LinkTADs

D5.1 Summary report with findings and recommendations

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D5.1

Summary report with findings and recommendations

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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

1. Introduction

This report summarizes the main findings and recommendations in the identification of research topics on animal infectious diseases (including zoonoses) of common interest for China and the European Union (EU). The report also suggests specific practical areas for cooperation on animal infectious diseases between EU and China, including existing bilateral programs, the governance structure and funding model, as well as the priority activity areas.

The main objective of work package 5 (WP5) is to support the international policy dialogue between the EU and China on animal infectious diseases (including zoonoses). It aims to 1) provide support data to the EU-China policy dialogue; and 2) enhance the policy framework for collaboration between the EU and China through the organisation of bi-regional consultations events.

Specifically, Task 5.1 aims at supporting the official policy dialogues on animal diseases and food security between the EU and China. One important part of Task 5.1 (3) is to provide guidance to future collaborations on areas of common interest by analysing the priority activity areas, the governance structure, the funding model, intellectual property rights (IPR) procedures, and criteria to elect members and evaluate the programme. The task leader is FAO and main contributors include SHVRI, SPI, RVC, CIRAD, SVA and HVRI.

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02.

Bilateral dialogues between China and EU countries

2. Bilateral dialogues between China and EU countries

2.1 Bilateral Programmes

The Science and Technology (S&T) cooperation between Europe and China is a very important part in the EU-China cooperation among all the types of cooperation, such as commercial, political, human right, etc. Since 1981, the EU-China S&T cooperation has been carried out in different fields of knowledge, i.e. energy, information and communication technology, biotechnology, environment, agriculture, and health among others[1]. The cooperation between Europe and China in particular on S&T is currently implemented at two levels, the EU-China level and the EU member states-China level, as described in more detail in the following sections.

2.1.1 EU-China level

EU and China signed the *Agreement for Science and Technological Cooperation between the Government of the People's Republic of China and the European Community* in 1998, which allowed Chinese researchers to participate in all the research, development and demonstration activities in the Framework Programmes (FP5 at that moment), and allowed European researchers to participate in similar activities within the corresponding fields in the Chinese national research programmes, such as the National High-Tech Research and Development Programme (863 Programme) and National Basic Research Programme (973 Programme)[2]. Since then, the EU-China S&T cooperation has developed fast in terms of the number of projects, in the ways of cooperation and in the fields it covers.

The EU and China have developed strategic development plans: the "EU 2020 Strategy" and the "China's two centenary goals and the 12th Five Year Plan", which present actions that could contribute to enhancing the cooperation between the two regions, with clear benefits for both the EU and China.

Building on these strategies, and aiming to promote a comprehensive and fruitful strategic partnership between EU and China in this decade, the Chinese government and the EU signed the China-EU 2020 Strategic Agenda for Cooperation[3] (the Agenda for short) in 2013, confirming the common goal of EU and China to strengthen the cooperation in peace and security, prosperity, sustainable development and culture exchange. The Agenda also outlines key initiatives to achieve the common goal for each area. Science, technology and innovation (S&T&I) is emphasized in the part of Key Initiatives in sustainable development, by

- reinforcement of cooperation on S&T&I
- establishment of an EU-China cluster cooperation initiative, joint research and innovation initiatives
- implementation of the Joint Statement on cooperation in new and renewable and energy efficient technologies
- promotion of cooperation in the multilateral framework of the ITER project.

[1]Brief Introduction on EU-China Cooperation, Ministry of Science and Technology, PRC, 2012

[2]Agreement for Science and Technological Cooperation between the Government of the People's Republic of China and the European Community, 1998

[3]http://www.eeas.europa.eu/china/docs/eu-china_2020_strategic_agenda_en.pdf

Joint research and innovation initiatives in specific areas will be further explored, in particular in the areas of food, agriculture and biotechnology, and health, (which are of particular relevance in the context of LinkTADs), by developing joint funding programs and promoting enhanced mutual participation of Chinese and EU researchers and innovators into respective programs.

According to the source of the funding, the major programmes that facilitate the EU-China S&T&I cooperation are divided into EU Framework Programmes and Chinese national research & innovation programmes as introduced below.

A. EU Framework Programmes

The Framework Programmes for Research and Technological Development (abbreviated FP1 through FP7) and Horizon 2020 (2014-2020), are funding programmes created by the EU to support and foster research in the European Research Area. China has taken part in the EU Framework programmes since FP5 in 1998. FP7 was the major way of cooperation between China and EU from 2007 to 2013[4]. China was a key partner in FP7 with one of the highest participation rates[5].

Horizon 2020 (H2020) is the new EU Research and Innovation programme, with nearly €80 billion of funding available for a period of 7 years. Chinese participation is welcomed in all Calls for Proposals of H2020. In addition, in the 2014/2015 calls, several topics are specifically flagged for targeted cooperation with China including the fields of Food, Agriculture and Biotechnology, Water, Energy, Information and Communications Technologies, Nanotechnology, Space and Polar research. In principle, participants from China will no longer get financial support from the European Commission automatically, as China is considered to have an economy similar to developed countries. The Chinese participants need to identify other sources of funding and may need to submit the funding proof from the Chinese side when they make application to H2020 calls. However it is important to note that funding opportunities for Chinese researchers do exist in most of the mobility schemes provided by Marie Skłodowska-Curie Actions (MSCAs) and the European Research Council (ERC) research grants[6].

B. Chinese national research & innovation programmes

The Chinese national programmes are managed by different agencies. The major funding agencies in China are the Ministry of Science and Technology (MoST), the National Natural Science Foundation of China (NSFC), and the China Scholarship Council (CSC) affiliated to the Ministry of Education (MoE). The Chinese Academy of Sciences (CAS) also has programmes to support the researchers at its institutions in R&D activities including international collaboration. The national programmes open to European researchers are listed in Table 1 below.

[4] Brief Introduction on EU-China Cooperation, Ministry of Science and Technology, PRC, 2012

[5] http://www.esastap.org.za/download/present03_ws_saeu_2013.pdf

[6] Practical Guide for China on Horizon 2020, Science, Technology and Environment Section Delegation of the European Union to China and Mongolia, 2014

Table 1 - Chinese National Programmes open to European Researchers[7]

National agency	Programme	Website	Summary
MoST	National Basic Research Programme (973 Programme)	www.973.gov.cn	Focuses on basic research. Open to European researchers who work at Chinese host organizations
	National High-Tech Research and Development Programme (863 Programme)	www.863.gov.cn	Focuses on pre-commercial high-tech projects
	National New Products Programme	www.most.gov.cn/bszn/new/xcp/jbxx/index.htm	For new technologies with indigenous intellectual property, high impact or adopting international standards
	International S&T Cooperation Programme (ISTCP)	http://www.istcp.org.cn/	Supports Chinese scientists in international research activities, and covers projects under multilateral and bilateral agreements
	EU-China SME energy conservation and emission reduction research collaboration fund	http://www.most.gov.cn/kjzc/gjkjzc/gjkjhz/201308/P020130823585366877056.pdf	For SMEs registered in China with established EU partnerships in energy conservation and emission reduction technologies
NSFC	General Programme	http://www.nsfc.gov.cn/nsfc/cen/xmzn/2015xmzn/04/index.html	To promote the development of natural science disciplines and to stimulate academic innovation, research topics are selected freely within the scope of NSFC
	Key Programme	http://www.nsfc.gov.cn/nsfc/cen/xmzn/2015xmzn/05/index.html	Frontier research, innovation resources integration and key scientific breakthroughs, topics are structured according to the Five Year Plans
	Major Programme	http://www.nsfc.gov.cn/nsfc/cen/xmzn/2015xmzn/06/index.html	Scientific issues with strategic significance in China's basic research
	Major Research Plan	http://www.nsfc.gov.cn/nsfc/cen/xmzn/2015xmzn/07/index.html	Forms groups of projects and coordinates with other programmes
	International Collaborative Research projects	http://www.nsfc.gov.cn/nsfc/cen/xmzn/2015xmz	Open to EU participation, on basic research

