

## SCIENTIFIC OPINION

### **Scientific Opinion on Review of the European Union Summary Report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2009 and 2010**

### **specifically for the data related to bovine tuberculosis, Echinococcus, Q fever, brucellosis and non-food borne diseases<sup>1</sup>**

**EFSA Panel on Animal Health and Welfare (AHAW)<sup>2,3</sup>**

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#### **ABSTRACT**

Following a request from EFSA, the Animal Health and Welfare Panel delivered a scientific opinion reviewing the “European Union Summary Report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks for 2009 and 2010” specifically for the data related to bovine tuberculosis, Echinococcus, Q fever, brucellosis and non-food borne diseases. A yearly report of the distribution and other epidemiological characteristics of the zoonoses among the different European Member States is an essential component in assessing the impact of these diseases and their potential preventive measures. These yearly reports, however, should not be considered as information on the current disease situation since they are only available 12 months after the year of interest. The reports do not always clearly identify the reference population, the data sources, and data collection approaches (surveillance methodology) used for the various diseases. There is a need to consider these three essential elements in order to make appropriate inferences. Limited data analyses were included in the reports although it was recognized that the nature of the data and the collection systems may preclude subsequent data analysis. Statistical methods, such as trend analysis, should be presented as part of the introduction and the data analysis methodology. The reports contain several statements to indicate statistical significance and the statistical method used should be specified in the text. It was noticed that the 2010 Report has improved in its presentation in comparison to 2009 report. The 2010 Report included more details of parasitic zoonoses than the 2009 Report. These results, however, are not linked to further interpretation e.g. the potential reasons for any decrease or increase. It was recommended that the AHAW and BIOHAZ Panels should be consulted (e.g. as part of their annual mandate) before the Report is released to the public.

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## SUMMARY

Following a request from EFSA, the Animal Health and Welfare Panel was asked to deliver a scientific opinion on review of the “European Union Summary Report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks for 2009 and 2010” specifically for the data related to bovine tuberculosis, Echinococcus, Q fever, brucellosis and non-food borne diseases. This opinion should be reviewed in conjunction with the European Union Summary Report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2009 and 2010. Further terms of reference (2 to 6) associated with this mandate, on the relevance of the data, its source, availability analysis and presentations as well as available analytical tools for aggregated data will be addressed in a separate opinion.

The panel provided general conclusions and recommendations as well as disease specific comments. The conclusions and recommendation to specific sections of these two reports should be considered for the improvement of future reports.

A yearly report of the distribution and other epidemiological characteristics of the zoonoses among the different European Member States is an essential component in assessing the impact of these diseases and their potential preventive measures. These yearly reports, however, should not be considered as information on the current disease situation since they are only available 12 months after the year of interest. Therefore, this should be emphasized in the report. The reports do not always clearly identify the reference population, the data sources, and data collection approaches (surveillance methodology) used for the various diseases. Although the intention is to get the best and reliable relevant data, there is a need to consider these three essential elements in order to make appropriate inferences. The use of weighted seroprevalence for brucellosis by the ratio of the number of herds to those tested is a good addition to the current report. This approach should be generalized to all other diseases that can be addressed from clustering either by herd or community. Limited data analyses were included in the reports although it was recognized that the nature of the data and the collection systems may preclude subsequent data analysis. Nevertheless, these types of limitation should be highlighted. Statistical methods, such as trend analysis, should be presented as part of the introduction and the data analysis. The reports contain several statements to indicate statistical significance and the statistical method used should be specified in the text. The 2010 Report included more details of parasitic zoonoses than the 2009 Report. These results, however, are not linked to further interpretation e.g. the potential reasons for any decrease or increase. It was noticed that the 2010 Report has improved in its presentation in comparison to 2009 report.

It was recommended that the AHAW and BIOHAZ Panels should be consulted (e.g. as part of their annual mandate) before the Report is released to the public.

## KEY WORDS

Summary Report, zoonoses, bovine tuberculosis, Echinococcus, Q fever, brucellosis, non-food borne diseases

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## BACKGROUND AS PROVIDED BY EFSA

The Directive 2003/99/EC establishes the system on EU-wide data collection for zoonoses, zoonotic agents, antimicrobial resistance and food-borne outbreaks. The Directive assigns EFSA the tasks analysing the data and publishing in collaboration with ECDC annual EU Summary Reports on trends and sources zoonoses, zoonotic agents and food-borne outbreaks.

