



## D 2.1 Review of emerging animal health and food security issues

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and zoonoses

D2.1

Review of the emerging animal health  
and food security issues

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Europa Media Non-profit Ltd.



Royal Veterinary College



Centre de Coopération Internationale en Recherche Agronomique pour le Développement.



National Veterinary Institute



Shanghai Veterinary Research Institute



Harbin Veterinary Research Institute



China Animal Health and Epidemiology Center



China Animal Disease Control Center



Sociedade Portuguesa de Inovação



Huazhong Agricultural University

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# 01.

## Introduction



## Introduction

In order to prioritize the emerging animal health, food safety and food security issues in the EU and in China, two literature reviews of published information were carried out, one each in the EU and China. These findings were then discussed at separate meetings involving key local stakeholders and experts. RVC and CADC lead this work in the EU and China, respectively. Findings of the literature reviews and discussions were then presented and discussed at the LinkTADs progress meeting in Shanghai, 14-16 April 2014.

This report presents and discusses the major findings of these activities and summarises the current key priorities in animal health, food safety and food security for the EU and for China.







# 02.

## Method

## Method

### Literature review

A protocol was devised by RVC along with input from LinkTADs WP2 partners, to aim to identify research papers relating to transboundary animal diseases and zoonotic issues in accordance with the aims and objectives of LinkTADs. Separate searches were conducted in the EU and China, using agreed search terms in English for the EU search and equivalent terms in both Chinese and English for the Chinese search. Search terms used are detailed in the protocol which is reproduced in the Appendix of this report. Only papers from the last 36 months were included in the search, and 360 papers were randomly selected for review. On the basis of abstracts only, papers were scored according to a list of pre-defined questions (see Appendix). Abstracts were only scored if they described original research, and that research was carried out in either the EU or China.

### Separate stakeholder meetings in the EU and China

Summaries of the literature review findings were circulated, following which a discussion was held in the EU by teleconference on 8<sup>th</sup> April 2014 and in China ahead of the LinkTADs progress meeting on 13<sup>th</sup> April 2014. Stakeholders were asked their opinion on the findings of the literature review, whether the findings reflected their prior expectations, and whether they felt that any key issues were missing or underrepresented. Additionally, stakeholders were asked to consider how priorities should be decided. A number of criteria were proposed which could be used to assign priority to animal health issues and help to reach consensus:

- Economic/trade reasons
- Lack of current knowledge
- Zoonotic potential
- Epidemic/epizootic potential
- Antimicrobial resistance
- Economically-damaging production disease (endemic)
- Cost/impact of controlling disease
- Transboundary risk
- Welfare issue
- Recent increase in prevalence or pathogenicity (emerging disease)

## Shanghai progress meeting – workshop on disease prioritisation

Results of the literature review and stakeholder discussions were presented to delegates at the LinkTADs progress meeting in Shanghai (14-16th April 2014). A workshop was held to discuss the most important criteria for prioritisation and to ask participants to consider the most important disease priorities based on these criteria. Further work is required to gain a full understanding of the motivations for prioritisation of particular diseases and animal health issues in both the EU and China, by different stakeholders. An online survey will be conducted to explore this, and results will be discussed as part of subsequent deliverables.

## Other sources of information

During the course of discussions and the LinkTADs progress meeting in Shanghai in April 2014, several possible sources of useful information were highlighted, including previous similar prioritisations that have taken place as part of other projects both in the EU and China (listed below). These were scrutinised for any additional issues not already identified that should be considered priorities in terms of the LinkTADs objectives.

### ***Prioritisations***

- China Ministry of Agriculture National Medium to Long Term Plan for Animal Epidemic Prevention and Control (2012-2020)
- UK-China Workshop on Major Zoonotic Diseases of Global Importance – British Embassy/CAAS
- DISCONTTOOLS EU FP7 project
- *(To follow) OIE World Delegates Assembly May 2014*

### ***Other sources of information***

- RISKSUR
- Eurostat
- European Commission disease priorities for co-funding opportunities

This report has been compiled using information from all of the above sources. We have reviewed the research landscape in both China and the EU and discussed the importance of this in determining current and emerging priorities in transboundary animal diseases and zoonoses. By seeking to identify specific criteria by which to assess priorities, and including opinion from a variety of EU and Chinese stakeholders, we have considered potential variance in perceptions of disease priorities and have refined the outcomes of this prioritisation.



# 03.

## Results

## Results

### Findings of the literature review and stakeholder discussions

#### Disease priorities

#### EU

Of 360 papers selected, 186 met the review criteria and were scored. The large proportion not meeting the initial criteria appears to be largely due to papers from outside the EU that mention Europe or European countries or animal species, and a considerable number of review papers. Figure 1 shows the animal health issues identified by the literature review and the number of papers in which they were mentioned. Some abstracts referred to more than one disease.

