

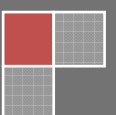
2010

Epidemiological Surveillance Systems Emphasis on World Organization for Animal Health and Food and Agriculture Organization of the United Nations

**Mr. K. Cirkel, internship student at the Federation of Veterinarians of Europe,
from the Faculty of Veterinary Medicine of Utrecht, Netherlands**

Mr. K. Cirkel

2010, March



Abstract

Globalisation, global environmental and climate changes multiply the risks of spreading pathogenic agents and can give rise to emerging and re-emerging diseases. These changes contribute to the fact that epidemiological surveillance systems are becoming more important in playing a role in the control and prevention of diseases. A large number of epidemiological surveillance networks exist. Several criteria can be used to classify the different networks.

The World Animal Health Information System (WAHIS) of the World Organisation for Animal Health (OIE) is an online secure notification system for the registration of all official reports to improve the transparency of the world animal health situation. Different methods are used to notify animal diseases to the OIE. Members of the OIE are obliged to report on the presence and absence of OIE-listed diseases at least once every six -months. The OIE can determine whether an epidemiological event in a territory or country is a significant epidemiological event or not, inter alia on the basis of the six monthly reports. Several elements stimulate Members of the OIE to report on their animal health situation (e.g. for trading purposes).

The Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES) of the Food and Agriculture Organisation (FAO) was established in 1994. The Global Animal Disease Information System (EMPRES-i) of the FAO's EMPRES is a web-based application that has been designed to support veterinary services by facilitating regional and global animal disease information. EMPRES-i compiles, stores and verifies animal diseases outbreaks data (including zoonoses) from numerous sources for early warning and risk analysis.

In 2010, the OIE expects to incorporate several developments regarding WAHIS.

The FAO and OIE are increasingly more occupied with emerging diseases, which have the potential to become a threat to public health.

Members of the OIE are legally obliged to inform the OIE on their animal health situation, whereas no obligations exist by Members to inform the FAO on their animal health situation.

The OIE, FAO and WHO have joined their forces in the form of Global Early Warning and Response System for Major Animal Diseases, including zoonoses (GLEWS) in order to avoid unjustified duplication of efforts and combining and coordinating verification processes through sharing of information on disease outbreaks. The detection and fight against animal diseases and zoonoses need to be done in a coordinated way.

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Introduction

Disease epidemics have an influence on several matters, among others: herd densities, trade barriers, sustained livestock production and costs of livestock production (Paskin, 1999). Epidemiological surveillance in animal health contributes in mitigating the adverse effects of an animal disease outbreak. Globalisation, global environmental and climate changes multiply the risks of spreading pathogenic agents and can give rise to emerging and re-emerging diseases (Dufour and P. Hendrikx, 2009). These changes contribute to the fact that epidemiological surveillance systems are becoming more important in playing a role in the control and prevention of diseases. A large number of epidemiological surveillance networks exist. Some of the systems contribute in the surveillance of a location or a country (local and national networks) others in several countries or global (regional and supranational). Differences do exist between them according to their mandates and objectives and this brings advantages and limitations to each of them. Furthermore, the optimal operations of these systems are dependent on several factors (for example: commitment of stakeholders, methods of sampling and types of tests used). The aim of this research is to summarise several important elements of the different kinds of networks, since this may be helpful to get more insight in this topic. In addition, this paper concentrates on the supranational epidemiological surveillance systems of the World Organisation for Animal Health (OIE) and the Food and Agriculture Organisation (FAO). This may be interesting, since these systems play an important role in the transparency of the world animal health situation^a. In addition, two interviews of specialists of these systems had taken place in order to question and clarify several important elements. Such as: its functioning, weaknesses and strengths, differences and/or similarities between the systems and future developments.

