

# Planning for rapid response to outbreaks of animal diseases transmissible to humans via food

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## Summary

Planning for rapid response to outbreaks of foodborne zoonoses requires coordination and intersectoral collaboration, making the process inherently complex. Guidance documents have been published by the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO) on the topics of foodborne outbreak investigation, establishing food safety emergency response plans, applying risk analysis principles during food safety emergencies, and developing national food recall systems. These guides should be used as resources by national authorities to develop national plans which should each reference the other in order to maintain consistency at the country level. FAO and WHO, together with the World Organisation for Animal Health (OIE), are the international organisations responsible at the global level for the health of people and animals and for food safety and security. As such, these organisations need to continue to work together to develop an intersectoral mechanism to conduct robust and timely joint risk assessments in the face of foodborne outbreaks and other food safety emergencies. Three international instruments have the potential to aid countries in their preparedness to face outbreaks of foodborne zoonoses and organise subsequent response efforts: the International Food Safety Authorities Network (INFOSAN), the newly enhanced Global Early Warning System for Major Animal Diseases, including Zoonoses (GLEWS+), and the FAO Emergency Prevention System for Food Safety (EMPRES Food Safety).

## Keywords

Food safety emergency – Foodborne zoonosis – Outbreak response planning.

## Introduction

Animal diseases caused by viruses, bacteria and parasites are commonly transmitted to humans. Often foodborne, such zoonotic disease risks have the potential to impact agricultural production, lead to food insecurity, create barriers to international trade and cause lost productivity in industry, all in addition to causing human morbidity and mortality. With a growing global population comes an increased demand for foods of animal origin, resulting in intensive agricultural and food production practices and globalisation of the food supply. Changes in such practices are modifying risk characteristics in the food chain, where issues such as the presence of zoonotic pathogens in livestock and the misuse of antimicrobials during animal production may amplify risks to public health.

Controlling foodborne zoonoses is important for public health and requires the involvement of many stakeholders, including stakeholders outside the public health sector, especially with respect to implementing preventive and corrective action at the source. Planning for the rapid response to outbreaks of foodborne zoonoses needs to involve all these stakeholders, including those in agriculture and animal health sectors. This requires the development of agreements and protocols for response and the rapid exchange of information on risks posed by food or feed, and on measures to be taken to counter such risks.

Responsibilities for the investigation and management of foodborne outbreaks of diseases of animal origin will vary between countries and according to a number of factors, including the nature and size of the outbreak, its potential public health impact, and economic implications,

among others. Successful investigation and control of foodborne disease outbreaks depends on the level of coordination among all relevant stakeholders. In order for a coordinated rapid response to be effective, all agencies and individuals involved in the investigations need to fully understand their roles and responsibilities during an outbreak. Ideally, such roles and modalities for coordination should be discussed and agreed upon before a large-scale outbreak takes place.

## General considerations

Responding to outbreaks of foodborne zoonoses is inherently difficult because of the requirement to involve and coordinate multiple sectors. In any given country, the responsibility for addressing outbreaks of animal diseases transmissible to humans via food is often shared among various authorities at various levels of government from local to central authorities. Collaboration among these partners and across sectors is of utmost importance to effectively manage an outbreak, trace the implicated food back to the source, and implement corrective and preventative measures at the source. Formalising processes to facilitate such collaboration and cooperation is the best way to prepare for a foodborne outbreak response. Planning to address these challenges is important since thoroughly investigated foodborne outbreaks often provide rapid advances in scientific knowledge. For example, investigation can lead to the discovery of new foodborne pathogens and provide information about the transmission of old and emerging pathogens, and about new sources or reservoirs for pathogens (9).

