EPIZONE

EPIZONE - Final report

1 June 2006 – 31 March 2012




Network of Excellence for Epizootic Disease Diagnosis and Control

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EPIZONE - Network of Excellence for Epizootic Disease Diagnosis and Control

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EPIZONE
New generation researchers in pig viral diseases
Building bridges from labs to policy and the farm
Madrid, 12-14 July 2010
Abstracts, Conclusions and Recommendations
EUROPEAN COMMISSION
European Research Area

1 - Introduction

Cross-border cooperation needed

Epizootic diseases, like foot-and-mouth disease, have always been a risk to livestock in Europe. In the past decade, despite extensive control measures, many other outbreaks have occurred, including classical swine fever and avian influenza. Epizootic diseases can wreak havoc across the entire food supply chain from producers and consumers to international traders, administrators and scientists and can often result in huge amounts of slaughtered animals and high economic costs.
In 2006, bluetongue virus was reported in northwest Europe for the first time. Almost every year since, the continent has been threatened by foreign invaders like peste des petits ruminants and Crimean Congo haemorrhagic fever. And that threat is growing. In 2011 again a new virus, the Schmallenberg virus, was reported for the first time in Europe.

Intensified international trade and transport of animals, global tourism and climate change are all contributing to the spiralling danger of new infectious disease agents pervading our borders.
For those reasons prevention and control of epizootic diseases are international issues and need international solutions. Only with cross-border cooperation can we combat and deal with transboundary diseases, and develop the innovative and rapid control strategies that are needed. To guarantee high quality and safe, animal-related food production in Europe, effective surveillance, prevention and control of epizootic animal diseases are critical. In essence, better animal production needs better diagnostics, effective vaccination strategies, improved surveillance methods, and integrated risk assessment.

And that is why EPIZONE, the EU funded Network of Excellence for Epizootic Disease Diagnosis and Control, was launched in 2006.

The Network EPIZONE

EPIZONE is the largest international scientific network focused on epizootic animal diseases caused by viruses. The network kicked off in 2006 supported by the European Union's 6th Research Framework Programme to the tune of €14 million for a period of five years.

For better prevention and control of animal diseases as foot-and-mouth disease, classical swine fever and to combat the increasing threat of new and emerging epizootic animal diseases such as Crimean Congo haemorrhagic fever and West Nile fever, a coordinated international research approach is definitely needed. In this respect EPIZONE has established over the past nearly 6 years (funded period 1 June 2006- 31 March 2012) a worldwide network of 350 excellent scientists focused on animal diseases. The expertise of the scientists involved with EPIZONE is unparalleled. Some of Europe's, indeed the world's, most distinguished epizootic disease researchers are members.

Aims and general project objectives

The mission of EPIZONE was to improve research on preparedness, prevention, detection, and control of epizootic diseases within Europe to reduce the economic and social impact of future outbreaks of foot-and-mouth disease, classical swine fever, avian influenza, and other relevant epizootic diseases like bluetongue and African swine fever, through increased excellence by collaboration.

Current research resources and knowledge in the field of animal health and animal production were integrated in order to establish and improve quality and progress of research beneficial to early detection, and control measures for epizootic diseases. In addition, current fragmented knowledge, expertises, skills, and available infrastructure were employed in new integrated research projects to increase knowledge in order to develop and improve tools necessary to control rapidly (re)-emerging epizootic diseases in Europe with ethically

accepted measures. Consumers, farmers, the whole veterinary profession (including veterinary laboratories, animal health services, veterinary faculties of universities), and other stakeholders throughout the whole food supply chain were the parties interested in EPIZONE.

Ambition

Pulling together 350 acknowledged experts in animal disease from 17 veterinary research institutes in Europe, Turkey and China, EPIZONE's ambition was to improve collaboration, integrate and harmonise research, standardise the methodologies used in its partner countries, and support the introduction of innovative, improved, fast, and acceptable control measures to combat animal diseases.

This worldwide network, which included partners in Turkey and China as well as the Food and Agricultural Organisation and a small enterprise that specialises in online communications, covered all fields of interest in epizootic diseases of poultry, swine, fish, sheep, cattle, horses and wildlife. EPIZONE focussed on spreading excellence between partner institutes and beyond, on strategic integration, and on scientific integration on the research themes of diagnostics, intervention strategies, surveillance and epidemiology, and risk assessment.

Virtual Institute

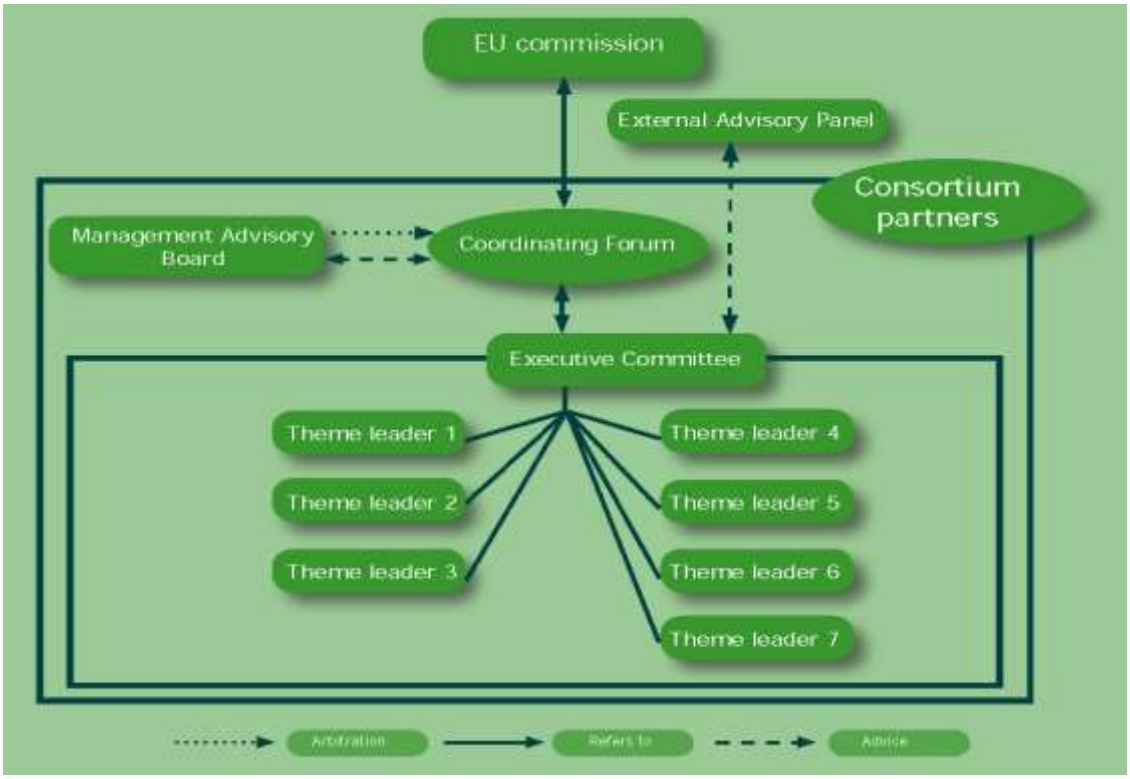
To achieve this, a virtual institute had to be developed, with focus on spreading excellence between partner institutes and beyond, on strategic integration, and on scientific integration. EPIZONE comprised virtual teams organised into three integration themes: Theme 1: Virtual Institute, Theme 2: Strategic integration and Theme 3: Spreading excellence and four scientific themes: Theme 4: Diagnostics, Theme 5: Intervention Strategies, Theme 6: Surveillance and Epidemiology, and Theme 7: Risk Assessment. Together they have promoted common access to resources such as collections of clinical materials and strains, expertise, high-containment facilities, and specialised equipment, provided training and exchange opportunities for both junior and senior scientists. They organised ring trials to harmonise and standardise diagnostic tests in partners countries to make fast and accurate control of animal diseases in Europe possible

The three integration themes have ensured the network ran smoothly. Theme 1 Virtual institute was responsible for the administrative and financial aspects of the network, including the development and implementation of the management structure. Theme 2 Strategic integration focused on strategic scientific

planning and integration, and coordinating the network's expertise, knowledge, data, resources and infrastructure. Spreading excellence within and out with EPIZONE was Theme 3's task. Using digital communication tools, flyers, reports, workshops and training courses, exchange programmes and internal networks like Young EPIZONE, Theme 3 stimulated networking and collaboration.

The four scientific themes: Diagnostics, Intervention Strategies, Surveillance and Epidemiology and Risk Assessment enabled an easy exchange of knowledge and supported the introduction of innovative, improved, fast, and acceptable control measures to combat animal diseases.

Governance



The Executive Committee (EC) was the daily management of the network. The Committee consisted of the Coordinator and the Theme leaders and they made plans and implemented the decisions of the Coordinating Forum (CF). The EC met every two months to discuss the management issues of EPIZONE, either in person or by teleconference. The CF was the decision making body and consisted of representatives from each partner institute. The CF was chaired by the Project Manager of the network and met twice a year (Annual Meeting and half yearly meeting Lelystad).

The Governing Board was renamed the Management Advisory Board (MAB) after the first year of the project. MAB members were directly linked to partners of EPIZONE. MAB consisted of five democratically elected members following the procedure described in the Consortium Agreement. MAB members were elected for 2.5 years. At the end of the period three positions were renewed by the same procedure. The MAB elected a chair whose role was to check the activities in WPs in relation to the objectives of the Network. As very experienced managers the MAB advised the CF, the decision making body, and the Coordinator in the broadest sense, mainly at the management level.

The scientific activities of the Network were guided by an External Advisory Panel (EAP). EAP members were independent from EPIZONE. Their role was to advise EPIZONE at the scientific level, identifying priorities, making decisions and suggesting directions in research, mainly by adjusting future plans as described in the working programmes/joint programme activities for the coming period of 18 months. Alternatively, on request of the CF the EAP could be asked for their opinion on for example new research topics for EPIZONE.

Young EPIZONE

In 2008 to invest in future scientists, EPIZONE launched its "Young EPIZONE" programme, in which young scientists could meet senior scientists from all over the world, follow dedicated training and were informed about job opportunities. Now, five years after inception, Young EPIZONE is a strong and vital network of young researchers and one of EPIZONE's greatest assets.

