



# An integrated web system to support veterinary activities in Italy for the management of information in epidemic emergencies



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## ARTICLE INFO

### Article history:

Received 6 May 2013

Received in revised form 7 January 2014

Accepted 10 January 2014

### Keywords:

Animal health  
Animal disease outbreaks  
Early detection  
Modelling  
Network analysis  
Risk maps  
Surveillance system

## ABSTRACT

The management of public health emergencies is improved by quick, exhaustive and standardized flow of data on disease outbreaks, by using specific tools for data collection, registration and analysis. In this context, the National Information System for the Notification of Outbreaks of Animal Diseases (SIMAN) has been developed in Italy to collect and share data on the notifications of outbreaks of animal diseases. SIMAN is connected through web services to the national database of animals and holdings (BDN) and has been integrated with tools for the management of epidemic emergencies. The website has been updated with a section dedicated to the contingency planning in case of epidemic emergency. EpiTrace is one such useful tool also integrated in the BDN and based on the Social Network Analysis (SNA) and on network epidemiological models. This tool gives the possibility of assessing the risk associated to holdings and animals on the basis of their trade, in order to support the veterinary services in tracing back and forward the animals in case of outbreaks of infectious diseases.

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## 1. Introduction

In epidemic emergencies, an efficient management of outbreaks of animal diseases can be obtained only if the competent authority has access to updated and reliable information. In such situations, a quick generation and processing of information is required for a timely and efficient delivery of control and eradication activities. The impact of emerging diseases can be minimized through a well-prepared and strong surveillance system (Merianos, 2007).

The main challenge faced by surveillance systems is the ability to expedite the process of collection and analysis

of data. Following the confirmation of an outbreak of a contagious animal disease, a pressing question is the identification of the most likely sources of infection and of the animals that might have further spread the disease. The efficiency of surveillance systems in case of epidemic emergency is strongly dependent on the efficiency of their underlying information systems. The efficiency can be increased by using specific software for data collection and analysis to provide the competent authorities with tools for better focusing the surveillance activities and the disease control measures. Information systems are the crucial tool for making information available for risk analysis.

Also in the absence of infection, surveillance systems and information systems are indispensable tools for the veterinary services. From one side, the probability of introduction of infectious diseases in different geographical areas and the likelihood of spread after an incursion need to be assessed, and this assessment depends on the existence of early warning systems. On the other side, the absence of

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a disease in a given territory needs to be demonstrated and documented for trade purposes.

Several information systems have been developed at international and national levels, with the aim of helping the veterinary services in the prevention and management of epidemic emergencies.

At the international level, the World Animal Health Information System (WAHIS) of the World Organisation for Animal Health (OIE) is the reference for all national or regional systems. Through its web interface and e-alert system, WAHIS collects and disseminates a large quantity of information on animal disease outbreaks occurring worldwide (Ben Jebara, 2007).

In the European Union, the Animal Disease Notification System (ADNS), instituted by the Council Directive 82/894/EEC (subsequently amended by Commission Decision 2008/650/EC), provides the rapid exchange of information on outbreaks of contagious animal diseases between the national authorities competent for animal health and the Commission. The system allows the coordination and monitoring of outbreaks of contagious animal diseases and enables Member States and Commission services to take immediate measures to prevent the spread of the diseases in question.

Detailed information on each outbreak in a Member State of an infectious disease in animals, listed in Annex I of Council Directive 82/894/EC, is sent by the Member States to the European Commission via the Animal Disease Notification System (ADNS). A weekly (every Friday at 3.30 pm) e-mail message is sent to all the ADNS members summarizing all primary and secondary outbreaks that have been entered into the system. However, when the first outbreak of a contagious animal disease occurs (i.e. classical swine fever or foot-and-mouth disease), the situation has to be considered extremely urgent. In some cases, due to the fast spread of some diseases, the reaction has to be immediate. For this reason round the clock control on these notifications is needed. In view of this, the Head of Unit in the Directorate General for Health and Consumers (DG Sanco) can be contacted via GSM/mobile telephone and in case of disease outbreaks, the Head of Unit and/or other colleagues can then come to the office to cover the epidemic event.

The on-going evolution of ADNS is the development of an Animal Disease Information system (ADIS), compatible with the World Animal Health Information System (WAHIS) of the World Organisation for Animal Health (OIE), providing key information to the general public on the animal health situation in Europe. The implementation of this new system started in 2009 and is now in the transition stage, to ensure that the software is available for its end users (Mesman, 2011).

At the national level, in Italy the veterinary services have at their disposal a variety of disease specific and non-disease specific information systems.

Examples of disease specific systems in Italy are the sentinel system for the early detection of the circulation of bluetongue virus (BTV) (Giovannini et al., 2004, 2008; Savini et al., 2007; Conte et al., 2005) and the surveillance system for West Nile Disease (WND) virus in wild birds for the early detection WND virus circulation (Calistri et al., 2010).

A non-disease specific system is the Information System for the notification of animal diseases (SIMAN), which collects data on outbreaks and has been in place since 2008. This system was developed in Italy by the Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise "G. Caporale" (IZSAM) to collect and make data available to the national veterinary services, and to dispatch data on outbreaks to the international Authorities (European Commission and OIE).

The computerization of the Italian notification system was the first step for the quick generation and processing of information required for a timely and efficient delivery of control and eradication activities. As a further improvement of this system, a web application for the tracing of animal movements between cattle herds has been recently developed. This application, called EpiTrace, extracts information on holdings and animal movements from the National Animal Database and is based on the Social Network Analysis (SNA) and on network epidemiological models (Duncan et al., 2012; Martinez-Lopez et al., 2009; Wasserman and Faust, 1994). It has been developed at the IZSAM in collaboration with the Institute for the Protection and Security of the Citizen of the European Commission (Natale et al., 2009, 2011).

The aim of this paper is the description and evaluation of the integrated system produced by the incorporation of the tracing utilities (EpiTrace) in the National Animal Database of Animals and Holdings (BDN) and the Information System for the notification of animal diseases (SIMAN).

## 2. Description of the integrated system

### 2.1. SIMAN

SIMAN has been designed to collect data on notification and follow-up of outbreaks of animal diseases and makes them available and analysable to the veterinary services all over Italy. Several tools for data analysis have been incorporated into the system. The structure of the system is described in detail in Colangeli et al. (2011).

In case of outbreaks, the Ministry of Health, using SIMAN, is able to immediately report to the European Commission through the Animal Disease Notification System (ADNS) and to the OIE's WAHIS all information requested by each system.

SIMAN has been designed to report data on outbreaks for all the OIE listed diseases. In other words, since not all OIE listed diseases are subject to notification to ADNS, this means that SIMAN has already implemented one of the functions foreseen for the future ADIS system of the European Union. In addition, the authorized users can download reports showing the updated situation of the infected holdings, including the number of susceptible, infected, sick, dead, slaughtered/killed and destroyed animals.

Recently, the SIMAN website has been updated with a dedicated section for the contingency planning in case of epidemic emergency. In particular, it is possible to look at each component of the contingency. More in depth, the plan describes the organization of the national centre for animal disease emergency management of the Ministry of health and its tasks. Moreover, the plan provides a detailed

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