LinkTADs

IDENTIFYING RESEARCH COLLABORATION OPPORTUNITIES ON ANIMAL HEALTH FOR EUROPE AND CHINA

Julien Cappelle - CIRAD

LinkTADs session at EPIZONE: Coordinating veterinary research between EU and China

29th September, 2006, Madrid, Spain

This project is supported by the Seventh Framework Programme of the European Union. Grant agreement no: 613804

Review of research topics

Literature review

To identify research papers relating to transboundary animal diseases and zoonotic issues

Separate searches in the EU and China

Equivalent terms in both Chinese and English for the Chinese search.

Papers from the **last 36 months**

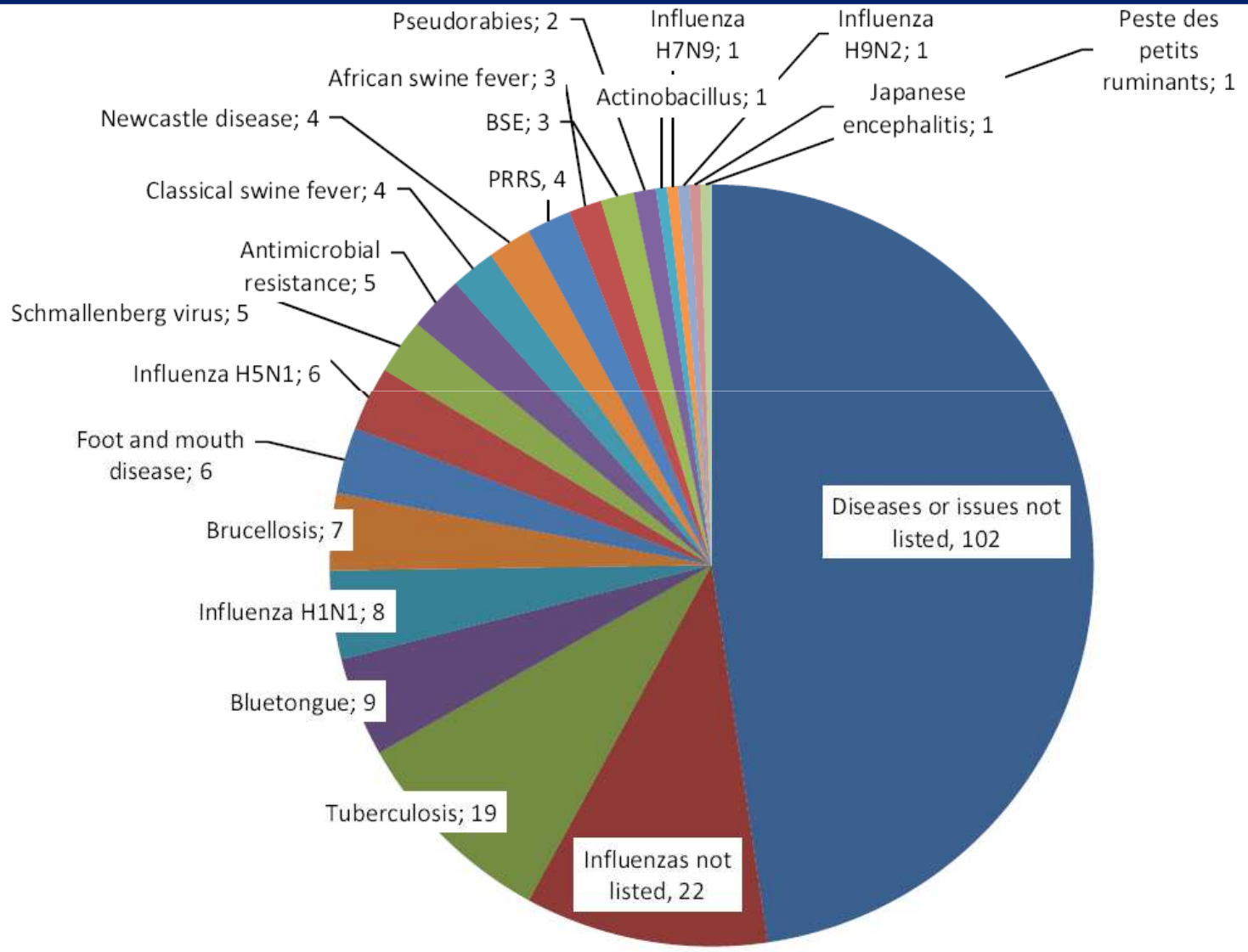
360 papers were randomly selected for review. For both EU and China

Papers were scored **based on Abstracts** according to a list of pre-defined questions

Abstracts were only scored if they described **original research**, and that research was carried out **in either the EU or China**.

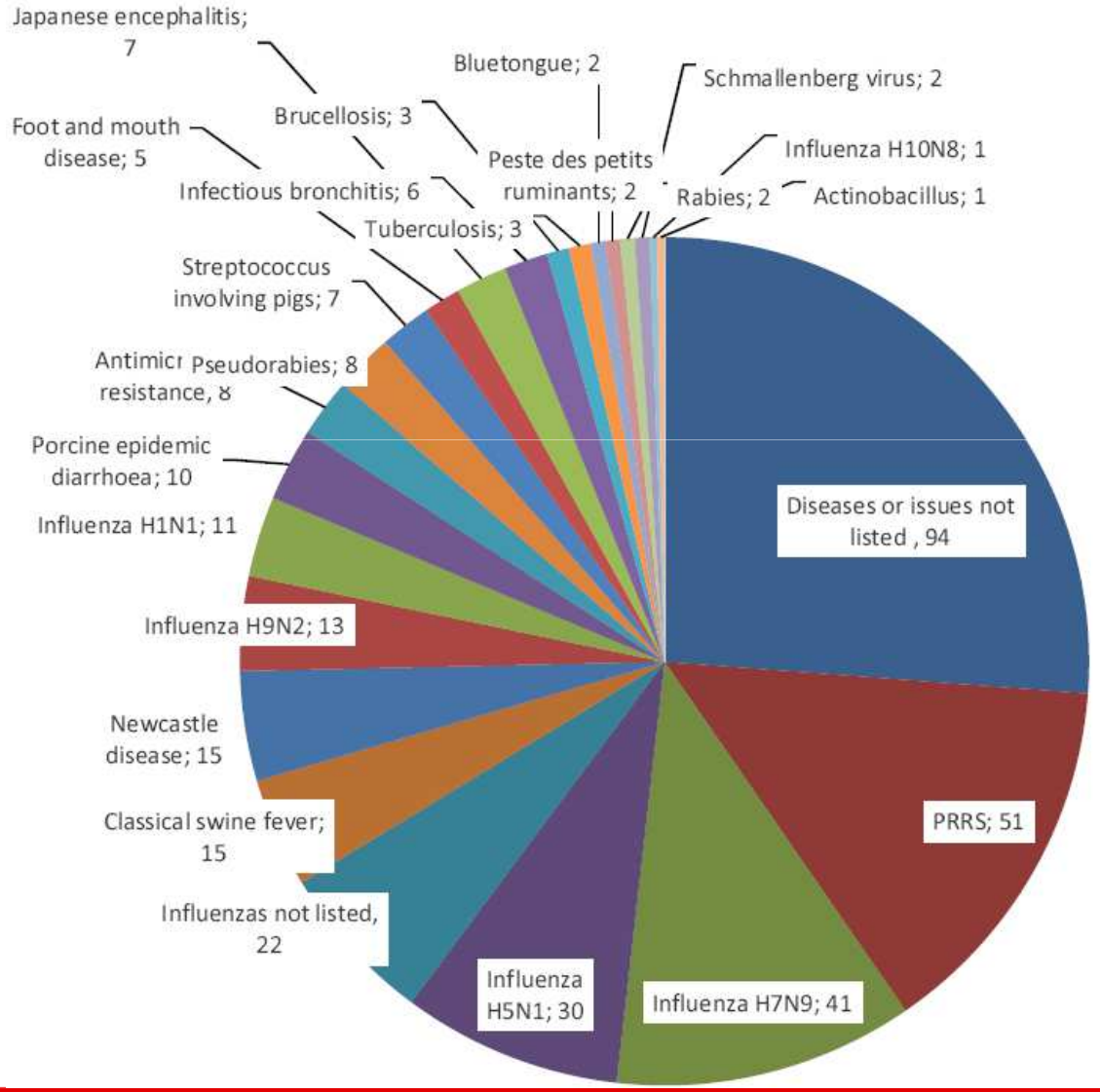
Review of research topics

EU (n = 186)