From the outset Young EPIZONE, which was open to PhD students and new post-docs within EPIZONE, has not only been for young people but also run by young people. During the 2008 annual meeting in Brescia, Young EPIZONE was formalised as a new work package with a PhD student (Eefke Weesendorp, from The Netherlands' Central Veterinary Institute,) at the helm. Every year, during the Annual Meeting, Young EPIZONE members organised their own (day) programme with oral presentations and workshops.

The effectiveness of Young EPIZONE has also been noticed outside the Network. In the reviews of the EPIZONE annual reports the European Commission noted the "particularly interesting" creation " where tomorrow's 'to be' scientists could listen to talks and discuss with established experts. This coddling and interest in career development may develop into an excellent tool to keep the brains in Europe". Perhaps the biggest payoff from this investment in the future generation of scientists, however, will be epizootic disease research in Europe as it seems clear that Young EPIZONE is poised to become EPIZONE's enduring legacy.

Internal calls

EPIZONE's chosen method of stimulating new collaborations, filling gaps in its existing research agenda, and ultimately consolidating its future, was its strategic Internal Call (IC) programme. Kicking off in 2007, the Internal Call programme provided up to 12 months of funding for integration activities within established research projects as well as new and original research pursuits within EPIZONE's scientific themes. The projects, which had to involve a minimum of four EPIZONE partners, needed to show a clear integrative approach and could include non-research activities such as those related to facilities or resources — for example bio safety labs or high containment units. The focus of the call changed each year covering topics such as serological diagnostics, joint animal experiments, emerging diseases, and molecular epidemiology. In total, EPIZONE approved 12 projects during the four-year internal call programme. An overview of all Internal Call projects can be found in chapter 7 at page 53.

External reviews

The networks' activities were very much acknowledged by the European Commission: EPIZONE was selected as an EU flagship projects by the European Commission to be presented at the World Expo in Shanghai in June 2010. In addition, the framework of the forthcoming 'Impact Assessment Conference on Agriculture and Food' held in Brussels in July 2011, highlighted eight success stories as selected by the European Commission's DG Research, from the vast list of FP6 projects. EPIZONE was chosen as one of these eight.

For each year of its existence the Network was subject to an external independent review on the basis of its annual activities and intended plans for the next period. For Years 1, 2, 3 and 4 the project was rated as 'Good-to-Excellent', that is "fully achieved its objectives and technical goals for the period and even exceeded expectations".

Communication and networking

A public and private website for internal and external communication were built and a quarterly newsletter was published as a more active information source to keep as many people as possible, in- and outside the Network informed For increase education and the spread of knowledge, courses, workshops, training and scientific missions (short term missions) were organised and E-Distance learning programmes were made available on the website. Besides the face to face management meetings work packages and theme meetings , EPIZONE organised an Annual Meeting each year, hosted by one of the partner institutes. The number of abstracts submitted rose to over 200 and the number of attendees to over 350 participants from all over the world, scientists, policymakers as well as stakeholders. To invest in future scientists, EPIZONE launched its "Young EPIZONE" programme, in which young scientist could meet senior scientists from all over the world, follow dedicated training and be informed about job opportunities. Three Building Bridges workshops were organised to introduce European and Asian scientists to each other and encourage cooperation and exchange views.

Table: 1 Dissemination of information of research and development at **non**-EPIZONE meetings

year	Nr meetings	Oral presentations	Poster presentations	Total audience	audience	countries addressed
1	19	28	5	>3500	Research scientists, OIE, FAO, EU, industry	Europe, USA, North Africa
2	30	23	11	>4000	veterinarians, research scientists	Europe, China, South Africa, USA
3	33	40	7	>4000	Research scientists, veterinarians, industry, policymakers	Europe, USA, Africa, China, Russia, Bhutan
4	44	51	13	>6000	Research scientists, veterinarians, policymakers, industry, media	Europe, China, USA, Canada, Australia,
5	33	47	10	>6000	Research scientist,veterinarians policymakers (DG SANCO, OIE, FAO), industry, media,	Europe,China, USA, Canada, Japan, Australia, Nordic and Baltic countries
total	159	189	46	23500		

Databases

On the database site EPIZONE partners shared all manner of data and data sources in a simple way. The EPIZONE "Superordinate database" is the gateway to images, databases, other websites and presentations. A list of databases is summarised in table 2 and 3.

The 'European Online Database on Epizootic Diseases' was a triumphant illustration of not only the difficulties of assessing data across borders but also of the potential benefits of being able to do so.

Table 2: EPIZONE databases- animal diseases, available for EPIZONE members and on request

Animal disease	available				
	GMM/GMO	mAbs	Sera	viruses	specimen
African Swine Fever	x	x	x	x	
Aviare Influenza		x	x	x	
Bluetongue	x	x	x	x	
Classical Swine Fever	CMM-DIVA	x	x	x	x
Foot and Mouth disease	x	x	x	x	x
Rift Valley fever		x	x	x	
African horse sickness		x	x	x	
West Nile fever	x	x	x	x	
Peste des petits ruminants		x	x	x	
Rinderpest		x	x		
Swine Influenza		x	x	x	

Table 3: EPIZONE databases

Name	Short description
Superordinate database	A gateway to databases on reference material of major epidemic diseases
PCR	Protocols for validated PCR tests for some viruses
Cell lines	Available cell lines virus culture
Vaccine Technologies	Protocols for techniques used in vaccine development
Protocol for diagnostics	Protocols for diagnostic tests for different viruses
Links to diagnostic methods	Links to some online available protocols for diagnostic tests
European online Database	Information of epizootic disease outbreaks in Europe
Virus and DNA chip probes	Sequences of probes of the EPIZONE microarray chip
EPIZONE molecular epidemiology	Prototype database of biological agents and their sequences
RNA/DNA	Available reference RNA/DNA in EPIZONE
Fish pathogens	Geographical distribution, search reports, statistics and configuration, links on VHSV
Virus images	Images of disease symptoms and pathology
Disease images	Images of disease symptoms and pathology
FAQ Top 200	Answers to the 200 most frequently asked questions on epizootic animal diseases
Expert database	Database with EPIZONE experts to find a colleague with a certain expertise

Future

The network's biggest challenge has been strengthening collaboration during the EU funding period in such a way. After a funding period of almost six years, EPIZONE has emerged as THE platform for researchers and diagnosticians to exchange information, communicate and to overcome geographical and other boundaries to combine their efforts to control major epizootic animal diseases.

To that end, EPIZONE recreated itself as a European Research Group to carry on the legacy. The new entity, whose founding members are all EPIZONE's current partners, started in May 2012. Its inaugural annual meeting took place in Brighton, England, in mid-2012, and new partners will be able to join the group from 2013.

If its predecessor's success is any indication, the new EPIZONE is almost guaranteed to produce strategically driven, state-of-the-art research of world-renowned quality that significantly boosts Europe's arsenal of weapons against epizootic diseases of mass destruction.

Acknowledgements

All participating institutes are grateful for funding and support from the EC for the duration of the EPIZONE project.

2 - Project objectives and how they were reached

General Project objective

The mission of EPIZONE is to improve research on preparedness, prevention, detection, and control of epizootic diseases within Europe to reduce the economic and social impact of future outbreaks of Foot-and-mouth disease, Classical swine fever, Avian influenza, and other relevant epizootic diseases like Bluetongue and African swine fever, through increased excellence by collaboration.

Current research resources and knowledge in the field of animal health and animal production will be integrated in order to establish and improve quality and progress of research beneficial to early detection, and control measures for epizootic diseases. In addition, current fragmented knowledge, expertises, skills, and available infrastructure will be employed in new integrated research projects to increase knowledge in order to develop and improve tools necessary to control rapidly (re)-emerging epizootic diseases in Europe with ethically accepted measures. Interested parties of EPIZONE are consumers, farmers, the whole veterinary profession (including veterinary laboratories, animal health services, veterinary faculties of universities), and other stakeholders throughout the whole food supply chain.

The mission can be divided into four main objectives

Objective 1

To establish Joint Scientific Integration Activities encompassing research on four themed areas, Diagnostics, Intervention Strategies, Surveillance and Epidemiology, and Risk Assessment related to preparedness, prevention, detection, and control of epizootic diseases.

In general: These activities involve integration and initiation of (new) international research projects, harmonisation of diagnostic tools, development of joint intervention strategies and decision support systems. These joint
scientific integration activities also include improvement of share of materials (e.g. collections of pathogens, clinical materials, biological standards and materials), databases (e.g. DNA sequences), and computer systems (e.g. Geographic Information Systems, Laboratory Information Management Systems, and Decision Support Systems) in order to guarantee optimal use of available and/or generated materials, information, and systems.

How this objective was reached

Scientific integration activities were organised in 4 scientific themes, *Diagnostics, Intervention Strategies, Surveillance and Epidemiology, and Risk Assessment.* In the first JPA these themes started with 4 work each packages, most of them planned to continue the full length of the project period. In most WP's scientists from more than half of the EPIZONE institutes participated. In following JPA's new integrating activities were started out of the joint funds, anticipating new developments within the network and the outside world.
Each year, progress of the different WP's of all 4 themes were discussed during half year meetings in Lelystad. In these half year meetings all WP leaders, theme leaders, External Advisory Board members and Governing Board/ Management Advisory Board members participated. This broad membership strengthened the integration between WP"s and themes. Each EAB member "adopted" a scientific theme, participated in round tables per theme and in such providing direct feedback to WP leaders and theme leaders.
In addition to the half year meetings, the Annual Meetings were an excellent opportunity to extend the personal networks of scientists. Scientific sessions during the Annual Meetings were organised as thematic sessions, further strengthening the integration in these fields.

Objective 2

To develop and implement Strategic Integration Activities for establishment of international priorities in scientific activities, strategic review and planning in themed areas.

In general: This also includes strategic plans for the formal and informal training of graduate and post-graduate scientists, the exchange of PhD students between partner institutes, and, where possible, between other European non-partner organisations/institutes.