[7] Final report, Science, Technology and Innovation (STI) Performance of China , 2014

National agency	Programme	Website	Summary
		n/14/index.html	
CAS	Einstein Professorship Programme	http://www.bao.ac.cn/gjjl/gzzd/201108/t20110801_3318721.html	Aims to enhance the science and technology links, cooperation and exchange between CAS scientists and respective Einstein Professors and their laboratories, and training of future generations of scientists in China
	Fellowships for Young International Scientists	http://english.qibebt.cas.cn/ju/fyis/201405/t20140530_121952.html	Aims to facilitate academic exchanges and cooperation between CAS institutes and international institutes and universities, and development of talented scientists by attracting young international scientists to conduct cooperative research at CAS institutes for 12 months
	CAS 100 Talent Programme	http://www.pe.cas.cn/zcgz/rcc_zcgz/brjh/201110/t20111026_3384579.html	Aims to support and invite experts of the different categories to China including overseas talent (Category A) and overseas and domestic talent funded by individual employers (Category Z)
	CPCCC 1000 Talent Plan	http://www.1000plan.org/qrjh/section/2	Aims to attract around 2,000 leading individuals under the age of 55, who hold professorships or equivalent positions in renowned foreign universities or research institutes, for a period of 5 to 10 years.
MoE	Yangtze River Scholar Award Scheme	http://www.1000plan.org/qrjh/channel/5	Supports the implementation of the National Programme for Long-Term and Medium-Term Educational Reform and Development (2010-2020), and the National Programme for Long-Term and Medium-Term Talents Development (2010-2020)
CSC	CHINA/UNESCO - the Great Wall Fellowship	http://www.unesco.org/new/en/fellowships/programmes/unescopeoples-republic-of-china-the-great-wall-co-sponsored-fellowships-programme/	Full scholarship programme set up by MOE for candidates recommended by the United Nations Educational, Scientific and Cultural Organization (UNESCO), only available to applicants who come to study as general scholars and senior scholars

National agency	Programme	Website	Summary
	Chinese Government Scholarship-EU Program	http://www.csc.edu.cn/Laihua/scholarshipdetailen.aspx?cid=97&id=3154	Supports students who come to study in China on undergraduate and postgraduate programmes, Chinese language training programmes, general scholar and senior scholar programmes
	Distinguished International Students Scholarship	http://en.csc.edu.cn/uploads/APPLICATION%20FORM%20FOR%20DISTINGUISHED%20INTERNATIONAL%20STUDENTS%20SCHOLARSHIP.pdf	Set up by MoE to sponsor outstanding international students who have finished their Bachelor's degrees or above in China and have been enrolled by designated Chinese Higher Education Institutions for higher education or are now doing their Masters or Doctoral degrees in those institutions

2.1.2 EU member states - China

Bilateral programmes between China and the EU member states is another important way of cooperation between Europe and China. The number of cooperation programmes is increasing fast in recent years. Co-funding programmes is the most common way of cooperation between China and EU MS, followed by the implementation of joint laboratories/institutes.[8]

A. Co-funding programmes

In 2012, there were 17 MS co-funding programmes with Chinese authorities, such as the Ministry of Science and Technology (MoST), Chinese Academy of Science (CAS), Chinese Academy of Agricultural Science (CAAS), or the Natural Science Foundation of China (NSFC). The cooperation priorities of the member states with China are more concentrated in agriculture, climate change and environment, health and medicine, information and communication technology, material science, biotechnology. The cooperation priorities of each member state are listed in Table 2, according to the research of S&T Section, EU Delegation in China in 2011.

[8]Science, Research and Innovation: Co-operation between the European Union, Member States and China, European Union Delegation to China, 2012

Table 2 - Cooperation priority of EU member states and China[9]

Member State	Priority in S&T cooperation with China
Austria	information technologies, geosciences, **agriculture** and forestry, medicine and biotechnology, new materials, environmental technologies, transport, **health and medicine,** science, and policy
Belgium	**food safety, animal pandemia,** climate change and biodiversity, biotech, **agriculture**, multimedia design, microelectronics
Bulgaria	education
Czech Republic	**agriculture**, chemistry, machinery, materials engineering, nanotechnologies
Denmark	biotechnology and medicine, **agricultural and food technology**, clean and renewable energy, nano science and technology, **health** and traditional Chinese medicine application, and information and communication technology
Finland	clean-tech, energy, nanotech, ICT, pharmacy
France	sustainable development, biodiversity and water management; green chemistry and green technologies; energy; life sciences (among them **infectious and emerging diseases**); information and communication technologies (ICT) and smart cities, advanced materials
Germany	environment, environmental technologies, global change, **life sciences**, material research, geosciences, marine and polar research, ICT, cultural heritage, basic research (physics, chemistry, mathematics), electric-mobility
Greece	renewable energy sources and energy saving, **agricultural Biotechnology**, environment (natural and cultural), transport and communication, **health sciences** (biology, biotechnology)
Hungary	natural, medical, **agricultural** and engineering sciences
Italy	**agriculture and food safety**; aerospace activities and physics; energy and environment; medicine and traditional Chinese medicine; natural risks prevention; technologies for cultural hritage preservation
Lithuania	Chinese language studies
Poland	biotechnology, **agriculture,** clean energy
Portugal	**agriculture**, medicine, materials science, environment, biotechnology, marine science, information and communication technology[10]
Slovenia	**agriculture**

[9] Overview of Europe-China Science and Technology (S&T) Cooperation， S&T Section, EU Delegation in China， 2011

[10] Cooperation between China and Portugal, Ministry of Science and Technology, PRC, http://www.cistc.gov.cn/World_ST/World_S&T_T_4_Sbgx.asp?countryId=143&Id=39

Member State	Priority in S&T cooperation with China
Spain	climate change & environmental sciences, low carbon emission industries and the new energy vehicles; new materials, energy research, high-tech manufactures; aviation; pharmaceutical and medicine manufacturing; Light Emitting Diode (LED) technologies; human resources; market needs analysis to foster investment.
Sweden	environment and energy, biotechnology, urban planning and architecture, biomedicine, sustainable development, materials research, robotics, innovation and entrepreneurship, nanotechnology, telecom
United Kingdom	climate change, energy and environment, nanotechnology and materials, **infectious diseases**, stem cells and modernization of traditional Chinese medicine, space, innovation

Examples of bilateral programmes between EU member states and China are listed as below:

A. Collaboration between the Austrian Science Fund (FWF) and the National Natural Science Foundation of China (NSFC)[11]

Based on a long-term memorandum of understanding (MoU), there are annual joint calls for proposals in commonly agreed priority areas. Joint research projects and joint seminars are the two possible instruments of cooperation.