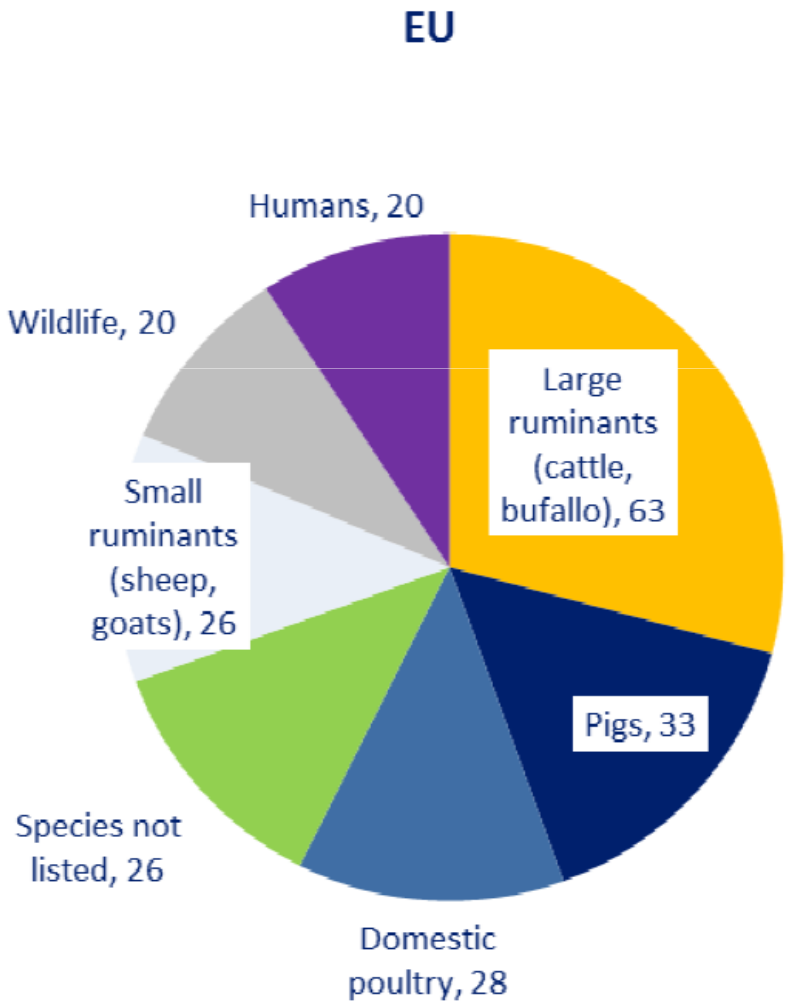
Review of research topics

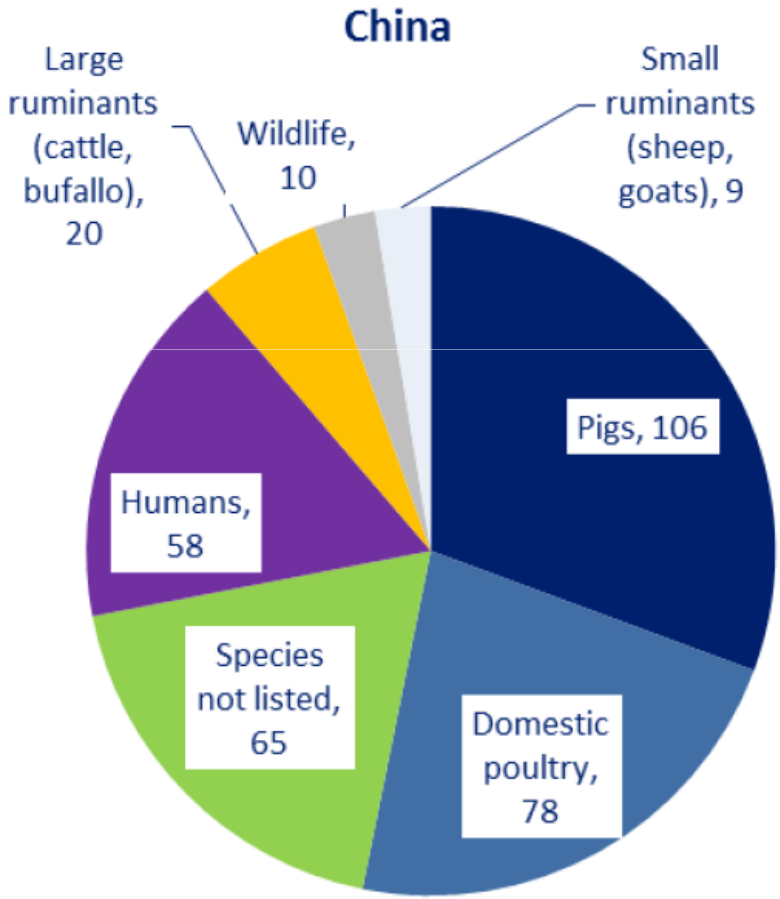
China (n = 307)



Review of research topics

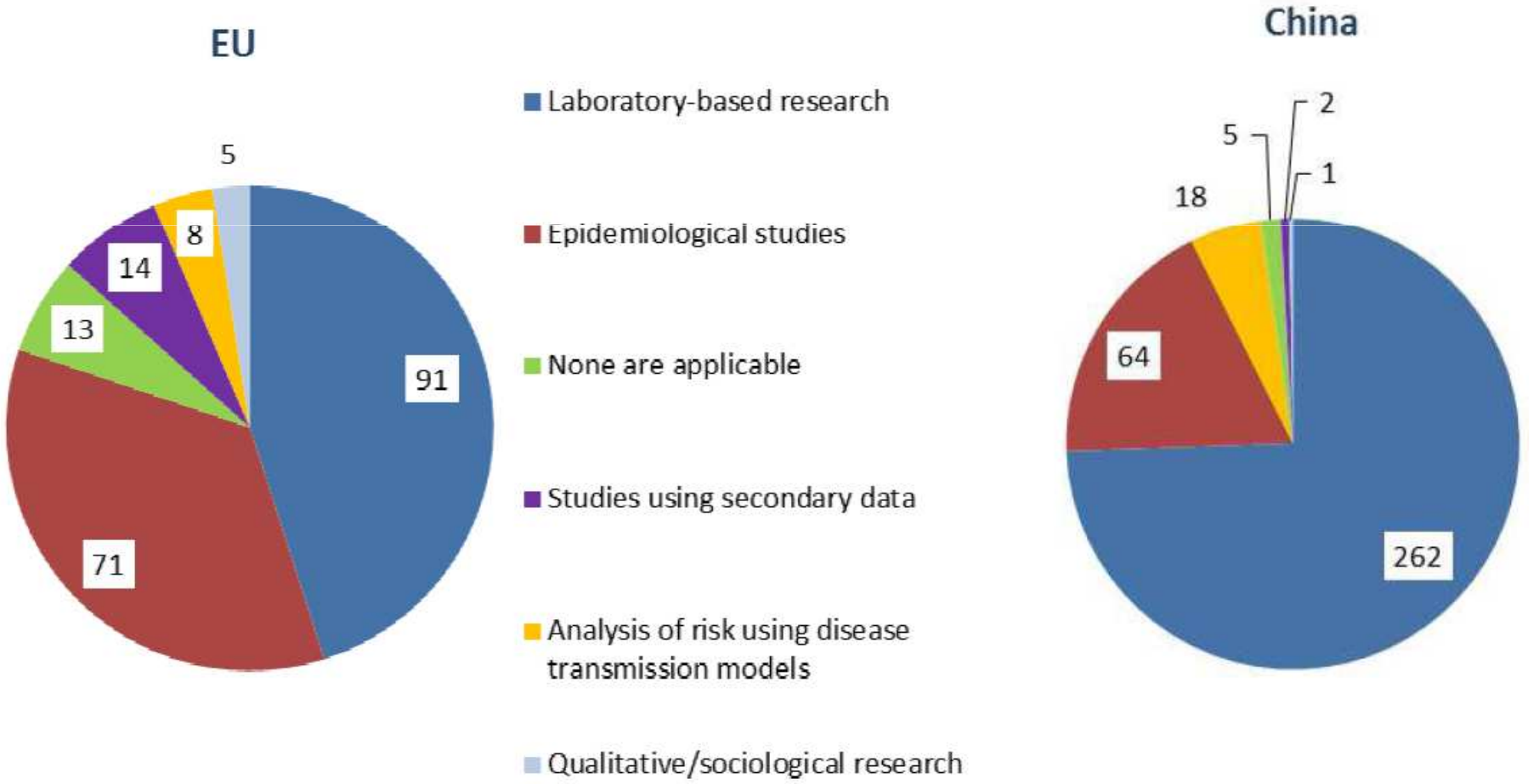
Most researched species in EU and China (no. of papers identified)





Review of research topics

Types of research



Identifying potential collaborations In the LinkTADs consortium

Online Questionnaire:

The diseases considered for potential collaborations were listed based on the results from WP2 and WP4 diseases prioritisation activities. The questionnaire proposed the following diseases and each participant had to score (from 0 to 5) his/her interest in setting up new collaborations on this topic:

Actinobacillus
African swine fever
Antimicrobal resistance
Avian Influenza
Bovine Spongiform Encephalopathy
Bovine tuberculosis
Brucellosis
Classical swine fever
Flaviviruses
Foot and mouth disease
Infectious Bronchitis in Poultry
Japanese Encephalitis
Newcastle disease
Porcine Epidemic Diarrhea
Porcine Respiratory Reproductive Syndrome
Pseudorabies
Rabies
Salmonellosis
Schmallenberg virus
Sheep and goat pox
Streptococcus in pigs
Swine flu
Tembusu virus
Vector borne diseases

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Identifying potential collaborations In the LinkTADs consortium

3 from Food and Agriculture Organization (FAO)

1 from Joint division of Food and Agricultural Organisation of the UN and the International Atomic Energy Agency (FAO IAEA)

2 from The Royal Veterinary College (RVC)

2 from CIRAD

2 from National Veterinary Institute (SVA)

1 from Shanghai Veterinary Research Institute (SHVRI)

2 from Harbin Veterinary Research Institute (HVRI)

2 from China Animal Health and Epidemiology Centre (CAHEC)

1 from Huazhong Agricultural University (HZAU)

1 from FAO and China Animal Disease Control Centre (FAO-CADC)

The repartition between EU and China scientists and between Epidemiology and Laboratory sciences was relatively balanced as shown by Table 1.