How this objective was reached

Strategic Integration Activities were organised in 3 horizontal themes: Virtual Institute, Strategic integration and Education. Activities in theme virtual institutes concentrated on the organisation of the network as a whole, the half yearly meetings and Annual Meetings and as such essential for the strategic review of the on-going activities of the network and further planning of new activities such as setting criteria for and organising calls for new integrating activities. A total of 12 new Internal Calls were started during the life of EPIZONE in addition to the on-going 'structural work packages". Evaluation of calls were carried out by a delegation of the Executive Committee and final decision was made by the Coordinating Forum. Within theme 3 "Education" short term missions were organised and supported stimulating exchange of scientists between institutes. Preparedness for new and emerging animal disease threats was enhanced, for example by the quick response to the PPR outbreak in Morocco. Reagents were distributed and a ring trial organised to enhance the preparedness of the participating laboratories. Especially for young scientists, Young EPIZONE was created , involving young scientists of many institutes outside EPIZONE.

The Annual meetings of EPIZONE have proved to be an excellent tool for integration of science and scientists. The first AM was a closed meeting in order to learn to know each other within the network, later AM's were open to external participants and from the 3rd AM onwards, a marketplace for external projects was organised. External projects were offered free meeting space during the AM in order to facilitate integration with other projects but also as an attempt to reduce travel costs and time for scientists.

Objective 3

To establish Spreading of Excellence between partner institutes and beyond in order to ensure optimal use of scientific resources, expertises, skills, and specific knowledge of (improved or new) methods and of (new or re-) emerging diseases.

In general: Mobility plans for experts with very specific developed skills will be organised. As a part of contingency plans, this also includes mobility of experts between the partner institutes, and where possible, between other European non-partner organisations in acute changed situations such as during future outbreaks of epizootic diseases. Modern electronic communication tools such as "share point technology" will be developed to distribute present and newly generated knowledge.

How this objective was reached

Spreading of excellence between partner institutes was realised by means of a broad participation in the different work packages within each of the themes, by participating in the Annual Meetings, workshops and short term visits. Spreading excellence beyond EPIZONE was realised by opening the AM for external participants and other projects. Furthermore a limited number of external experts could participate in the different work packages. EPIZONE was able to quickly respond to the outbreak of Blue Tongue in North Western Europe by organising a successful satellite symposium during the second AM in Brescia. The share point technology was used for the internal website to function as a `project place` and document archive for the participants. Both the EPIZONE external website as well as the EPIZONE electronic newsletter were used for external communication. During the five years both the number of visitors to the website and the receivers of the newsletter developed well.

Abstracts of the AM were available as downloads on the website; Last of all, the work of EPIZONE has resulted in more than hundred scientific publications.

Optimum use of expertise, resources and skills were facilitated by organising different databases within the network, resulting at the end of the project in a super ordinating database with links to all developed databases.

Objective 4

To develop and establish a sustainable and democratic management structure based on a "virtual institute" with clear rules, written processes and procedures including mechanisms for review and assessment, and appropriate administrative support as defined by a Consortium Agreement.

In general: This will generate sustainable interactions between European and non-European institutes that play, nationally and internationally, central roles in epizootic research. In addition, a website with share point technology will be developed and established in order to effectively manage and communicate in a structured way within and outside EPIZONE.

How this objective was reached

The project team (administration bureau consisting of a project manager, communication officer, legal officer and financial officer) of the coordinating institute has supported both the coordinators representative, the EC members, EAB, MAB and CF members in all their activities. In the consortium agreement

between participating members, clear rules were set for the democratic structure of the network. During CF meetings, first priority was to reach general consensus and exceptionally voting was required to reach decisions. During the course of the project, the original Governing Board was replaced by a management advisory board. Main task of the MAB was to assist, advise and supervise the coordinator in order to guarantee the quality of the work and the democratic structure of the network. During the project clear rules were established for a.o. review of project proposals to new internal calls, review of annual reports by first Theme leaders and secondly CF members. For each Annual Meeting a scientific committee was selected, which included some of the External Advisory Board members.

CF meetings and new JPA's were prepared by the coordinator together with the executive committee. At least 1-2 meetings per year were organised for the EC in addition to telephone meetings.

The external project reviewers on behalf of the European Commission were allowed to participate in both the Annual Meetings and the half yearly meeting in order to give them optimal access to the activities within the network. During the last years of EPIZONE, partners agreed to the formation of an EPIZONE European Research Group (ERG) to continue the activities of the (sustainable) network in the coming years.

3 - Summary of deliverables and milestones

EPIZONE 's major achievements

EPIZONE achievements (major outputs and spreading excellence) form important benefits for the control and prevention of epizootic diseases in Europe. Scientists in the network, in and outside Europe, can get in touch with each other to solve epizootic animal disease problems together easily. Their scientific opinions and recommendations are more and more internationally based, agreed, and accepted. They increasingly harmonise and standardise their diagnostic tests, protocols and research programmes. By using the research network built by EPIZONE the experts aim to identify newly introduced high risk infectious diseases early. Knowledge of such infectious disease risks will also increase our chances to prevent new introductions. Potential routes of introduction can demonstrated by means of geo-information systems.

Almost all deliverables (96%) and milestones (95%) are achieved in the EU funding period from 1 June 2006 until 31 March 2012, see table 4 page 23.

EPIZONE major outputs

- ### EU EPIZONE RNA panels

Within the network a number of EU EPIZONE RNA panels for important epizootic viruses have been developed. They include pestiviruses, bluetongue virus, avian influenza, classical swine fever virus, and foot-and-mouth disease virus. These RNA panels are valuable reference materials which can be used by diagnostic laboratories to validate their diagnostic tools. Laboratories within and out with EPIZONE have shown an interest in these RNA panels and several laboratories are currently using these panels .

- ### EPIZONE DNA-Chip

The EPIZONE DNA-Chip which was developed and partially validated by EPIZONE partners covers at least 37 virus families and can be used to accurately detect, determine and differentiate important epizootic viruses. Within the network raw chip analysis data were stored in a unique database and the homogeneity of the data analyses, from the different partners, was performed via a unique web based tool (DetectiV) linked with the database. Several partners also successfully used the developed DNA chip for discovery of new emerging epizootic viruses, for example Schmallenberg virus. In the final period of the network a shift was made to high quality custom made chip production with in situ oligo synthesis by the company Agilent.

- ### Novel real-time PCR assays

During the running time of the network a number of real-time RT-PCR assays for detection of epizootic viruses have been developed. Several of these assays have been successfully implemented in partner laboratories. A good example of these real-time PCR assays developed by EPIZONE is the novel real-time PCR assay for classical swine fever virus developed which can quickly and accurately differentiate the wild-type or naturally occurring virus from the C-strain vaccine viruses, a critical differentiation when managing disease outbreaks.

- ### European online database on epizootic diseases

A European online database on Epizootic Diseases was developed as an early warning system for epizootic animal disease outbreaks. A protected internet site was created to register for access and data entry. The database was made available online to all partners. Laboratories throughout Europe have access to this European online database on epizootic diseases, which includes an EPIZONE-designed mapping tool, to share and map epidemiological data (see table 3 page12). The basic concept of a surveillance database as an instrument for risk assessment and early-warning is gaining acceptance by decision makers in the EU member states and the European Commission (DG SANCO).

- ### EPIZONE databases

During the life of the EPIZONE project a series of databases were developed to share relevant data related to epizootic animal diseases.
This includes data on:

- animal diseases,
- materials (virus strains, DNA/RNA sequences, clinical materials, reference materials etc.),
- diagnostic methods,
- fish pathogens,
- micro-array testing,
- BTV outbreaks, and
- epizootic disease outbreak in the EU.

To guarantee the sustainment and the accessibility of the developed databases it was decided to invite reference institutes or institutes active in the specific fields to host and maintain the specific databases. A database coordinator was appointed to set up a superordinate database as an overarching database of all databases developed and active within EPIZONE. The superordinate database can be accessed via the EPIZONE website and forms the portal to all the developed EPIZONE databases.

• Dedicated Geographical Information Systems (GIS)

Dedicated Geographical Information Systems (GIS) in different field of epizootic animal diseases were established and implemented for recording and epidemiological analysis. This included a GIS for fish diseases e.g. Koi Herpes virus, a GIS-based risk assessment system for the impact of climate change on the emergence of CCHFV in livestock in Europe and additional GIS systems for specific epizootic diseases. The currently developed GIS systems within EPIZONE are a valuable tool for epidemiological studies and results of this work have been included in a number of EPIZONE research papers.

• A Clinical Decision Support System for Classical Swine Fever

In this work a complete CDSS protocol was developed to support a reliable and swift clinical decision of classical swine fever in the field. Since actual data of clinical CSF suspicions or real CSF outbreaks were not available, results of experimental infection data from several experiments executed by participants (investigating the sensitivity of the CDSS to detect CSF outbreaks) were discussed to validate the newly developed CDSS-protocol on herd-level.

• Raised preparedness regarding PPRV within Europe.

Organising a ring trial on PPRV diagnostics a raised preparedness regarding PPRV within Europe. To do this a series of PPRV positive samples was circulated among at least six EPIZONE partner institutes. The leading institute was partner CIRAD in France, which has a recognized expertise in the field of PPRV. All participating laboratories were able to show an adequate performance of PPRV RT-PCR and PPRV serology, which demonstrated that EPIZONE is prepared to detect a PPRV introduction in Europe as needed.

• Standardised import risk assessment approach for epizootic diseases

In order to assess the need for standardization of animal and animal product import risk assessment a review to characterize existing assessments (IRAs) was undertaken. An audit spreadsheet in Excel was developed consisting of three sections, addressing (a) hazard identification, (b) risk assessment, and (c) risk communication. This audit form was shown to be a helpful tool in comparing import risk assessments (IRAs) currently executed within EU.

• Sustainable scientific integration

Through the developed integration activities on epizootic animal disease research and the establishment of the EPIZONE European Research Group (ERG) as the follow up sustainable structure of the EPIZONE network, EPIZONE has accomplished the creation of sustainable scientific integration between veterinary research institutes in Europe. The EPIZONE ERG will continue all basic network activities and aims to act as a solid international network of veterinary research institutes able to rapidly respond to new emerging epizootic animal diseases in Europe.

