

The importance of intergovernmental standards in reducing biological threats associated with accidental, natural or deliberate acts

B. Vallat & D. Chaisemartin*

World Organisation for Animal Health (OIE), 12 rue de Prony, 75017 Paris, France

*Corresponding author: d.chaisemartin@oie.int

Summary

Pathogens represent a considerable and ever-present threat to animal health, agriculture-based economies, food safety, public health and food security. Whatever the origin of the event (natural, accidental or intentional), the standards set by the World Organisation for Animal Health (OIE) enable countries to improve their organisation to reduce the risk, relying mainly on quality Veterinary Services, which can be assessed using the OIE Tool for the Evaluation of Performance of Veterinary Services (PVS). Setting up a surveillance and early detection system in line with OIE standards, underpinned by an animal health network involving a public-private partnership with veterinarians, farmers, hunters, laboratories and wardens of protected areas, makes it possible to deal with the appearance of any pathogens and to intervene rapidly to control and eradicate them. Emergency plans to deal with pathogens with the most serious repercussions on animal health, public health and the economy are vital and must be regularly assessed using simulation exercises in order to identify and implement any adaptations or improvements to them.

Keywords

Biological threat – Early detection and response – PVS pathway – Standards – Surveillance – Veterinary Services.

Introduction

Biological threats do not respect borders. The presence of infectious pathogens and toxins in animal populations and products of animal origin represents a considerable and ever-present threat to animal health, agriculture-based economies, food security (cereals and livestock), food safety and public health. For millennia, infectious diseases have spread between animals (domestic and wild) and humans, causing plagues and pandemics with significant social, economic and environmental repercussions. Recent examples of emerging or re-emerging infectious diseases, such as Ebola or zoonotic influenza, show how difficult it is to predict when and where new diseases will emerge naturally, or where diseases that have disappeared will reappear.

The vast majority of disease outbreaks and cases of food contamination are natural in origin. Nevertheless, the risk of diseases spreading in susceptible human or animal populations following the deliberate or accidental dissemination of a pathogen or toxin is very real.

Unfortunately, pathogens can also escape accidentally from a laboratory, as was the case for the foot and mouth disease virus.

‘Non-natural’ biological threats carry special risks because the pathogens may have been modified or dispersed with the deliberate intention of increasing the harm they cause. Although the probability of intentional or accidental dissemination remains quite low, its impact has the potential to cause a national or global disaster.

Because of their high impact, modest cost and their ease of acquisition and propagation, as well as the possibility of illegally taking them across poorly controlled borders, pathogens of animal origin can be used as biological weapons or for terrorism. The biotechnology revolution has resulted in a proliferation of techniques for modifying such pathogens at an increasingly low cost.

In 1920, a new incursion of rinderpest virus in Europe caused by the transit of zebus from south Asia travelling to Brazil via the port of Antwerp, led to 28 countries coming

together, on 25 January 1924, to prepare and sign an international agreement creating the *Office international des épizooties* (OIE – World Organisation for Animal Health). One of the Organisation's missions was, and still is, the development of international standards to be employed by Member Countries to guarantee the safety of international trade, largely by protecting themselves against the introduction of diseases and pathogens, without erecting unjustified barriers.

The most effective and sustainable way of protecting against the threat of the deliberate or accidental dissemination of pathogens of animal origin is to reinforce biosafety and biosecurity measures while also supporting scientific networks that work for the common good and strengthening existing systems for surveillance, early detection on farms and response.

If OIE standards are applied and respected, it is easier to manage biological threats of any nature by:

- setting up an effective surveillance and early detection system for any biological threat
- carrying out regular surveillance and implementing early detection tools
- communicating in real time if a threat is detected
- intervening in order to reduce or even eliminate the threat
- defining an emergency plan to deal with the threat.

Governance of Veterinary Services

National animal health and welfare systems should, in principle, be capable of:

- the early detection of disease incursions, transparency and animal health notifications
- a rapid response in the event of animal disease outbreaks and the implementation of biosafety and biological containment measures
- the application of compensation strategies for farmers affected by outbreaks
- vaccination, where appropriate.