Materials and Methods

The book of Dufour and Hendrikx (2009) and several other sources, such as the internet, articles and other books were used to summarise different important elements about epidemiological surveillance networks, including the objectives, the classification of the different kinds of networks and the advantages and constraints of supranational networks. Furthermore, two specialists of the supranational epidemiological surveillance system of the World Organisation for Animal Health (OIE) and of the Emergency Prevention System of the Food and Agriculture Organisation (FAO) were interviewed to discuss advantages, limitations, opportunities and threats of the supranational epidemiological surveillance systems.

^a World Animal Health Information System 2010 OIE website [Online] URL: http://www.oie.int/eng/info/en_info.htm?e1d5 [Accessed: January 2010]

Summary of several important elements of epidemiological surveillance networks

Definitions and Objectives

Epidemiological surveillance is defined as an observational method based on continuous recording to follow health status or risk factors in a defined population, and particularly to detect the appearance of pathological processes and study their development over time and in space, with a view to adopting appropriate control measures (Toma *et al.*, 1991). According to Dufour and Hendrikx (2009):

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“An epidemiological surveillance network consists of all individuals or agencies organised to ensure surveillance in a given region of one or more pathological entities.”

Furthermore:

“A network implies the circulation of information in all directions, not solely from the field towards a data collection centre and vice versa (i.e. ascending and descending, but also transversally between actors at the same level, thus ensuring full coverage of the region concerned.”

The four main objectives are (Dufour and Hendrikx, 2009):

- To detect the appearance of an exotic disease or new disease in a given region, so as to enable its early control;
- To enable the establishment of a hierarchy of importance (economic or health) concerning the different diseases present in a population, so that action priorities can be determined;
- To determine the true importance of a disease (incidence, prevalence, economic losses, etc.) and follow the course of the situation, so that a decision as to appropriate control (or not) can be taken, and to adjust the means of control; and
- To evaluate results of control programmes by monitoring decline of the disease.

Therefore, epidemiological surveillance is a tool that can be used in decision-making.

The operational stages

The epidemiological surveillance networks consist of four operational stages: data collection, data centralisation and validation, data processing and analysis, and dissemination of results. For more information, refer to the book of Dufour and Hendrikx (2009).

Classification of networks

A large number of epidemiological surveillance networks exist. Because of the large number and different tasks they perform it's sometimes difficult to distinguish one

from another. The following classification can be used to classify the networks according to several criteria.

Table 1 Criteria used to classify epidemiological surveillance networks (Dufour and Hendrikx, 2009)

1. Scope of surveillance	Local, national, regional or supranational
2. Type of surveillance	Targeted (one or more well-defined diseases) or Global (all diseases or syndromes)
3. Epidemiological situation	Exotic or emerging disease, or endemic disease
4. Population under surveillance	Sample or exhaustive population
5. Data collection method	Passive or active
6. Dependence on control activities	Autonomous or integrated

Surveillance can be local such as for the Canadian RAIZO (Alert and Information Network on Animal Health in Quebec); national such as for REPAMO (Mollusc Health Surveillance Network in France); the regional network MECIDS (Middle East Consortium on Infectious Disease Surveillance) and the supranational network of the World Animal Health Organisation (OIE). Regional is reserved for several countries, which correspond to a geographical area (such as the Mediterranean) or a political unit. Supranational is used for networks covering a large number of countries, which usually covers several continents. The prime objective of supranational networks is the exchange of epidemiological information between partners rather than generate new epidemiological data. This information has already been processed and validated by national or local networks. Supranational networks are therefore ‘networks of networks’.

The type of surveillance depends on the target. ‘Targeted’ surveillance is aimed at a single or maybe a small number of diseases. The term ‘global’ surveillance is reserved for networks that monitor several diseases (and/or syndromes) or which have very broad surveillance objectives. An example of the linking up of several networks is the National Animal Health Monitoring System in the United States of America (USA).

The epidemiological networks deal with a disease already present in a country or it deals with a new (or exotic) disease in a country. The objective of the former is to keep an eye on the endemic situation. The objective of the latter is to detect the introduction of a new or exotic disease. This brings different methods with it, such as the amount and type of sampling. In most cases only a sample of herds are kept under surveillance instead of the entire susceptible population.