The call in 2015 focuses on "experimental physics" and "from biomedical research to translational medicine". The project will lasts for three years. The two parts of the research project from Austria and China are financed separately by the respective national funding agency. NSFC finances the costs for the Chinese part, while FWF finances the costs for the Austrian part. Applicants have to submit identical applications to NSFC and FWF using the application forms by FWF and NSFC, respectively, with a narrative text as an attachment. NSFC and FWF will jointly evaluate the applications for Joint Projects. On the basis of the reviews, the two funding agencies take their funding decision. Only if both funding organisations approve to fund a joint project, the project can be financed[12].

B. Collaboration between the Danish National Research Foundation (DNRF) and the National Natural Science Foundation of China (NSCF)

A MoU was signed between DNRF and NSFC to promote scientific cooperation in the areas of life sciences, natural sciences and engineering, where this seems desirable and where the available resources permit. DRNF and the NSFC establish joint calls for research projects between Danish and Chinese partners within thematically and jointly prioritized scientific fields. The goal is to launch one call per year.

The call in 2010 was on "information and communication technology", with a project duration of three years (2010-2013). Applications had to be jointly made by parts from Demark and China. Application documents had to be in

[11] http://www.fwf.ac.at/de/forschungsfoerderung/fwf-programme/internationale-programme/joint-projects/

[12] http://www.fwf.ac.at/fileadmin/files/Dokumente/Antragstellung/Internationale_Programme/Joint_Projects/NSFC-FWF_Information-for-Applicants.pdf

both English and Chinese and submitted to the respective national funding agency. DNRF and NSFC evaluated the applications and decided together on the project to be financed [13]. Three out of 11 applications got funded in 2010[14]. In 2013, before the end of the projects, the three projects applied for further funding and two of them got extended funding to the end of 2016[15].

C. Collaboration between the Netherlands Organisation for Scientific Research (NWO) and the Chinese Academy of Sciences (CAS)

CAS and NWO are long-term partners in international research co-operation. The CAS-NWO Programme offers funding opportunities for bilateral research co-operation between Dutch and Chinese research groups. A new call was launched in March 2015, aiming to stimulate sustainable research collaboration by funding joint research projects and aspire a high level of visibility of the projects and their output. The call addresses stem cell research. Project duration is three years. This call for proposals is jointly facilitated by CAS, NWO and The Netherlands Organisation for Health Research and Development (ZonMw). Applicants from Netherlands and China need to apply jointly and, if approved, they will receive financial support from their respective national funding agency[16].

D. Collaboration between the UK Research Councils (RCUK) and the Ministry of Science and Technology (MoST)

RCUK aims to extend relations and engagement with MoST through a jointly funded pilot initiative that supports bilateral research projects in key areas of mutual interest, aiming to develop mechanisms to support larger and long-term research partnership. MoST and RCUK jointly launched "China-UK Cooperation Programme in Global Priorities" in 2012, which focused on human health, smart power grids and food security. The budget from UK was 1 million GBP (1.4 million Euros), while that from China was of similar amount. Funding period is three years. The applicants from UK and China should have already had basis for cooperation. The partner from UK was required to be funded by Chinese agencies through the Medical Research Council (MRC), the Engineering and Physical Sciences Research Council (EPSRC) and the Biotechnology and Biological Sciences Research Council (BBSRC). The application had to be in both English and Chinese and submitted to MoST and RCUK, respectively, by the Chinese and UK partners. MoST and RCUK evaluated the applications separately and only the ones getting approval from both side can be financed[17]. One project in the programme is carried by the University of Cambridge and Huazhong Agricultural University (partner 11 in LinkTADs) to investigate *Streptococcus suis,* which is a pathogen of pigs with the potential to transfer to humans. They will be looking at key stages in the pig supply chain to prevent and control the spread of this disease ensuring healthier pigs and humans without the need for antimicrobial intervention which can lead to antimicrobial resistance[18].

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[13] http://www.nsfc.gov.cn/publish/portal0/tab235/info24257.htm

[14] http://www.nsfc.gov.cn/publish/portal0/tab87/info4354.htm

[15] http://www.nsfc.gov.cn/Portal0/InfoModule_396/52112.htm

[16] http://www.bic.cas.cn/tzgg/index.html, http://www.zonmw.nl/nl/subsidies/subsidiekalender/detail/item/tas-internationale-samenwerking-china-netherlands-cas-nwo-programme-joint-research-projects-st/

[17] http://program.most.gov.cn/htmledit/A0E4321F-076E-1DBF-3B19-02A88C023986.html

[18] http://www.rcuk.ac.uk/media/news/130114/

B. Joint Research institutes

Until 2012, 12 member states had established joint institutes in China with Chinese partners, including Austria, Belgium, Denmark, Finland, France, Germany, Hungary, Italy, Lithuania, Netherlands, Spain and the United Kingdom[19]. These joint structures may take different forms, are concentrated on a range of specific fields of research, and are mostly located in second-tier cities at specialized research centres. Innovation co-operation between European countries and China takes different forms. Examples of joint institutes of EU MS and China related to health and agriculture are listed in Table 3.

Table 3 - Samples of Joint institutes of EU MS and China related to health and agriculture[20]

Member State	Joint Institute
Austria	Sino-Austrian Diagnosis, Treatment and Research Center
	Sino-Austrian Diagnosis, Treatment and Research Center of Cardiovascular Diseases, Nanjing Medical University
Belgium	China-Belgium Technology Center (Wuhan)
Denmark	Innovation Center Denmark (Shanghai)
Germany	NSFC-DFG Sino-German Centre for the Promotion of Science
	Chinese-German Campus (CDH), Chinesisch-DeutschesHochschulkolleg (CDHK) and Sino-German University of Applied Sciences (CDHAW)
France	Sino-French research center in life science and genomics (Shanghai)
	Pasteur Institute – IPS (Shanghai)
	Sino-French oriental center of urology (Shanghai)
	Sino-French research center for biomedical information - CRIBs (Nanjing)
	Fudan University Shanghai cancer center – InstitutMérieux Laboratory – FDUSCC-IM Lab
	Sino-French physiology & pathology laboratory (Shanghai)
	Biology laboratory of mammals embryonic cells – LABIOCEM (Beijing)
	Sino-French laboratory of molecular pathology (Shanghai)
	Post-translational modifications in cancer – LIA PMC (Shanghai)
	Sun Yat Sen University-Ecole Normale Supérieure – SYSU-ENS (Guangzhou)
	Laboratory of genomics of cereals and biotechnology (Beijing)
	Sino-French center for research and innovation (Chengdu)
	Dutch Studies Center
	Sino-Dutch Centre for Preventive and Personalized Medicine

[19] Science, Research and Innovation: Co-operation between the European Union, Member States and China, European Union Delegation to China, 2012

[20] Science, Research and Innovation: Co-operation between the European Union, Member States and China, European Union Delegation to China, 2012

Member State	Joint Institute
	Sino-Dutch Joint lab of Horticultural Genomics
Finland	Sino-Finnish Center
	Sino-Finnish Joint Biomedical Research and Development Center
	Sino-Finland Life Sciences Centre

2.2 Chinese research competences and governance structure

2.2.1 Governance structure of Chinese research institutes in animal health

As shown in the diagram (Figure 1), research in animal health mainly occurs at national institutes, as well as Universities and veterinary colleges (such as Huazhong Agricultural University), which belong to MoA and Ministry of Education, respectively. The Chinese Academy of Agricultural Sciences (CAAS) lies under the MoA and has four veterinary research institutes focusing on fundamental and applied research. The Veterinary Bureau (VB) is in charge of animal disease prevention and control, as well as the management of veterinary drugs and bio-products. There are three institutes under VB: the China Animal Disease Control Centre (CADC), the China Animal Health and Epidemiology Center (CAHEC), and the Chinese Institute of Veterinary Drug Control (IVDC). These institutions play multiple roles in the system: 1) Implementation of VB's policies and administrative actions; 2) providing technical support and policy suggestions to VB; 3) Conduct research, especially on R&D of diagnostic technologies and vaccines; and 4) setting up technical standards and specifications.