Each year substantial quantities of data are received from the Member States and part of this data monitoring and reporting is harmonised by EU legislation or by EFSA specifications. The analyses of the data at supra-national EU level is challenging due to different epidemiological situations in the Member States and the fact that the data are not always directly comparable between the countries and years.

The scientific panels of Biological Hazards (BIOHAZ) and AHAW have been in past consulted about the Community Summary reports from years 2004 and 2005, and two opinions from the panels have been issued on this review (EFSA Journal (2006) 403, 1-62 and EFSA Journal (2007) 600, 1-32). It would appropriate to repeat this review of the EU summary report in order to further improve the scientific quality of the reports, the data collected and the analyses carried out.

## TERMS OF REFERENCE AS PROVIDED BY EFSA

The AHAW panel is asked to:

1. review the European Union Summary Report on trends and sources zoonoses, zoonotic agents and food-borne outbreaks in 2009 and 2010. This review should in particular focus on data related to bovine tuberculosis, *Echinococcus*, Q fever, brucellosis, and non-food-borne zoonoses including the current analyses of the available data;
2. evaluate the appropriateness of the data collected at EU level;
3. consider what data are needed at EU level to provide an accurate picture of the epidemiological situation in the EU and the Member States;
4. assess if the analyses methods used in the report are appropriate;
5. consider if the collection of sampled based data for the report's aim instead of aggregated data would improve the quality and analyses of data at EU level;
6. consider if the data collection should be extended to additional zoonoses, or zoonotic agents, such as vector-borne zoonoses; and
7. propose any improvements to the data collection, the presentation of the data and their analyses, as appropriate.

## ASSESSMENT

### 1. INTRODUCTION

In accordance to its founding regulation (Reg.178/2002/EC), EFSA must collect and analyse data regarding the occurrence of zoonoses in Europe. The objectives and processes for data collection and which zoonoses should be considered are described in Directive 2003/99/EC.

Each year EFSA in close collaboration with the European Centre for Disease Prevention and Control (ECDC) analyses the available data and publish a European Union Summary Report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks.

Over the past years (EFSA 2006 and EFSA 2007) the EFSA panel on Animal Health and Welfare (AHAW) has been requested to review and make recommendations on ways to improve the collection, reporting and analysis of EFSA data collection on zoonoses (EFSA, 2006, and 2007).

The AHAW panel with the support of a ad-hoc working group created for this purpose has approached this mandate in the following way.

In relation to the first term of reference regarding the available 2009 and 2010 Report, a critical review of the Report's strengths and weaknesses including the relevant collected data with the analysis and summaries. This opinion addresses the first term of reference and should be reviewed in conjunction with the European Union Summary Report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2009 and 2010.

Further terms of reference (2 to 6) associated with this mandate, on the relevance of the data, its source, availability analysis and presentations as well as available analytical tools for aggregated data will be addressed in a separate opinion.

### 2. REVIEW OF THE 2009 AND 2010 REPORTS

The contents of this scientific opinion are comments and suggestions related to the published report entitled "Scientific report of EFSA and ECDC- The European Union Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks in 2009" and the homonymous report of 2010. The aim of this opinion is to improve the future presentation of the data so that these reports can be utilized accurately and more effectively. The Opinion focuses on data presented related to disease and infection that are not foodborne in nature. The Opinion is divided into general comments and suggestions and specific infections/diseases. Some of the comments are related to the type of presentation and analysis, others are related to the factual information of the disease under consideration.

### 3. GENERAL COMMENTS

In the Zoonoses database, an attempt has been made to distinguish between data collected through active and passive surveillance. However, the terms in the report (surveillance, control and eradication programmes, monitoring, and survey) are ambiguous, and it was not possible to identify representative data with any level of confidence.

In the summary of both reports (2009 and 2010), the positive impact of the reliable surveillance and control measures for specific diseases can be emphasized; for instance the surveillance of salmonellosis among the member states can be emphasized.