	Epi	Epi & Lab	Lab	Total
China	2	2	4	8
EU	6	1	2	9
Total	**8**	**3**	**6**	17

Table 1: Repartition of the participants according to their location and discipline

Identifying potential collaborations In the LinkTADs consortium

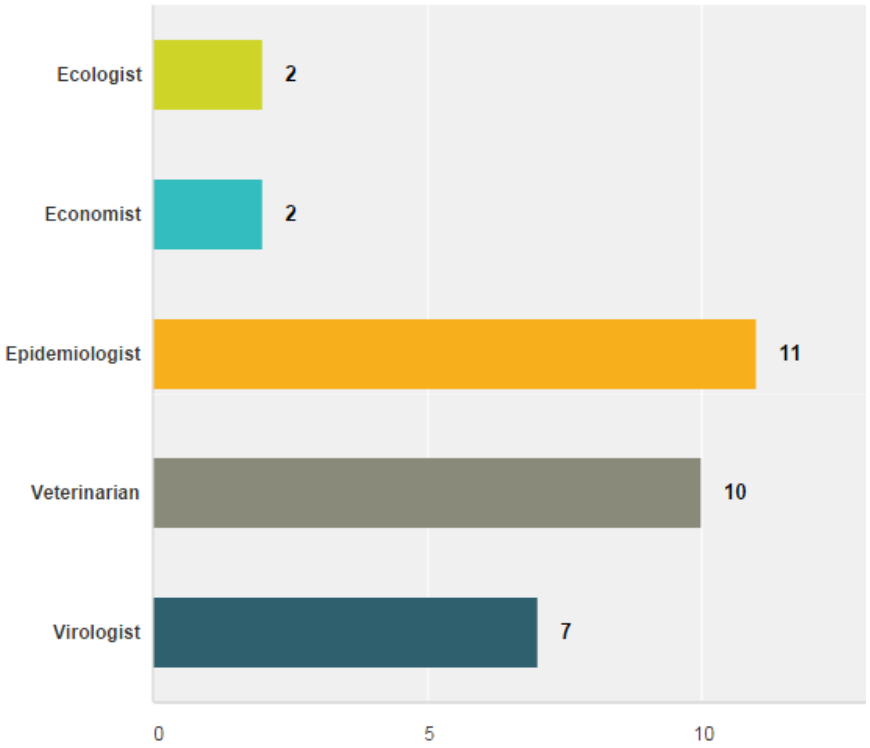

Figure 1: Description of participants' current position

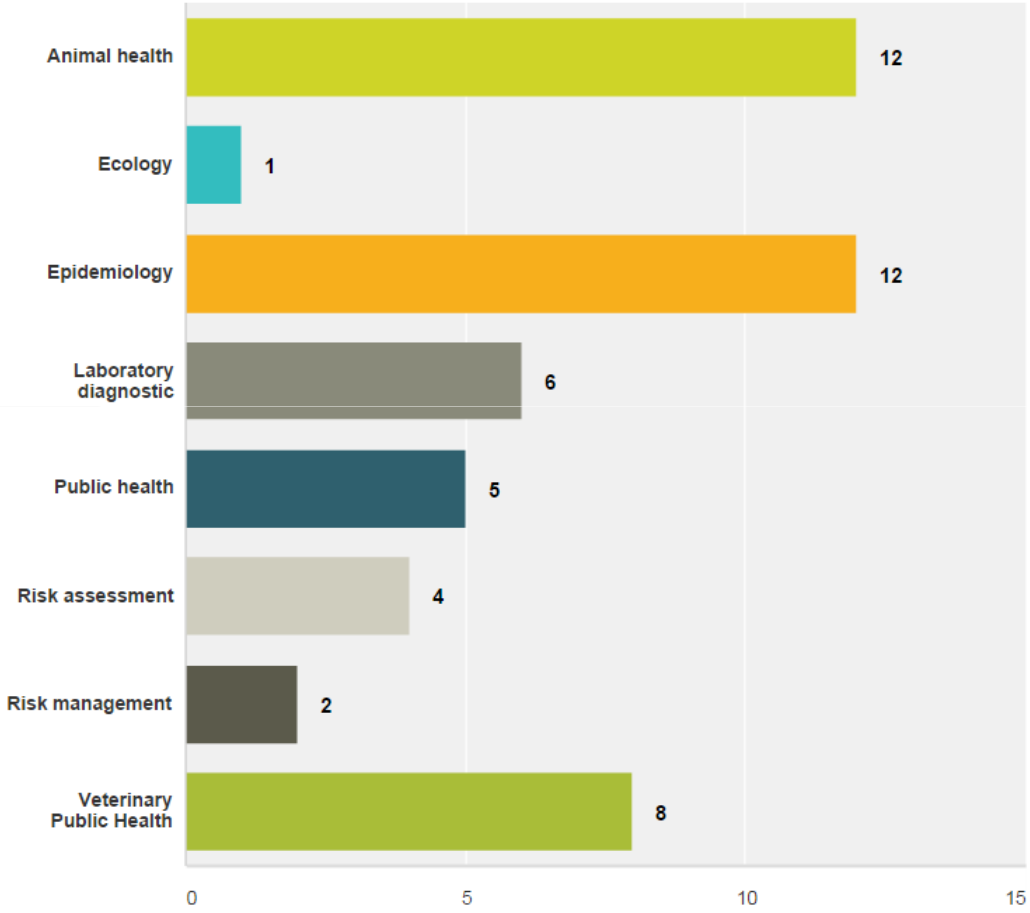

Figure 2: Description of participants' discipline

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LinkTADs

Overall results

3.18	**African swine fever**
2.65	Avian Influenza
2.47	Porcine Epidemic Diarrhea
2.41	Bovine tuberculosis
2.24	Classical swine fever
2.06	Porcine Respiratory Reproductive Syndrome
2.06	Foot and mouth disease
2.06	Rabies
1.82	Flaviviruses
1.82	Japanese Encephalitis
1.76	Pseudorabies
1.71	Brucellosis
1.71	Antimicrobial resistance
1.71	Swine flu
1.41	Newcastle disease
1.41	Salmonellosis
1.06	Sheep and goat pox
1.00	Henipaviruses
1.00	Streptococcus in pigs
0.65	Bovine Spongiform Encephalopathy
0.59	Schmallenberg virus
0.47	Tembusu virus
0.35	Infectious Bronchitis in Poultry
0.12	Actinobacillus

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Epidemiologists		Laboratory Scientists		Average Results	
3.64	**African swine fever**	**3.11**	**African swine fever**	**3.37**	**African swine fever**
3.09	**Avian Influenza**	**2.78**	**Porcine Epidemic Diarrhea**	**2.43**	**Avian Influenza**
3.00	**Bovine tuberculosis**	**2.44**	**Classical swine fever**	**2.40**	**Classical swine fever**
2.73	**Rabies**	2.44	Pseudorabies	**2.34**	**Porcine Epidemic Diarrhea**
2.36	**Classical swine fever**	**2.11**	**Japanese Encephalitis**	**2.33**	**Bovine tuberculosis**
2.09	**Foot and mouth disease**	**2.11**	**Porcine Respiratory Reproductive Syndrome**	**2.09**	**Rabies**
2.09	Brucellosis	2.00	Flaviviruses	1.99	Pseudorabies
2.00	**Antimicrobial resistance**	**1.89**	**Foot and mouth disease**	**1.99**	**Foot and mouth disease**
1.91	**Porcine Epidemic Diarrhea**	1.89	Swine flu	**1.96**	**Porcine Respiratory Reproductive Syndrome**
1.82	**Porcine Respiratory Reproductive Syndrome**	**1.78**	**Avian Influenza**	1.77	Flaviviruses
1.73	Newcastle disease	**1.67**	**Bovine tuberculosis**	1.76	Swine flu
1.64	Swine flu	**1.44**	**Rabies**	**1.74**	**Japanese Encephalitis**
1.55	Flaviviruses	1.33	Salmonellosis	1.66	Brucellosis
1.55	Pseudorabies	1.33	Streptococcus in pigs	**1.61**	**Antimicrobial resistance**
1.45	Sheep and goat pox	**1.22**	**Antimicrobial resistance**	1.36	Newcastle disease
1.36	Salmonellosis	1.22	Brucellosis	1.35	Salmonellosis
1.36	**Japanese Encephalitis**	1.00	Newcastle disease	1.06	Sheep and goat pox
1.27	Henipaviruses	0.67	Henipaviruses	0.97	Henipaviruses
0.91	Bovine Spongiform Encephalopathy	0.67	Sheep and goat pox	0.94	Streptococcus in pigs
0.73	Schmallenberg virus	0.44	Tembusu virus	0.57	Bovine Spongiform Encephalopathy
0.55	Streptococcus in pigs	0.33	Infectious Bronchitis in Poultry	0.53	Schmallenberg virus
0.45	Tembusu virus	0.33	Schmallenberg virus	0.45	Tembusu virus
0.36	Infectious Bronchitis in Poultry	0.22	Actinobacillus	0.35	Infectious Bronchitis in Poultry