Passive data collection is produced by spontaneously reporting in the field. As opposed to active, in which the manager actively collects data, via interrogations of actors on a regular basis (using questionnaires for example). Most data collection is passive as it is not a workable situation to actively contact all the actors (including farmers) every week to ask them about suspected or confirmed cases.

Furthermore, epidemiological surveillance networks are divided in ‘autonomous’ or ‘integrated’. ‘Integrated’ means that the network is coupled to another activity. The surveillance constitutes a sort of ‘by-product’. This is the case with prophylactic

activities. Therefore, autonomous networks are generally much more expensive, because they are not based on pre-existing activities. An example of the integrated network is the epidemiological surveillance network for bovine brucellosis in France. The network corresponds to the epidemiological use of data resulting from prophylaxis against brucellosis.

Supranational epidemiological surveillance system of the World Organization for Animal Health

General information

The World Organisation for Animal Health (OIE) was created in 1924 to fight animal diseases on a global scale. In 2005, their mandate was changed to “to improve animal health worldwide”. One of the main objectives of the OIE is to ensure the transparency of the world animal health situation (OIE website^a).

According to a paper of the OIE about the “International Standards of the OIE” (link to the paper^b) the OIE develops two types of international health standards for animals and animal products - trade standards and biological standards. These standards are adopted by OIE Members. The four publications containing the OIE standards are:

- the Terrestrial Animal Health Code;
- the Manual of Diagnostic Tests and Vaccines for Terrestrial Animals;
- the Aquatic Animal Health Code; and
- the Manual of Diagnostic Tests for Aquatic Animals.

According to the paper^b the Terrestrial Animal Health Code and Aquatic Animal Health Code (called the “codes” hereafter), aim to assure the sanitary safety of international trade in terrestrial animals (mammals, birds and bees) and aquatic animals (amphibians, fish, crustaceans and molluscs) and their products. This is achieved by detailing the health measures to be used by veterinary services or other competent authorities of trading countries to establish health regulations for the safe importation of animals and animal products. The measures are aimed at avoiding the transfer of pathological agents for animals and humans, without creating unjustified trade barriers. In addition, the codes are the primary reference for international trade. The adoption of the standards allows Members of the World Trade Organisation (WTO) to meet their obligation under the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement).

The World Animal Health Information System (WAHIS) is an online secure notification system for the registration of all official reports, used by the animal health department of the OIE to improve the transparency of the world animal health situation (OIE website^a). In addition, WAHIS is a tool to gain and disseminate more timely information (Informal discussion with an expert of WAHIS, January 2010).

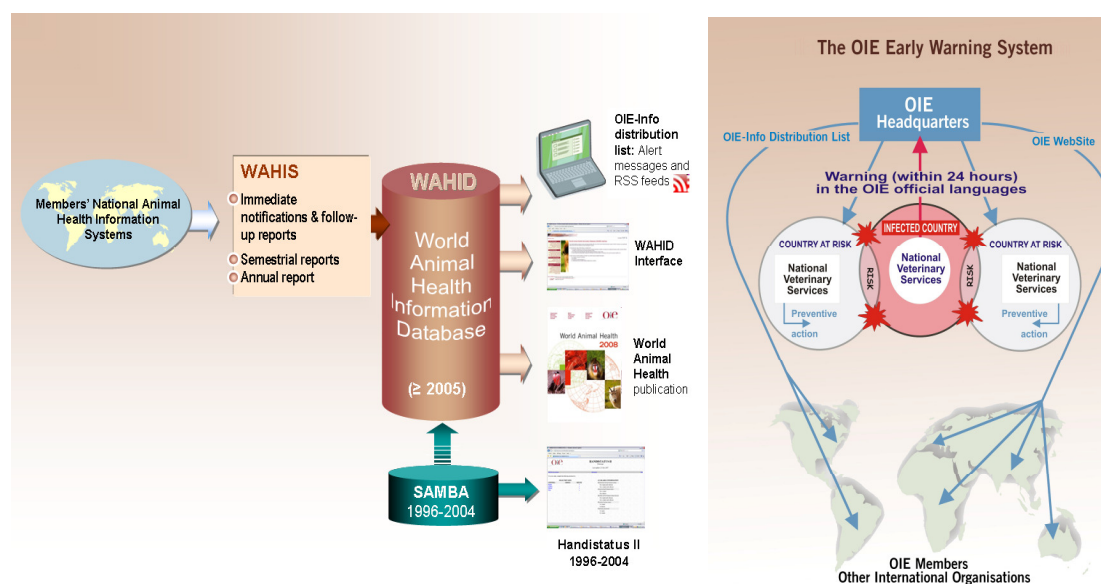
^a World Animal Health Information System 2010 OIE website [Online] Url: http://www.oie.int/eng/info/en_info.htm?e1d5 [Accessed: January 2010]