## At the national level

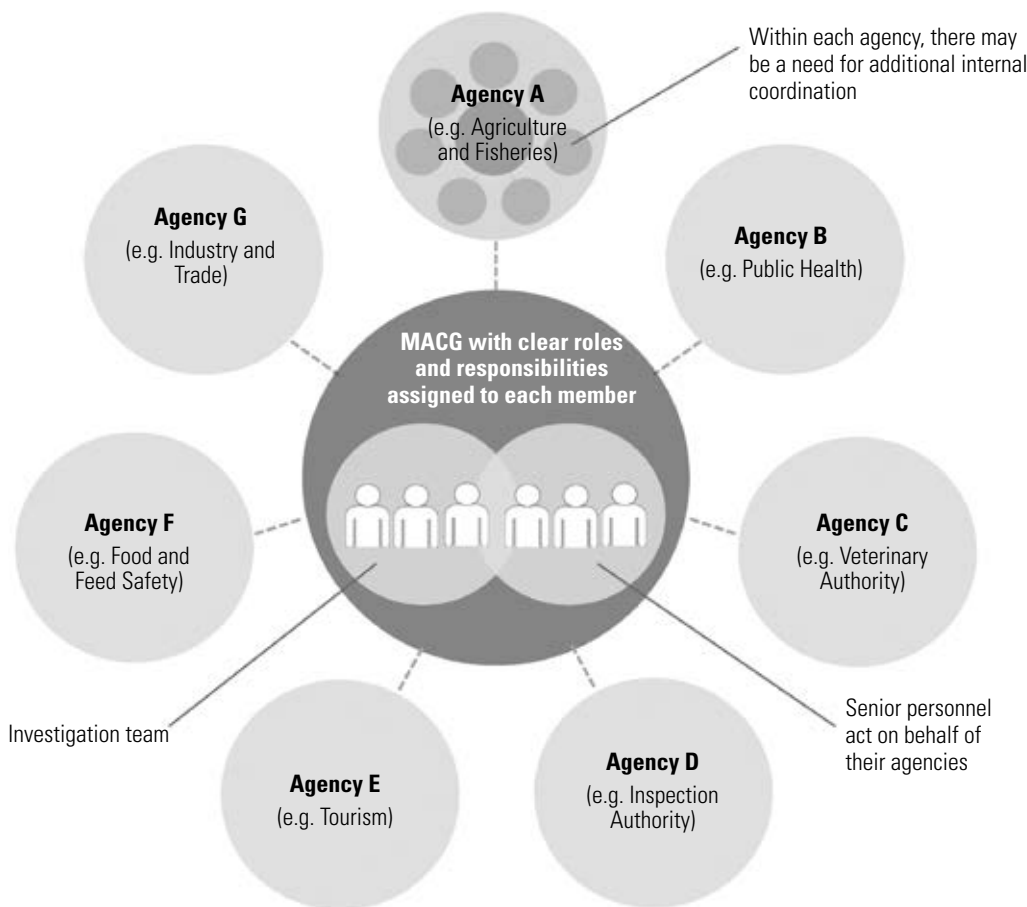
The World Health Organization (WHO) has published guidelines for foodborne disease outbreak investigation and control (11). The guidelines have been written for public health practitioners, food and health inspectors, district and national medical officers, laboratory personnel and others who may undertake or participate in the investigation and control of foodborne disease outbreaks. While the guidelines focus on practical aspects of outbreak investigation and control, they also provide generic guidance that can be adapted for planning purposes for individual countries in order to meet local requirements. For local investigations, the guidelines are useful for carrying out initial epidemiological, environmental and laboratory investigations, implementing appropriate control measures, and alerting investigators to the need to seek assistance for more complex situations. At national and regional levels, the guidelines can assist decision-makers in identifying and coordinating resources

and in creating an environment appropriate for the successful management of foodborne disease outbreaks. Although these guidelines are not explicitly written to guide investigations of foodborne disease outbreaks of animal origin, the general principles for outbreak investigation are the same and can aid in the planning process. Other information resources should be identified that can provide risk managers or investigators with background information on potential hazards. One useful resource under development is FOSCOLLAB ([www.who.int/foodsafety/foscollab/en/](http://www.who.int/foodsafety/foscollab/en/)), which is a global platform for food safety data and information.

As noted previously, rapid response to an outbreak will require a coordinated approach. It is important, therefore, that every country establish a multi-agency coordination group (MACG) to investigate foodborne outbreaks. The name of this group will differ from country to country, but the aim will be the same – to link together all relevant data sources and ensure all stakeholders are informed. In this way, all relevant government agencies would be engaged to reduce risks to consumers, minimise the public health impact, remove implicated products from the market, and institute control measures at the source. In the planning process, the roles and responsibilities of different national agencies involved should be described and the procedures for responding to a foodborne outbreak should be documented and linked to any existing national food safety emergency response plans. This will ensure a consistent approach throughout the entire investigative process and help everyone involved (those investigating the human health aspects, those conducting the food safety investigation, and those responsible for animal health) to coordinate their work smoothly. An example of the structure of a national MACG is depicted in Figure 1.