The precautionary paragraph on the inconsistency in the surveillance and monitoring systems by member states (page 11 of the 2009 report) is valid. It reflects the nature of the data collection and the limitations associated with the data analysis.

The minimum number of 25 tested samples for the requirement for the data analysis (page 11 of the 2009 report) should be justified. The assumption is that this number is per member state and should be collected from all members. Otherwise it should be clarified.

There is limited analysis of the data collected, most are a simple statement of what is found which perhaps is adequate in light of a later comment regarding over-interpretation. The Report therefore should indicate the limitations of the data analysis. Statistical analysis methods, such as trend analysis, should be presented as part of the introduction to the data analysis. The Report contains several statements to indicate statistical significance without any specification of the statistical methods that were used. Statistical methods were included in the appendix of the report. There is however a need to, at least, indicate the statistical methods in the body of the report with a reference to the Appendix.

Although the 2009 report includes cumulative cases by the 29 members, the majority of the cases for specific infections are related to a region or one country. The Report's summary should indicate this type of diversity so the readers can recognize the risk areas. For instance, the Q-fever cases were restricted to a specific region, but it was not summarized as such. The regional data for Echinococcosis and rabies in the 2010 Report is a clear way to present the data and that approach should be adopted for the other infections and diseases.

The 2010 Report has included some changes to the 2009 Report. Modifications of the instructions to the Member States (MS) for the submission of the data were included in the published manual (EFSA, 2011) including the optional submission of regional data within each MS. The NUTS standards were made available in the specific pick list. MSs were asked to report data at the highest level of available detail (granularity), following the rule that in each line (row) the total number of unit tested and unit positives for the selected NUTS level should be reported. Thus the reporting tables on the regional basis were improved in the 2010 Report particularly for the data related to *Echinococcus* spp. and rabies.

The 2010 Report included more details of the parasitic zoonoses than the 2009 Report. These details, however, are not subjected to further interpretation and the potential reasons for the decrease or increase of these specific parasitic diseases.

The 2010 Report has a slight improvement in the description and the presentation of the analytical methods used for the data analysis. Nevertheless, both reports still present the findings from the statistical analysis in terms of P-values instead of the point estimates with their confidence intervals. The recommendations of the EFSA Scientific Panel on "Statistical presentation and interpretation" should be applied in the future reports.

### **3.1. Specific Comments**

The report for each of the listed diseases was assessed in terms of the completeness of the data, validity of the data, representativeness of the susceptible populations, and the presentation of the data.

#### **3.1.1. Brucella**

There is an improvement in the report compared with the previous years specifically in terms of linking the human cases with animal data on prevalence. Nevertheless there are some issues that are needed to improve the precision of the Report.

The statement about the zoonotic aspects of the following species *B. canis* in dogs, and *B. ceti* and *B. pinnipedialis* in marine animals, should be elaborated since these species are associated with only a single human incident. It is indicated in the Report that the notification rate of all MSs decreased, however an increase in total cases is observed from the earlier 2008 data in some MS (which appears to be due to imported cases) and the absolute number of cases in Portugal has increased.

The presentation of the animal brucellosis data is still problematic; a case definition for seropositive should be included. It is recognized that not all MSs have the same serological tests, therefore,

seropositivity is open to misinterpretation. Furthermore the definition of 'herd' may also have a different interpretation by various MSs. The Report should indicate this type of limitation. It would be useful if listed serological tests by the brucellosis endemic member states were included.

Figure BR 1 is still presented as a histogram; this should be presented as a bar chart since data are incremented on a yearly basis. Figure BR2 and Table RB1 with their interpretations are very useful.

The use of weighted seroprevalence by the ratio of the number of herds to those tested is a good addition to the 2010 report.

Human cases would be better described if they were presented with the clinical signs since that frequency of specific clinical signs can be an important factor in the future differential diagnosis. This type of information will be useful for the readers and the public health officers in general.

The 2010 Report has the same type of presentation of brucellosis data with no changes from the 2009 report.