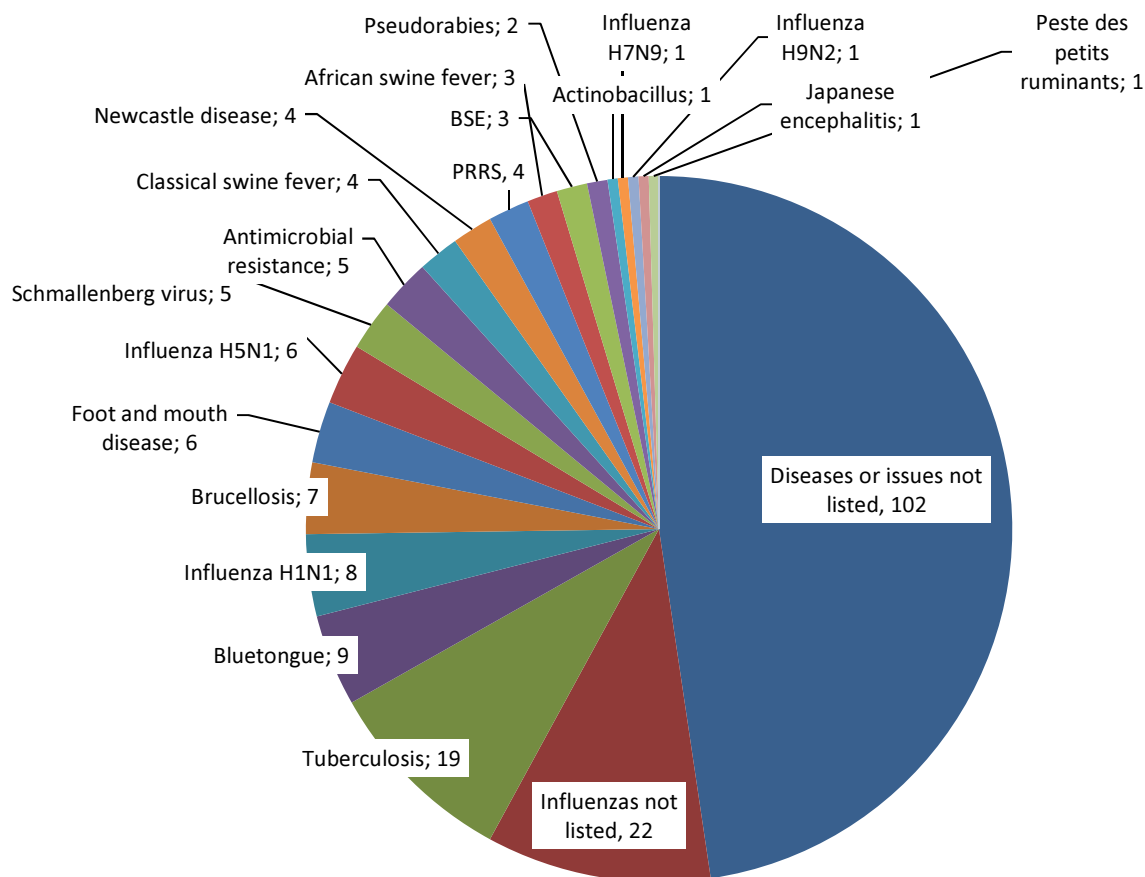


Figure 1 - Most researched diseases in the EU (no. of papers identified)

A number of diseases were identified which were not listed in the literature review protocol, these involved a large variety of diseases which were not frequently identified, and these were mainly endemic production diseases, with a notable exception of **Q fever** (*Coxiella burnetii*) which was identified in 6 papers. **Salmonella** was also mentioned in 5 papers, which may potentially be of interest in terms of antimicrobial resistance and food safety concerns. Influenzas not listed include 5 papers describing subtype **H3N2**. 78 non-listed diseases or issues were identified in total.

Stakeholder discussions revealed that **African swine fever** is now considered to be an important priority as an emerging disease. It was noted that a literature review may not be a satisfactory tool to identify emerging issues. Other emerging issues of high concern were **antimicrobial resistance**, and **goat and sheep pox** on the borders of the EU. It was thought that **rabies** and **vector-borne diseases** should be highly prioritised currently, and these were underrepresented by the literature review. It was suggested that the Schmallenberg may now be declining in importance, and that, depending on criteria for prioritisation, it could be argued that tuberculosis should not be such a high priority as is reflected in the literature review. EU co-funded projects (part of the EU Animal Health Strategy) also reflect EU-level priorities in general and include: Salmonellosis, **swine vesicular disease**, **classical swine fever**, and ovine and caprine brucellosis.

## China

Figure 2 shows the results of the Chinese literature review. Of 360 papers selected, 307 met the review criteria and were scored.