• Harmonisations and validations

Harmonisation and validation of techniques and protocols etc. was one of the important activities of the network. Harmonisation efforts were completed for:

- detection techniques and development and distribution of reference materials,
- approaches for testing antivirals,
- surveillance programmes for a number of infectious diseases,
- molecular epidemiology analyses for a number of epizootic diseases (FMDV, PPRV, AI, BTV etc.), and
- wildlife surveillance protocols.

Validation efforts were completed for a number of diagnostic assays including: several commercially available assays for epizootic animal diseases, several DIVA diagnostic assays and several pen-site detection methods (LAMP, LFDs etc.).

• Implementation of protocols

Protocols implemented at partner institutes of the network include:
- standardized protocols for disease control;
- guidelines for epizootic diseases risk assessments and
- standardised import risk assessment approach for epizootic diseases.

The aim will be to implement more protocols within the sustainable structure of the EPIZONE ERG, especially in the field of new and emerging epizootic animal diseases.

Spreading Excellence

• Young EPIZONE

With this strong and vital network of young researchers EPIZONE has invested and continues to invest in future generation scientists (> 100 participants). During annual meetings the core group of the Young EPIZONE group organised their own event with training and workshops, for example, on communication skills, presentation skills and job opportunities. The group was also invited to the yearly Theme 5 annual meetings. At both meetings the young scientists had the opportunity for networking and interaction with senior scientist.

• Building Bridges workshops

Three building bridges workshops were organised, in 2008, 2010, and 2011, with the aim to encourage cooperation and to exchange views between young European and Asian scientists in the field of epizootic animal diseases. The meeting was held twice in China, Shanghai and Beijing and once in Europe, Madrid. EPIZONE has financially supported the young scientists to make it possible for a large amount of young scientists to participate in the meetings.

• EPIZONE Annual Meetings

The EPIZONE annual meetings were hosted by a different EPIZONE partner every year. Participants and stakeholders visiting this meeting came from Europe and beyond. Each year the meeting had a special topic, eg: Bluetongue satellite, Emerging and transboundary diseases, Major epidemic threats, Schmallenberg virus. The high quality scientific programme and the special topics attracted scientists from within the network as well as scientists from other related networks.

- ## Periodic (quarterly) e-newsletters (EPIZONE update)

The EPIZONE newsletter was circulated periodically to communicate EPIZONE scientific outputs and information on courses and events, and also information from the network management. In the first two years of the network the newsletter EPIZ-O-News was sent as PDF to all EPIZONE participants. Later on, the e-newsletter "EPIZONE Update" was also sent to stakeholders, industry, EC official, veterinarians and scientists outside the network (circa 1000 addresses).

- ## Short term missions and training courses

EPIZONE has offered participants a great opportunity to learn more about the scientific work carried out by the partner institutes: the short term mission programme. This short term mission programme was open for scientists and also technicians of the partner institutes. The visits to other EPIZONE partner institutes had to be relevant to EPIZONE objectives. More than 65 scientific missions were organised during the working period of the network. Each scientist who went on a scientific mission produced a mission report which was made available via the EPIZONE website.

- ## Sharing of knowledge

An important asset of the EPIZONE network was the sharing of knowledge between scientists in the field of epizootic animal diseases and the exchange laboratory techniques and protocols used at partner institutes. This kind of knowledge sharing often went hand in hand with sharing laboratory tools, tool-boxes and specific reagents (monoclonal antibodies, immune response proteins etc. etc.). Such knowledge sharing and material sharing was very helpful for diagnostics and studies performed at the different partner institutes.

- ## Development of a rapid research response network

Within EPIZONE an internal network of scientists experienced in high impact emerging epizootic animal diseases was established. This internal network was created to enable scientist to find each other as quickly as possible in emergency situations. The network functioned successfully during the outbreaks of AI, BTV, and SBV. T The development of standardised diagnostic tests at partner institutes was supported, enabling the network to be prepared for an outbreak of PPRV .

- ## Peer reviewed publications

Within the funding period of EPIZONE at least 145 peer reviewed scientific publications were produced as a result of research performed in the network or supported by the network. In addition a number of publications are in preparation, have been submitted for publication or are in press.

- ## Workshops

To support the training of network participants and of related workers, at least 20 workshops were organised for scientists, decision makers, and sometimes stakeholders. Several of the workshops were laboratory based too.. Six workshop reports with workshop outcomes were made available as downloads on the website.

- ## E-distance learning programmes

As a modern education tool E-distance learning programmes were made available on the EPIZONE website. The subjects of these programmes included : Animal health and production, -Transboundary diseases, -Zoonotic diseases, -Epidemiology and risk assessment, -Laboratory animal medicine, and –Statistics.

- ## Annual Meeting proceedings

At every EPIZONE annual meeting an abstract book was published with abstracts from the invited speakers, keynote lectures, the oral presentations and the poster presentations of the annual meeting. All abstract books are available as free download on the EPIZONE website.

- ## FAQ-sheets

To help EPIZONE participants and external visitors to the EPIZONE website navigate their way in the EPIZONE network FAQ-sheets for use within the epizootic animal disease research network were developed. During the first years of the network these FAQ-sheets were very helpful and improved the efficacy of the network.

- ## Links

To embed the EPIZONE network within the wider animal health community links between veterinary scientific institutes, stakeholders and related scientific projects were established. At present these links are used in both directions and clearly contribute to support contacts between people and institutes in the field of animal health.

Table 4 : Milestones and Deliverables 1 June 2006- 31 March 2012 month 70

	MILESTONES				DELIVERABLES			
Year	**No**	**Achieved**	**Continued**	**Failed**	**No**	**Achieved**	**Continued**	**Failed**
1	59	58	1	0	48	48	0	0
2	100	95	1	0	95	95	0	0
3	121	116	3	2	121	115	2	4
4	131	119	5	7	121	111	3	7
5	138	133	2	3	147	141	1	5
Total %	**549**	**521 (95%)**	**12**	**12**	**533**	**510 (96%)**	**6**	**16**

EPIZONE

疫病控制技术领先

中国农业科学院兰州兽医研究所是**EPIZONE**项目的十九个合作伙伴之一。该项目是

- 以口蹄疫、非洲猪瘟、猪瘟、禽流感西尼罗河热和小反刍兽疫等动物疫病为研究对象的最大的国际科技合作网络
- 来自欧洲、中国、土耳其的三百多名科学家并肩合作，优化并完善动物疫病防控措施。
- 主题：诊断、疫苗研发、流行病学及检测、风险评估

www.epizone-eu.net

EPIZONE: 欧盟委员会动物流行病诊断和控制的优秀网络 (2006 – 2011)

- 联系人：殷宏 电话：+86-931-8342515； 传真：+86-931-8340977；
  电邮： ttbdcn@public.lz.gs.cn 中国甘肃兰州市徐家坪1号

4 - Impact of the project on the field of epizootics

EPIZONE has created an unique opportunity for scientists from different veterinary fields to interact. Scientist who worked on different animal species or different pathogens in different countries, had the chance to meet each other during EPIZONE meetings and in work package activities. This was enhanced by the structure of and the working within scientific themes: Diagnostics, Intervention strategies, Epidemiology, Surveillance and Risk assessment.

EPIZONE has stimulated a completely new quality of working together — exchanging data, exchanging protocols, conducting animal trials together, developing test systems together, even independent of funding in some cases. The network really had a high impact, both at the laboratory level as well as the exchange of knowledge between scientists.

EPIZONE brought scientists together and thereby improved the understanding of different aspects of animal related food production in the various member states. As a consequence, scientific opinions and recommendations from the network have been and will be internationally based, agreed, and accepted. EPIZONE has functioned as a platform and intends to continue to do so within the EPIZONE European Research Group.

A main achievement of the EPIZONE project are the connections that were made and the contacts that now exist, not only with scientists from all over Europe, but also with Turkish and Chinese scientists. Trust between scientists has grown because they know each other personally after meeting at the annual meetings and the half yearly meetings of EPIZONE.

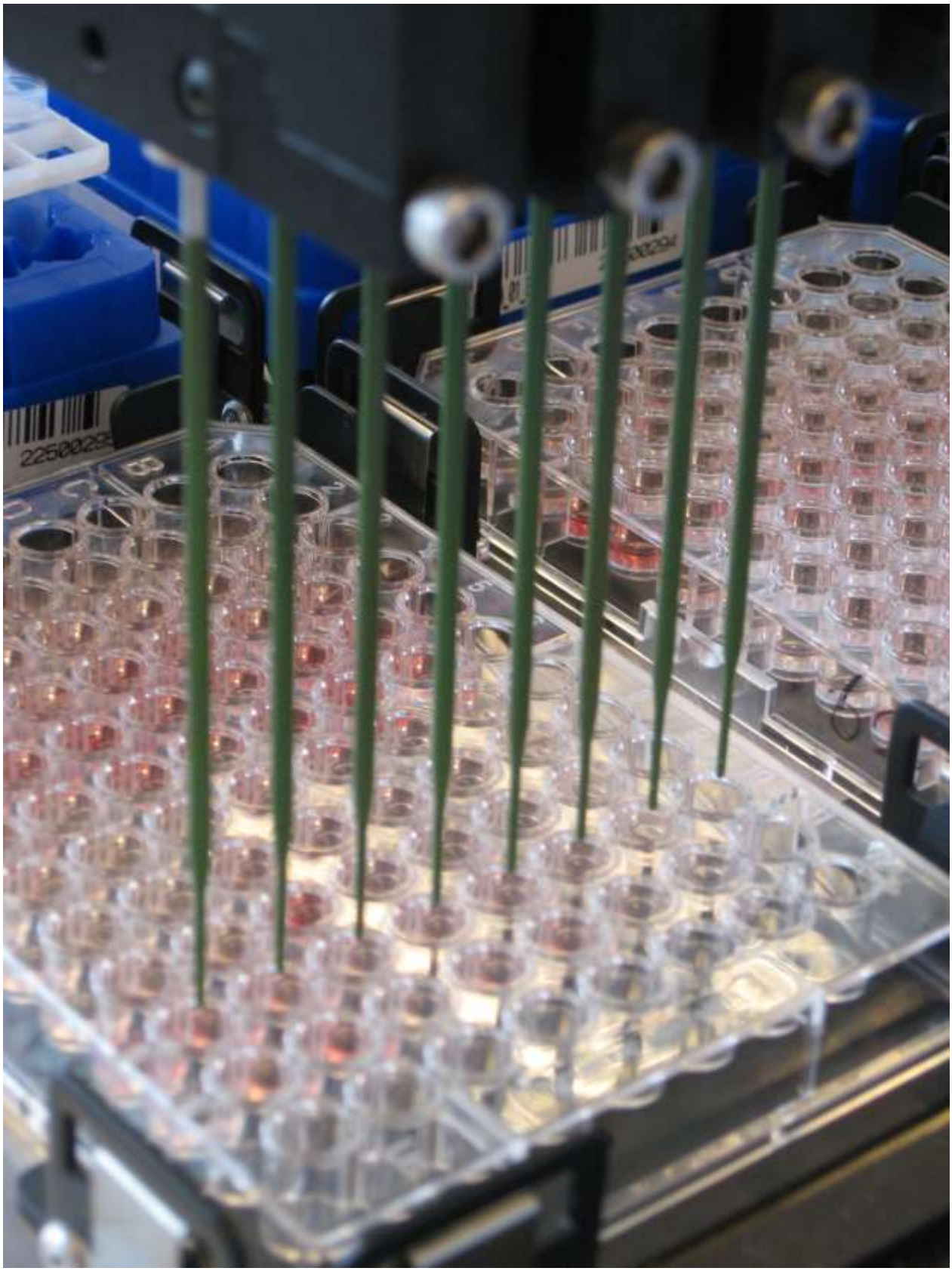
As a result of the close cooperation between the national research institutes within the frame of EPIZONE, it is now possible to exchange experience and share unpublished diagnostic protocols within a very short time, thus providing standardised detection methods and enabling a harmonised control of epizootic disease outbreaks on an EU level.