Chinese scientists		European Scientists		Average Results	
3.13	**Avian Influenza**	**3.56**	**African swine fever**	**3.15**	**African swine fever**
2.75	**African swine fever**	**3.00**	**Porcine Epidemic Diarrhea**	**2.67**	**Avian Influenza**
2.38	**Bovine tuberculosis**	**2.89**	**Foot and mouth disease**	**2.44**	**Porcine Epidemic Diarrhea**
2.25	Pseudorabies	**2.67**	**Classical swine fever**	**2.41**	**Bovine tuberculosis**
2.00	Brucellosis	**2.44**	**Bovine tuberculosis**	**2.21**	**Classical swine fever**
2.00	Swine flu	**2.44**	**Rabies**	**2.04**	**Porcine Respiratory Reproductive Syndrome**
1.88	**Porcine Epidemic Diarrhea**	**2.33**	**Porcine Respiratory Reproductive Syndrome**	**2.03**	**Rabies**
1.75	**Classical swine fever**	**2.22**	**Antimicrobial resistance**	**2.01**	**Foot and mouth disease**
1.75	**Japanese Encephalitis**	**2.22**	**Avian Influenza**	**1.82**	**Japanese Encephalitis**
1.75	**Porcine Respiratory Reproductive Syndrome**	2.22	Flaviviruses	1.80	Flaviviruses
1.63	**Rabies**	2.22	Newcastle disease	1.79	Pseudorabies
1.38	Flaviviruses	**1.89**	**Japanese Encephalitis**	1.72	Brucellosis
1.13	**Antimicrobial resistance**	1.89	Salmonellosis	1.72	Swine flu
1.13	**Foot and mouth disease**	1.67	Sheep and goat pox	**1.67**	**Antimicrobial resistance**
0.88	Salmonellosis	1.56	Henipaviruses	1.38	Salmonellosis
0.88	Streptococcus in pigs	1.44	Brucellosis	1.36	Newcastle disease
0.50	Bovine Spongiform Encephalopathy	1.44	Swine flu	1.02	Sheep and goat pox
0.50	Newcastle disease	1.33	Pseudorabies	0.99	Streptococcus in pigs
0.38	Henipaviruses	1.11	Streptococcus in pigs	0.97	Henipaviruses
0.38	Infectious Bronchitis in Poultry	0.89	Schmallenberg virus	0.64	Bovine Spongiform Encephalopathy
0.38	Sheep and goat pox	0.78	Bovine Spongiform Encephalopathy	0.57	Schmallenberg virus
0.38	Tembusu virus	0.56	Tembusu virus	0.47	Tembusu virus

Identifying potential collaborations In the LinkTADs consortium

The main objective of the online questionnaire was to **identify the diseases for which LinkTADs partners could set up EU-China and epidemiology-laboratory sciences collaborations in the future.**

Based on the questionnaire results, we selected diseases for which at least 1 Chinese and 1 European partner and at least 1 epidemiology and 1 laboratory sciences partner showed a high interest (score above 4).

According to these results 10 diseases were selected:

African swine fever
Antimicrobal resistance
Avian Influenza
Bovine tuberculosis
Classical swine fever
Foot and mouth disease
Japanese Encephalitis
Porcine Epidemic Diarrhea
Porcine Respiratory Reproductive Syndrome
Rabies

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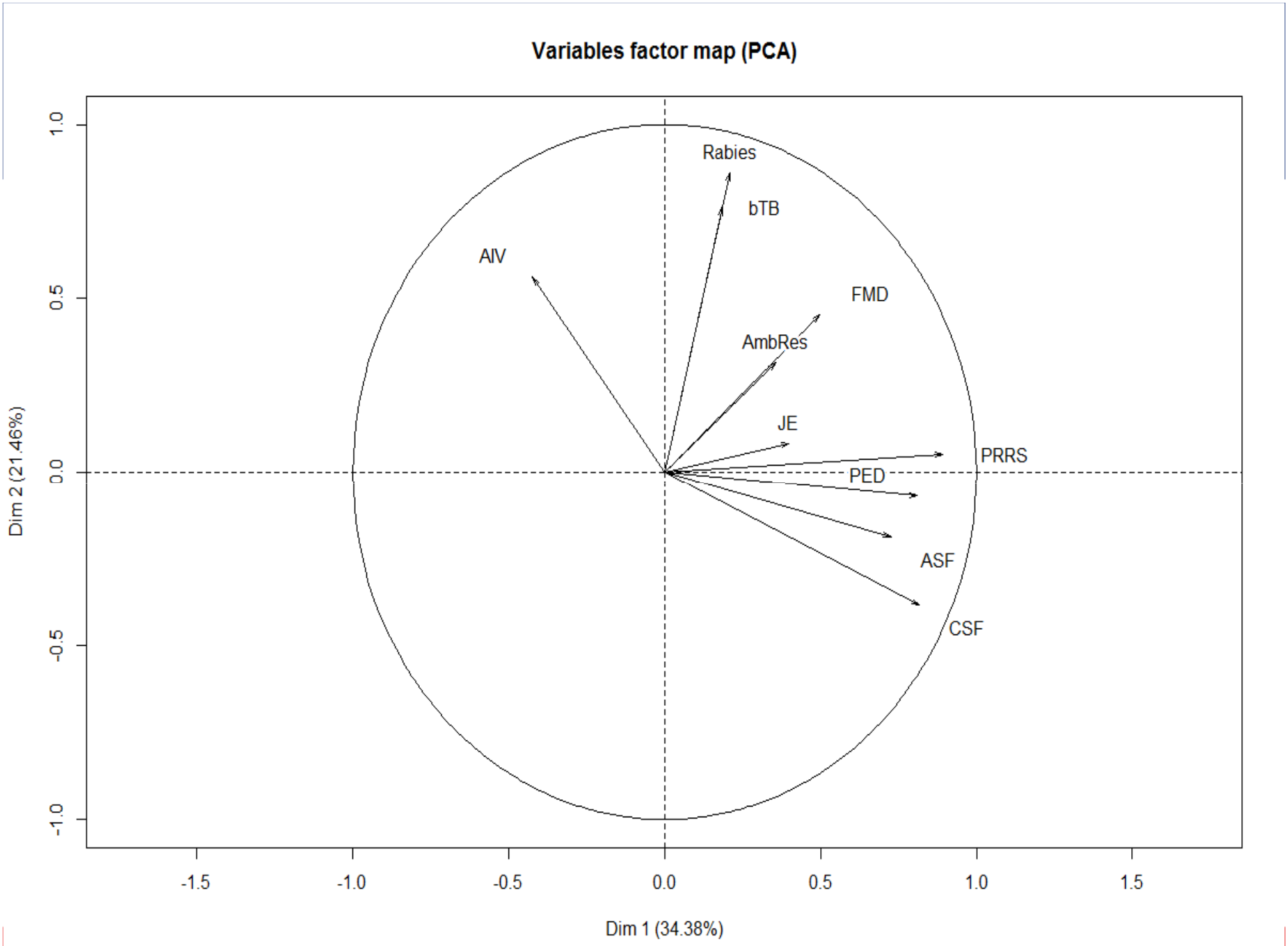
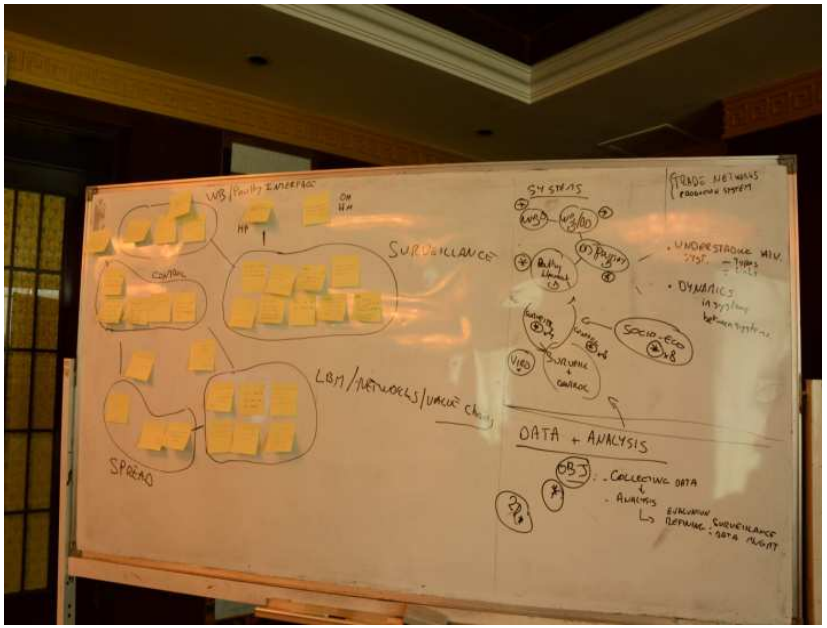

Variables factor map (PCA)
Rabies
bTB
AIV
FMD
AmbRes
JE
PRRS
PED
ASF
CSF
Dim 2 (21.46%)
Dim 1 (34.38%)
1.0
0.5
0.0
-0.5
-1.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5