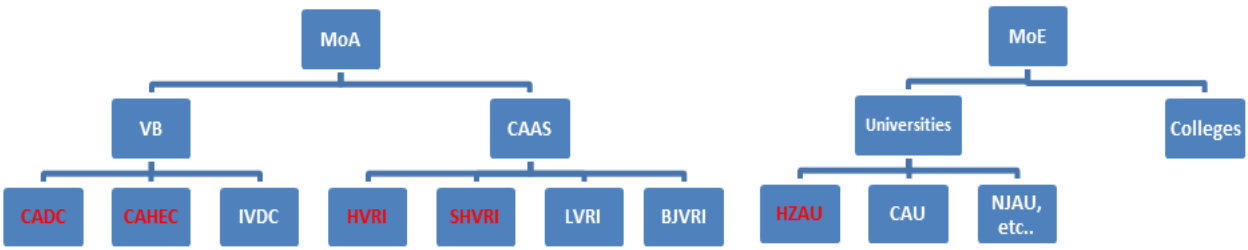

Figure 1 - Structure of Chinese research institutes in animal health (LinkTADs Partners in red)

2.2.2 Chinese Academy of Agricultural Sciences (CAAS)

CAAS is a national, integrative agricultural scientific research organization with the responsibility for carrying out both basic and applied research, as well as research into new technologies impacting agriculture. Established in 1957, CAAS has more than 5,000 professionals working in 42 institutions. Its research covers a broad range of topics that have been categorized in eight disciplinary clusters: crop science, horticulture science, animal science, veterinary medicine, agricultural resources and environment, agricultural mechanization and engineering, agro-product quality, safety and processing, and agricultural information and economics. CAAS is considered as a top-rated institution in Chinese agricultural research. In 2013, 4,394 research papers were published in various journals, of which 1,557 were published in Science Citation Index/Engineering Index （SCI/EI） journals and 16 were published in top international journals such as Science, Nature and Nature Genetics, etc. In addition, in 2013 there were more than 93 products and 228 applied technologies developed and promoted, 515 patents obtained, and 272 books published.

CAAS is active in international collaborations. There are 27 joint laboratories and research centres set up in cooperation with various countries and international organizations, and 13 international organizations and foreign agricultural institutions have established liaison offices within the academy. CAAS also signed MoUs/agreements for 19 major cooperation projects and organized 67 high-level international conferences and summits, which had a big impact on boosting international exchanges in agricultural science and technology.

Harbin Veterinary Research Institute (HVRI)

Aiming to protect the health of livestock, to ensure public health, and to promote scientific and technological developments for the prevention and control of animal infectious diseases, HVRI was founded in June 1948 as the first veterinary medicine research institute in China. There are 566 staffs, including 76 senior researchers, as well as 210 postgraduates involved in various ongoing researches in the institute.

The vaccines that developed by HVRI (such as attenuated ovinized and caprinized rindpest vaccine for cattle and attenuated lapinized bovine pleuropneumonia vaccine), contributed to the eradication of rinderpest and contagious bovine pleuropneumonia (CBPP) in China. Moreover, the attenuated lapinized Chinese strain of classical swine fever (CSF) virus vaccine is the most extensively used vaccine in the world. In recent years, HVRI is leading the Chinese research on influenza in animals and possesses the title of the national reference laboratory on Avian Influenza (AI). The first recombinant avian vaccine in China, the fowl pox viral vector-based chicken infectious laryngotracheitis vaccine, was also developed in HVRI. Achievements have also been made in fundamental pathogenesis studies, for example, identifying key proteins essential for trans-species transmission of avian influenza virus, etc.

Shanghai Veterinary Research Institute (SHVRI)

SHVRI, formerly Shanghai Institute of Domestic Animal Parasitology was founded in 1964. One of the four national institutes of veterinary research, SHVRI has 120 full-time employees, including 90 scientific researchers, and 13 professor-ranked principle investigators. Since spring 2006, SHVRI also serves as the branch of the China Animal Health and Epidemiology Centre (CAHEC), in charge of animal diseases surveillance in Southern China.

SHVRI consists of five main departments: Department of Animal Schistosomiasis, Department of Animal Parasitology, Department of Swine Infectious Disease, Department of Veterinary Public Health, Department of Avian Infectious Diseases, Department of Pharmacology, and Animal-borne Food Safety Research Center. SHVRI focuses on basic, applied and biotechnological research in the field of veterinary medicine. The core activities are following: (1) Epidemiological investigation of animal infectious and parasitological diseases; (2) Development of new vaccines, veterinary drugs and diagnostic methods for animal diseases; (3) Pathogenesis of animal pathogens; (4) Pathogen-host interactions; (5) Food safety of animal origin.

Despite its specialty on parasitology and vector-borne diseases, SHVRI is carrying out research on various pathogens, focusing on basic, applied and biotechnological research in the field of veterinary medicine. In addition, SHVRI has endeavoured translational work of Veterinary scientific and technological achievements into industrial developments. In accordance with the Chinese government's strategic directives and the principle of knowledge innovation, SHVRI will become one of the national bases for innovative research in animal medicine.

2.2.3 Public Institutions affiliated to Veterinary Bureau

Similar to the CAAS institutes, there are three public institutions under the authority of the Veterinary Bureau (VB): China Animal Disease Prevention and Control Centre (CADC), China Animal Health and Epidemiology Centre (CAHEC) and Chinese Institute of Veterinary Drug Control (IVDC). One of the characteristics of these institutes is that they have their own administration and management mandates and directly report to VB. These institutes are mainly funded by Chinese government. Therefore, the research conducted within these institutes is highly related to its mandates, with a preference on applied research compared to fundamental research.

China Animal Disease Prevention and Control Centre (CADC)

Established in 2006, CADC's mandate is to perform analysis on and respond to national animal disease epidemics, conduct prevention and control of major animal diseases, perform food-safety tests on animal product and supervise animal health. There are about 140 staff working at CADC and among them, 35 are research professionals. The main research carried out by CADC focuses on applied technology on prevention and control (vaccine development and diagnostic methods), as well as studying and drafting relevant documents such as prevention and control schemes, eradication schemes and contingency plans for major animal diseases. There are five research groups, divided mainly based on the animal species (swine, avian, grazing animals, and zoonoses), except for the group working on animal product safety. CADC also has four laboratories for swine, livestock, poultry and zoonoses, and will soon have BSL3 facilities. The swine prevention and control laboratory has OIE Reference Centre status for PRRS since 2010.