One of the greatest benefits of EPIZONE is the network that we have established. It was shown how important it is to collect data in a standardised way and to jointly generate basic biological research results. Moreover the benefits of sharing data and information across member states has been demonstrated. As a result of these, rapid research responses to new emerging epizootics are possible.

- After the introduction of bluetongue (2006) in Europe, there was an immediate exchange of protocols, materials and knowledge, which would have taken much more time in the absence of the established network of EPIZONE. The network quickly responded to requests from international organisations, FAO (within EPIZONE), WHO, and OIE, by providing access to experts , the exchange of experience, and making standardised detection methods available to the affected countries.
- When the outbreak of peste des petits ruminants in Morocco became a threat for Europe (2008), EPIZONE organised a ring trial among EPIZONE partner institutes, disseminated reference materials and distributed a test kit in order to have institutes prepared.
- Again in 2011, at the start of the outbreak of Schmallenberg virus, the EPIZONE network allowed scientists to find each other quickly and they relied on each other to exchange materials and share knowledge.

The exchange of knowledge between scientists has made it possible to jointly develop an online European Superordinate Database on epizootic diseases (table 3 page 12), to standardise diagnostic tests, intervention strategies, and reference material that can be used to validate diagnostic tools. Also novel real time PCR assays, and risk assessment protocols are established.

Altogether the EPIZONE achievements have made a great impact on the control and prevention of epizootic diseases in Europe.



5 - Summary of effective communication tools

An important task of EPIZONE was to stimulate networking and sharing knowledge not only within but also outside the EPIZONE network to the stakeholders: (non-) governmental organisations, (pharmaceutical) industry, scientists and veterinarians. For that purpose public and private websites for internal and external communication were built and a quarterly newsletter was published as a more active information source to keep as many people as possible, in- and outside the Network informed. Besides the face to face management meetings , work packages and theme meetings, EPIZONE organised an Annual Meeting each year, hosted by one of the partner institutes. Three Building Bridges workshops were organised to introduce European and Asian scientists to each other and encourage cooperation and exchange views.

Website

A public and a private website for internal and external communication were built, hosted by DiVa, the small enterprise partner of EPIZONE. The public and private websites were used as a tool to share knowledge, expertise and experience with all 300 scientists from the network who came from 12 different countries and also to inform industry, governments and the scientific community outside EPIZONE.

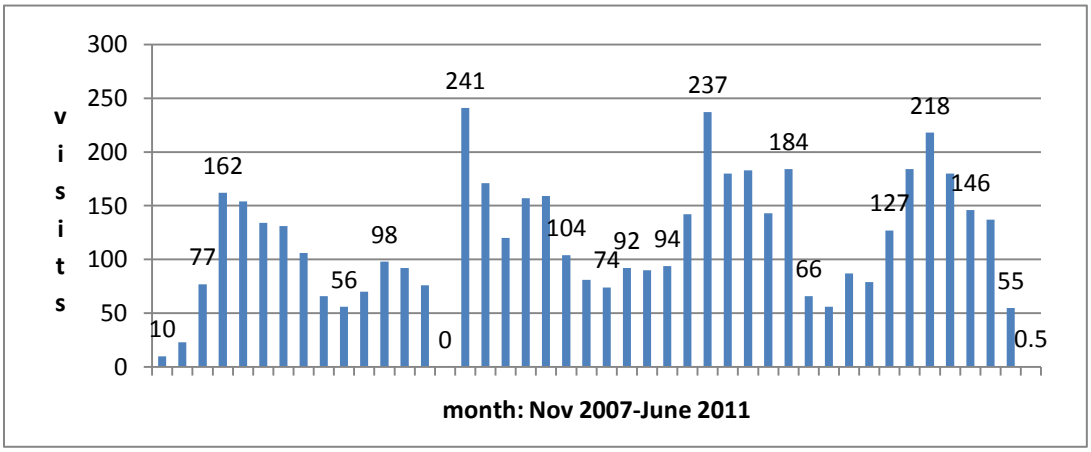
After the first Annual Meeting a special Annual Meeting website was set up for each of the next Annual Meetings. This provided general information (invitation, venue, travel), programme, registration page, abstract submission tool and hotel registration page. The abstract submission tool was developed in cooperation with DiVa and it also functioned as review tool and helped to generate the abstract book.

Besides the yearly Annual Meeting website, all general information concerning EPIZONE can be found on the public website: theme progress, partner institutes, information concerning animal diseases, workshops, short term missions, internal calls and the e-newsletter EPIZONE Update. Proceedings of the EPIZONE Annual Meetings, workshop reports, and general information flyers are available as downloads.

Statistics were recorded on the public website from November 2007 until June 2011.The amount of visits to the website peaked every year during the organisation of the Annual Meeting: 162,596 per month (February 2008), 241,707 per month (February 2009), 237,033 per month (February 2010) and 218,265 per month in January 2011.

The private website (share point) was used to compile the EPIZONE Periodic Activity Reports, for the JPA's and the financial reports. Also the abstract submission tool, the EPIZONE Update and contact details of the network participants were available on the private website. Each Work package had its own page for shared documents, meeting minutes etcIn autumn 2010 the layout of the public website was modernized.Table….

Table 5: Public website visits x 1000 per November 2007-June 2011



Annual Meetings

The broadest way of supporting the integration of scientists with all levels of experience was the organisation of the Annual Meetings of EPIZONE. These open meetings were also a good opportunity to present EPIZONE to the target groups and stakeholders and to discuss the major issues with them. Each year, one of the EPIZONE partner institutes acted as the host for the Annual Meeting. Speakers were invited from within and outside the EU and scientists showed their work by delivering oral and poster presentations . From year two onwards, a full day for the Young EPIZONE programme complete with workshops and invited speakers was organised. From year three onwards other EU Commission funded projects were invited to present their projects and work or to have their own meetings or workshops during the EPIZONE annual meeting. Sponsors were also invited to participate in the annual meetings.

Table 6: Overview of activities at the EPIZONE Annual Meetings

year	Annual Meetings
1	**First Annual Meeting "EPIZONE INSIDE OUT"** in Lublin and Pulawy, Poland, was hosted by the National Veterinary Research Institute (NVRI). This meeting was for EPIZONE partner institutes only, with the goal to build upon and further strengthen the established relationships and to get more familiar with the Network. All themes and work packages presented themselves.
2	**Second Annual Meeting** "**The NEED FOR SPEED**" in Brescia, Italy, was hosted by Istituto Zooprofilattico Sperimentale della Lombardia e dell 'Emilia Romagna (IZSLER). This meeting was open to scientist from outside the network and for stakeholders and governmental bodies. Young EPIZONE, EPIZONE's network for starting scientists and PhD students, was launched in a special meeting. 50 PhD's participated in this workshop meeting. This Annual Meeting was combined with a Bluetongue satellite symposium' **BLUETONGUE IN EUROPE, BACK TO THE FUTURE**' organised by EPIZONE, because of the bluetongue outbreaks in Northern Europe at that moment. Sponsors were very interested, and participated in both meetings.
3	**Third Annual Meeting "CROSSING BORDERS"** in Antalya, Turkey, was hosted by the FMD Institute Ankara. Special topic of this meeting was**' Emerging and transboundary diseases".** For the first time a market fair was organised, with booths for sponsors and other (EU) projects were invited to present themselves. The 9 (EU) projects who gave their presentation were: DISCONTOOLS, ETPGAH, EADGENE, ARBO-ZOONET, FLUAID, ESNIP2, EUFMD, EuroPRRSnet and GFRA. A GFRA and an ARBO-ZOONET workshop were organised and a EuroPRRSnet and FLUTRAIN session.
4	**Fourth Annual Meeting EPIZONE "BRIDGES TO THE FUTURE'**, in Saint Malo, France, was hosted by AFSSA (since 2011 ANSES). Special this year was the **interactive session on ''Major Epidemic Threats"** prepared by EPIZONE's Theme 7, working on Risk Assessment. PhD and overall poster prizes were acknowledged. Young EPIZONE elected all prize winners. of the EU projects GFRA, FluLabNet, ICONZ, CSFV go DIVA, NEW-Flubird, ArboZoonet, FLUTEST, WildTech, GlaD, FLUTRAIN, and MED-VET-NET presented themselves. EPIZONE Internal Call BT-DYNVECT presented the findings of the one year project in a satellite Symposium. A GFRA Workshop was held.
5	**Fifth Annual Meeting '' 'SCIENCE ON ALERT'** in Arnhem, The Netherlands, was hosted by the coordinator CVI. A welcome session on "**HOW VETERINARY RESEARCH RELATES TO ANIMAL HEALTH POLICIES**" with 4 invited speakers was held. Besides that, 4 Keynote speakers and a '**Bluetongue and other vector borne diseases' satellite** made a programmeme filled with outstanding work. PhD and overall poster prizes were acknowledged. Young EPIZONE elected all prize winners. Again presentations of related EU project were accommodated.