This requires good governance of animal health systems, based on a close partnership between the public and private sectors. Governance of animal health systems falls under the responsibility of the Veterinary Services. To ensure that the Veterinary Services of its Member Countries operate effectively, the OIE first established definitions of the terms

Veterinary Services, Competent Authority, Veterinary Authority, veterinarian, veterinary paraprofessional and veterinary statutory body and it then developed the following chapters under the heading of 'Quality of Veterinary Services' in the *Terrestrial Animal Health Code (Terrestrial Code)* (1):

- Chapter 3.1 Veterinary Services
- Chapter 3.2 Evaluation of Veterinary Services
- Chapter 3.3 Communication
- Chapter 3.4 Veterinary legislation.

Two chapters have also been developed in the *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (Terrestrial Manual)* (2):

- Chapter 1.1.1 Management of veterinary diagnostic laboratories
- Chapter 1.1.5 Quality management in veterinary testing laboratories.

Corresponding chapters have also been developed in the *Aquatic Animal Health Code (Aquatic Code)* (3) and the *Manual of Diagnostic Tests for Aquatic Animals (Aquatic Manual)* (4).

These provisions of the *Codes* and *Manuals* were adopted democratically by all OIE Member Countries and constitute the standards recognised by the World Trade Organization (WTO) as benchmark international sanitary rules.

OIE international standards and guidelines are used as the basis for external independent evaluations of the quality of national Veterinary Services and animal health systems, either as a self-evaluation carried out by the country itself, or as an evaluation of the Veterinary Services of a country by another country that wishes to analyse the risks associated with international trade. When a Member Country requests an evaluation by OIE experts, these experts employ the OIE Tool for the Evaluation of Performance of Veterinary Services (OIE PVS Tool), which is mentioned in Chapter 3.2 (Evaluation of Veterinary Services) of the *Terrestrial Code*. Similarly, for aquatic animals, a Member Country can employ the OIE Tool for the Evaluation of Performance of Veterinary Services and/or Aquatic Animal Health Services (OIE PVS Tool: Aquatic), which is mentioned in Chapter 3.1 (Quality of Aquatic Animal Health Services) of the *Aquatic Code*.

Between 2006 and 2010, the OIE developed its PVS pathway, which is a progressive global approach that provides targeted assistance for the systematic reinforcement of Veterinary Services, based on international standards.

The pathway is depicted in the diagram below, which represents the OIE strategy for the use of its quality

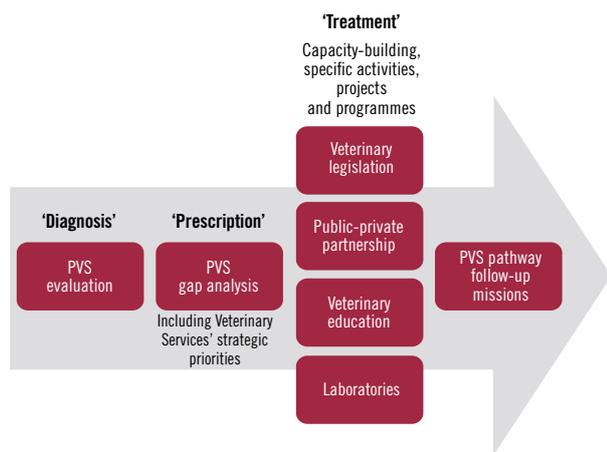


Fig. 1
Components of the PVS process

standards for Veterinary Services and its guidelines on veterinary legislation (Fig. 1).

The first step in the pathway is a PVS evaluation. This initial evaluation consists of a qualitative assessment of the performance of Veterinary Services based on 47 critical competencies, grouped into the four fundamental components of the PVS Tool (5), namely:

- i) human, physical and financial resources
- ii) technical authority and capability
- iii) interaction with interested parties
- iv) access to markets.

This set of critical competencies is directly supported by the OIE standards and recommendations on the quality of Veterinary Services. The same applies to the OIE PVS Tool: Aquatic (6).