Identifying potential collaborations In the LinkTADs consortium

Workshops enhancing EU-China networking in epidemiology

Workshop on Eco-epidemiology of TADs and EIDs

Discussion using participatory methods



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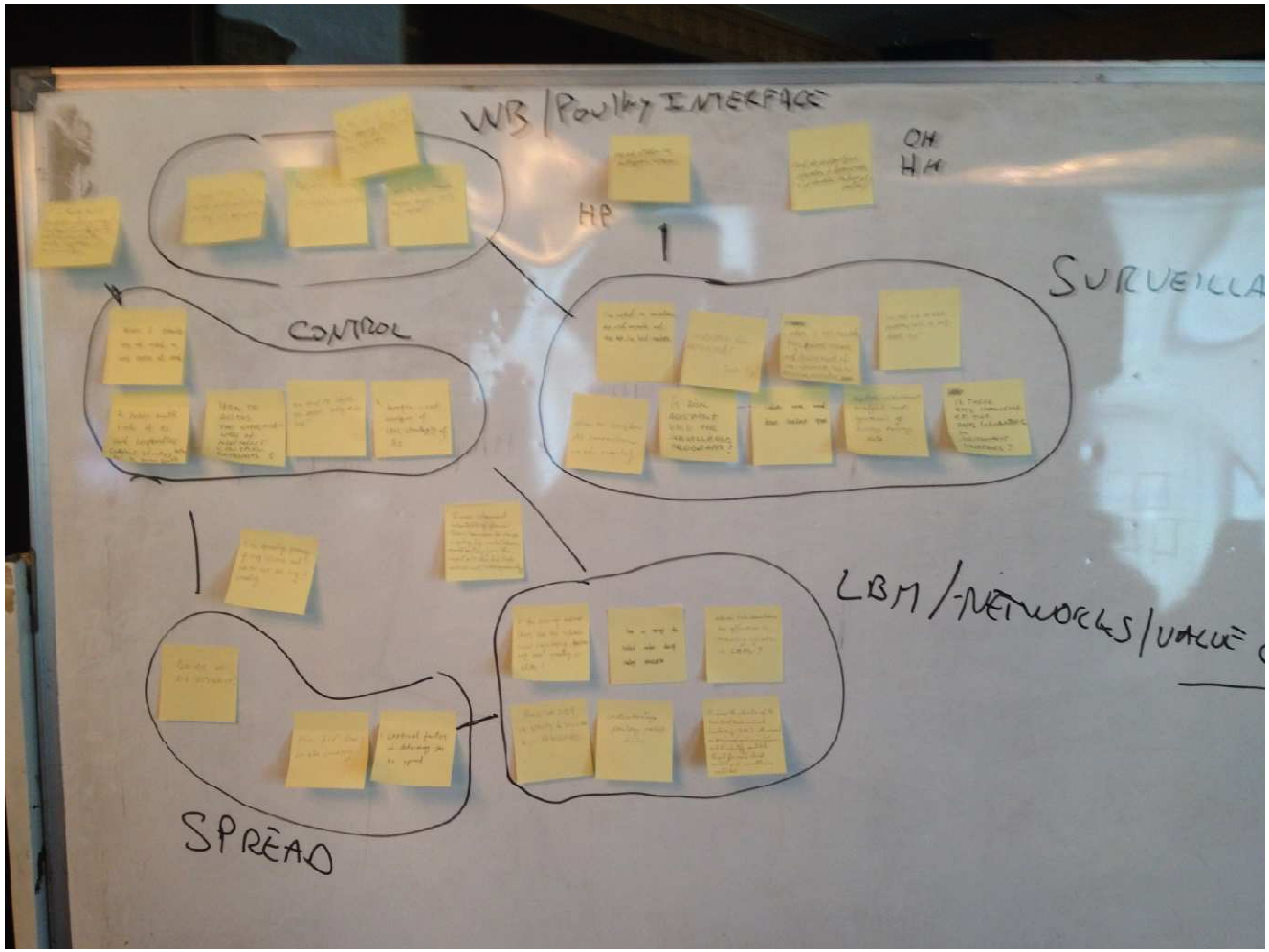
Discussion Reports



Identifying potential collaborations In the LinkTADs consortium

Identifying potential collaborations In the LinkTADs consortium

Workshops enhancing EU-China networking in epidemiology

Workshop on Eco-epidemiology of TADs and EIDs

Concept notes have been drafted for 7 diseases:

- Improving **bovine tuberculosis** control and surveillance in China
- Targeted research efforts on **peste des petits ruminants** in China to support the global eradication plan
- Improving **African swine fever** preparedness in China
- Improved Surveillance and Control Strategies towards the Eradication of **classical swine fever** in China
- **Antimicrobial resistance** and its transmission in bacteria of animal, environment and human origin
- Improving **Avian Influenza Virus** control and surveillance in China
- Improving **porcine respiratory and reproductive syndrome** control and surveillance in China

And one project is already funded by the Chinese Ministry of Science and Technology:

Eco-epidemiology and risk analysis of genotype shift of **Japanese encephalitis** virus in pigs and mosquitos. (SHVRI – SVA – CIRAD).

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Identifying potential collaborations In the LinkTADs consortium

- **Potential funding and grants where to apply for the proposed project:**

  EU (H2020 – Trade project)

  Wellcome Trust

  NIH

  13th 5-year national Chinese plan, submission to MoA

  FAO contributions

  Gates foundation

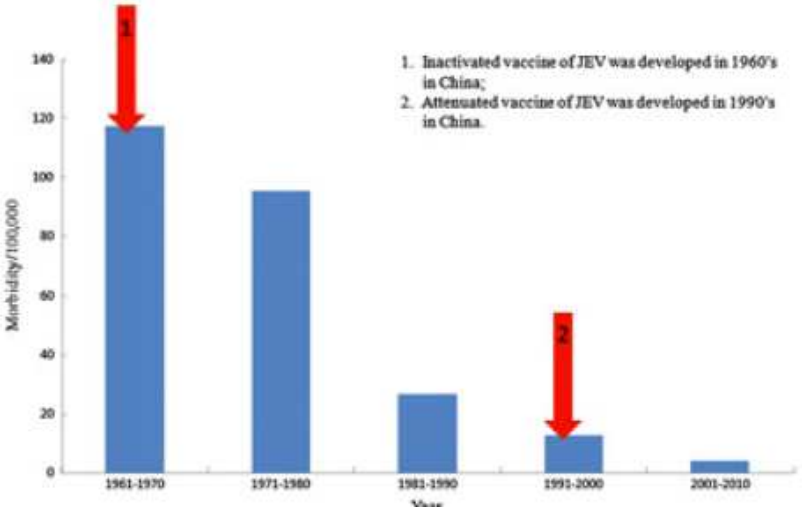
  Chinese epidemiological investigations

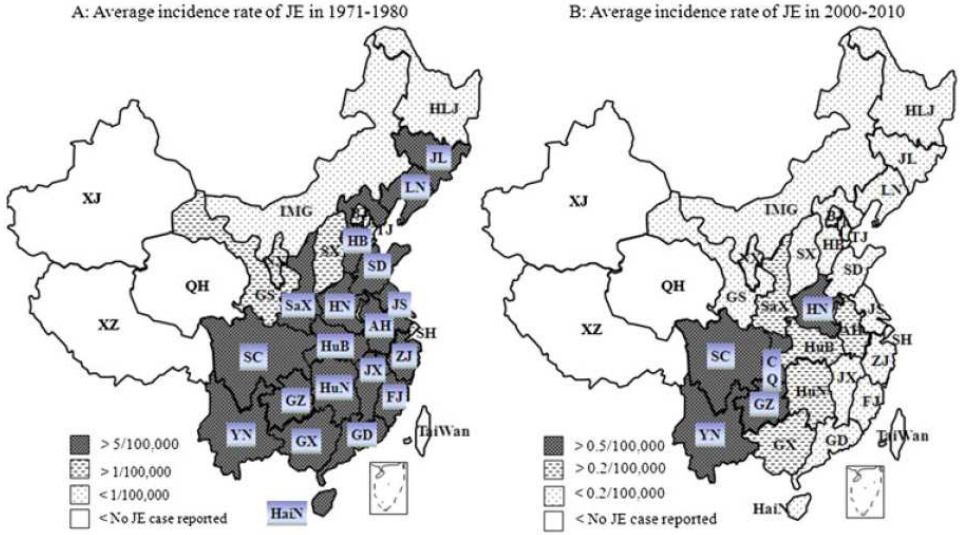
  National Chinese Research Foundation

Identifying potential collaborations: Japanese encephalitis

Human JE in China

- The first case in China was reported in 1949. Subsequently, China has become a highly epidemic area in Asia, and over 170,000 cases were reported in 1971.
- JE vaccination became common in the late 1970s. Afterward, reported cases, morbidity, and mortality rates gradually decreased.
- 5,000-10,000 cases are reported.





(Yayun Zheng et al 2012)

Identifying potential collaborations: Japanese encephalitis

Swine JE in China

- Most of commercial pigs are not vaccinated, antibody positive conversion rate is up to 100% after mosquito season.
- Sows and boars are routinely vaccinated before mosquito breeding season in most pig farms.