### 3.1.2. *Q*-Fever

The section on Q fever in humans is clear, with little potential for confusion. The data are presented at the level of the individual, focusing on Q fever (the disease). The material would be clearer if a 'confirmed case' was defined, so that it was clear that a similar definition was being used in each of the reporting MSs. The difference between 'reported' and 'confirmed' cases is not clear and a reference to the human case definitions as established by the relevant legislation would be useful.

The material presented on Q fever in animals is less clear, reflecting inconsistency in data available for analysis and interpretation. The EFSA dataset includes data with each of the following potential differences.

- Data relating to Q fever (the disease) and to *Coxiella burnetti* (the infection)
- Data derived from the herd and from the animal
- Samples collected in very different epidemiological circumstances, including suspect sampling, when prevalence would be expected to be greater, and from surveys, presumably using random sampling methods
- Data of serological results (measuring immune response to infection) and as a result of agent detection

In the report, the authors have sought to group the results in a manner that would minimise confusion (cattle: animal then herd level; sheep: flock level, etc), however, this has only been partially effective.

In several member states (such as Finland, Italy and the UK), the Report highlighted very low levels of herd level prevalence. It is unclear whether these results may actually provide evidence for freedom from infection, with positive results being a reflection of imperfect test specificity rather than true positive results.

The section relating to Q fever in humans is very similar in both the 2009 and 2010 reports, and comments above are relevant. In each of these reports, some explanation is needed of the terminology 'Report type' (either aggregated data report, case-based report or unspecified), and implications when considering patterns of confirmed Q fever cases in each of these years.

The same challenges were faced in both the 2009 and 2010 Reports about the presentation of material about Q fever in animals. In the 2010 Report, several of these issues were effectively disentangled, by separately reporting animal- and herd-level data, and data relating to suspect cases and to serological monitoring. Many countries have not reported the sampling context, and temporal trends in Tables QF3 and QF4 therefore need to be interpreted with considerable care. This is correctly



reflected in the following statement, from the 2010 Report, and also in the discussion: “As monitoring and reporting schemes and diagnostic methods can differ considering the country or the period of time, results should be interpreted with caution.” (p. 295). The discussion has been enriched by references to key recommendations from an earlier EFSA opinion (EFSA, 2010) and from a scientific report submitted to EFSA (Sidi Boumedine et al, 2010).

### 3.1.3. Tuberculosis

Regarding the 2009 Report, the section on tuberculosis in humans is straightforward, reporting the number of individuals with tuberculosis during the period of interest. The material would be clearer if a 'confirmed case' was defined, so that it was clear that a similar definition was being used in each of the reporting MSs. The difference between 'reported' and 'confirmed' cases is not clear.

The tuberculosis data for animals are underpinned by herd-level measurements,, which is entirely appropriate, given the nature of this infection. It is unclear the reason for differing definitions for numerator data for countries and regions that do not (infected herds) and do (positive herds) receive EU co-financing for eradication programmes. Some of the reported trends are a consequence of differences, in the years under investigation, and in the countries under consideration, as acknowledged in the Report (2009). For this reason, temporal country-level trends (Figure TB4) and trends in a defined and consistent subset of countries (Figure TB5) are more meaningful than Figure TB3, where the mix of countries under consideration varies from year to year. The reported “greater than two-fold increase in herd prevalence in Northern Ireland in 2009 (6.12%) compared to 2008 (2.88%)” is probably an error in data entry, as this increase is not reflected in the official figures ([http://www.dardni.gov.uk/tuberculosis - internet monthly statistics - december\\_2011 - \\_pdf.pdf](http://www.dardni.gov.uk/tuberculosis - internet monthly statistics - december_2011 - _pdf.pdf)).

The reporting methods in the 2009 and 2010 Reports were very similar, and the comments above still apply. In the 2010 Report, detailed information is presented on the TB situation in cattle in the UK, noting that the UK had received co-financing from the EU in 2010, the first time for many years, in support of eradication activities. The discussion on TB in wildlife would have been enhanced if the authors had considered the different epidemiological role(s) that wildlife can play in the epidemiology of TB in cattle, with specific consideration of the difference between spillover hosts, maintenance (or reservoir) hosts and maintenance hosts with spill-back to cattle. These issues are considered, albeit superficially, in the information about bovine tuberculosis in wildlife in France.