Table 7: Facts and figures Annual Meetings EPIZONE

Annual Meeting	Total Submitted abstracts	Select Poster	Keynote / Select. orals	Number participant	Special items	Numb. sponsor	Young EPIZONE
2006 Belgium,	Kick off meeting		Theme and work package presentations	80		-	
2007 Poland	87	59	7/28	189		-	
2008 Italy	108	63	5/45	305		2	Full day programme
2008 Italy	75	49	4/26	210	-Satellite Bluetongue	4	
2009 Turkey	217	150	5/48	332	-Presentation EU projects	5	Full day programme
2010 France	243	200	5/36	343	-Presentation EU projects, -Expert opinion workshop	9	Full day programme
2011 The Netherlands	213	160	8/54	303	-Welcome session for Policy makers -Satellite Bluetongue and other vectorborne diseases -presentations EU projects	7	Full day programme

Newsletters

During the whole EPIZONE project a quarterly newsletter was published as an active information source to keep as many people as possible informed about what was going on within the network. The newsletter included news and information about theme and work package meetings, EPIZONE Annual Meetings, work package achievements, workshops, short term missions, management activities, databases, reports and agendas etc. The newsletter was distributed within as well as out with the network.

During year 1, 2, and a part of year 3, the newsletter EPIZ-O-News was circulated as a PDF file to over 350 addresses in and outside the network in Europe and beyond.
From December 2006 – November 2008, 8 newsletters were published.

In April 2009 the newsletter was changed into a digital e-newsletter: named "EPIZONE Update". A special tool was developed by DiVa to generate this e-newsletter easily and make it available on the central project site. The 'EPIZONE Update' still is sent to over 1000 addresses worldwide.
From April 2009 - February 2012, a total of 15 EPIZONE Update newsletters were published.

The EPIZONE European Research Group aim to continue the "EPIZONE Update" newsletter.

Table 8: Newsletter EPIZONE

Newsletter	amount	Period	Size of audience	Type of audience
EPIZ-O- News	8	December 2006-November 2008	>350	EPIZONE participants
EPIZONE Update	15	April 2009 – February 2012	>1000	Worldwide, EPIZONE participants, industry, members other EU project, scientists, policy makers,

6 - Summary effective education tools

Another major goal of EPIZONE was to exchange and share knowledge and to learn from each other. For education purposes EPIZONE organised and facilitated short term missions (scientific missions), courses, workshops and training to further increase the spread of knowledge. Also E-Distance learning programmes were made available on the website.

Short term missions

EPIZONE offered its participants an easily accessible opportunity to learn more about the scientific work carried out by partner institutes: the short term mission programme. This short term mission programme was not only for scientists but for technicians active at partner institutes. Short term missions from one to another EPIZONE partner institute have been very relevant to EPIZONE objectives: to meet and work with scientists from different countries and to learn from their experiences and ways of working.

During the funding period 70 short term missions were established

Table 9: Number of short term missions/year

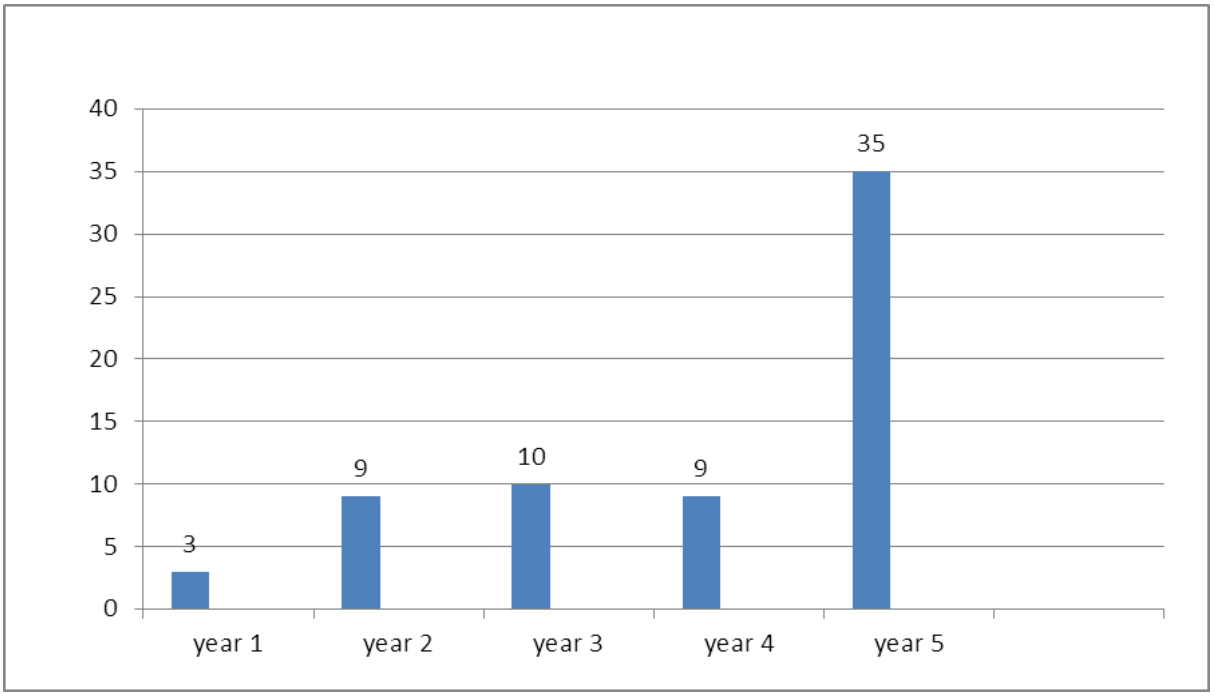
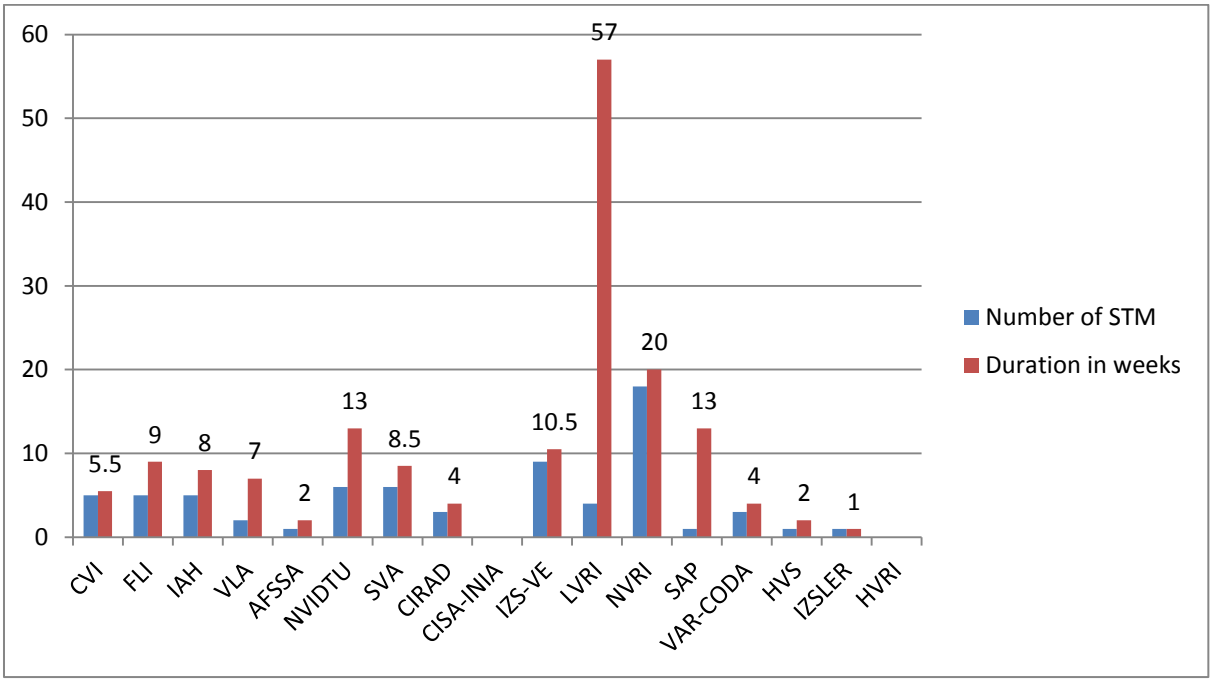


Table 10: Number/duration of short term missions per partner institute



Training and workshops

Sharing knowledge and expertise through training is crucial to network integration. Training and workshops have contributed significantly to the EPIZONE objectives, for example workshops on specific scientific areas such as crisis management and swine viral diseases. Workshops and training also facilitated the contact between the different partner institutes. In the funding period 20 workshops/training courses were held.