Distribution of pathogens

Province	No.	PRRSV%	PRV%	PPV%	PCV-2%	CSFV%	JEV%
Jiangsu	30	80.0	10.0	33.3	23.3	16.7	6.7
Shanghai	9	77.8	0	44.4	44.4	0	22.2
Anhui	23	82.6	8.7	47.8	34.8	47.8	13.0
Zhejiang	19	84.2	15.8	52.6	26.3	0	10.5
Hubei	20	85.0	15.0	35.0	55.0	10.0	25.0
Hunan	15	93.3	13.3	26.7	66.7	20.0	0
Jiangxi	11	100	18.2	72.7	45.5	45.5	9.1
Total	127	85.0	11.8	42.5	39.4	20.5	11.8

Samples collected from pig farms showing reproductive failure. (Yang X et al., 2009)

Identifying potential collaborations: Japanese encephalitis

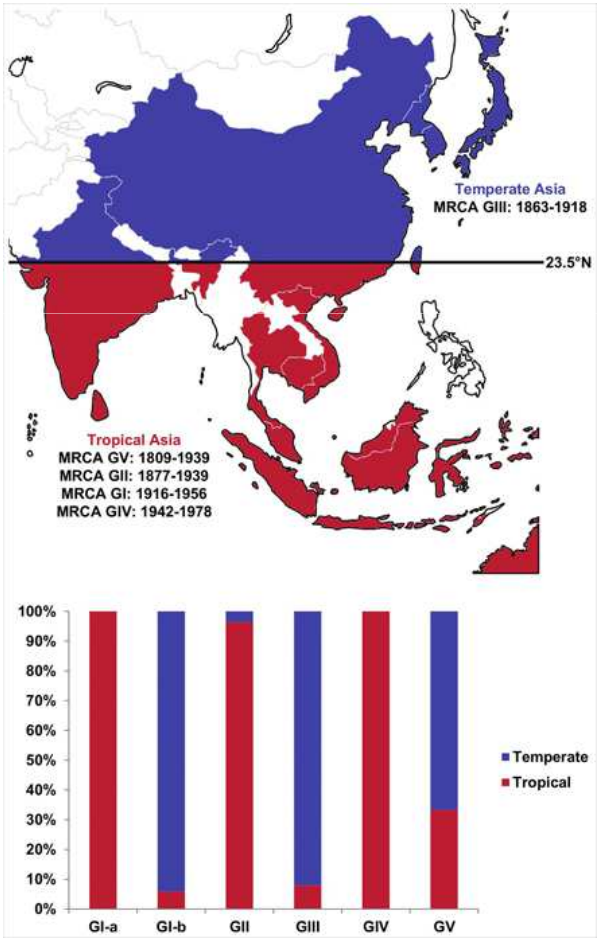
Genotypes and Geographical distribution

Only one serotype

JEV is divided into five genotypes (genotype I, II, III, IV, V), based on nucleotide sequence of E gene.

GI and GIII: mostly in temperate zones
GII and GIV: mostly in tropical zones

- GI: China, India, Japan, Korea, Laos, Malaysia, Taiwan, Thailand and Vietnam, northern Cambodia, northern Australia.
- GIII: China, India, Indonesia, Japan, Korea, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, the former Soviet Union, Taiwan, Thailand and Vietnam.
- GII: sporadically in Indonesia, Korea, Malaysia, Papua New Guinea and southern Thailand, northern Australia,
- GIV: Indonesia from mosquitoes only.
- GV: Malaysia, China and South Korea

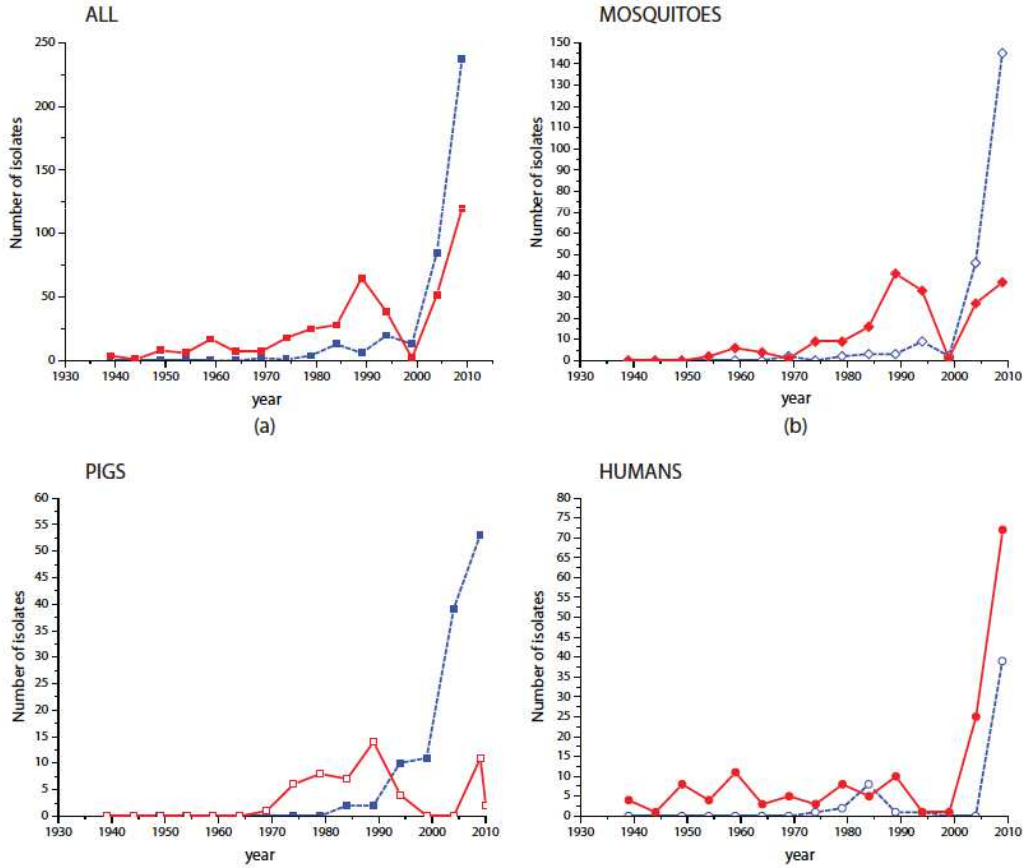


(Amy J. Schuh et al., 2013)

Identifying potential collaborations: Japanese encephalitis

Emerging of JEV genotype I

GIII was the most frequently isolated genotype. However, over the past two decades, GI has displaced GIII as the most frequently isolated virus genotype.



- GI viruses replicated faster than GIII viruses.
- Adaption to the immune pressure exerted by vaccine?

Na Han, James Adams, Ping Chen, et al. Journal of Virology,2014,88(19):11469-11479

Identifying potential collaborations: Japanese encephalitis

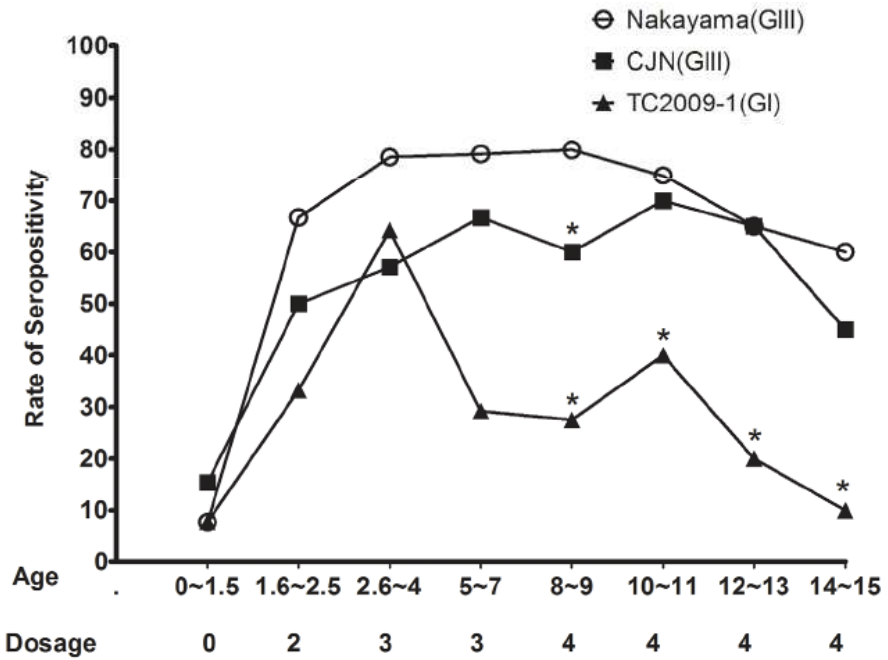
Differences in host composition for genotype I and III isolates

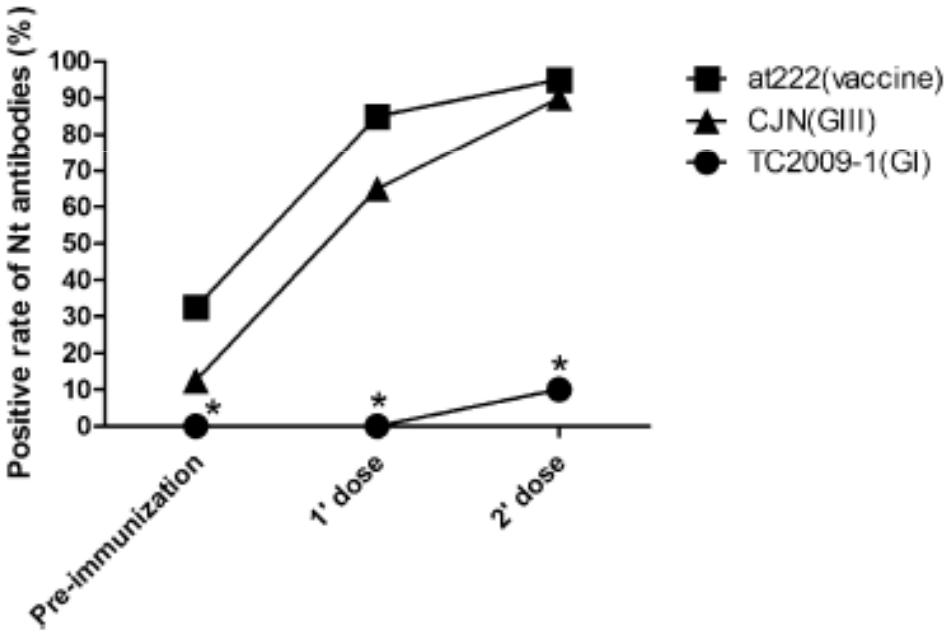
	No. of isolates with indicated genotype	
Host	GIII	GI
Mosquito	197	278
Pig	54	120
Human	175	54
Horse	4	1
Bat	6	0
Midge	2	1
Bird	1	0
Total	439	454