### 3.1.4. Rabies

In general, data on rabies in any host species are well prepared for public access through the WHO facility (e.g. <http://www.who-rabies-bulletin.org/Queries/Maps.aspx>). Thus the main need for the EU zoonoses reporting should focus on:

- changes in rabies incidence in MS;
- justification for the general trend of rabies elimination from EU wild life by oral mass vaccination; and
- the follow up of rabies in bats and human immigrants.

In the 2010 report, data presentation on specific rabies situation in animals was supported with detailed regional maps of rabies diagnosed in animals. The particular geospatial presentation of case detections is well justified for regions in Poland or Italy to highlight the remnant or remerging rabies problem in spite of past control efforts. For other regions where mass vaccination is more recent and rabies is not yet fully controlled by vaccination, the case mapping is less targeted as the ubiquitous presence of cases is natural. However, the regional display of the situation in Italy and Romania does not represent the expected epidemiological variations related to this disease between these two members particularly in the control measures and the presence of susceptible wild animal species.

The recurrent issue with the Figure RA3 (RA2 in 2009 Report) is that the main messages for disease management (e.g. the effect of control efforts on rabies occurrence) are hidden behind irrelevant



information (e.g. the percentage of wildlife species contributing to outbreaks of disease). Here, as in previous years, it would be necessary to stratify annual data by groups of MSs with the same duration of membership to the EU (hence the same time since access to large-scale mass vaccination). As proposed, annual bars of total numbers could be segmented by the percentage of all rabies detections due to EU17, EU22, EU27, third countries, etc.

European bat lyssavirus (EBLV) occurrence and distribution is reported only on the basis of virus isolation, which presents an incomplete and misleading picture of these infections in the EU. Presentation of serological data would give a more complete, and less misleading, picture of EBLV distribution.

### 3.1.5. Echinococcus

This section has been expanded in 2009 and 2010 in comparison to previous reports, with more data and valuable information. Information for *Echinococcus granulosus* and *Echinococcus multilocularis* has been improved, and trends in these two human parasitic infections can now be better assessed. Data on Echinococcosis in animals have been grouped, whenever possible, according to the role of the different species as definitive or intermediate host, and they allow better understanding of trends in *E. multilocularis* and *E. granulosus* infection. Live cycles for the two parasites are well described, and now they appear in different figures. However, the risk factors for *E. multilocularis* infection in humans are too concentrated on food products (“In accidental cases, humans may acquire *E. multilocularis* infection by ingesting eggs shed by the definitive host via e.g. contaminated vegetables, berries or hands, or when touching animals with infective eggs in the fur, such as dogs”). It should be clear that the origin of the contamination is faecal shedding of eggs either by wild carnivores or dogs/cats (when the parasite establishes an urban, domestic cycle).

In the definition of the disease in humans a reference to the liver as the main organ affected is lacking (e.g. “alveolar echinococcosis is a chronic disease of the liver with infiltrative growth in the affected organs....”)

The identification of the species involved in human disease (*E. multilocularis* vs. *E. granulosus*) decreased from 2008 to 2009 (77% vs. 45%), but in the 2010 Report the proportion of identified species has again turned to a high level (78%). Species identification of *Echinococcus* affecting humans and accurate reporting should be encouraged.

Data on echinococcosis in animals have been grouped attending to the role of the different species as intermediate or definitive host for the two human diseases. This has greatly improved interpretation of the trends and its relevance to human disease. For *E. multilocularis*, the findings in foxes compiled in Table EH5 are of special relevance. Information on sampling and testing procedures is not available. Data on *Echinococcus* prevalence in farm animals (Table EH4) are collected routinely at the slaughterhouse, and in most MSs these figures are based on a large number of inspected animals. These data probably include cases of animal echinococcosis caused by *E. granulosus*, *E. equinus* and *E. ortleppi*. These data, for *E. granulosus*, are indirect indicators of the presence of adult taenia in the intestine of dogs and cats. However, trends in the risk factors for human hydatidosis are difficult to assess because data on *E. granulosus* prevalence on the definitive domestic and wild carnivores is scarce or absent (see Table EH7, *Echinococcus* in pets). From this table it can be concluded that the efforts to monitoring *E. granulosus* or *E. multilocularis* in domestic carnivores are insufficient.