China Animal Health and Epidemiology Centre (CAHEC)

CAHEC is a technical supporting institution responsible for carrying out epidemiological investigation, diagnosis, surveillance of major animal diseases, evaluation of the status of animal health and animal product safety, studies on animal health regulations and standards, as well as research on prevention and control technologies on prioritised exotic animal diseases. CAHEC has more than 160 staff (58 senior researchers), of which 40 possess a PhD degree, 34 hold a master's degree.

CAHEC hosts the National Diagnostic Centre for Exotic Animal Diseases (transmissible spongiform encephalopaties, peste des petits ruminants, Africans wine fever, etc.) as well as research groups working on other major animal diseases. These groups are also divided into departments for avian, swine and zoonotic diseases. CAHEC also performs outbreak investigations and value chain analyses in the event of urgent outbreaks (e.g. PPR and H7N9 AI) to trace the possible source and trends of disease spread. As the only veterinary epidemiology institute in China, CAHEC has established collaborations in epidemiology with many international organizations. CAHEC is an OIE Collaborating Centre for Veterinary Epidemiology. The linkage between laboratory and epidemiology is a priority strategy for China. Also, working together with FAO, CAHEC has established a training system on veterinary epidemiology through the implementation of the Field Epidemiology Training Programme for Veterinarians (FETPV) program, which promotes joint epidemiological studies with provincial veterinary agencies. Research groups in CAHEC also work on risk modelling and risk analysis for major animal diseases. Due to its expertise in veterinary epidemiology, CAHEC has assisted VB in drafting national surveillance plans every year. CAHEC is also responsible for evaluating the disease situation and providing the animal disease-free status to farms and animal industries in China.

2.2.4 Veterinary Universities and Colleges

In China, there are over 20 Universities and colleges providing veterinary education and conducting research in the field of animal health. They are mostly self-funded, but there are also various national research foundations (e.g. the National Natural Science Foundation of China). The management in universities and colleges is very similar to that of EU countries, i.e. most universities and colleges are under the authority of Ministry of Education, or the provincial education bureau. In these universities and colleges, professors/senior research fellows/principle investigators lead research groups that consist of postdocs, technicians and students. Veterinary colleges are closely linked to clinical practice and their researches are often divided into three subjects: fundamental, preventive and clinical veterinary studies. Generally speaking, universities and colleges have high competences in fundamental veterinary research and activities involving

clinical practice, but have relatively less participation in the national-level surveillance and applied research when compared to government-owned public institutions. However, compared to VB and CAAS institutions, researchers in universities and colleges are more autonomous in their work and hence more 'free' to participate in international collaborations.

2.3. Research trends in the field of animal health

2.3.1 Major Animal diseases in China

The 'General policy-National Mid- and Long-term Animal Disease Prevention and Control Plan (2012-2020)' is the main guideline for China's animal disease prevention and control. It has identified 16 domestic diseases and 13 exotic diseases (see below). According to the 'Mid-long term plan', by 2020, "the preferred prevention and control of the 16 domestic animal diseases should meet the pre-set appraisal standards. Accordingly. the animal incidence, mortality and public health risks should decline significantly. The risks from the introduction and spread of the 13 exotic animal diseases is expected to be reduced, and the capabilities to prevent and deal with exotic animal diseases will improve notably."

Animal diseases for preferred prevention and control in China (16):

Class I Animal Diseases (5): Foot and mouth disease (A type, Asia I type, O type), high pathogenic avian influenza (HPAI), highly pathogenic porcine reproductive and respiratory syndrome (HP-PRRS), classical swine fever (CSF) and Newcastle disease (ND).

Class II Animal Diseases (11): brucellosis, bovine tuberculosis (bTB), rabies, schistosomiasis, echinococciosis, glanders, equine infectious anemia (EIA), salmonellosis, avian leukosis, swine pseudorabies, and classical porcine reproductive and respiratory syndrome (classical PRRS).

Exotic animal diseases for key prevention of introduction (13):

Class I Exotic Animal Diseases (9): Bovine spongiform encephalopathy (BSE), African swine fever (ASF), sheep scrapie, peste des petits ruminants (PPR), contagious bovine pleuropneumonia (CBPP), foot and mouth disease (FMD -C-type, SAT1 type, SAT2 type, and SAT3-type), swine vesicular disease, African horse sickness (AHS), H7 subtype avian influenza (H7 AI).

Animal diseases that are not included in the disease class, but have high risks of introduction (4): vesicular stomatitis, Nipah virus disease, West Nile fever, and Rift Valley fever (RVF).

2.3.2 Current research and future research trends on major animal diseases and zoonosis

For most priority animal diseases, there is intensive basic research on the pathogen and pathogenesis, as well as more applied research for the development of diagnositc technologies and vaccines. For most of these diseases, there are vaccines and diagnostic tests available, but studies continue to find out better vaccines and diagnostic tests to cope with the changing situation or the massive amount of samples that need to be tested.

Foot and mouth disease (FMD)

FMD is one of the top priority animal diseases in China. The current research on FMD focuses on advanced vaccine development, as well as diagnostic technologies.

Vaccine development. These are based on the in-depth understading gained through fundamental studies on FMD virus and its pathogenesis. Intensive studies using the approach of reverse-genetic engineering of FMDV are carried out, aiming at generating new vaccine strains or optimizing existing vaccines with improved productivity (e.g. 3' UTR structure), antigen matching (exp. P1 gene, structural protein VP1), stability (e.g. heat- and pH-stable), antigenicity (e.g.

factors that inhibit/ stimulate host humoral/cell immune responses), DIVA ("differentiating infected from vaccinated animals", e.g. marker insertions at L, 3A, 3B, 3D and VP1 proteins), and so on.

Diagnostic technologies. Although there are many diagnosit technologies developed, there is still a strong demand for fast, accurate and easy-operating diagnostic methods with relatively low cost for FMDV antigen and antibody tests. Among the various diagnostic methods (CFT, VNT,IHA, AGID and so on), ELISA is more and more widely used because of its many advantages, such as reliability, easy to perform, possibility to process many samples in a single test, etc. At present, liquid-phase blocking ELISA, which is recommended by OIE, is still the most commonly used diagnositic methods in China for FMDV antibody test. Molecular biology technologies such as PCR, qPCR are very commonly used in veterinary laboratories to detect the virus, but they require skillful technicians and need to be performed in professional and well-equiped laboratories. Other methods including LAMP, DNA chips and GICA for FMDV are also being developed. Current studies focus on the detection of surface epitopes using monoclonal antibodies, the use of anti-idiotypic antibodies in FMD diagnosis, the development of GICA methods that can perform test not only qualitatively but also quantitatively. Instensive research is being done to optimize ELISA and qPCR that can be directly applied to FMD diagnosis and antibody tests.

Avian Influenza (AI)

AI has caused great damage to the avian industry, and poses a great threat to public health. Chinese scientists have conducted intensive work on both fundimental and applied research, achieving great success.