^b International Standards of the OIE 2010 OIE website [Online] Url: http://www.oie.int/eng/normes/A_standardisation_activities.pdf [Accessed: January 2010]

The OIE surveillance system, involving WAHIS, relies on the commitment, capacity and capabilities of the OIE Members to notify the main animal diseases that are

present in their country or territories in accordance with the requirements laid down in chapter 1.1. of the Terrestrial Animal Health Code and Chapter 1.1. of the Aquatic Animal Health Code on “notification of diseases and epidemiological information”. Reference needs to be made that the OIE is already coordinating the efforts of its Members since 1924. The Organic Statutes of the basic texts of the World Organisation for Animal Health already refer to notification obligations of OIE Members to the OIE Headquarters (OIE website^a).

Different methods are used to notify animal diseases to the OIE, these are: immediate notifications & follow-up reports (basis of the OIE’s early warning system), six-monthly reports and annual reports (basis of the OIE’s monitoring system). See figure 1 and 2 for the flow of data and information (OIE website^b).



Figuur 1: Wereld Diergezondheid Informatie Systeem

Figuur 2: Nood procedure

SAMBA and Handistatus II (figure 1) were part of the previous system and provide some historical data in electronic format from 1996 up to 2004 (OIE website^a; Informal discussion with an expert of WAHIS, January 2010).

According to the OIE website^c, the World Animal Health Information Database (WAHID) interface provides access to all data held within OIE’s WAHIS. A comprehensive range of information is available from

- Immediate notifications and follow-up reports submitted by Member Countries in response to exceptional disease events occurring in these countries as well as follow-up reports about these events;

^a Appendix to the international agreement organic status of the Office International des Epizooties 2010 OIE website [Online] Url: http://www.oie.int/eng/OIE/textfond/en_statuts_organiques.htm [Accessed: February 2010]

^b World Animal Health Information System 2010 OIE website [Online] URL: http://www.oie.int/eng/info/en_info.htm?e1d5 [Accessed: January 2010]

^c World Animal Health Information Database (WAHID) interface 2010 OIE website [Online] Url: <http://www.oie.int/wahis/public.php?page=home> [Accessed: February 2010]

- Six-monthly reports describing the OIE-listed disease situations in each country;
- Annual reports providing further background information on animal health, on laboratory and vaccine production facilities, etc.

One can then explore available information:

- by country (or group of countries);
- by disease;
- focusing on control measures; or
- comparing the animal health situation between two countries.