When reporting *Echinococcus* in wild species (Table EH6), information regarding the role of the different species as intermediate or definitive host should be added. Ruminants and wild boars are intermediate hosts, but some of the species included in the column “other/unspecified wildlife” contains probable intermediate and definitive hosts.

### 3.1.6. Cysticerci

The adult forms of *Taenia solium* and *T. saginata* infect the human intestine and the intermediate

stages (cysticercus) cause cysticercosis in the muscle tissue of pigs and cattle respectively. *T.solium* is also able to induce disease in humans due to dissemination of larval stages to many tissues, such as muscle, central nervous system and eye. In the Report, there are no reported cases of *T.solium* infection leading to Cysticercosis in humans. Adult taeniasis is also not reported.

Data on findings of muscular cysticercosis at the slaughterhouse are scarce, and mixed with data related to other non-zoonotic cysticerci. Only information regarding bovine and swine muscular cysticercosis is relevant as a zoonotic risk. There is published information showing that both bovine cysticercosis (*C.bovis*) and porcine cysticercosis (*C. cellulosae*) can be found in several MSs.

### **3.1.7. Francisella**

The information is limited reports submitted by few countries and although there is a great lack of data, those available should be specified and not, as in Table OZ1, be combined with data for other zoonoses (Cysticerci),

The text describing the disease is in some areas not entirely correct and valuable data are missing. The current text with support of Dr Dolores Gavier-Widén, partly based on data presented at a recent “One Health tularemia workshop, Uppsala, 9 Feb 2012” specified the appropriate and correct information. These modifications and additional data are highlighted in the text from 2009 Report as presented in the Annex C, which when applicable are useful and valid also for the 2010 Report.

First available epidemiological knowledge should be extended as suggested above. The important message is that tularaemia is a highly infectious emerging disease in Europe. Its original geographical range is expanding and also distant new areas are being affected, for example by translocation of hares. Currently, tularemia affects most of Europe except for United Kingdom, Ireland and Iceland. The infection is often unrecognized in both humans and animals. Wild animals have a key role in the epidemiology as reservoirs and amplifying infection, as well as a direct source of human infection.

Surveillance in wild animals in Europe is minimal or completely absent in most countries (T. Kuiken et al., 2012). It is highly recommended that as a minimum, general surveillance of wild animals found dead be conducted, including shot (hunted) animals, which would improve the quality and analyses of data at EU level. For example a protocol is established for the detection of *Francisella* in drinking water and new methods are underway for detection of pathogens in wild life including of *Francisella*.

### **3.1.8. Leptospira**

There is no specific section related to leptospirosis. The Report 2009 however refers to a potential association of human cases with leptospirosis including food borne illness. Leptospirosis is receiving more attention these days due to the emergence of human cases and their association with exposure to animals and animal products. Thus, this disease should be separately included in a section with the appropriate data that can be obtained from at least the regional sources and MS animal disease diagnostic laboratories. These data can be linked to geographical distribution of human cases through ECDC as well as other sources. Sources of disease occurrence (exposure to the agent) in a wildlife population may include existing surveys, research, and surveillance conducted among several wildlife species in Europe. The 2010 Report did not considered this zoonotic disease.

## CONCLUSIONS AND RECOMMENDATIONS

Conclusions and recommendation to specific sections of the Zoonosis summary reports 2009 and 2010 that are identified in the opinion should be considered for the improvement of the future reports. The statements below are general conclusion and recommendations and they are not specific for any given section of the yearly reports.