Diagnostic technologies: Through the optimization of existing methods and the application of new technologies, the diagnostic technologies for AI subtypes in China have been significantly improved. At present, HVRI has generated serum and antibodies, as well as diagnostic standards for H1-H15 and N1-N9. HI tests with reletively high specificity and accuracy were then established based on these materials. Many research groups have established ELISA and PCR/qPCR test for various AI subtypes. Although not widely applied yet, many researchers have been working on new methods, such as bio-chips that can test 16 HA subtypes and 9 NA subtypes at once, and GICA methods with improved accuracy and specificity that is convenient for on-site diagnostic tests.

Epidemiological studis: Through long-term surveillance, the characterists of epidemiology and evolution of avian in fluenza in China have been clarified. According to the continuous surveillance and research, the main subtypes in Chinese poultry are H5N1 HPAI and H9N2 LPAI. HVRI and CAHEC have conducted long-term epidemiological studies on H5N1 HPAI, through evolutional analysis on the circulating strains, confiming that these strains belong to different clades (e.g. clades 2.3.2, 2.3.4, and 7) and present different antigenicities. The matching evaluations of the vaccine strains (Re-6/5/4) show poor cross-protection among these clades. The survellance and epidemiological studies provide guidence not only for vaccine development and production, but more importantly, they support the national vaccination strategy and play a crucial role in policy making. Similar work will continue on H5N1, H7N9 and H9N2, which has significant importance in terms of public health. Moreover, more thorough and in-depth research on risk analysis and market chain analysis will also be conducted.

Fundamental research: Using reverse genetics and protein techniques, the key part of the genome that contribute to pathogenicity and transmissibility are examined and identified, and relevant virus-host mechanisms are revealed. HVRI influenza laboratory has been working on this for many years achieving great success. Reverse-genetics and site-directed mutagenesis technologies have been widely used to find the key location on the viral genome that are significantly relevant to the pathogenicity to different animal species. This work help scientists to predict influenza pandemics and the potential change of pathogenicity of certain virus strains. Meanwhile, researchers from the Chinese

Academy of Science investigate the function of specific viral proteins in order to find the potential treatment against influenza.

Vaccine development: Only one type of H5N1 HPAI vaccine (Reassortant Avian Influenza Virus Vaccine, Inactivated) is currently used national-wide in China. However, researchers continue optimizating existing vaccines and developing new ones. Because of the rapid envolution of the virus, the vaccine strain has to be updated accordingly and timely. It is suggested that an H9N2 mutant strain has already emerged, thus the urgent need to evaluate the protection of existing vaccine strains against new H9N2 strains. At present, many efforts has been made on improving the manufacturing techniques, e.g. substituting chick embryo cultivation by cell cultivation, which is now more and more widely used, while microcarrier culture technique and serum free culture techinque are now applied to the viral antigen production.

The research conducted by Chinese researchers has formed a solid basis to AI prevention and control. However, the rapid evolution of AI viruses, poses a threat to the public and animal health in China, especially the recently emerging H7N9 subtypes. More efforts and more international collaborations are required in this field.

LinkTADs

03.

Linking existing programs between EU and China

3. Linking existing programs between EU and China

3.1 Main research projects carried out by Chinese partners

Shanghai Veterinary Research Institute (SHVRI)

Department of Veterinary Public Health The department is currently researching on the epidemiology, immunology, pathogenesis, diagnosis and prevention of zoonotic diseases such as influenza, Japanese B encephalitis, rabies, tuberculosis, leptospirosis and toxoplasmosis, and in the development of rapid techniques for the detection of drug residues in animal food, aquatic products and environment. In addition to the zoonotic diseases, the department is also performing research on pseudorabies etc.

Department of Swine Infectious Diseases Research focuses on 1) epidemiological investigation of swine infectious diseases; 2) development of serology and immunological diagnostic reagents and kits; 3) research and development of novel vaccines, including genetic, subunits and viral-vectored vaccines against major emerging and reemerging diseases; 4) molecular dissection of virus replication process, via reverse genetic manipulation; and 5) virus-cell molecular interactions. The ongoing research focuses on the major swine viral pathogens including PRRS virus, swine influenza viruses (SIV), porcine circovirus 2 (PCV-2), CSF virus, etc. Using the reverse genetics method, it aims at investigation on the mechanisms of pathology as well as viral mutations, the regulation of gene expression in PRRSV and the development of new recombinant vaccines against PRRS, SI, etc.

Department of Avian Infectious Diseases Research projects focus on: 1) investigation of epidemics of avian diseases in China, focusing on AI, Newcastle disease, and avian chronic respiratory disease (caused by *Mycoplasma gallisepticum*); 2) pathogenicity and evolution of Newcastle disease virus strains from wild birds, waterfowl and chicken; 3) molecular markers of immune cells, the function of cytokines, and molecular immunology of poultry diseases, as well as constructing a platform on avian immunology research; 4) preparation of novel vaccines against chicken and waterfowl infectious diseases; and 5) development of efficient expression systems and recombinant techniques for the study of structural and functional proteins of avian pathogens, such as *Riemerella anatipestifer*, duck hepatitis virus, and paramyxovirus, etc.

Harbin Veterinary Research Institute (HVRI)

Research at HVRI covers a variety of infectious diseases of swine, poultry, horses, cattle and sheep, as well as zoonotic diseases, with specific focus on epidemiology, pathogenic mutations, aetiology and pathogenesis, technologies for preventing and controlling animal infectious diseases, basic immunobiology and immunology of infectious diseases, and techniques used for the cultivation and quality control of the laboratory animal. Till present, HVRI has developed more than 140 diagnostic reagents and vaccines, and achieved 335 significant scientific advances during its tenure. The institute successfully developed the first lentiviral vector-based vaccine (the Donkey leukocyte-attenuated vaccine), which has been widely used to control equine infectious anaemia virus.

Huazhong Agricultural University (HZAU)

Prof. Zhao Ling's group works mainly in the field of neurovirology, including the interaction mechanisms between virus and host immune systems, fast diagnosis and identification of neuroviruses, anti-viral drugs,

development of new vaccines and adjuvants, etc. In the last 5 years, the group has published several papers in international journals, including one publication on Cell Host & Microbe and four on the Journal of Virology.

China Animal Health and Epidemiology Centre (CAHEC)

CAHEC is OIE's coordinating centre on veterinary epidemiology, and it performs all duties related to OIE affairs. CAHEC also cooperates with FAO China in the China Field Epidemiology Training Program for Veterinarians (FETPV China).

China Field Epidemiology Training Program for Veterinarians

FAO is currently partnering with the Ministry of Agriculture (MoA) in China and international development agencies to develop the China FETPV in response to the serious need for trained practitioners in the field of veterinary epidemiology. FETPV China seeks to improve animal and public health using scientific and risk based approaches for the control of transboundary animal diseases (TADs) and emerging infectious diseases (EIDs). The program aims to be a self-sustaining in-service training model that will inform evidence based decision-making that will benefit the economy, the community and agricultural producers, including smallholders. It will do this by improving the knowledge, expertise and experience of veterinary field epidemiologists in government services. The objectivities of FETPV China are:

- Strengthen the knowledge and approaches on applied veterinary epidemiology in China;
- Apply interdisciplinary (One Health) approaches in epidemiology training;
- Create a sustainable program for training veterinary field epidemiologists capable of dealing with complex animal health problems;
- 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 FETPV program contains a series of trainings and workshops in various formats targeting different groups, including:

1. Veterinary Epidemiology for Executive (FETPV-E) training workshop that aims to enhance senior government officials' understanding of basic veterinary epidemiology and its role in disease control and thus strengthen their ability to develop effective animal and public health programs.
2. China FETPV Introductory Course, which is intended to provide participants with expertise in the basic concepts and applied approaches of field epidemiology, targeting participants such as veterinary professionals from provincial and municipality level Animal CDCs and national level veterinary institutions.
3. China FETPV 2-year program, which is a systematic training with will-designed modules, aiming to train veterinary field epidemiologists capable of dealing with complex animal health problems.
4. Chinese trainers' capacity development program that aims at training and engaging potential Chinese trainers to assist with the long term sustainability of the China FETPV program and epidemiology capacity development in China.
5. Partnering with the Career Field Education and Training Plan (CFETP), FETPV has also developed a series of joint workshops and trainings. These activities aim to enhance trainees' understanding on One Health

approaches, facilitate the implementation of One Health approaches in the field, and enhance cooperation among animal health and public health sector trainees at local level.