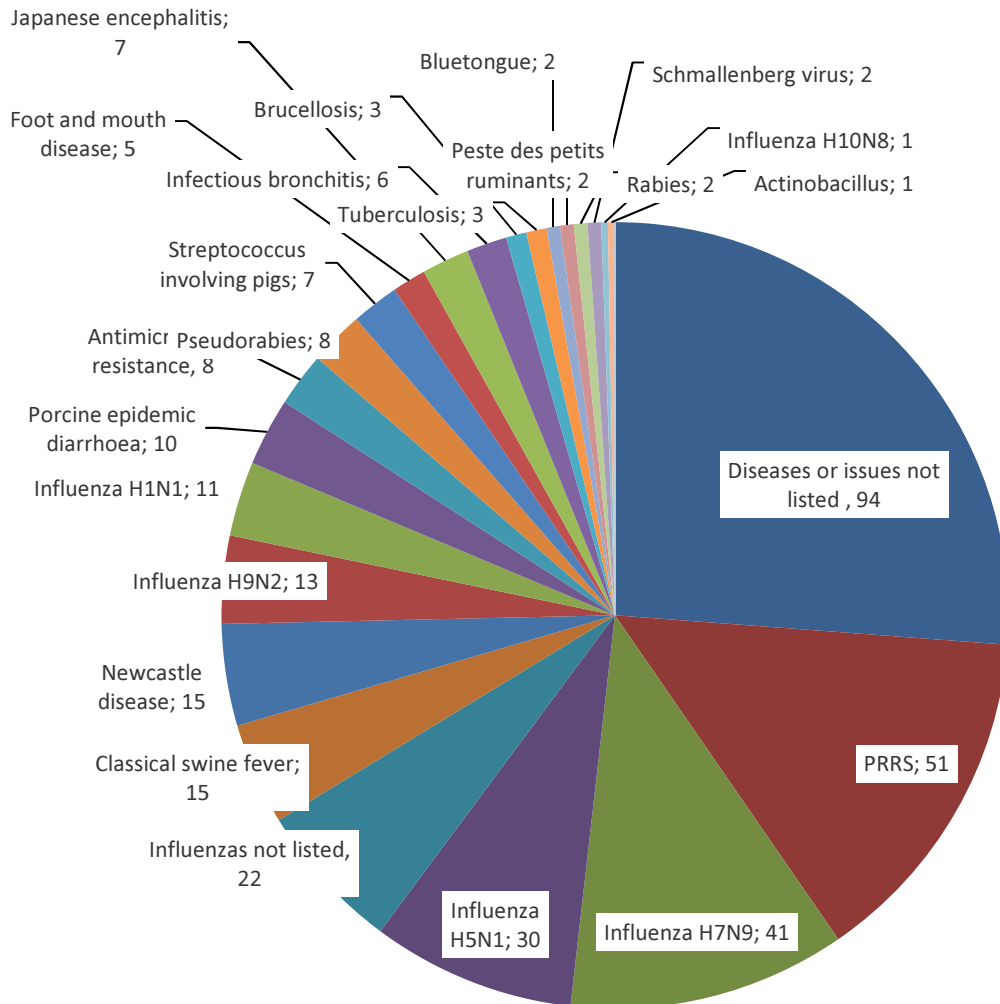


Figure 2 - Most researched diseases in China (no. of papers identified)

49 diseases or issues were identified which were not listed as part of LinkTADs priorities in the initial literature search, and these include notably **Porcine transmissible gastroenteritis (TGEV)** which was identified in 7 papers, and **Porcine Circovirus type 2 (PCV2)** (6 papers). Tembusu virus was identified in 2 papers. There were 5 papers on **porcine rotavirus** and 3 each on **porcine parvovirus** and **enterovirus**.

Having examined these results, experts and stakeholders produced a ranked list of diseases that they consider to be priorities in China. These are: (in order of importance) **Influenza, PRRS, Classical swine fever (CSF), Newcastle disease and porcine epidemic diarrhoea (PED)**, followed by (in no particular order) **pseudorabies, Japanese encephalitis, brucellosis, peste des petits ruminants, rabies and African swine fever**. It should also be noted that the literature review may not reflect the current importance of **peste des petits ruminants** and **African swine fever** which are emerging issues for China at the present time and **brucellosis** which has increased in importance in recent years.

China as well as the EU considered that **rabies** seemed to be underrepresented. It was suggested that there may genuinely be fewer published papers on zoonoses due to the stringent biosafety requirements of conducting laboratory research on zoonotic pathogens.

Therefore, both regions appear to be concerned about influenza, African swine fever, rabies and brucellosis. PRRS, CSF, Newcastle disease, and PED seem to be of major importance in China but lesser importance in the EU; while, tuberculosis, bluetongue and FMD are seemingly of high importance in the EU and of lesser importance in China.



### Species

The literature review shows a distinction between the types of species studied in the EU and in China, as shown in Figure 3. This pattern appears to reflect the types of diseases studied, with large ruminants being most important in the EU and pigs and poultry most important in China.