1. The AHAW and BIOHAZ Panels should be consulted (as part of their annual mandate) before the Report is released to the public. It would be necessary to give adequate time for this review.
2. It was noticed that the 2010 Report has improved in its presentation since 2009. This improvement is an indication of the dynamic interest in presenting reliable and useful information.
3. A yearly report of the distribution and other epidemiological characteristics of the zoonoses among the MSs is an essential component in assessing the impact of these diseases and their potential preventive measures. These yearly reports, however, should not be considered as information on the current disease situation since they are only available 12 months after the year of interest, this point should be emphasized in the report.
4. The reports do not always clearly identify the reference population, the data sources, and data collection approaches (surveillance methodology) used for the various diseases. Although the intention is to get the best and reliable relevant data, there is a need to consider these 3 elements in order to make appropriate inferences.
5. Limited data analyses were included in the Reports although it was recognized that the nature of the data and the collection systems may preclude subsequent data analysis. Nevertheless these types of limitation should be highlighted.
6. Statistical methods, such as trend analysis, should be presented as part of the introduction and the data analysis. The reports contain several statements to indicate statistical significance and the statistical method used should be specified in the text.
7. The application of the exclusion criterion for the requirement for 25 animals minimum for data analysis should be scientifically justified.
8. The 2010 Report included more details of parasitic zoonoses than the 2009 Report. These results, however, are not linked to further interpretation such as the potential reasons for any decrease or increase.
9. The use of weighted seroprevalence for brucellosis by the ratio of the number of herds to those tested is a good addition to the current report. This approach should be generalized to all other diseases that can be addressed from clustering either by herd or community.

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## APPENDICES

### A. FRANCISELLA

#### “ 3.13.1 *Francisella*

Tularemia is a highly infectious emerging zoonotic disease caused by *Francisella tularensis*, a gram negative coccobacillus geographically widely distributed. Rabbit fever is the disease name in North America, where it is frequently seen in wild rabbits, in Europe, it rarely affects wild rabbits. Another name is lemming fever. *F. tularensis* has a very broad host range and has been isolated from more than 250 animal species including vertebrates and invertebrates. The bacterium is able to survive for long periods of time in diverse environments such as water, mud and decomposing carcasses. There are several subspecies of *F. tularensis*, but tularaemia in Europe is caused by *F. tularensis* ssp. *holarctica* (type B tularaemia). Tularemia has complex ecological transmission cycles. A terrestrial cycle involving European brown hares (*Lepus europaeus*) and ticks is prevalent in central and Eastern Europe. An aquatic cycle occurs in Scandinavia, involving mosquitoes and vertebrate hosts, such as water voles (*Arvicola amphibius*). The main transmission routes for humans are via haematogenous arthropods, particularly tick and mosquito bites, inhalation, ingestion and direct contact. Tularemia is a disease often associated with rural environments due to inhalation of hay-dust contaminated with bacteria shed by infected rodents. Human infection from mosquito bites also occurs in recreational areas adjacent to water. In addition, transmission may occur through the skin after direct contact with infected animals, often during hunting trapping or skinning wild animals. Several human outbreaks have been related to hunting or handling of European brown hares (Eurosurveillance, 2007), which is one to the most hunted species in Europe. Drinking water contaminated by excreta or carcasses of infected rodents has been a source of several outbreaks in humans in Europe (Akalin et al, 2009)

Tularemia in humans has an incubation period that typically varies between three to five days. Although there are several (7 different forms are recognized) different clinical forms of tularemia (ulceroglandular, oculoglandular, oropharyngeal, gastrointestinal, pneumonic), the ulceroglandular form accounts for 80 % of human cases. Ulceroglandular tularaemia is characterised as fever, an ulcer appearing at the bite site, painful and swollen lymph nodes and fever. Tularemia may lead to severe complications such as septicaemia, meningitis, pericarditis and renal and hepatic failure. Long-term immunity is developed after recovery and re-infection is extremely rare.

The ecology of *F. tularensis* is complex. Tularemia occurs endemically and causes cyclic outbreaks of mortality when the conditions are favourable. Factors that trigger epidemics, emergence and re-emergence are not well known or not clear. There is an overlap in the distribution of human and animal tularaemia. The epidemiological role of the different animal species as reservoirs is poorly understood. For example, in Europe, wild boar, red foxes, and several other species are serologically positive but their role has been little investigated. Other wild animals such as brown hares (in the US), voles, lemmings (in the US) and vectors such as ticks are considered important reservoirs or key hosts in the epidemiology of tularemia. There is a wide range of susceptibility of different wild animal hosts to develop severe disease. For example, European brown hares are moderately susceptible and develop chronic forms while mountain hares (*Lepus timidus*) and certain rodents (voles, lemmings) are highly susceptible and die of acute sepsis.”