6. Alumni activities: A nationwide network for epidemiology has been gradually shaped through the early stages of China FETPV. The program will organise a series of activities to engage alumni from China FETPV-E, the introductory course and the previous 2-year program, as well as provide further support and services to the alumni. (please see Annex 1 for detailed introduction of FETPV program)

China Animal Disease Control Centre (CADC)

CADC carries out applied research related to diagnostic methods, epidemiology investigation and surveillance. The research group on swine diseases is mainly working on 1) developing standard/reference materials for diagnosis of major pig diseases such as PRRS, PCV and PRV; 2) implement eradication schemes for major pig diseases in large-scale pig farms; 3) carrying out applied research on highly-pathogenic PRRS, including research and development of DIVA vaccines, and improve diagnostic technologies; 4) genetic surveillance and analysis of HP-PRRS on-circulating strains and evaluate the protection efficiency of vaccines that are currently in use; 5) Evaluation of commercial diagnostic kits; 6) Development of clinical and laboratory detection technologies for African swine fever (ASF); and 7) research on PCV, PPV, swine hepatitis E and *Haemophilus parasuis*.

3.2 Main research projects carried out by EU partners

Centre de coopération internationale en recherche agronomique pour le développement (CIRAD)

CIRAD's Animal and Integrated Risk Management research unit (AGIRs) is a result of the fusion of several disciplines, bringing together fundamental and applied ecology, modern epidemiology, social sciences, risk surveillance and analysis, and modelling. The unit tackles the ecology and epidemiology of animal diseases at different scales by developing its research activities around three main questions. What are the conditions and determinants of pathogen emergence: real emergence, expansion of a pathogen's geographic area or host spectrum? What are the conditions and determinants of the maintenance of a pathogen and of a disease becoming endemic: persistence in an ecosystem or a commercial sector? What are the conditions and determinants of disease epidemics (spread, epidemic, pandemic)?

Examples of the projects in which AGIRs research unit is currently involved include the following:

- BiodivHealthSEA (Local impacts and perceptions of global changes: Health, biodiversity and zoonoses in Southeast Asia) http://www.biodivhealthsea.org/
- ComAcross (Companion Approach for Cross-sectoral collaboration in health risks management in SEA - ComAcross) http://ur-agirs.cirad.fr/en/projects/comacross
- REVASIA (Research for the evaluation of animal health surveillance) http://revasia.cirad.fr/en/
- Vmerge (Integrative and innovative research for improving surveillance and control of emerging vector-borne diseases of farm animals in Europe and neighbouring countries) http://www.vmerge.eu/
- DREAM (Reinforcement of Agricultural and Environmental RESEARCH in TFCAs) http://ur-agirs.cirad.fr/en/projects/dream
- ASFORCE (targeted research effort on African swine fever): http://asforce.org/
- RISKSUR (development and evaluation of scientific methodologies for cost-effective risk-based animal health surveillance): http://www.fp7-risksur.eu/

Royal Veterinary College (RVC)

Research activities within the Veterinary Epidemiology, Economics and Public Health (VEEPH) focus on livestock and companion animal epidemiology, veterinary public health and animal health economics. Overall, members of the Group are currently involved in over 70 research projects spanning four continents; Europe, Asia, Africa and South America. Research themes include antibiotic resistance, emerging diseases, livestock health and production, economics, welfare and behaviour.

Examples of the projects in which the VEEPH group is currently involved include the following:

- ASFORCE (targeted research effort on African swine fever): http://asforce.org/
- RISKSUR (development and evaluation of scientific methodologies for cost-effective risk-based animal health surveillance): http://www.fp7-risksur.eu/
- Controlling and monitoring emerging zoonoses in the poultry farming and trading system in Bangladesh: an interplay between pathogens, people, policy
- Establishment of a multi-sectoral strategy for the control of brucellosis in the main peri-urban dairy production zones of West and Central Africa
- Vet Compas (Veterinary Companion Animal Surveillance System): http://www.rvc.ac.uk/vetcompass
- NEAT (Networking to enhance the use of economics in animal health education, policy making and research in Europe and beyond): http://www.neat-network.eu/

National Veterinary Institute (SVA)

Research acitivities within SVA focus mainly on animal disease diagnosis and prevention, epidemiology, surveillence, and antibiotic resistance. SVA also carries out research relating to the impact of the environment and climate on diseases of veterinary and zoonotic importance including vecor borne diseases as well as feed contamination and and risk assessment. SVA has participated a number of ongoing EU proejcts such as:

- RAPIDIA-FIELD (Development of field test for rapid screening of pathologies as well as simple laboratory test in animals): http://rapidia.eu/
- RISKSUR (development and evaluation of scientific methodologies for cost-effective risk-based animal health surveillance): http://www.fp7-risksur.eu/
- NADIV (Co-circulation of avian influenza and velogenic Newcastle disease viruses - impact on pathogenesis, immune response and disease prevention): http://nadiv.eu/
- PROMISE (Phosphorus recycling of mixed substances): http://www.bonusportal.org/promise
- CCH fever, fighting energence of CCHF virus in Europe: http://www.cch-fever.eu/
- ECALEP (Emergence of highly pathogenic Caliciviruses in Leporidae through species jumps involving reservoir host introduction)

SVA also contribute to global development and poverty reduction with its core competeence areas such as control of antimicrobial resistance and diagnosis of infectious animal diseases and zoonoses.

3.3 Potential twinning projects (input needed)

On 9-10 April 2015, a workshop was organized under LinkTADs in Qingdao, China, with the main objective to develop new China-EU joint research projects that will fill the main knowledge gaps on the top emerging infectious diseases (EIDs) and transboundary animal diseases (TADs). Eight diseases were identified as priorities by LinkTADs partners in both the EU and China: avian influenza (AI), bovine tuberculosis (bTB), classical swine fever (CSF), African swine fever

(ASF), antimicrobial resistance (AMR), porcine reproductive and respiratory syndrome (PRRS), Japanese encephalitis (JE) and peste des petits ruminants (PPR).

The 2-day meeting was structured as a highly interactive workshop, with all the time dedicated to develop the framework of research project proposals targeting the eight priority diseases. Discussions took place in parallel in two separate meeting rooms (four disease discussions each), where participants chose which session to attend according to their interests. Each disease/session started with a 20-minute introductory presentation covering the disease background, its epidemiological situation in EU and China, the current research, prevention and control programs, and the main gaps that need be addressed. The discussion session that followed used participative methods to lead participants through the identification of potential research topics; its grouping under a small number of research objectives; the ranking of these objectives (by proportionate piling) according to their perceived importance; the definition of the activities and steps needed to complete each selected objective; and the identification of all relevant partners (including potential external partners); and grants that could be targeted to fund these projects.