Table 11: Trainings and workshops funded by EPIZONE

year	Name workshop/training	Period (duration)	WP concerned	No Participants
1	Avian flu outbreak management and decision making	June 2007, 3 days, Italy	6.2	20
2	Avian flu laboratory-based training	July 2007 5 days, Italy	6.2	4
3	Building Bridges for Research in Swine Diseases", 6-9 July 2008	July 2008, 3 days Shanghai, China	all	10
3	Science Communication	October 2009 2 days, Arhus, Denmark	3.1	20
3	Biosafety of veterinary high containment facilities	April 2009 2 days, Switzerland	all	2x 6
4	Design and analysis of transmission experiments	November 2009, 6 days, Netherlands	6.3	20
4	Epidemiological tools to support risk managers in controlling animal epidemics	March 2010, The Netherlands		21
4	Laboratory contingency planning workshop	March 2010, Italy		13
4	Spatial epidemiology (distance learning)	February 2010, website		18
4	Laboratory-based training	March-April 2010, United Kingdom		3
5	"New generation researchers in pig viral diseases : building bridges from labs to policy and the farms	July 2010, 3 days, Madrid, Spain		
5	Theme 4 last annual meeting	February 2011, 3 days, Germany	4	
5	Data and Information Sharing within the Veterinary Scientific Community: Legislative State of the Art and the Role of EPIZONE	March 2011, 1 day, Mira,Italy	2	
5	Workshop Abstract writing	April 2011, Netherlands	3,3	20
5	Promoting Scientific Cooperation between China and Europe to Combat Epizootic Diseases"	July 2011, 3 days Beijing, China	1& 3	
5	Young EPIZONE project management course	September 2011, Amsterdam, The Netherlands	3.3	20
5	Theme 5 last annual meeting	November 2011 5 days	5	
5	Metadata and Data Sharing in the Veterinary Field	November 2011, 1 day, Mira, Italy	2	
5	Biosafety workshop	January 2012, 1 day, Lelystad, The Netherlands		11

Building Bridges workshops, China-Europe

A very special output of EPIZONE were the Building Bridges workshops. In cooperation with Partner LVRI, the European Commission, the EU-project Conflutech, and hosting institutes, EPIZONE organised 3 Building Bridges workshops. These workshops were primarily focussed on swine viral diseases and were organised especially for young scientists from Asia and Europe to exchange views.

- 2008 "Building Bridges for Research in Swine Diseases. Shanghai , 6-9 July.
- 2010 "New generation researchers in pig viral diseases: building bridges from labs to policy and the farms". Madrid, 12 -14 July.
- 2011 "Promoting Scientific Cooperation between China and Europe to Combat Epizootic Diseases". Beijing, 2-4 July.

A large number of young scientists were involved in these workshops they were able to interact and to exchange views amongst their peers and with senior scientists regarding their research activities. These workshops also dealt with the important aim of introducing European and Asian scientists to each other and encourage cooperation.

E- Distance learning programme

E-distance learning programmes were made available on the website.
The programmes included: General, Animal health and production, transboundary diseases, zoonotic diseases, epidemiology and risk assessment, laboratory animal medicine and statistics. Several paticipants of the EPIZONE network used those programmes.

A workshop on spatial epidemiology (e distance learning) was held. Eighteen participants from the EPIZONE network have joined this workshop via the website.

7 – Scientific summary of all work performed

During the funding period the EPIZONE Network of Excellence had 7 themes with 23 work packages.

The outputs from the themes and work packages have contributed to the goals of EPIZONE; integrating research, validation, standardisation and harmonisation of diagnostics, intervention strategies, risk assessment, epidemiology and surveillance within the EU and beyond to make better control of animal diseases possible. 'Networking' functioned very well and the practise of sharing of knowledge was established. During the funding period the exchange of knowledge across the themes and work packages increased remarkably .

Some changes were made to the work packages after one year: work package 2.4 "Joint funds" was integrated in work package 1.1 "Virtual institute" and work package 3.1 "Communications" was turned into work package 1.2 "Communications" . Work package 3.3 "Young EPIZONE" was added in year 2.

Overview Themes and Work Packages

Table 12: Themes and work packages

Theme/WP no	Title	Leader	Location
Theme 1	**Virtual Institute**	**Piet van Rijn, Wim van der Poel**	**CVI, The Netherlands CVI, The Netherlands**
WP 1.1	**Virtual institute**	**Piet van Rijn, Wim van der Poel**	**CVI, The Netherlands CVI, The Netherlands**
WP 1.2	**Communication**	**Mogens Madsen**	**DTU Vet, Denmark**
Theme 2	**Strategic Integration**	**Wim van der Poel, Alessandro Cristalli**	**CVI, The Netherlands IZS-Ve, Italy**
WP 2.1	**Scientific coordination and strategic planning**	**Wim van der Poel**	**CVI, The Netherlands**
WP 2.2	**Shared resources**	**Sabine Kühne**	**HVS, Germany**
WP 2.3	**Expertise development**	**Johan Bongers**	**CVI, The Netherlands**
Theme 3	**Spreading Excellence**	**Emmanuel Albina**	**CIRAD, France**
WP 3.1> WP 1.2	**Communication**		
WP 3.2:	**Education**	**Emmanuel Albina**	**CIRAD, France**
WP 3.3	**Young EPIZONE**	**Eefke Weesendorp**	**CVI, The Netherlands**
Theme 4	**Diagnostics**	**Martin Beer, Åse Uttenthal**	**FLI, Germany DTU Vet, Denmark**
WP 4.1	**PCR-diagnostics**	**Bernd Hoffmann**	**FLI, Germany**
WP 4.2	**DNA-Chip-based diagnostics**	**Yannick Blanchard**	**ANSES, France**

Theme/WP no	Title	Leader	Location
WP 4.3	DIVA Diagnostics	Åse Uttenthal	DTU Vet, Denmark
WP 4.4	Pen-side tests	Phil Wakely, Karl Ståhl,Neil LeBlanc	SVA, Sweden
Theme 5	Intervention Strategies	Linda Dixon, Marie-Frédérique Le Potier	IAH, United Kingdom ANSES, France
WP 5.1	Vaccine technologies	Alejandro Brun	INIA, Spain
WP 5.2	Host responses to infection	Gunther Keil, Thomas Vahlenkamp	FLI, Germany FLI, Germany
WP 5.3	Adjuvants	Peter Heegaard	DTU Vet, Denmark
WP 5.4	Antivirals	Frank Koenen Robert Vrancken	VAR-CODA-CERVA, Belgium
Theme 6	Surveillance and Epidemiology	Alexander Sorensen, Claes Enøe, Laura Powell	DTU Vet, Denmark VLA, United Kingdom
WP 6.1	Surveillance & Epidemiology of emerging viral diseases in aquaculture	Niels Jørgen Olesen	DTU Vet, Denmark
WP 6.2	Field Epidemiology & Surveillance of AI and APMV	Ilaria Capua, William Dundon	IsVe, Italy
WP 6.3	Experimental Epidemiology	Phaedra Eblé	CVI, The Netherlands
WP 6.4	Molecular Epidemiology	François Thiaucourt	CIRAD, France
Theme 7	Risk Assessment	Louise Kelly Franz Conraths	VLA, United Kingdom FLI, Germany
WP 7.1	Standardisation of import risk assessment	Larry Paisley	DTU Vet, Denmark
WP 7.2	European online database on epizootic diseases as an early warning system	Franz Conraths	FLI, Germany
WP 7.3	Decision support system for CSF	Armin Elbers	CVI, The Netherlands
WP 7.4	Impact of environmental effects on the risk of introduction of epizootic diseases in Europe: Identification and Prioritisation.	Paul Gale	AHVLA, United Kingdom

Theme 1 Virtual Institute

Work package 1.1
Virtual institute

Aim

The aim was to develop a strategically placed European "virtual institute" for European research on epizootic diseases. This included the development of an organisation structure based on a "virtual institute" for a coordinated and integrated approach. Appropriate processes and procedures for management and administrative purposes were to be enabled and an appropriate environment for (key) scientists and scientific managers was to be created.

Achievements

All official boards, the Coordinating Forum, the External Advisory Panel, the Governing Board and the Executive Committee were installed as planned.

Procedures for organisation of meetings and teleconferences on a regular basis were developed as well as procedures and templates for financial and scientific reporting.

A website was operational directly after the start of the project. This communication platform for EPIZONE, supported by share point technology, played a key function in all communication matters, in particular for administrative support, progress reporting and financial issues.
In addition, a central mailbox epizone.cvi@wur.nl was made available.

Management processes and procedures were optimized wherever appropriate and hard
closures of financial budgets were installed to ensure the use of unspent budgets in a subsequent time period of the network.

Meetings of EPIZONE WPs, committees and boards were very important for EPIZONE and therefore were facilitated during the half yearly meetings in Lelystad (January) and the EPIZONE Annual Meetings.

When the network was established , options were explored for a sustainable structure for the network beyond the EU funded period. A draft discussion document was produced and subsequently a proposal for the set-up of the EPIZONE European Research Group was written. Finally the proposal was approved by almost all partner institutes. These partners will be the founding partners of the EPIZONE ERG.

The joint funds in WP1.1 were used to finance, 1 ; a ring trial on PPRV detection to raise the preparedness regarding Peste des petits ruminants after the outbreak in Morocco, organised by CIRAD for EPIZONE institutes, 2; the activities of the EPIZONE database coordinator who was appointed in the beginning of 2010, 3; an interactive session on "major epidemic threats" during the 4th annual meeting.

Work package 1.2
Communication

Aim

The aim of this WP was to spread the excellence of knowledge encompassed within EPIZONE to the wider scientific community (other existing European networks, international scientists), general public and develop communication inside the network.

Achievements

An overall Communication plan was drafted and adapted yearly.

Both private and public websites were built in collaboration with DiVa, and a quarterly internal newsletter was published

To promote the recognition of EPIZONE, visual guidelines, logo, and publicity materials, including brochures and posters, became available.

An external website was launched.

To improve the exposure of EPIZONE for participants and its stakeholders and interested parties outside the network, the newsletter "EPIZONE Update" was launched on the internal as well as the external website. The e-newsletter tool was developed by DiVa, the SME of EPIZONE

Frequently asked questions (FAQ) were added to the websites to enhance the use of it (IC1.3)

Online descriptions of the most important animal diseases dealt with by EPIZONE have been published on the website with the involvement of all partner institutes.
A simplified access via the website to publications and outputs from the projects was established.

To provide information and promote the Annual Meetings dedicated website pages were created each year with an abstract submission tool and registration page developed.

A network of communication officers within the EPIZONE partner institutes was established in order to support and promote EPIZONE at the national level to press and media by the individual partner institutes.

Theme 2 Strategic Integration

Work package 2.1
Scientific coordination and strategic planning

Aim
Strategic integration, the overall aim of this work package was to bring together all non-scientific activities within the network. This included scientific coordination and strategic planning, and expertise development.

Achievements
To structure the scientific coordination, strategic planning, and expertise development for the network, a Strategic Research Plan (SRP) was established. In particular the agreement of which pathogens to focus on during the working period and the identification of unmet research needs within the EPIZONE virtual institute.