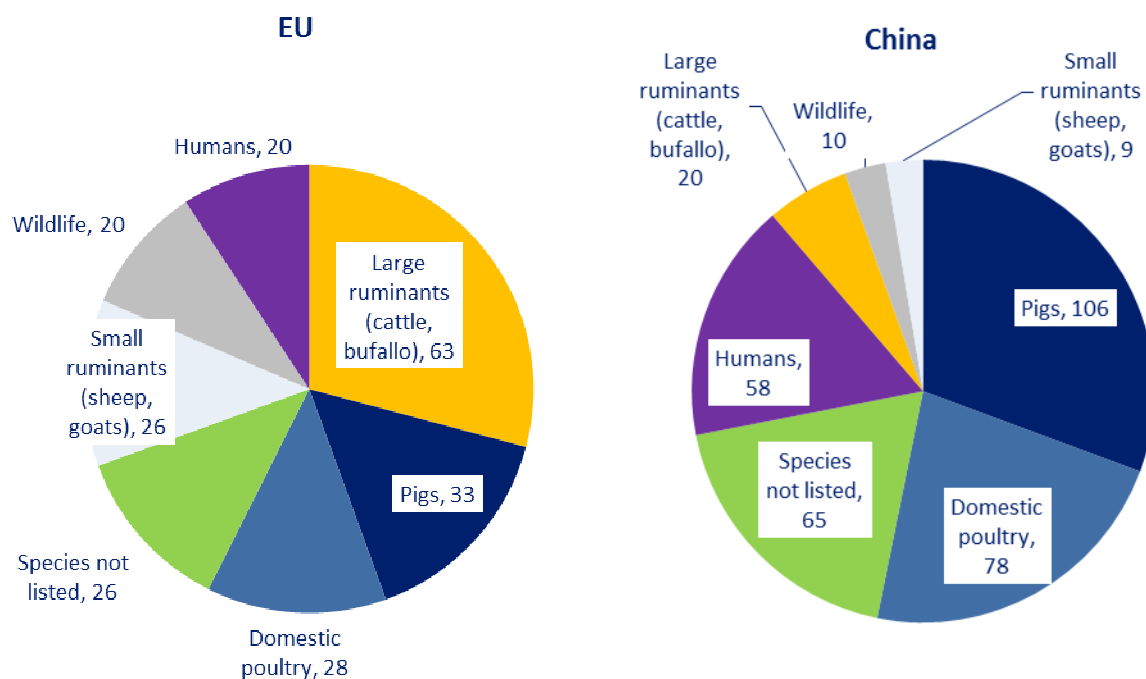


Figure 3 - Most researched species in EU and China (no. of papers identified)

It would be useful to know whether research policy is influenced by the economic importance or distribution of different livestock species, and to what extent the diseases being most heavily researched might reflect the importance of these diseases in terms of their zoonotic risk or epidemic or transboundary potential. It is likely that a combination of these factors influences the research landscape. The EU FP7 RISKSUR project could yield further information on the distribution of livestock species in the EU which could increase understanding in this regard. Species not listed are all non-livestock species. The large proportion of non-listed species identified in animal health research papers in China is accounted for by laboratory animals, e.g. mice, dogs, cats, rabbits, and in vitro research. In the EU, non-listed species are horses and laboratory animals. The large proportion of research involving humans in China is likely to be largely attributable to influenza H7N9, while the large proportion of wildlife research in the EU might be explained by a recent focus on the sylvatic transmission of tuberculosis.

### Types of research

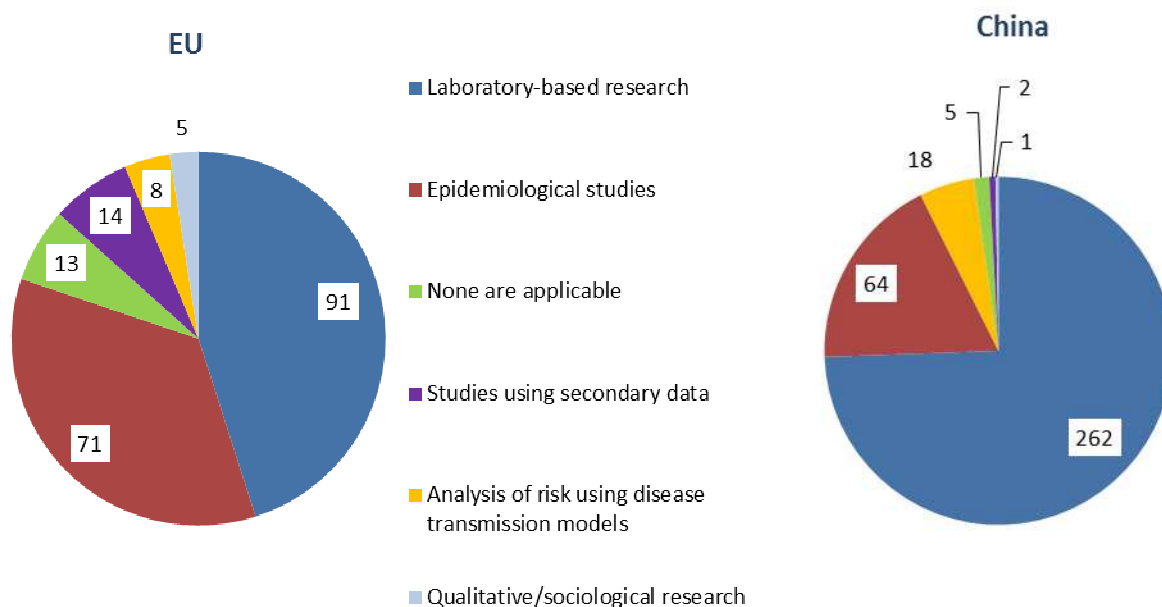


Figure 4 - Types of research comprising animal health research in the EU and China (no. of papers identified)

Figure 4 clearly shows that laboratory research and epidemiology are of major importance in both China and EU. Almost three quarters of animal health research in China involves laboratory research, and there is comparatively considerably more research activity in epidemiology in the EU than in China. Research involving risk analysis and mathematical modelling also makes up a small proportion of all research in both the EU and China, so it may be necessary to explore any constraints to this type of research and seek opportunities to increase research activity in this area, given its importance in surveillance, contingency planning and response to epidemics of zoonoses and transboundary animal diseases. Linking LinkTADs with the EU FP7 projects RISKSUR and ASFORCE and the NIH Avian Influenza project will facilitate opportunities for increasing skills and research activity in risk analysis and mathematical modelling in the future.