## Epidemiological investigations

At the national level, the MACG should assess what information is required and determine which partner is best able to gather the identified information and collate it in a standardised format. Integrating surveillance data from various sectors is a standard that national authorities should work towards. When multiple partners are involved, the overall collation and analysis of epidemiological data needs to be coordinated and this is most easily done when a single agency takes the lead. This process of analysis will support the examination of findings from all aspects of the outbreak investigation. It is important to also describe which agency has primary responsibility for sending reports to WHO, according to the International Health Regulations (IHR 2005) (10) and to the World Organisation for Animal Health (OIE), in accordance with the regulations contained within its *Terrestrial Animal Health Code (Terrestrial Code)* and *Aquatic Animal Health Code (Aquatic Code)* (14, 15).



MACG: multi-agency coordination group

**Fig. 1**  
**Multi-agency coordination group**

Adapted from the Food and Agriculture Organization/World Health Organization framework for developing national food safety emergency response plans (4)

### Food safety investigations

When the source of an outbreak is determined to be a food animal, a food safety investigation will be conducted and will attempt to identify the root cause of the contamination in the affected food and to determine what measures can be implemented at the source, to prevent future outbreaks. If the implicated food has been imported or domestically produced but exported internationally, this should be reported to the Secretariat of the International Food Safety Authorities Network (INFOSAN), which is a joint programme of the Food and Agriculture Organization of the United Nations (FAO) and WHO (12). The food safety investigation carried out in response to a foodborne disease outbreak should follow a national plan to ensure consistency of process. FAO and WHO have developed a framework for developing national food safety emergency response plans to aid national authorities. Such a plan should refer to relevant regulations or national legislation that provide the legal basis for its implementation. In addition, when other national plans exist, for example, those relating to response to foodborne disease outbreaks (as mentioned above),

the response plan should be linked to these to ensure an integrated response (4).

Both epidemiological and food safety investigations usually involve laboratory testing. Each respective agency will be responsible for conducting the appropriate laboratory data analyses as part of their investigations and mandates. Having an MACG can ensure coordinated laboratory analyses, which prevent gaps and duplication of effort, permit discussion of issues, and allow the sharing of results. In some cases the primary authority may not have the necessary capacity or expertise to perform the necessary tests. It should then contact supporting laboratories in order to send the samples to a laboratory that has the required expertise and capacity. When such expertise is not available in the country, WHO, OIE and FAO can facilitate international collaboration. Identifying laboratories for key pathogens in advance of an emergency constitutes good planning. INFOSAN can be used to identify laboratories with specific capacities and link them to national authorities requiring assistance. During planning and when gaps in country capacity are identified, the Global Foodborne Infections Network (GFN) can be

leveraged for training and mentoring to improve laboratory and epidemiological capacities.

### **Coordinated data analysis and health risk analysis**

Information and data from epidemiological, food safety and laboratory investigations need to be analysed in a coordinated and integrated way to inform decision-making and allow conclusions to be drawn from all available data. Findings from the epidemiological, laboratory, and food safety investigations should be shared with the partner members of the MACG and integrated to identify the cause and source of the outbreak and areas for further investigation.

During a foodborne outbreak investigation, science-based health risk assessments should be completed in a rapid and timely manner in order to ensure that appropriate risk management decisions are taken to prevent additional contaminated food from reaching consumers. Data gathered through the coordinated data analysis should be considered in the health risk assessment to determine the level of risk posed by a food. This process should follow the guidelines developed by the FAO/WHO Codex Alimentarius Commission (3). In order to assist national authorities in understanding essential elements in the application of risk analysis specifically during emergencies (such as an outbreak situation in which a food of animal origin has been identified as the source), the FAO/WHO developed the *Guide for application of risk analysis principles and procedures during food safety emergencies* (5). The principles and procedures described in the guide may also apply to other food safety events that are not necessarily associated with a foodborne disease outbreak, but that nonetheless require action to be taken under time constraints and uncertainty. The document outlines best practice for the application of risk analysis during food safety emergencies, and suggests practical ways of incorporating such processes into existing systems. The food safety risks described in this document include biological, chemical and physical risks associated with food consumption (but not limited to risks associated with those hazards that are transmissible to humans via food). In addition to the established Codex guidelines and related texts on food safety risk analysis, this document provides practical guidance that is based on a collection of examples of best practice provided by experts from various parts of the world.