The subsequent phases of this methodology are used to refine the initial PVS evaluation. The second phase, PVS gap analysis, develops a detailed strategy for reinforcing Veterinary Services and quantifies needs by calculating an indicative five-year operating budget, taking into account the budgetary items required to achieve the desired performance level or the level envisaged by national decision-makers compared with the initial situation. Countries are also encouraged to conduct PVS follow-up evaluations to measure the impact of programmes and the efforts made. In addition, if so requested, the OIE will conduct legislation missions to help governments that wish to modernise the national veterinary legislation and thereby help the Veterinary Services to meet the OIE standards.

Through collaboration with major international lenders, PVS evaluation missions have been conducted in 130 countries

(7), PVS gap analysis missions in 90 countries (8) and legislation missions in 56 countries (9). Implementation of the PVS pathway and the missions that have been carried out have resulted in major improvements to national Veterinary Services, which fall into three categories: obtaining resources, institutional reform and legislative reform (10).

Given that 60% of human diseases originate from animals, good coordination between animal health and public health services and systems is vital for organising the resources to control and prevent animal diseases, including zoonoses. The OIE and World Health Organization (WHO) share a crucial role in this respect, through their standard-setting activities aimed at preventing zoonotic diseases (OIE intergovernmental standards and WHO international health regulations).

However, for many countries, the current challenge is to ensure that the political will, infrastructure, resources and effective governance are in place in order to ensure that the OIE and WHO international standards are applied. Appropriate collaboration between the animal health, public health and security sectors is essential to ensure respect for intergovernmental standards. Where they are robust and properly governed, animal and human health systems have proven to be resilient, protecting against a wide range of threats, whether from naturally occurring diseases, emerging diseases, acts of bioterrorism or laboratory accidents. Conversely, countries with fragile health systems are particularly vulnerable and, at a time when infectious diseases rapidly cross borders, the entire international community is under threat.

Control at the animal source of all zoonotic pathogens (i.e. transmissible from animals to humans and vice versa) is the most effective and most economic solution for protecting human populations. It follows that, in order to protect human health, we need to formulate global strategies for the prevention and control of pathogens, coordinated at the human–animal–ecosystem interface and implemented at global, regional and national level by adopting appropriate policies.

The OIE and WHO have created tools to help Member Countries to implement their respective standards and to support them in defining suitable coordinated strategies to confront national risks at the human–animal interface. The objectives of these strategies are:

- to evaluate the capacities of the animal and human health sectors
- to identify gaps in the implementation of sanitary standards.

Based on the experience acquired during two pilot national workshops targeted at the national animal and human health authorities in Azerbaijan and Thailand, a guide was drawn up jointly by WHO and the OIE (11) for the attention of national bodies responsible for public health and for animal health (represented by the Veterinary Services), in which the proposed methods for enhancing the governance of health systems worldwide are explained.

Disease surveillance and early detection

Animals play an important role as biosensors in monitoring the accidental or deliberate spread of infectious agents and toxins, or the appearance of emerging diseases. The disease surveillance and early detection systems set up to detect outbreaks occurring naturally within countries and along their borders will also identify any intentional or accidental release.

The most effective and sustainable method of protecting against threats from the intentional or accidental release of pathogens of animal origin is therefore to reinforce existing surveillance systems and, of course, early detection in the field.

As a general rule, the purpose of surveillance is to demonstrate the absence of disease or infection, to determine the presence or distribution of a disease or infection, or to detect exotic or emerging diseases at the earliest possible moment. The type of surveillance employed depends on the results required to underpin decision-making. The recommendations given in Chapter 1.4 of the *Terrestrial Code* can be applied to all diseases and to all infections, as well as to all susceptible species, including wildlife. The general recommendations appearing in this chapter can be refined using the specific approaches described in the chapters covering the diseases listed in Volume 2 of the *Terrestrial Code*. It was deemed necessary to complement the general recommendations on surveillance in Chapter 1.4 with recommendations on the surveillance of arthropod vectors of animal diseases; these are covered in Chapter 1.5 of the *Terrestrial Code*.