It was considered that reviewers in China and the EU may have differed in their interpretation of what constitutes laboratory research, and that this category may have been over-represented in the Chinese review. This does in itself illustrate what may be a strong propensity to focus on laboratory research in China over other types of research, a subject that was well discussed during the LinkTADs progress meeting in Shanghai in April 2014.

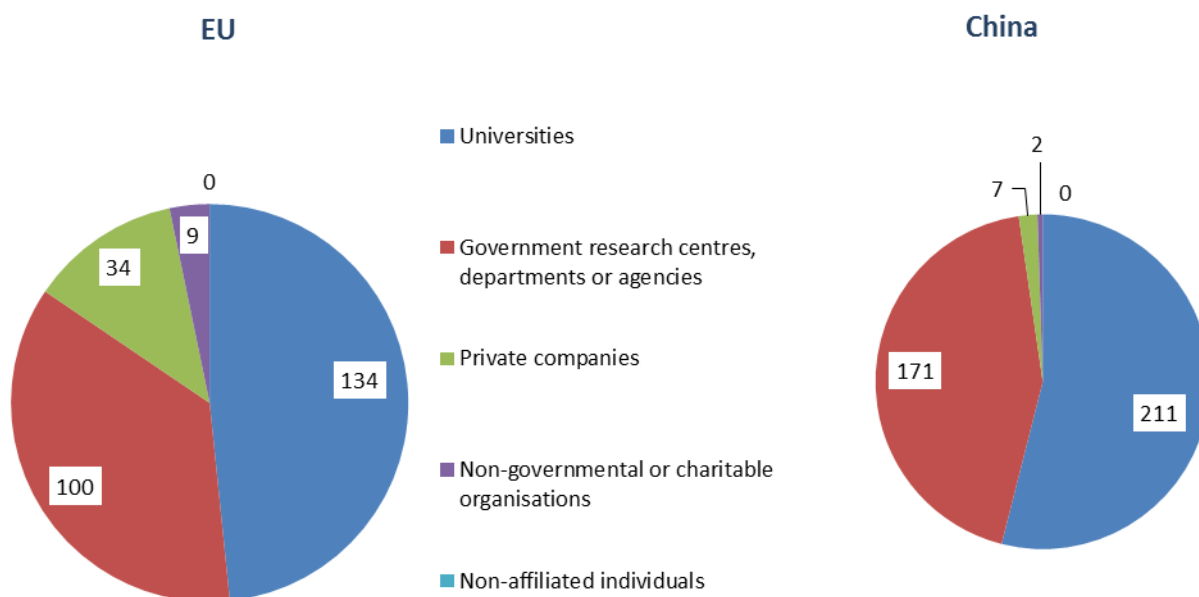
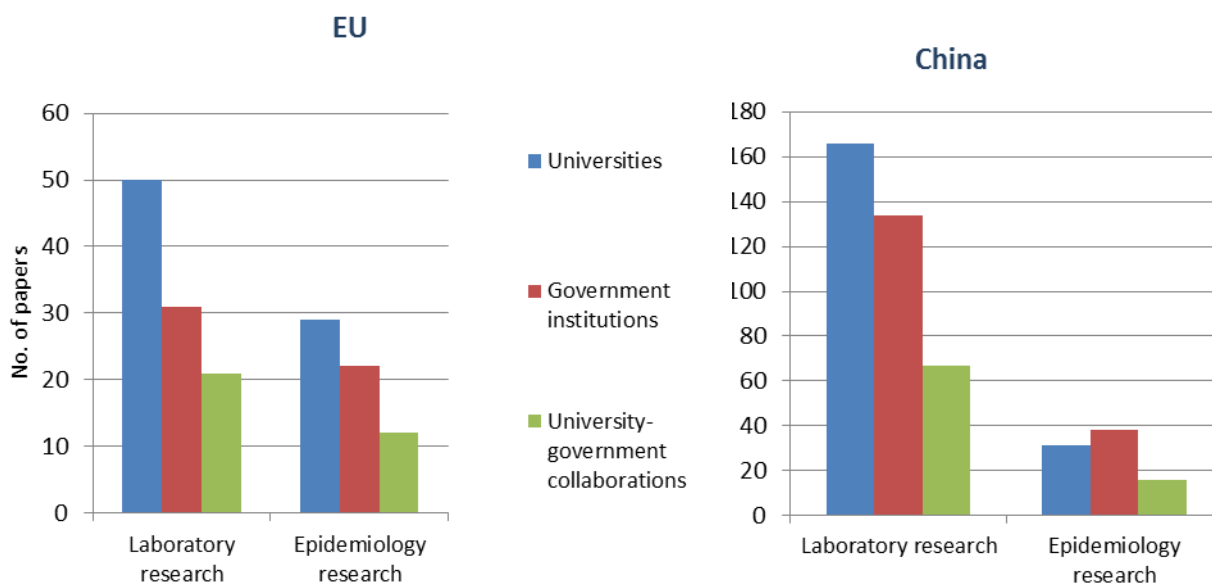


Figure 5 - Types of institutions involved in animal health research in the EU and China (no. of papers identified)

Figure 5 shows that universities account for the largest proportion of all research in both EU and China, with government institutions also playing a very important role. Private companies have a considerable role in research in the EU compared to their involvement in Chinese research. There could perhaps be an opportunity for knowledge sharing between the EU and China concerning strategies for engaging with private industry. In the EU, universities are more likely to collaborate with private companies (12% of all university research representing such collaborations) than are government institutions (4% of their research).