According to Ben Jebara and Shimshony (2006) Members of the OIE are obliged to report on the presence and absence of OIE-listed diseases at least once every six - months. Information can be provided by first administrative division (e.g. by province for Canada and by region for Italy). Two distinct functions of WAHIS are monitoring the animal health situation and the early warning system (see figure 1 and 2). The early warning system comprises the alert procedure for exceptional epidemiological events and that require immediate notification by Members (OIE website^a; Ben Jebara and Shimshony, 2006; FAO, OIE and WHO document, 2006). An immediate response can mitigate the adverse effects on animal health and public health (Ben Jebara and Shimshony, 2006; FAO, OIE and WHO document, 2006). An exceptional epidemiological event is for example ‘the first time an OIE-listed disease or infection is identified in a country or zone/compartment’. The OIE has developed a list with animal diseases that are notifiable to the OIE. These diseases are determined following several criteria. New diseases can be incorporated on the list when it meets the criteria. Reference needs to be done to emerging diseases not included on the OIE list and being reported as well (for example pandemic influenza H1N1 2009). In a second phase, emerging diseases can become listed and part of the system, as was the case for example for West Nile Fever (OIE website^a; Informal discussion with an expert of WAHIS, January 2010). According to informal discussion with an expert of WAHIS (January, 2010) the OIE has the historical data of each of its Members, based on its monitoring system. Therefore, if an epidemiological event occurs in a country or territory, the OIE can determine whether it is a significant epidemiological event (e.g. an outbreak of a OIE-listed disease) or not (e.g. the disease is present in that country and the occurrence of new outbreaks do not constitute an exceptional event unless there is an increase in the incidence, morbidity or mortality of this existing disease in the country). The former needs immediate notification and the latter will be reported in a six-monthly report with the rest of the national monitoring data (Informal discussion with an expert of WAHIS, January 2010; OIE website^a).

Standardisation and quality of data

According to Dufour and Hendrikx (2009) the advantage of a supranational network over a national network is that the same information is sent to each Member. To realise this, the data has to be standardised. The collection of data has to be done in an identical fashion. In this way, the animal health situation can be compared between member countries. This improves the transparency, which is an important premise for trade. However, the standardisation of the huge amounts of data, which is delivered

^a World Animal Health Information System 2010 OIE website [Online] URL: http://www.oie.int/eng/info/en_info.htm?e1d5 [Accessed: January 2010]

by national veterinary services, is not an easy task. The quality and the type of information received can vary enormously and the system relies on the quality of data it receives (Informal discussion with an expert of WAHIS, January 2010). Training programs are in place to keep on improving the quality of data provided by OIE Members (Informal discussion with an expert of WAHIS, OIE website^a).

Motivation of OIE Members to report

One can imagine that conflicts in interests can develop whether to notify an outbreak or not, because it can cause adverse effects on trade. In this respect several elements play a role in motivating OIE Members to notify events that are considered of epidemiological significance. First, according to the agreement of the OIE of 1924 and the OIE International Standards, Members have the obligation to notify to the OIE. Second, in exceptional circumstances the Directorate General of the OIE can notify an epidemiological event that can impact the international community. Third, this is related to the credibility of national veterinary services and their willingness to act transparently. It will damage trade relations when Members of the OIE are lacking in providing information on the animal health situation and this affects directly the degree of trust among partners which can have negative consequences on trade (Informal discussion with an expert of WAHIS, January 2010).

For more information refer to the OIE website^a.

Supranational epidemiological surveillance system of the Food and Agriculture Organisation

General information

According to the Food and Agriculture Organization's (FAO's) website^b the mandate of FAO is to raise levels of nutrition, improve agricultural productivity, better the lives of rural populations and contribute to the growth of the world economy. One of the main points in fighting hunger, malnutrition and poverty is to protect the livestock against diseases and prevent their spreading (FAO website^c). In addition, most of the emerging human pathogens have an animal origin. This led to the need for national and regional animal disease surveillance systems to prevent not only losses to livestock production, but to reduce threats to human health as well (FAO website^b). FAO's Director-General established the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES) in 1994 (FAO website^b). The Animal and Health Division (AGA) of the FAO is entrusted with the EMPRES animal disease component. The objective of EMPRES livestock program is to promote the effective containment and control of the most serious epidemic livestock diseases/Transboundary Animal Diseases (TAD) as well as newly emerging diseases by progressive elimination on a regional and global basis through

^a World Animal Health Information System 2010 OIE website [Online] URL: http://www.oie.int/eng/info/en_info.htm?e1d5 [Accessed: January 2010]

^b Mission, constitution and governance 2010 FAO website [Online] URL: <http://www.fao.org/about/mission-gov/en/> [Accessed: January 2010]