The summary of the discussion sessions were presented to the bigger group. As a result of this workshop, eight concept notes (one per disease) are being currently finalized. They will lead to the identification of twinning projects where both LinkTADs and external partners can collaborate beyond the life-span of LinkTADs, addressing the major research gaps. Additional point project proposals submitted to national donors are described in D4.8.

The exchange programs under WP7 of LinkTADs will support the development of these concept notes into project proposals by allowing Chinese and EU partners to meet on a regular basis. The JE exchange program between SHVRI, SVA and CIRAD will for example support the preparation of a new project about the “Eco-epidemiology and risk analysis of genotype shift of Japanese encephalitis virus in pigs and mosquitos”, coordinated by SHVRI and recently funded by the Chinese Ministry of Science and Technology. Another exchange program on Epidemiology betwenn CAHEC, CIRAD and RVC will allow to implement a Chinese case study in the framework of the European RiskSur project, strenghtening the links between Chinese and European rearchers.

LinkTADs

04.

Areas of common interests

4. Areas of common interests

Previous work done under WP2 by RVC and CADC has identified the prioritised diseases by reviewing the published papers in EU and China, respectively. The results suggest that the EU and China share common interests in the research of **influenza, classical swine fever (CSF), African swine fever (ASF), rabies, porcine epidemic diarrhoea (PED), porcine reproductive and respiratory syndrome (PRRS) and brucellosis**. Moreover, although not intensively studied in China, **antimicrobial resistance** is also a significant concern in both EU and China (Figures 2 and 3).

More interestingly, almost 75% 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. It has been agreed among the Chinese partners that there should be more twinning projects in veterinary epidemiology, as well as linking epidemiology to laboratory research. The collaboration between FETPV China and LinkTADs has already been established, and activities have been organized that build up strong networks between EU (RVC and CIRAD) and China (VB, CAHEC) in the area of veterinary epidemiology.

Within the deliverable 2.2, several apparent gaps in research resources were highlighted. One issue of concern for both regions was the lack of awareness of and difficulties in access to postgraduate epidemiology courses. The other issues were highlighted in one region but not the other, in other words these are gaps which could potentially be filled by cross-collaboration between the two regions.

Filling the gaps in resources is a common interest shared between both regions, as is the need to address a lack of existing collaborations. This is encouraging and the identification of resource gaps in Figure 13 can help in targeting future collaborations more precisely. The need to prevent cross-border transmission of important diseases is of major concern for the EU. This may be influenced to some degree by stakeholders' definitions of the term 'borders', as many EU stakeholders may have in mind their own country's borders rather than the EU; while Chinese stakeholders may not relate to their notion of borders in the same way as China is so much larger than an individual EU country.

Following this disease prioritisation work at the European and Chinese level, a similar work has been implemented under WP3 to identify the areas of common interest within the LinkTADs consortium that could lead to future collaborations. As detailed in D3.2, based on the results of an online questionnaire, ten diseases for which at least one Chinese and one European partner and at least one epidemiology and one laboratory sciences partner showed a high interest 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, and rabies). As explained in section 3, the workshop organised in Qingdao on 9-10 April 2015 helped to initiate discussions of future collaboration between Chinese and EU partners in the framework of these identified areas of common interests.

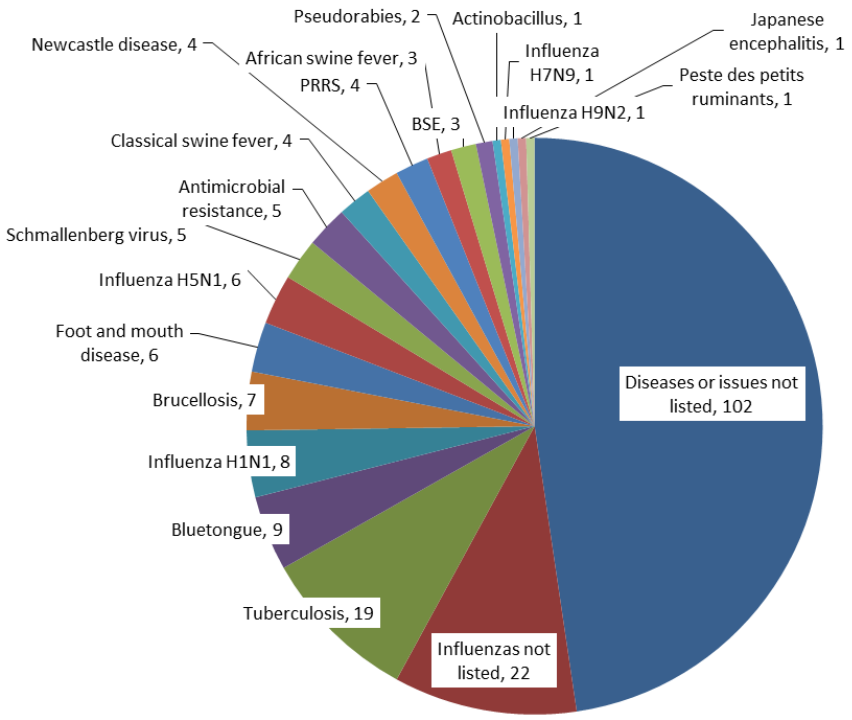

Figure 2 - Most researched diseases in the EU (no. of papers identified)

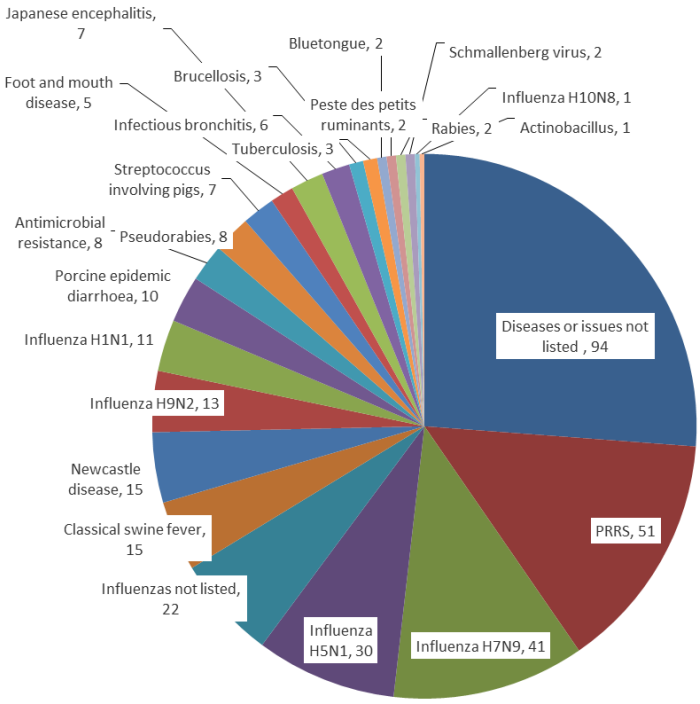

Figure 3 - Most researched diseases in China (no. of papers identified)

Annex 1: introduction of FETPV program