early warning and detection)
- provision of contingency funds and urgent-intervention (early response) instruments
- strengthening of veterinary services
- promotion of integrated human, animal and environmental health objectives.

Properly funded, GF-TADs and its global early warning (and response) system can provide the international and sub-regional tools for the same objectives of transatlantic cooperation that the EU has set up. The initiative also embraces food security and safety at the local level through better veterinary care delivery, participatory epidemiological approaches and development of strategies to identify the sources of infection. In the case of human influenza pandemic preparedness, it would be cost effective – not only in terms of direct financial costs, but also in terms of preventing the disruption of people's lives, maintaining business, manufacturing and service sectors, avoiding emotional pain and the like – if more funding and resources were available to avert the human threat at the source. This means paying attention to poultry farms and markets, flock hygiene and good farming practices, animal production biosecurity, improved avian influenza vaccines and diagnostics, and enhanced veterinary surveillance.

Additional areas of concern that require international convention and cooperation

One aspect that has been poorly explored by the international community, though numerous state agencies

are actively tackling the problem, is the introduction of non-native species that may out-compete existing native species and are thus likely to create environmental imbalance. Examples include rabbits or cane toads (*Bufo marinus*) in Australia, northern snakehead fish in North America (*Channa argus*), or the Asia tiger mosquito (*Aedes albopictus*), which today appears in many parts of the world and is a competent vector for several diseases of animals and humans. The international veterinary and public health communities, including FAO and WHO, should incorporate into their structures and activities better ecological understanding of pathogens and hosts, environmental triggers, and the modelling and integration of such imbalances in order to provide better control and mitigation measures.

A second aspect for which greater awareness and action are required is the strengthening of veterinary and human public health education schemes and improving the quality of their curricula. In the case of veterinary medicine, the glut of veterinary schools in many countries around the world makes for a less than optimal environment to learn the profession as thoroughly as is necessary; similarly, once qualified, many veterinarians find it difficult to practise the profession and receive fair remuneration for their services.

Ancillary to the education of veterinarians and physicians is the parallel education and training of biologists, microbiologists, molecular geneticists and other bioengineers. Good basic laboratory practices are needed to instil a high code of conduct for agent handling, laboratory procedures, documentation and reporting; systems are also needed to integrate these skills into national and international preparedness planning. The introduction of good laboratory practices early in the education of such specialists is directly related to the later levels of biosafety, biosecurity and expertise required in an

emergency. National standards must be instituted and professional organisations promoted, and there needs to be a widespread incorporation of international accreditation of institutes, schools and laboratories which can foster productive international collaboration, networks and synergy in peaceful (as opposed to dual-purpose) research.

A systematic scheme for prevention, preparedness, response and recovery requires multidisciplinary teams of professionals and auxiliary staff working in an environment of national and regional intergovernmental cooperation that encompasses decision-makers from the Ministries of Health, Agriculture, Livestock, Environment and Natural Resources, Public Works, Police and Defence; most important of all, perhaps, is the creation and pre-financing of emergency contingency plans, for which Ministers of Planning and Finance must be responsive, responsible and accountable. Networking through regional and international collaboration leads to greater trust and mutual respect that is based on a sound and tested appreciation of worth. Good governance of the national, regional and international institutions is bound to improve confidence at all levels, from individual consumers to individual ethnic groups, and to individual countries. Greater inter-professional confidence comes from experience in productive interactions, critical thought, shared information, joint problem-solving and sound decision-making.

The vital conclusion is that we live on one globe. There is only one health that we should strive for, which encompasses wildlife and domestic animals, humans and the environment. To succeed we have to share knowledge and resources, and improve international interactions to build the necessary trust for a promising future.



Coopération internationale et préparation face aux catastrophes biologiques d'origine naturelle ou intentionnelle : leçons et orientations futures