Na Han, James Adams, Ping Chen, et al. Journal of Virology,2014,88(19):11469-11479

Identifying potential collaborations: Japanese encephalitis

Protective efficacy of genotype III vaccines





(Yi-Chin Fan et al., 2012, 2013)

Reduced neutralizing antibody titer against genotype I JEV

Identifying potential collaborations: Japanese encephalitis

Reasons responsible for the genotype shift

- Project: Eco-epidemiology and risk analysis of genotype shift of Japanese encephalitis virus in pigs and mosquitos.
- Consortium: SHVRI, CIRAD and SVA.
- Objectives: to identify the ecological and epidemiological factors that are associated with JEV genotype shift.

Linking Epi and Lab, EU and China

Identifying potential collaborations: African Swine Fever

Spread of ASF

Emergence in Europe

Risk of emergence in China ?

Vergne et al, Veterinary Records 2016

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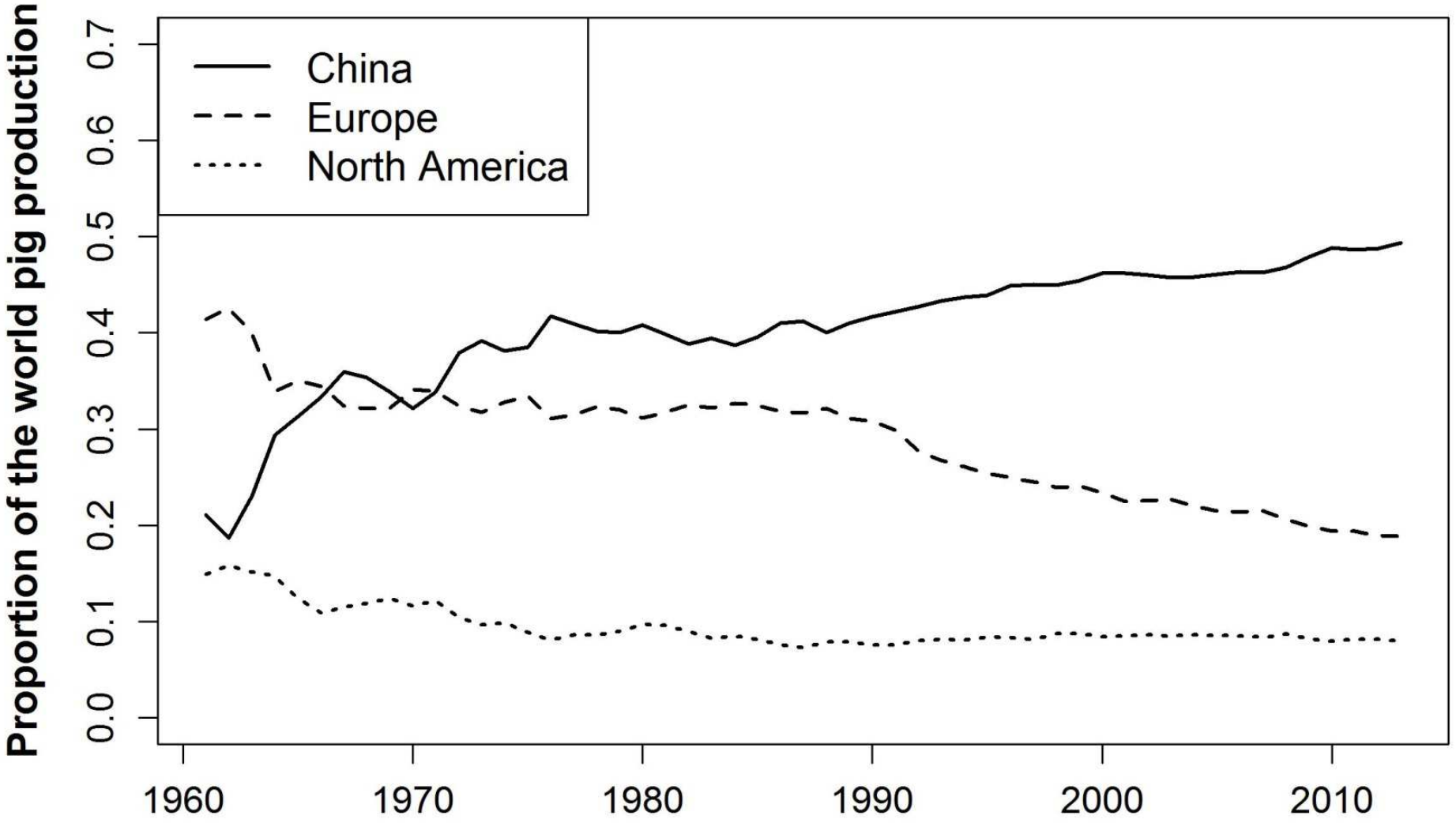
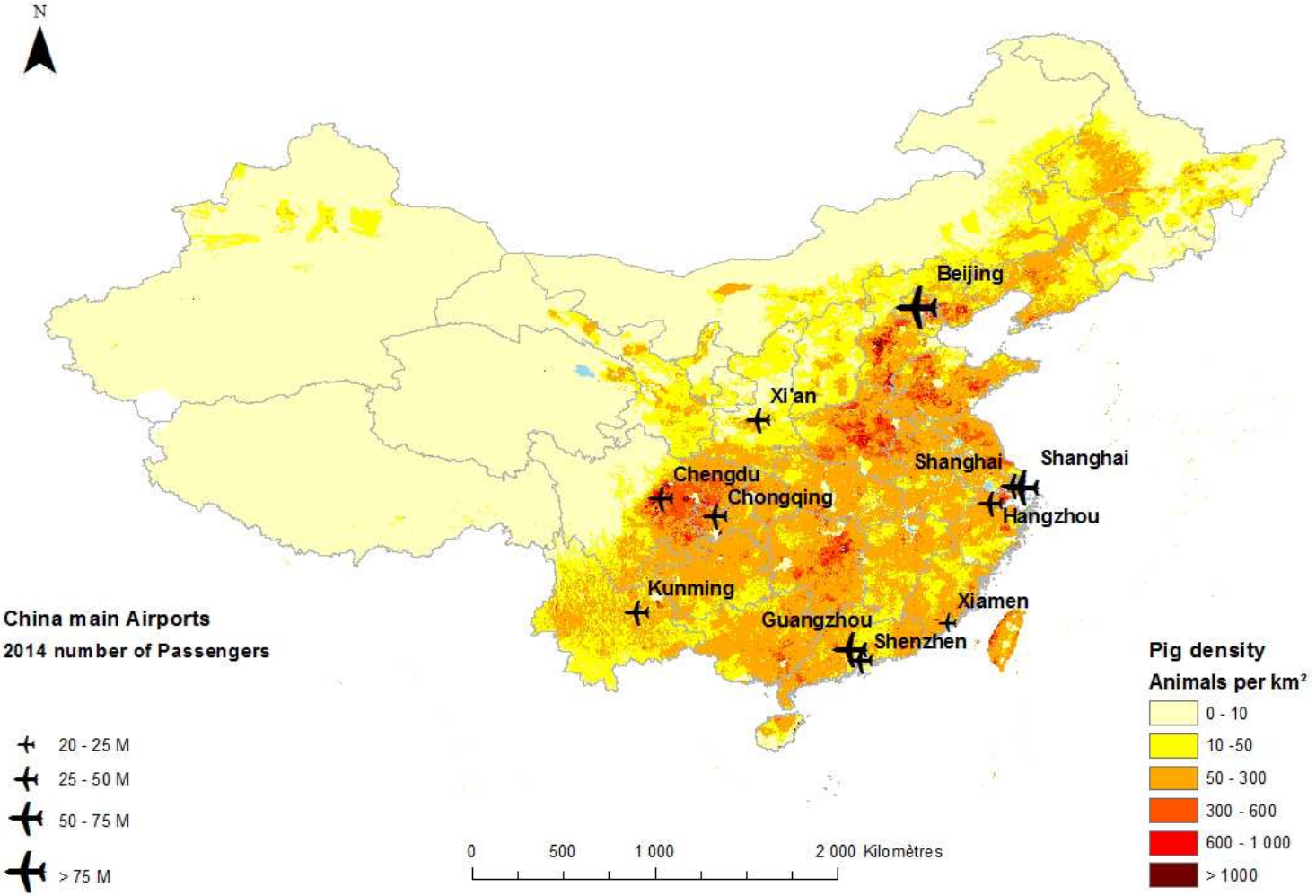
Identifying potential collaborations: African Swine Fever