### **Coordinated public health and food safety actions**

Actions undertaken during a foodborne illness outbreak to address the source of the outbreak and prevent further cases of human illness may include a wide range of activities

carried out by one or more of the partners from the MACG and beyond. Examples include:

- recalling a food from the market
- detaining a product
- disposing of contaminated or suspected foods
- public communication outlining recommended prevention and control activities and raising awareness through communication with vulnerable populations
- case management
- prevention and control measures at the source (i.e. on farm, in the slaughterhouse, etc.).

In order to allow the MACG to focus on managing response efforts rapidly and efficiently, it is imperative that as much preparation as possible is undertaken in advance. Advance preparation will also reduce the need to negotiate acceptable approaches during an actual emergency, reduce the number of decisions that need to be made and limit the stress on those involved in managing the emergency. Simulation exercises could also be considered to test the soundness of action plans.

Templates, checklists and decision trees that will facilitate rapid action can be drawn up in advance, and the following key elements of the response can be pre-agreed:

- risk categories, including definitions, descriptions and examples
- risk management options appropriate to individual risk categories
- implementation approaches
- communication approaches appropriate to individual risk management options, including communication with international bodies and other governments
- the roles and responsibilities of the MACG members
- structures and rules for removal of products from the market.

Because food recall is a fundamental tool in the management of risks in response to foodborne outbreaks, a national food recall system should be in place. Some countries are still in need of an effective recall system and the necessary infrastructure to support it. A successful system requires a robust legal basis/regulatory framework, effective pre-established protocols and the necessary collaboration between competent authorities and food business operators. Foods and the ingredients in food products are increasingly grown, processed and consumed in different locations around the globe; this poses new challenges in conducting key activities associated with food recalls, such as the trace-forward and trace-back activities required for a

food suspected or confirmed to be unsafe and/or linked to an outbreak. Even countries that have established the most advanced science-based national food control systems may be challenged by the globalisation of food markets. The FAO/WHO have published a guidance document to assist countries in the establishment and implementation of an effective national food recall system (6).

## At the international level

The OIE, FAO and WHO are the international organisations responsible at global level for the health of people and animals and for food safety and security. By working together, they increase opportunities to detect and assess health events of potential international concern at the human–animal–ecosystems interface, including wildlife, in order to inform prevention and control measures. By pooling their expertise, data, and functional global networks and systems, the three organisations can foster a unique cross-sectoral mechanism to conduct robust and timely joint risk assessments in the face of foodborne outbreaks and other food safety emergencies (in addition to other health issues at the human–animal–ecosystems interface). This helps to ensure efficient, coordinated and relevant risk communication about health events of potential international concern, within and between the three organisations, with Member States, and with other stakeholders, including the public.

### International Food Safety Authorities Network

INFOSAN systematically monitors for potential international food-safety-related events in addition to receiving information through INFOSAN Emergency Contact Points. This monitoring is carried out in close collaboration with the WHO Alert and Response Operations programme as part of WHO's event detection activities. Working under the overall umbrella of the International Health Regulations (10), INFOSAN facilitates the identification, assessment and management of food safety events of possible international concern. Collaborating closely with countries, INFOSAN develops alerts and distributes them among its members. To help respond to country requests for assistance during food safety emergencies, including foodborne outbreaks, INFOSAN encourages the designation of a single INFOSAN Emergency Contact Point from the agency responsible for coordinating national food safety emergency response, and additional Focal Points from other national agencies with a stake in food safety issues. Agencies designating INFOSAN members could potentially include all those depicted in Figure 1, forming the MACG during a food safety emergency. INFOSAN partners with the Global Outbreak Alert and Response Network (GOARN) and also works with the Global Early Warning System for Major Animal Diseases, including Zoonoses (GLEWS) to promote

seamless action throughout the food-chain continuum (12). In a major effort to further strengthen cross-sectoral coordination and cooperation at national and global levels, the INFOSAN Secretariat has worked with the OIE to invite OIE National Focal Points for Animal Production Food Safety (from national veterinary authorities) to become INFOSAN members to cover the whole range of food safety issues from farm to table.