J. Lubroth

Résumé

La préparation des plans de coopération internationale pour réagir aux catastrophes sanitaires à l'échelle régionale ou continentale n'est pas suffisamment coordonnée et la coopération reste limitée, bien que les organisations intergouvernementales et internationales répètent depuis des années qu'il faut planifier au niveau national et préparer les interventions d'urgence face aux foyers de maladies infectieuses. Certes, les gouvernements sont responsables des plans d'urgence pour la protection de la population, mais cette responsabilité doit être élargie pour couvrir les crises régionales et internationales. Le domaine public ne dispose guère d'informations sur la coordination des réactions internationales en cas de diffusion volontaire d'agents biologiques pathogènes. Les actions terroristes au début du 21^e siècle ont fait prendre davantage conscience des risques, mais les engagements fermes et les initiatives appuyées sur des ressources internationales font toujours défaut. La crise actuelle due à l'influenza aviaire a fait l'objet de travaux très poussés de la part de trois organisations internationales, l'Organisation des Nations Unies pour l'alimentation et l'agriculture (FAO), l'Organisation mondiale de la santé animale (OIE) et l'Organisation mondiale de la santé (OMS), sur la base des mêmes principes sur lesquels repose le Plan-cadre mondial pour la lutte progressive contre les maladies animales transfrontalières (GF-TADs). Le GF-TADs offre une base solide pour améliorer l'information épidémiologique et environnementale au niveau régional, les réseaux de diagnostic, l'analyse des tendances et l'intervention contre les épizooties importantes. La prévention, la préparation et l'intervention au niveau international nécessitent des équipes pluridisciplinaires qui travaillent dans un cadre de coopération intergouvernementale regroupant de nombreux ministères et organismes. Le présent article se concentre sur les aspects connus de la collaboration internationale en matière de préparation aux situations d'urgence et aborde l'initiative FAO/OIE qui vise à renforcer les Services vétérinaires et de santé publique impliqués dans le contrôle et la prévention des menaces graves pour la santé.

Mots-clés

Agroterrorisme – Bioterrorisme – Fièvre aphteuse – Fièvre charbonneuse – Guerre biologique – Influenza – Maladie animale transfrontalière – Organisation mondiale de la santé – Organisation mondiale de la santé animale (OIE) – Organisation pour l'alimentation et l'agriculture – Peste bovine – Préparation aux situations d'urgence – Santé animale – Santé publique vétérinaire – Système de prévention des urgences pour les ravageurs et les maladies transfrontières des animaux et des plantes.



Cooperación internacional y preparación para responder a desastres biológicos de origen natural o intencionado: experiencia y orientaciones futuras

J. Lubroth

Resumen

La cooperación internacional para dar una respuesta de ámbito regional o continental a desastres sanitarios no sólo es escasa, sino que además está poco preparada y coordinada, pese a que las organizaciones intergubernamentales e internacionales llevan años propugnando que la respuesta de emergencia a brotes infecciosos se planifique y prepare a escala nacional. Los gobiernos de los países son responsables de elaborar planes de emergencia para proteger a su población, aunque es preciso ampliar estas responsabilidades para que den cabida a intervenciones de alcance regional o internacional. Hay poca información de dominio público sobre medidas internacionalmente coordinadas para responder a la introducción deliberada de patógenos biológicos. Aunque los atentados terroristas de principios del siglo XXI han generado una mayor conciencia de los riesgos, siguen faltando un sólido compromiso e iniciativas dotadas de financiación internacional. De la actual crisis de la influenza aviar se han ocupado básicamente tres organismos mundiales: la Organización de las Naciones Unidas para la Agricultura y la Alimentación (FAO), la Organización Mundial de Sanidad Animal (OIE) y la Organización Mundial de la Salud (OMS), utilizando los preceptos que subyacen al "Marco mundial para el control progresivo de las enfermedades animales transfronterizas" (GF-TADs). Este programa sienta sólidas bases para perfeccionar a escala regional la información epidemiológica y ambiental, las redes de diagnóstico, el análisis de tendencias y las actuaciones contra las enfermedades epizooticas importantes. La prevención, preparación y respuesta internacionales requieren la presencia de equipos multidisciplinares que trabajen en condiciones propicias a la cooperación intergubernamental, con participación de numerosos ministerios y organismos. El autor se centra especialmente en los aspectos conocidos de la colaboración internacional en torno a la preparación para emergencias, y examina la iniciativa de la FAO y la OIE para reforzar los sistemas de salud pública y veterinaria que intervienen en el control y la prevención de amenazas sanitarias de gravedad.

Palabras clave

Agroterrorismo – Bioterrorismo – Carhunco bacteridiano – Enfermedad animal transfronteriza – Fiebre aftosa – Guerra biológica – Influenza – Organización Mundial de la Salud – Organización Mundial de Sanidad Animal – Organización de las Naciones Unidas para la Agricultura y la Alimentación – Peste bovina – Preparación para emergencias – Salud pública veterinaria – Sanidad animal – Sistema de prevención de emergencias para enfermedades de animales y plantas.



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