Surveillance of both domestic animals and wildlife relies on Veterinary Services. Good organisation of the chain of command and interventions in the field is fundamental, hence the importance of applying OIE standards. It also requires effective public-private partnerships: public-sector veterinarians must have effective partnerships with farmers and private-sector veterinarians and, in the case of wildlife, with hunters and wardens of protected areas. In addition to standards, the OIE has also published a guide to disease surveillance of terrestrial animals (12). This guide,

which was developed with the contribution of experts in surveillance methodology from around the world, takes into account the dynamics of animal health, as well as the diversity of livestock production systems and the variety of situations encountered in OIE Member Countries. Disease surveillance of aquatic animals is covered by the provisions published in the *Aquatic Code* (Chapter 1.4).

Equally as important as the detection of suspected cases is their diagnosis. Depending on the pathogens concerned, there is a range of diagnostic methods. The recognised standards in this domain, which were adopted by the 180 OIE Member Countries, are published in the *Terrestrial Manual* and the *Aquatic Manual*.

The earlier an outbreak or suspected case is detected, the easier it is to intervene rapidly to control it or eliminate the risk.

In order to control global risks, the 180 OIE Member Countries have adopted provisions for the notification of all the information required to stamp out diseases (Chapters 1.1 to 1.3 of the *Terrestrial Code*; Chapters 1.1 to 1.3 and 1.5 of the *Aquatic Code*). To facilitate notification, the OIE has set up a secure online notification system, ensuring the dissemination of information to all Member Countries and its publication on the OIE website.

Response to a threat

The response to a threat is always the same, whether that threat be a natural outbreak or the deliberate or accidental spread of an infection. To deal with zoonoses, a concerted response by the animal health and public health sectors is vital, as we know that control measures are generally more effective when they focus on eliminating the pathogen at its animal source. Identifying the origin of an outbreak requires specialised investigations carried out at the request of the health authorities; veterinary laboratories are often the first to locate the origin. If a malevolent release of infection is suspected, collaboration with the forces of law and order forms an important part of the response mechanism.

The first step consists of identifying the danger and the possible pathogens. To avoid any incorrect interpretation, it is important to employ internationally recognised methods and to conduct the identification process in laboratories that meet international standards. All these points are covered by resolutions adopted by the 180 OIE Member Countries and the corresponding standards are published in the *Terrestrial Manual* and the *Aquatic Manual*. In addition to these standards, the OIE has also published quality standards and guidelines for veterinary laboratories (13).

Having identified the danger, the risk must be assessed and managed, while providing communication concerning the risk in parallel. Risk analysis is covered by a specific chapter in the *Terrestrial Code* (Chapter 2.1) and the *Aquatic Code* (Chapter 2.1) to avoid any disputes or suspicions between the parties concerned should the risk affect international trade.

Depending on the contagiousness and spread of the pathogen, it may be necessary to set up an emergency vaccination zone for a certain period. For this, there must be vaccine banks holding reserves of antigens or vaccines, in the form of ready-to-use vaccines or antigenic components that can be formulated rapidly into the end product for emergency use or vaccination campaigns. Vaccine banks are covered by a specific chapter of the *Terrestrial Manual* (Chapter 1.1.10). Each chapter covering a disease in the *Terrestrial Manual* indicates whether or not vaccines can be used and, if so, the requirements associated with them; these international standards are very important in avoiding the risk of poor quality vaccines that do not satisfy requirements.

To best prepare for the appearance of a highly contagious and rapidly spreading pathogen with a significant threat to animal health, as well as to the economy and public health, it is vital to draw up emergency health plans that can very rapidly be put into operation, whatever the origin of the outbreak or the detected case (natural, accidental or intentional). Emergency health plans must take into account all actors that may have to intervene following an outbreak or case. These include public- and private-sector veterinarians, farmers, hunters, wardens of protected areas, laboratories, and even the police, who may be called upon to mark out prohibited entry and exit zones.

Special disinfection or decontamination services will also be involved, depending on the type of risk. It is important to conduct regular simulation exercises in order to put into practice the emergency health plan and ensure that it is perfectly operational, or even to complement or adapt it depending on the results of simulation tests. The OIE encourages Member Countries to share their experiences of drawing up national emergency plans.