To further understand the culture of research in the EU and China, the roles of universities and government institutions in laboratory and epidemiology research respectively will be compared in Figure 6, also indicating whether collaboration takes place between universities and governments in the fields of laboratory and epidemiology research.



**Figure 6 - Comparison of the contributions of universities and government institutions to laboratory and epidemiology research in the EU and China (no. of papers identified) – (Note that these graphs have different scales)**

It appears that universities make the greatest contribution towards both laboratory and epidemiology research in the EU, while in China there is slightly more epidemiology research published by government institutions than by universities. The greatest focus of universities in both the EU and China is on laboratory research, but in China the difference between laboratory and epidemiology research taking place in universities is much greater, with epidemiology research making up a considerably smaller proportion of their animal health research output than laboratory research. Collaborations with universities make up a considerable proportion of both laboratory and epidemiology research by government institutions, in both EU and China.

### International collaborations

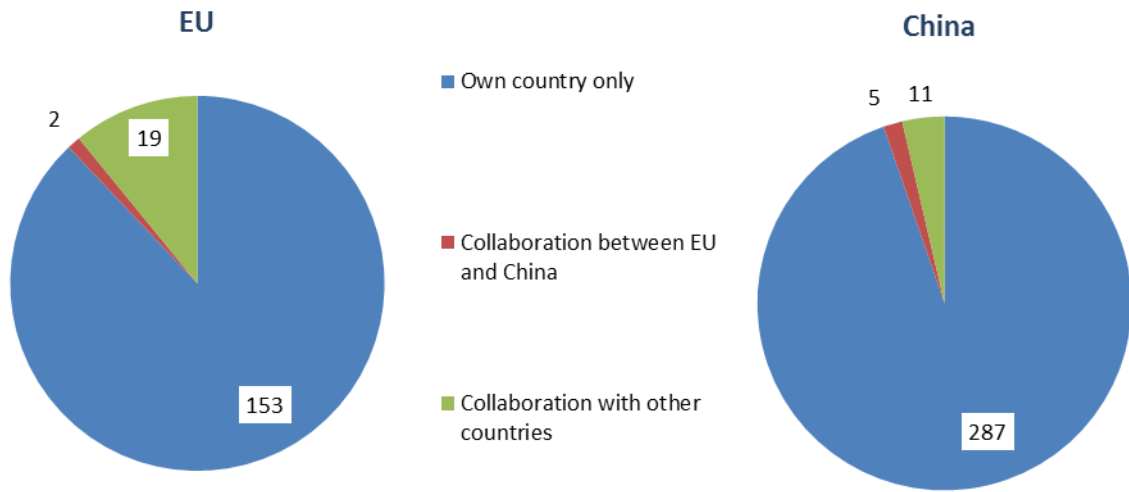


Figure 7 - Collaborating countries (no. of papers identified)

Figure 7 shows the small number of papers that currently involve collaborations between researchers in the EU and China. EU research is more likely to involve collaborations with other countries than Chinese research, while papers published in China are more likely to involve European collaborators than vice versa. While collaborations are currently fairly few, both partners already have experience in collaboration that can be built upon in forming networks between the EU and China and increasing opportunities for collaboration as per the aims of LinkTADs.

## Relevant information from external disease prioritisation projects

The Chinese MOA has published its National Medium and Long-term Plan for Animal Epidemic Prevention and Control (2012-2020), which details key animal disease priorities in terms of endemic and exotic diseases. Most of the class 1 and class 2 TADs and zoonoses were already identified as priorities by the literature review and discussions in China, with the exception of equine infectious anaemia, African Horse sickness, and four exotic diseases with “higher risk of introduction”: vesicular stomatitis, Nipah virus disease, West Nile fever, and Rift Valley fever.

A UK-China Workshop on Major Zoonotic Diseases of Global Importance was held in 2012 by the Chinese Academy of Agricultural Sciences (CAAS) and the British Embassy in Beijing. The three main areas highlighted were **vector-borne diseases** (due to increasing emergence), **rabies** (due to human mortality in China) and **brucellosis**. For UK scientists, a high scoring priority was the **role of wildlife** as reservoirs of zoonotic disease. This was not generally identified as a high priority among Chinese scientists, although there was interest in the role of bats as reservoirs.

The prioritisation and categorisation of animal diseases for disease control programmes will be on the agenda of next OIE World Assembly of Delegates, (May 2014) as a technical item.