^c Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES) 2010 FAO website [Online] Url: <http://www.fao.org/ag/againfo/programmes/en/empres.html> [Accessed: January 2010]

international co-operation involving Early Warning, Early Reaction, Enabling research, Coordination (FAO website^a). The four main components of EMPRES are^b:

- Early Warning: identified as all disease initiatives based predominantly on epidemiological surveillance, which would lead to improved awareness and knowledge of the distribution of disease or infection and which might permit forecasting the further evolution of an outbreak.
- Early Reaction: identified as all actions that would be targeted at rapid and effective containment of, and leading to, the elimination of a disease outbreak, thus preventing it from turning into a serious epidemic. This includes contingency planning and emergency preparedness.
- Co-ordination: involves either co-ordination of global eradication of an identified animal disease such as rinderpest e.g. through the Global Rinderpest Eradication Programme, or encouraging regional initiatives for eradication of a given transboundary disease.
- Enabling Research: identified as prime element of EMPRES to emphasize the collaboration between FAO and scientific centres of excellence in directing research efforts towards problem solving.

EMPRES-i

The Global Animal Disease Information System (EMPRES-i) of the FAO's EMPRES is a web-based application that has been designed to support veterinary services by facilitating regional and global animal disease information (FAO website^c). i compiles, stores and verifies animal diseases outbreaks data (including zoonoses) from numerous sources for early warning and risk analysis. Different sources amongst others are: government Ministries of Agriculture and Health, ground information stemming from field projects and collaborators, FAO reports, OIE reports, European Commission, FAO reference centres, laboratories, the media and web-based health surveillance systems (EMPRES-i website^d; FAO, 2009). In addition, official and unofficial sources for information on animal diseases worldwide that EMPRES-i receives will be tracked down for further validation and verification through the FAO network of FAO officers that are strategically distributed over the 192 member countries, FAO collaborators and personal contacts with Non-Governmental Organisations (NGOs) and other institutions (Empres-i website^b).

Developments of the supranational epidemiological surveillance systems

In 2010, the OIE expects to incorporate several developments regarding WAHIS. During the Avian influenza crisis it became clear that sometimes more information was needed on the spread of the diseases in wildlife. Stakeholders wanted to have

^a EMPRES About us 2010 FAO website [Online] Url:
<http://www.fao.org/AG/AGAInfo/programmes/en/empres/mission.html> [Accessed: January 2010]

^b EMPRESKEY ELEMENTS 2010 FAO website [Online] URL:
http://www.fao.org/ag/againfo/programmes/en/empres/k_elements.html [Accessed: January 2010]

^c AGA in action 2010 FAO website [Online] Url:
http://www.fao.org/ag/againfo/home/en/news_archive/AGA_in_action/epidemiological_genetic_information.html [Accessed: January 2010]

^d EMPRES-i Global Animal Disease Information System 2010 EMPRES-i website [Online] Url:
<http://empres-i.fao.org/empres-i/home> [Accessed: January 2010]

more details on the involved wild species. Currently, the OIE is expanding the information provided, which includes the Latin names of the species involved (Informal discussion with an expert of WAHIS, January 2010).

In 2009, when relevant, the differentiation has been implemented between the presence and absence of diseases in domestic and wild. OIE Delegates and national focal points for disease notification and focal points on wildlife will play a crucial role in improving the reporting on the animal health situation in wildlife and thus a better knowledge of the animal health situation of wild animals. It is an important step, since diseases circulating in the wild can have a major effect on biodiversity, on the animal health situation of domestic animals and vice versa as well as on public health in certain circumstances (Informal discussion with an expert of WAHIS, January 2010). The network of the OIE now provides information on domestic and wild species in both terrestrial and aquatic animal diseases.

The FAO and OIE are increasingly more occupied with emerging diseases, which have the potential to become a threat to public health. Since, emerging diseases regularly arise in the world, it may be appropriate to investigate the factors that cause the diseases to emerge (Informal discussion with an expert of EMPRES, January 2010).