Conclusion

In conclusion, it is very important to have quality Veterinary Services which comply with OIE standards. They must be able to be evaluated using the OIE PVS Tool in order to ensure the best organisation of their pathogen surveillance network, the effectiveness of which is of primary importance. Using the OIE standards as a basis for surveillance and early detection of any pathogen can limit risks and ensure the best response to any threats, whatever their origin. Given the very severe repercussions that certain pathogens can have on animal and public health, as well as on the agricultural and food economy, it is essential to make proper preparations by drawing up emergency health plans and testing them using simulation exercises. OIE standards and all OIE activities for the benefit of its Member Countries highlight both the importance that the Organisation affords to this subject and the need for an international organisation such as the OIE. Whatever the origin of infectious biological risks (natural, accidental or intentional), the prevention and control measures for such risks are virtually identical and described in detail in the existing international standards, in particular OIE standards for pathogens of animal origin (which concern 80% of potential biological weapons). ■

References

1. World Organisation for Animal Health (OIE) (2016). – *Terrestrial Animal Health Code*, 25th Ed. OIE, Paris. Available at: www.oie.int/en/international-standard-setting/terrestrial-code/access-online/ (accessed on 18 October 2016).
2. World Organisation for Animal Health (OIE) (2016). – *Manual of diagnostic tests and vaccines for terrestrial animals* (online version including updates since 2012). OIE, Paris. Available at: www.oie.int/en/international-standard-setting/terrestrial-manual/access-online/ (accessed on 18 October 2016).
3. World Organisation for Animal Health (OIE) (2016). – *Aquatic animal health code*, 19th Ed. OIE, Paris. Available at: www.oie.int/en/international-standard-setting/aquatic-code/access-online/ (accessed on 18 October 2016).
4. World Organisation for Animal Health (OIE) (2016). – *Manual of diagnostic tests for aquatic animals* (online version, including updates since 2012). OIE, Paris. Available at: www.oie.int/en/international-standard-setting/aquatic-manual/access-online/ (accessed on 18 October 2016).
5. World Organisation for Animal Health (OIE) (2013). – *OIE Tool for the Evaluation of Performance of Veterinary Services*. OIE, Paris. Available at: www.oie.int/fileadmin/Home/eng/Support_to_OIE_Members/pdf/PVS_A_Tool_Final_Edition_2013.pdf (accessed on 20 October 2016).
6. World Organisation for Animal Health (OIE) (2013). – *OIE Tool for the Evaluation of Performance of Veterinary Services and/or Aquatic Animal Health Services*. OIE, Paris. Available at: www.oie.int/fileadmin/Home/eng/Support_to_OIE_Members/pdf/A_PVS_Tool_aquatic_animals.pdf (accessed on 20 October 2016).

7. World Organisation for Animal Health (OIE) (2016). – PVS evaluation missions. OIE, Paris. Available at: www.oie.int/en/support-to-oie-members/pvs-evaluations/status-of-missions/ (accessed on 10 November 2016).
 8. World Organisation for Animal Health (OIE) (2016). – PVS gap analysis missions. OIE, Paris. Available at: www.oie.int/en/support-to-oie-members/pvs-gap-analysis/status-of-missions/ (accessed on 10 November 2016).
 9. World Organisation for Animal Health (OIE) (2016). – Legislation missions. OIE, Paris. Available at: www.oie.int/en/support-to-oie-members/veterinary-legislation/status-of-missions/ (accessed on 10 November 2016).
 10. World Organisation for Animal Health (OIE) (2016). – Finding success along the PVS pathway. *OIE Bull.*, 2016 (1), 6–11. doi:10.20506/bull.2016.1.2495.
 11. World Organisation for Animal Health (OIE) & World Health Organization (WHO) (2015). – WHO–OIE operational framework for good governance at the human–animal interface: bridging WHO and OIE tools for the assessment of national capacities. Available at: www.oie.int/fileadmin/Home/fr/Media_Center/docs/pdf/WHO_OIE_Operational_Framework_Final2.pdf (accessed on 18 October 2016).
 12. World Organisation for Animal Health (OIE) (2015). – Guide to terrestrial animal health surveillance. OIE, Paris.
 13. World Organisation for Animal Health (OIE) (2008). – OIE quality standards and guidelines for veterinary laboratories: infectious diseases, 2nd Ed. OIE, Paris, 70 pp.
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