### GLEWS+

GLEWS+ is the recently enhanced version of the GLEWS mechanism. In addition to bringing together the information and expertise of the three organisations, it enables more joint risk assessment, better event detection, and improved risk communication. By facilitating rapid detection and assessment of health threats at the human–animal–ecosystems interface, GLEWS+ aims to better inform prevention and control measures. This goal is critical to attaining the vision of the OIE, FAO and WHO of a world capable of preventing, detecting, containing, eliminating, and responding to animal and public health risks attributable to zoonoses and animal diseases with an impact on food security through multi-sectoral cooperation and strong partnerships. GLEWS+ will act as a bridge between the complementary event-verification processes of the OIE, FAO and WHO, and provide a framework for the rapid sharing of information and expertise. Outbreaks of disease in animals can provide direct early warning of a need to increase public health surveillance; conversely, public health surveillance could trigger investigations into animals. GLEWS+ will provide interconnectivity between networks, recognising the interdependence of the various sectors involved at the human–animal–ecosystems interface. Legal and regulatory frameworks provided by the WHO (IHR 2005) (10) and the OIE (*Terrestrial Code* and *Aquatic Code*, the World Animal Health Information System and the Performance of Veterinary Services Pathway) (14, 15) support early detection and notification of events, including emerging events, at the human–animal–ecosystems interface. Information assembled within GLEWS+ provides a more complete and appropriate epidemiological context (13).

### EMPRES Food Safety

The FAO Emergency Prevention System for Food Safety (EMPRES Food Safety) works with FAO members and other partners to assist in the prevention and management of global food safety emergencies. It is a fundamental component of the FAO Food Chain Crisis Management Framework (FCC), which addresses, in an integrated way, all food chain threats from production to consumption, including in animal health, plant protection and food safety. EMPRES Food Safety supports Member Countries with the three pillars of early warning, emergency prevention

and rapid response and aims to complement and enhance ongoing FAO work on food safety, as well as animal health and plant health. EMPRES Food Safety engages with INFOSAN and strengthens this network by ensuring the inclusion of appropriate members from sectors other than public health, such as food safety and agriculture, as well as ensuring that an emphasis on a preventive approach that focuses on intelligence-gathering, as opposed to a reactive approach, is instilled among all INFOSAN members (2).

### Global prospects for the future

The environment in which we must tackle foodborne disease outbreaks of zoonotic origin is constantly changing and evolving, but so too is the technology which we can use for monitoring and response. For example, whole genome sequencing (WGS) is a laboratory process that determines the complete DNA sequence of the genomes present in a DNA sample of a pathogen. The potential efficiency of WGS in diagnostic microbiological settings and 'tracking-and-tracing' efforts has been demonstrated in several recent studies (1, 8), including the tracking of the outbreak of enterohaemorrhagic *Escherichia coli* (EHEC) in Germany in 2011 (7). During the EHEC outbreak, scientists from around the world performed WGS and shared their results for analysis. The collaboration between these researchers allowed for joint and rapid analysis of the genomic sequences, revealing important details about the new strain of *E. coli*, including why it demonstrated such high virulence. This is a major change from the traditional identification techniques and these new technologies and methods are becoming more accessible, relatively inexpensive, quick to conduct and easy to apply. Efforts are ongoing globally to explore how to harness this technology as a generic tool to promote global health, combat infectious diseases, and improve food safety. Specific to foodborne outbreak investigations, WGS could provide strong pieces

of evidence by linking contaminated food to human cases of disease and revealing the sources of foodborne pathogens in the environment. Data obtained by WGS could also suggest treatment regimens by providing details relating to virulence and antimicrobial resistance of pathogens.

## Conclusion

The primary challenge for effectively responding to outbreaks of foodborne zoonoses is ensuring collaboration and coordinated planning across sectors while harnessing the available technologies. However, processes involved in the planning and implementation of intersectoral actions are complex and each country needs to develop or review its own strategy and approaches for intersectoral action. The guidance documents produced by WHO and FAO on the topics of foodborne outbreak investigation, establishing food safety emergency response plans, applying risk analysis principles during food safety emergencies, and developing and improving food recall systems should all be used as resources by national authorities to develop national plans and they should all reference one another for consistency. National activities as well as international actions from the OIE, FAO and WHO should encourage cooperation in planning response efforts by different stakeholders across sectors in the fields of public health, animal health, zoonoses control, and food safety.