Discussion

Members of the OIE are legally obliged to inform the OIE on their animal health situation through immediate notification and follow-up (early warning) for exceptional epidemiological events when they occur, and through reports at least once every six months (monitoring) on the presence and absence of OIE-Listed diseases (OIE website^a; Ben Jebara and Shimshony, 2006; Informal discussion during a visit to the OIE Headquarters, in Paris in January 2010). In addition, to further improve the transparency of the world animal health situation, the OIE has set up since 2002, a verification procedure for non-official information from various sources on the existence of disease outbreaks that have not yet been notified to the OIE (OIE website^a; Ben Jebara and Shimshony, 2006; Informal discussion during a visit to the OIE in Paris, January 2010).

FAO's EMPRES livestock-program aim is to fight against persisting and/or spreading of transboundary animal diseases at a global level, with emphasis on developing countries (FAO website^b). EMPRES-i, part of EMPRES, compiles and verifies information on animal diseases worldwide (FAO website^c). However, no obligations exist by Members to inform the FAO on their animal health situation (Informal discussion with an expert of EMPRES, January 2010). Therefore, FAO uses information from the OIE on the world animal health situation for early warning and risk analysis. Since the FAO has a huge network in developing countries - including field staff that are in daily contact with Ministries of Agriculture and therefore with

^a World Animal Health Information System 2010 OIE website [Online] Url: http://www.oie.int/eng/info/en_info.htm?e1d5 [Accessed: February 2010]

^b EMPRES About us 2010 FAO website [Online] Url: <http://www.fao.org/ag/againfo/programmes/en/empres/about.html> [Accessed: February 2010]

^c EMPRES-i Global Animal Disease Information System 2010 EMPRES-i website [Online] Url: http://empres-i.fao.org/empres-i/home?!=en_US [Accessed: February 2010]

veterinarians – EMPRES-i receives complementary information (Informal discussion with an expert of EMPRES, January 2010).

The OIE and the WHO (World Health Organisation) have mandates that include the official notification of disease outbreaks to the international community within conditions determined by their Members (FAO, OIE and WHO document, 2006). The mandate of the FAO includes the dissemination of information to their Members on amongst others agricultural statistics (FAO, OIE and WHO document, 2006). Furthermore, the Codex Alimentarius Commission (CAC) is the joined effort of the FAO and the WHO to *inter alia* set standards for the international trade of food (Codex Alimentarius Website^a; Informal discussion with an expert of EMPRES, January 2010). The OIE, FAO and WHO have joined their forces in the form of GLEWS in order to avoid unjustified duplication of efforts and combining and coordinating verification processes through sharing of information on disease outbreaks (FAO, OIE and WHO document, 2006; GLEWS website^b; Informal discussion with experts of EMPRES and WAHIS, January 2010). This way zoonotic diseases, which effect both animals and humans, are detected through alerts of animal disease outbreaks (OIE and FAO) and/or alerts of human cases (WHO) (FAO, OIE and WHO document, 2006; GLEWS website^b; Informal discussion with experts of WAHIS and EMPRES, January 2010). The detection and fight against animal diseases and zoonoses need to be done in a coordinated way. In addition, the developed and developing countries have to work together in this field ('One World, One Health'). For example, several transboundary diseases existing in developing countries need a regional or an international approach. According to an expert of Empres (January, 2010):

“Regarding H5N1 we learned that in places like Jakarta or Cairo the ordinary man on the street does not give much about pandemic threats, because he has hundreds of other problems to solve, which are more important for his every day life or survival. Therefore, it does not have his priority. Without acknowledging this, we learned that we could not be effective in terms of operating.”

This quote shows the relevance of the 'One World, One Health' concept.

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^a Welcome 2010 Codex Alimentarius Website [Online] Url: http://www.codexalimentarius.net/web/index_en.jsp [Accessed: February 2010]

^b About GLEWS 2010 [Online] Url: http://www.glews.net/index.php?option=com_content&view=article&id=48&Itemid=27 [Accessed: February 2010]

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