Identifying potential collaborations: African Swine Fever



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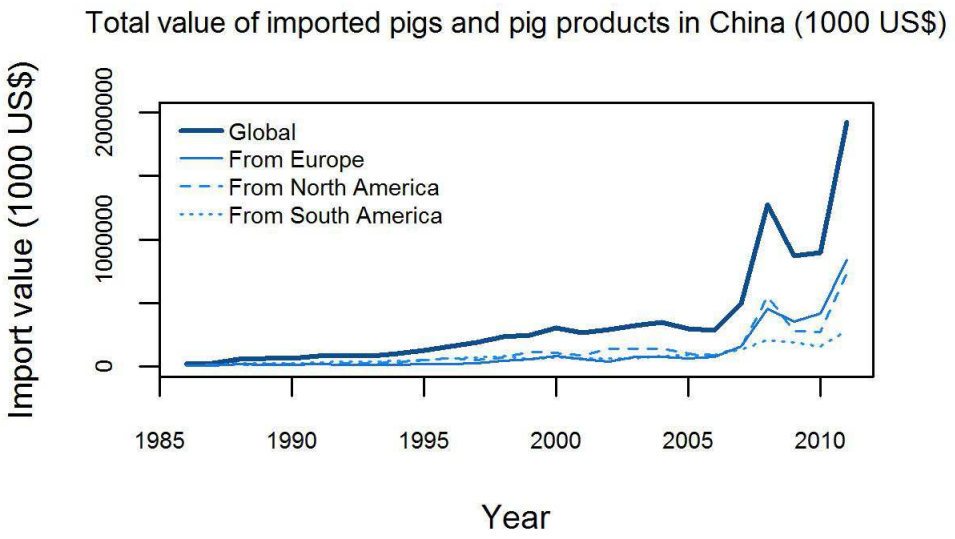
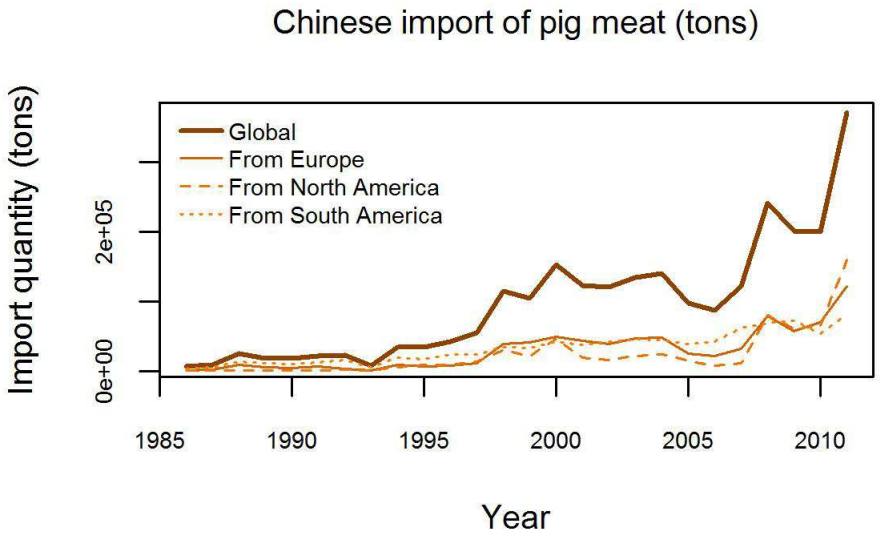
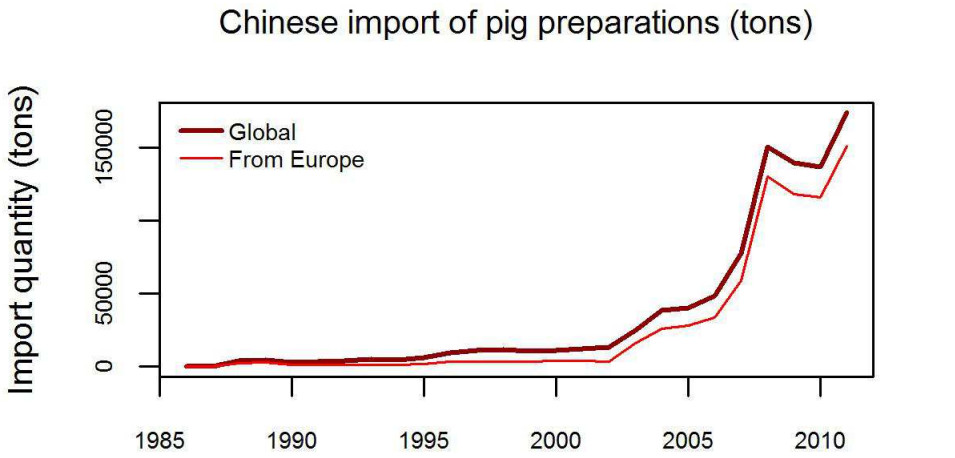
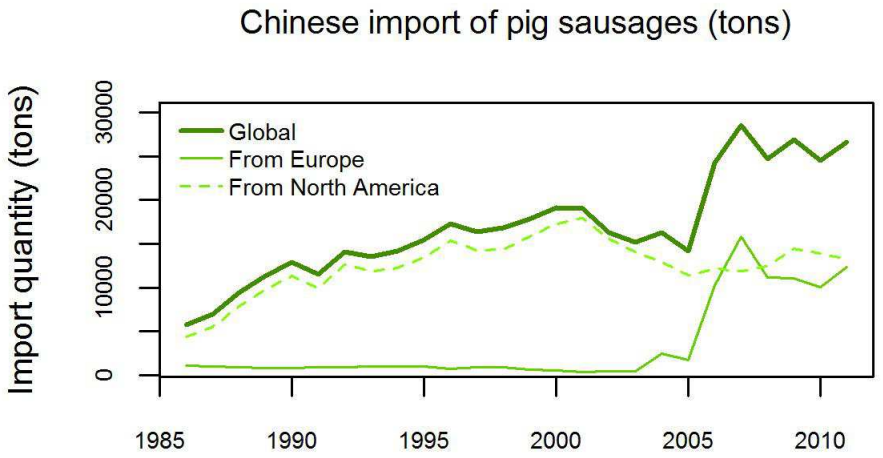
Identifying potential collaborations: African Swine Fever









Identifying potential collaborations: Capacity building

Epidemiology: Training of trainers

Lab: network of joint laboratories

Identifying potential collaborations: CFETPV

The China Field Epidemiology Training Program for Veterinarians (China FETPV)

The **objectives** of the program are:

- Apply interdisciplinary (One Health) approaches in field epidemiology training
- Create a sustainable program for training skilled veterinary field epidemiologists for the future
- Standardize the knowledge and methodology on applied veterinary epidemiology for China
- Strengthen partnerships among national, provincial and international institutions and foster greater synergy and collaboration
- Nurture **trainers** and mentors within a national network for training veterinary epidemiologists in China

The best students of each cohort were selected at the end of each program to become teacher / facilitator for the next year training.

Identifying potential collaborations: CFETPV

Type	Training	Time	Trainees	International Trainers	National Trainers	Period
3rd Cohort	Introductory	2014.11	43	6	0	4 weeks
3rd Cohort	First	2015.04	20	6	10	4 weeks
3rd Cohort	Second	2015.07	20	6	10	4 weeks
TOT	**First**	**2015.04**	**10**	**3**	**0**	**1 week**
TOT	**Second**	**2015.07**	**10**	**4**	**0**	**1 week**
E-Training	Third	2015.07	48	4	10	2 days
University Faculties	First	2015.1	28	2	2	1 week
University Faculties	Second	2015.8	28	2	2	1 week
Western Areas	Second	2015.6	40	0	5	1 week

Identifying potential collaborations: CFETPV

Field Epidemiology Training

TOT 1 1-3 April 2015

The first part of the Field Epidemiology Training (for Chinese trainers) was held in Qingdao from 1st to 3rd April. Ten Chinese CFETPV graduates, who showed excellence in previous trainings and interests in **becoming local trainers**, participated in this training for trainers. They were mainly from national and provincial level animal disease control centers and research institutions, including China ACDC, CAHEC, Harbin VRI etc.

The 1st training workshop is specifically aiming at:

1. Having insights into **best practice teaching methods** and the theory underpinning these.
2. Revising and reaching agreement on the **FETPV curriculum** for future FETPV courses (ensuring relevance to the Chinese context).
3. Discussing and reaching agreement to a list of **teaching sessions** and case studies for each topic, with each session having a named trainer attached to lead the development of it.

Identifying potential collaborations: CFETPV

Field Epidemiology Training

TOT 2 8-10 July 2015

Following the first training of trainer workshop in April, the second part of the training was held in Qingdao from 8th to 10th July. Ten **Chinese trainers** of FETPV participated in the 3-day workshop.

In order to improve the teaching capacity, the Chinese trainers' plans for teaching were also reviewed. **Trainers presented a summary of their plans** for each of the 16 topics identified in the last workshop, such as surveillance, outbreak investigation and control strategy. Following contents were included in each topic:

1. Learning objectives
2. Syllabus
3. Teaching methods
4. Course notes
5. Teaching slides
6. Exercise
7. Case study
8. Proposed method(s) of assessment

Conclusion

Common (Lab-Epi, EU-China) research topics identified

Capacity building: trainings, networking

On-going new projects

Future projects: H2020 on AMR

Thank you !

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