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▶ **To cite this version:**

Gwenaël Vourc'h, Jacques J. Barnouin. How to improve the detection of animal emerging diseases ? A two-level (veterinarian/farmer) approach based on an Internet-Oracle® database. 10. Symposium of the International Society for Veterinary Epidemiology and Economics, Nov 2003, Vina del Mar, Chile. hal-02760602

HAL Id: hal-02760602

https://hal.inrae.fr/hal-02760602v1

Submitted on 4 Jun 2020

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How to improve the detection of animal emerging diseases? A two-level (veterinarian/farmer) approach based on an Internet-Oracle® database.

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Summary

No functional system exists for detecting emerging animal disease without targeting at a specific disease. Our EPIDEM research program aims at developing epidemiological methodology to study emerging animal diseases with a strong link to clinical observations. Two kinds of diseases are registered: "atypical syndromes" (as potential unknown emerging disease) and "model diseases". The program has two components (1) a farmer component via routine surveys in farms, and (2) a veterinarian component via clinical case notification on the "emergences" website (http://www.inra.fr/maladies-emergentes). The website is linked to an Oracle® database and developed to be applicable to any country and any animal species.

Introduction

Predicting which diseases will emerge in the future is one of the most difficult challenge facing researchers and health managers (MacLehose et al. 2002). Therefore, improving animal emerging disease detection is of prime necessity. In a given area, emerging diseases are both, those that already exist and increase in incidence and "atypical" diseases, i.e. diseases that are unexpected or unknown for the area. The detection of such atypical diseases has triggered the development of "syndromic surveillance" concept in Human medicine (Ackelsberg et al. 2002). However, until now, no functional system in animal health exists.

Objectives

Our research program, EPIDEM (EPIdemiology and Detection of EMergences), aims at developing an epidemiological methodology to study emerging animal diseases with a strong link to clinical observations. The collaborative program is being started in France in bovine herds and is aimed to be applicable to any country and any animal species. Two kinds of diseases are registered: "atypical syndromes" and "model diseases" (Lyme disease, babesiosis, ehrlichiosis (*Anaplasma phagocytophilum*), bovine influenza, and tumors). Atypical syndromes are described as (i) clinical signs that the clinician cannot link to a known disease or as (ii) a known disease which expression is atypical due to its clinical signs and severity, the region where it appears, or the non-response to usually efficient treatment. Atypical syndromes are interesting as potential unknown emerging disease. Model diseases are chosen for their emergence potential, their importance in public health, and in order to test methodological tools on known diseases.

The EPIDEM program has two components (1) a farmer component via routine surveys performed in a representative set of farms, and (2) a veterinarian component including clinics and schools through and website. This paper will mainly focus on the veterinarian component after a short presentation of the farmer's one.

System presentation

For the farmer component, the data were collected in farms by specialized surveyors from a random sample of French cattle herds, via the national survey of the CSSSS (Central Service for Survey and Statistical Studies). The first survey was done in November 2001 on bovine influenza in a set 16,583 farms of the national sample (see Gay and Barnouin 2003 this volume). The second survey was done in 2,532 herds from 7 French states to study the occurrence of bovine influenza, babesiosis, photosensitization and "unknown" disease (i.e. not previously seen in the herd or a known disease which expression is atypical due to its clinical signs or severity) in November 2002. All the interviewed farmers answered the survey. 14.15% of the herds declared at least one of the three model diseases and 3.51% declared a "unknown" disease. This shows that this survey system would be potentially very informative and should be repeated regularly.

For the veterinarian component, clinical cases are notified through the "emergences" website (http://www.inra.fr/maladies-emergentes, the English version is under construction). The website is linked to an Oracle8.0® database built on a multi-platform technology (linking SqlPlus language and Java). The website has a public part with information on our program and an Intranet part with reserved access for members to 1) register, 2) notify clinical cases, 3) answer complementary survey, and 4) get more specific information on the programs and participate to the forum (see Figure 1).

Figure 1: "émergences" front page.

In addition, an administration website is available to the administrator to 1) manage member registration, 2) manage notification, 3) built up complementary surveys, 4) manage forum, and 4) send email to members.