# 04.

## Summary of disease priorities

## Summary of disease priorities

Both the EU and China consider **influenza, African swine fever, rabies** and **brucellosis** to be high priority issues. **Antimicrobial resistance** is also of significant concern in both EU and China.

**Tuberculosis, bluetongue** and **foot-and-mouth disease** are of high importance in the EU. TB and FMD are also priorities for China, but are less highly prioritised than some other diseases.

**Porcine reproductive and respiratory syndrome, Newcastle disease, classical swine fever porcine epidemic diarrhoea** and **pseudorabies** are of high importance in China. These diseases are lower priorities in the EU. **Peste des petits ruminants**, along with **Japanese encephalitis** and African swine fever are emerging issues of increasing concern for China.

A large proportion of EU animal health research focuses on cattle, whereas the majority of research taking place in China concerns pigs and poultry. Almost three quarters of animal health research in China takes place in the laboratory, while in the EU there is a more even split between laboratory-based and field-based epidemiology research.

These findings indicate potential gaps and opportunities for collaboration which will be explored further as part of Work Package 2.





# 05.

## Appendix

## Appendix

### Protocol for the identification and assessment of published literature on animal health in the EU and China

#### Aim

To identify and assess published scientific literature in the EU and China in order to inform further discussions on the prioritization of emerging animal health, zoonotic aspects and food security issues in the EU and in China.

#### Approach

##### 1. Identification of relevant published scientific literature

###### a. EU countries

Four electronic data bases; CAB Direct (CABI), PubMed, Web of Science (ISI) and DART-Europe E-theses Portal will be searched using the following terms:

OR	<p>           "Animal health"            "Animal disease"            "Livestock health"            "Livestock disease"            "Poultry health"            "Poultry disease"            "Zoonotic disease"            Zoonosis            Zoonoses            Actinobacillosis OR Actinobacillus            "African swine fever" OR ASF            Bluetongue OR BTV            Brucellosis OR Brucella            "Bovine spongiform encephalopathy" OR BSE            "Classical swine fever" OR CSF            "Contagious bovine plueropneumonia" OR CBPP            "Equine infectious anaemia" OR EIA            "Foot and mouth disease" OR FMD            "Haemorrhagic septicaemia"            "Infectious bronchitis"            Influenza            "Japanese encephalitis"            "Newcastle disease"            "Peste des petits ruminants" OR PPR            "Porcine epidemic diarrhoea" OR PED            "Porcine reproductive and respiratory syndrome" OR PRRS            Pseudorabies            Rabies            Schmallenberg            Streptococcus OR Streptococcus            Tuberculosis         </p>
----	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

AND

- |           |          |
|-----------|----------|
| <b>OR</b> | Cattle   |
|           | Pig      |
|           | Ruminant |
|           | Poultry  |
|           | Sheep    |
|           | Goat     |
|           | Goats    |
|           | Bovine   |
|           | Swine    |
|           | Porcine  |
|           | Ovine    |
|           | Bird     |
|           | Birds    |
|           | Avian    |
|           | Chicken  |
|           | Chickens |
|           | Duck     |
|           | Ducks    |
|           | Fowl     |
|           | Horse    |
|           | Horses   |
| Donkey    |          |
| Donkeys   |          |
| Equine    |          |

AND

- |             |                  |
|-------------|------------------|
| <b>OR</b>   | Europe           |
|             | European         |
|             | EU               |
|             | Austria          |
|             | Belgium          |
|             | Bulgaria         |
|             | Croatia          |
|             | Cyprus           |
|             | “Czech Republic” |
|             | Denmark          |
|             | Estonia          |
|             | Finland          |
|             | France           |
|             | Germany          |
|             | Greece           |
|             | Hungary          |
|             | Ireland          |
|             | Italy            |
|             | Latvia           |
|             | Lithuania        |
|             | Luxembourg       |
| Malta       |                  |
| Netherlands |                  |

Poland  
 Portugal  
 Romania  
 Slovakia  
 Spain  
 Sweden  
 "United Kingdom"  
 UK  
 "Great Britain"  
 GB  
 England  
 Scotland  
 Wales  
 Mediterranean

Time limits will be set to include only papers published in the last 36 months.

**b. China**

Five electronic data bases; CAB Direct (CABI), PubMed, Web of Science (ISI), Chinese Science Citation Database and China Doctoral and Masters Dissertations Full-Text Database, will be searched using the following terms:

动物卫生  
 动物疫病  
 牲畜卫生  
 牲畜疫病  
 家禽卫生  
 禽病  
 人畜共患病  
 "Animal health"  
 "Animal disease"  
 "Livestock health"  
 "Livestock disease"  
 "Poultry health"  
 "Poultry disease"  
 "Zoonotic disease"  
 OR  
 Zoonosis  
 Zoonoses  
 Actinobacillosis OR Actinobacillus  
 "African swine fever" OR ASF  
 Bluetongue OR BT  
 Brucellosis OR Brucella  
 "Bovine spongiform encephalopathy" OR BSE  
 "Classical swine fever" OR CSF  
 "Contagious bovine pleuropneumonia" OR CBPP  
 "Equine infectious anaemia" OR EIA  
 "Foot and mouth disease" OR FMD  
 "Haemorrhagic septicaemia"  
 "Infectious bronchitis"  
 Influenza  
 "Japanese encephalitis"  
 "Newcastle disease"