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## Planification d'une réponse rapide en cas de foyer de maladie animale transmissible à l'homme par les aliments

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### Résumé

La planification d'une réponse rapide en cas de foyer de maladie zoonotique nécessite une coordination appropriée et une collaboration intersectorielle, ce qui rend le processus complexe par nature. Des documents d'orientation ont été publiés par l'Organisation des Nations unies pour l'alimentation et l'agriculture (FAO) et par l'Organisation mondiale de la santé (OMS) concernant les enquêtes à mener sur les foyers de maladies d'origine alimentaire, la mise en place de plans de

réponse aux urgences en matière de sécurité sanitaire des aliments, l'application des principes de l'analyse du risque lors de ces urgences et l'organisation de systèmes nationaux de retrait et de rappel des aliments. Ces guides devraient être utilisés par les autorités nationales lors de l'élaboration des différents plans nationaux, lesquels devraient se référer les uns aux autres afin d'assurer une cohérence des interventions au niveau national. La FAO, l'OMS et l'Organisation mondiale de la santé animale (OIE) sont les organisations internationales compétentes au niveau mondial pour la santé des populations humaines et animales, la sécurité sanitaire des aliments et la sécurité de l'approvisionnement alimentaire. De ce fait, ces organisations doivent continuer à travailler ensemble à la mise en place d'un mécanisme intersectoriel visant à réaliser rapidement des évaluations du risque robustes en cas de foyer de maladie d'origine alimentaire ou d'urgence en matière de sécurité sanitaire des aliments. Trois instruments internationaux (à savoir le Réseau international des autorités de sécurité sanitaire des aliments [INFOSAN], le Système d'alerte précoce et de réaction rapide pour les principales maladies animales, y compris des zoonoses [GLEWS+] et le volet du Système de prévention et de réponse rapide relatif à la sécurité sanitaire des aliments [EMPRES Sécurité sanitaire des aliments]) sont à même d'aider les pays à se préparer à l'éventualité d'un foyer de zoonose d'origine alimentaire et à organiser les mesures de réponse appropriées.

#### **Mots-clés**

Planification de la réponse en cas de foyer – Urgence en matière de sécurité sanitaire des aliments – Zoonose d'origine alimentaire.



## **Planificación de una respuesta rápida a brotes de enfermedades animales transmisibles al hombre por vía alimentaria**

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#### **Resumen**

La planificación de una respuesta rápida a brotes de zoonosis transmitidas por los alimentos requiere coordinación y colaboración intersectorial, lo que hace que el proceso resulte necesariamente complejo. La Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO) y la Organización Mundial de la Salud (OMS) han publicado documentos orientativos sobre temas como: investigación de brotes de transmisión alimentaria; elaboración de planes de respuesta ante emergencias ligadas a la inocuidad de los alimentos; aplicación de principios de análisis del riesgo durante este tipo de emergencias; e instauración de sistemas nacionales de recuperación de productos alimentarios. Las autoridades de los países pueden servirse de estas guías para definir planes nacionales, que deberían remitirse unos a otros para que no se perdiera coherencia a escala nacional. La FAO y la OMS, junto con la Organización Mundial de Sanidad Animal (OIE), son las organizaciones internacionales que a escala mundial son responsables de la salud de personas y animales, la inocuidad de los alimentos y la seguridad alimentaria, y como tales deben seguir trabajando de consuno para definir un mecanismo intersectorial que les permita poner en marcha

conjuntamente y a tiempo procesos robustos de determinación del riesgo ante brotes de enfermedades de transmisión alimentaria u otro tipo de emergencias ligadas a la inocuidad de los alimentos. Hay tres instrumentos internacionales que pueden ayudar a los países a prepararse para afrontar brotes de zoonosis transmitidas por los alimentos y adoptar las medidas de respuesta subsiguientes: la Red Internacional de Autoridades de Inocuidad de los Alimentos (INFOSAN), el Sistema Mundial de Alerta Temprana de las Enfermedades Animales incluidas las Zoonosis (GLEWS+), y el Sistema de Prevención de Emergencias para la Inocuidad de los Alimentos (EMPRES Inocuidad de Alimentos).

#### Palabras clave

Emergencia ligada a la inocuidad de los alimentos – Planificación de la respuesta en caso de brote – Zoonosis transmitida por los alimentos.



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