Members can register as different types, for which the administrator defines the Intranet habilitation. For example, in the EPIDEM project, "veterinarian practitioners" have full access to the Intranet, whereas "other collaborator"s cannot notify clinical cases nor answer complementary surveys. After the registration has

been validated by the administrator, the member can notify an atypical syndrome or a model disease case by two means: 1) directly on the website, or 2) through a locally downloaded software, which allows the data to be sent to the website later on. Clinical case notification proceeds in two steps as an initial notification can be modified 15 days later in case changes occurred. If no modification occurs the case is automatically confirmed 30 days after the initial notification. The notification form requests information on the case identification, the diagnostic bases, the numbers of sick or dead animals per category, some clinical precisions for the most targeted category, and the occurrence of contact with other animals (see Figure 2).

Complementary surveys to identify risk factors in case of suspected emergences can readily be set up by the administrator thanks to a tool that is implemented in the database to generate epidemiological questionnaires.

In the Intranet program information part, members have access to 1) research program information, 2) notification results, 3) survey results, 4) forum, 5) "emergences" website news, 6) the collaborator list, 7) disease inclusion criteria, and 8) unfilled notification forms. The notification results are automatically implemented to be readily accessible to all members. It includes completed notifications, the number of notifications for a given disease in a chosen period, and the list of notifications that were confirmed during the last 30 days.

The system was successfully tested in France from February to July 2003 with 10 veterinarian practioners, 2 veterinarian teachers and 12 other collaborators (researchers, journalists, …). 33 notifications were made among which 2 atypical syndromes (1- slow growth with pulmonary and liver atrophy and depilation, and 2- sudden death of 5 cows over 5 weeks).

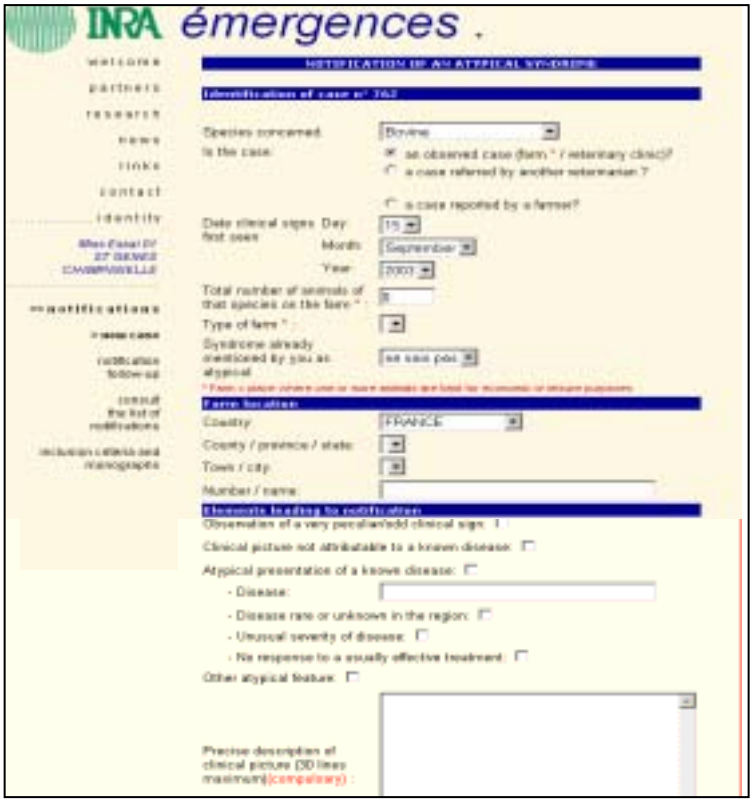

Figure 2: Beginning of an atypical syndrome notification form.

Notification of atypical syndromes is a very challenging issue as it has never been done at a large scale. In order to identify potential emergence, atypical syndromes will be regularly reviewed by a group of clinician and epidemiologist experts. However, if two similar syndromes occur or if a case is linked to a human case, the cases will be transmitted to the expert group right away. All case notifications are geographically referenced in order to develop spatio-temporal analyses and modeling for detecting increased incidence.

Conclusion

The system is ready to be used for real. Because animal emerging diseases are not limited to bovine in France, we were careful to have a system applicable to any country and any animal species. The challenge for emergence detection is also to have the system used by a significant number of veterinarians for the targeted area as well as pertinent data analysis and modeling.

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