"Peste des petits ruminants" OR PPR  
"Porcine epidemic diarrhoea" OR PED  
"Porcine reproductive and respiratory syndrome" OR PRRS  
Pseudorabies  
Rabies  
Schmallenberg  
Streptococcus OR Streptococcosis  
Tuberculosis

**AND**

牛  
猪  
反刍动物  
家禽  
绵羊  
山羊  
牛的  
猪的  
绵羊的  
鸟  
鸟类  
鸟类的  
鸡  
小鸡  
鸭  
家禽  
野禽  
Cattle  
Pig  
Ruminant  
Poultry  
Sheep  
Goat  
Goats  
Bovine  
Swine  
Porcine  
Ovine  
Bird  
Birds  
Avian  
Chicken  
Chickens  
Duck  
Ducks  
Fowl  
Horse  
Horses  
Donkey

**OR**

	Donkeys
	Equine

AND

OR	中国
	中国的
	北京
	天津
	河北
	山西
	内蒙古
	辽宁
	吉林
	黑龙江
	上海
	江苏
	浙江
	安徽
	福建
	江西
	山东
	河南
	湖北
	湖南
	广东
	广西
	海南
	重庆
	四川
	贵州
	云南
	西藏
陕西	
甘肃	
青海	
宁夏	
新疆	
香港	
澳门	
台湾	
China	
Chinese	
Beijing	
Tianjin	
Hebei	
Shanxi	
"Inner Mongolia"	
Liaoning	

Jilin  
 Heilongjiang  
 Shanghai  
 Jiangsu  
 Zhejiang  
 Anhui  
 Fujian  
 Jiangxi  
 Shandong  
 Henan  
 Hubei  
 Hunan  
 Guangdong  
 Guangxi  
 Hainan  
 Chongqing  
 Sichuan  
 Guizhou  
 Yunan  
 Tibet  
 Shanxi  
 Gansu  
 Qinghai  
 Ningxia  
 Xinjiang  
 Hong Kong  
 Macau  
 Taiwan

Time limits will be set to include only papers published in the last 36 months.

Duplicate entries will be eliminated, and RVC will then select a random sample of 360 Chinese entries and 360 EU entries. The first 300 of the EU entries and the first 300 of the Chinese entries will be distributed among WP2 partners for screening of abstracts and data extraction. The remaining 60 entries will be used as “reserves” to replace entries that do not fulfil criteria 1 and 2 below.

## 2. Screening process and data extraction

Each abstract of the first 300 entries will be screened and quality-assessed by one person. **Using a standardised template** (to be produced by RVC) **and on the basis of the abstract only** the following questions will be answered for each entry:

- |                                                                            |     |    |
|----------------------------------------------------------------------------|-----|----|
| 1. The study includes original research (rather than being a review only): | Yes | No |
| 2. The study describes work carried out either in China or an EU country:  | Yes | No |

*Only entries for which the answer to 1 and 2 is yes will be included, other entries will be replaced.*

### 3. The study describes work carried out in relation to (tick all options that apply):

Actinobacillus  
 African swine fever  
 Bluetongue  
 Brucellosis

BSE  
Classical swine fever  
Contagious bovine pleuropneumonia  
Equine infectious anaemia  
Foot and mouth disease  
Haemorrhagic septicaemia  
Infectious bronchitis  
Influenza:           H1N1  
                          H5N1  
                          H7N9  
                          H9N2  
                          H10N8  
Other influenza (please specify)

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Japanese encephalitis  
Newcastle disease  
Peste des petits ruminants  
Porcine epidemic diarrhoea  
Porcine reproductive and  
                          respiratory syndrome  
Pseudorabies  
Rabies  
Schmallenberg virus  
Streptococcus involving pigs  
Tuberculosis  
Other diseases (Please specify)

---

---

Antimicrobial resistance

**4. The study describes/was carried out in (tick all options that apply):**

Humans  
Large ruminants (cattle, buffalo)  
Small ruminants (sheep, goats)  
Domestic poultry  
Pigs  
Horses  
Wildlife  
Other species (please specify)

---

**5. In this study, according to its objective and methodology (tick all options that apply):**

Laboratory-based research was conducted on pathogens, diagnostic tests, vaccines or immunology

Samples and epidemiological information through questionnaires were collected in the field, and analysed in terms of prevalence, incidence, risk factors, disease distribution, diagnostic test performance or vaccine efficacy

Mathematical models of disease transmission were used

Qualitative research was carried out concerning sociological or anthropological factors



The study is based on the analysis of secondary data (data collected for other purposes and available from external databases)

None of the above are applicable

**6. The research team includes individuals affiliated with (tick all options that apply):**

Universities

Government research centres, departments or agencies

Private companies

Non-governmental or charitable organisations

Non-affiliated individuals

**7. The research team includes individuals with affiliations in:**

One country only

Two different countries

Three different countries

Four or more different countries

**8. The research team includes individuals with affiliations in:**

China only

EU only

China and EU

Other

**9. The research carried out uses data from countries other than China or EU countries**      Yes      No