To ensure the standards of EPIZONE outputs, the network agreed on review procedures for proposals and reports, these were made available on the website.

Internal and external cooperation between scientists was facilitated through scientific missions and annual meetings.

To stimulate integrative research activities and to fill potential gaps in the research within EPIZONE, calls for internal scientific proposals were launched.

Contacts with related (EU) projects were established and during the annual meetings these projects were invited to present themselves.

Moreover links with institutes, international organisations and stakeholders were improved through meetings and bilateral contacts. To integrate existing knowledge on collections of samples and laboratory materials and to make such resources accessible to partners, additional inventories on reference materials of major epizootic diseases were made.

Work package 2.2
Shared resources

Aim
The main target of this work package was to collect data on reference material and useful information for diagnosis of major epizootic diseases. Databases were designed and built to give access to inventories of reference material like virus strains, polyclonal sera and monoclonal antibodies. Some partners presented their own websites with already existing external databases, which were linked to the databases website. All databases are accessible through the EPIZONE website: http://www.epizone-eu.net/cps/databases.

Achievements
Databases have been established on ASF, CSF, FMD, BT and AI. In addition databases on African Horse Sickness (ASF), Rift Valley Fever(RVF), and West Nile Encephalitis (WNE) were filled with information on virus strains, monoclonal antibodies and serum samples.

Databases on genetically modified material (GMM) for ASF, WNE, CSF, FMD and BT were created as well.

Data on reference material for Peste des Petits Ruminants, Rinderpest and Swine Influenza have been collated and uploaded in databases.

A collection of validated protocols for the diagnosis of major epizootic and emerging diseases has been assembled.

All databases are accessible through the EPIZONE webpage http://www.epizone-eu.net/cps/databases.

Work package 2.3
Expertise development

Aim
The aim was to integrate existing knowledge within EPIZONE and to make this knowledge accessible for all partners. Meaning the enhancement of knowledge by identifying and filling the gaps in knowledge.

Achievements
Additional epidemiological databases were made available and accessible.

Database integration, database use and database sustainment was improved by appointing a database coordinator within EPIZONE.

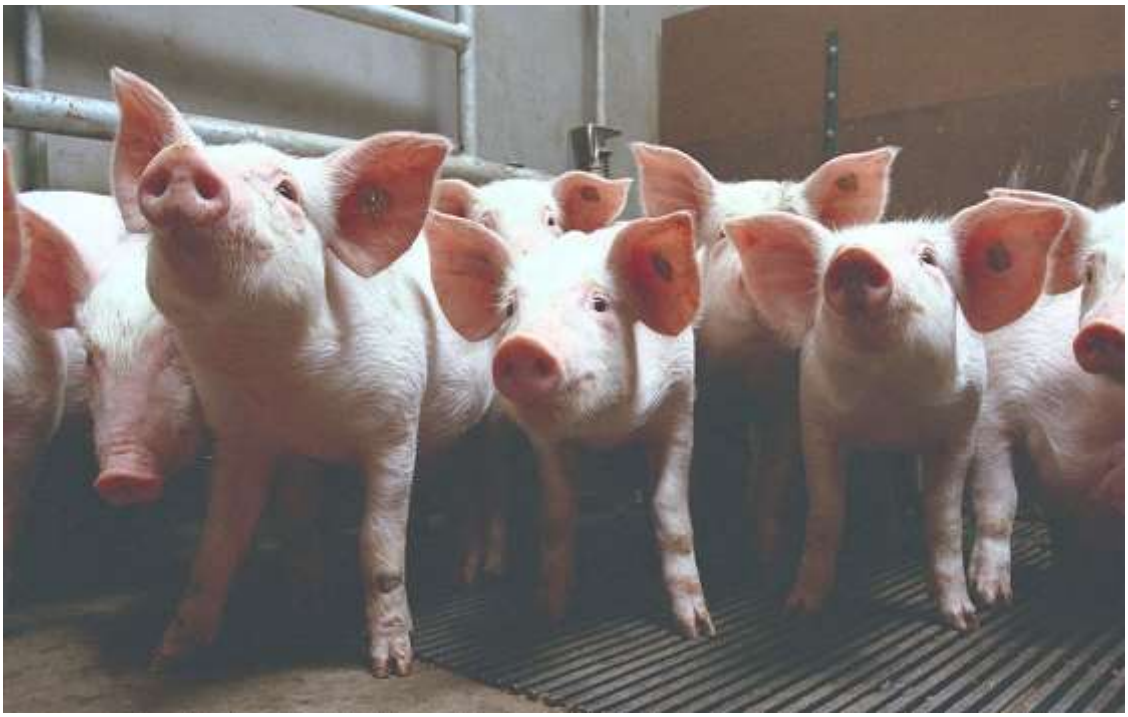
A draft model expertise database was developed by partner DiVa and was made available for use within EPIZONE

For mobility exchange (Short Term Missions) specific criteria were established within the network. Priority was placed on internal visits between EPIZONE partners in the fields of expertise covered by the scientific work packages.

Work package 2.4
Joint funds

Aim
The overall aim of this work package was to create some budget flexibility within the network in order to be able to respond to urgent research questions without having to wait until the next JPA.

After year one the work package 2.4 was integrated in work package 1.1 'Virtual Institute' as part of the reorganisation within the EPIZONE management office.



Theme 3 Spreading Excellence

Work package 3.2
Education

Aim
The aim of this work package was the organisation of training activities and workshops within and out with the network, the exploitation of distance learning systems for the dissemination of training courses and instruction courses employing among other tools; the E-platform established by the consortium.

Achievements
An integrated education network was assessed by the partners already involved in teaching activities.

An inventory of existing distance learning systems was made after the partners completed a questionnaire.

A dedicated web-page with web-links sorted by disciplines was created on the EPIZONE web-site.

EPIZONE offered its participants the great opportunity to learn more about the work carried out by a partner institute: the short term mission programme. This short term mission programme was available to scientists and technicians. During the EU funding period 66 short term missions were organised (see table 9 and 10 page 32)

Workshops and training courses were developed and organised for decision makers as well as for technicians and young EPIZONE members (see table 11 page 33). During the funding period 19 workshops were organised. The workshops were dedicated to several themes such as virus diseases, epidemiology, risk assessment, data bases and laboratory issues.

Work package 3.3
Young EPIZONE

Aim
To create a network of young scientists working on epizootic diseases. Such a network should become a basis for future collaboration on a worldwide level. During meetings young scientists can meet other young scientists and established scientists to expand their network.

Achievements
The Young EPIZONE programme was able to recruit approximately 170 members. Nine of these formed the Young EPIZONE core group, which led the activities.

Meetings of Young EPIZONE were organised during the Theme 5 meetings, the half-yearly meetings and the Annual Meetings of EPIZONE.

One of the most important communication tools for the 170 members of the programme was the Young EPIZONE newsletter. Twice a year this newsletter was sent to the members with information on meetings, courses, job opportunities for young scientists, partner institutes, work packages and reports of previous meetings.

A young EPIZONE website was embedded in the EPIZONE website to ensure that every young member of the network had access to all the information available.

Theme 4 Diagnostics

Aims

To standardise and optimize (new) diagnostic methods and their use in prevention and control of epizootic diseases.
Solve actual problems in diagnostics of epizootic diseases with: State-of-the-art methods, New developments, and Team work.

Relevance

Prevention and control of epizootic diseases starts with the use of fast specific, sensitive and reliable diagnostic tools to detect infected animals.

In recent years a new generation of sophisticated diagnostic tests, like real-time PCR (polymerase chain reaction) and micro-array systems using DNA-chip technology, have become available. As a result, the need to validate, optimise, and standardise those tests across Europe and beyond is more urgent than ever.

Impact

The formation of a "European veterinary diagnostic group".
Markedly improved and harmonized diagnosis of epizootic diseases in Europe.

Highlights

Equally successful products of Theme 4's collaborations were the **EPIZONE RNA reference panels** and the **EPIZONE DNA-Chip**, which are now being utilised around the world.

The EPIZONE Review on RT-PCR technologies (Hoffmann et al, 2009) was among the top 10 most downloaded articles in Veterinary Microbiology.

Work package 4.1
Real-time PCR-diagnostics

Aim

The collection, comparison, standardisation and further development of real-time PCR assays for the most important epizootic diseases. Playing a leading role in implementation and acceptance of this diagnostic tool for epizootic diseases was a major goal. Networking with other projects was a main focus, and a central role of EPIZONE concerning the projects including real-time PCR for the detection of epizootic diseases should be aspired.

Achievements

EPIZONE RNA/DNA Reference Panels: unique tool for validation/standardization. Available for classical swine fever virus CSFV), foot and mouth disease virus (FMDV), bluetongue virus (BV) and avian influenza virus (AIV). It's a unique collection of nucleotide samples for several diseases that people from all over the world want to have to validate and test their systems.

Material for standardization and validation of molecular diagnostics have been made available for:
CSFV/Pestiviruses, BTV, FMDV, AIV, NDV, AHSV

Real-time PCR ring trials were performed for:
- CSFV, AIV, FMDV, BTV, NDV, PPRV
- AHSV, EHDV, WNV, Lyssavirus, PRRSV
- extraction methods

The development of a new tool that improves the diagnosis of classical swine fever (CSF). In control programmes for CSF, rapid detection and identification of the causal agent, classical swine fever virus, is a crucial step. The novel real-time PCR assay developed by EPIZONE can quickly and accurately differentiate the wild-type or naturally-occurring virus from certain C-strain vaccine viruses – a critical differentiation when managing disease outbreaks.

Work package 4.2
DNA-Chip-based diagnostics

Aim
The design of pan viral DNA chip(s) for the detection of viruses affecting livestock populations, and for the fast and accurate subtyping of important epizootic viruses.

Achievements
The EPIZONE DNA-Chip, which covers 37 virus families and can be used to accurately detect, determine and differentiate important epizootic viruses. The EPIZONE pan viral chip is a chip for broad diagnostics of unknown viral infection diseases, not allowing a mass screening.

The EPIZONE panviral DNA-chip, new version is produced by Agilent. The next generation is 15000 probes, ca. 1800 virus species.

A DNA-chip ring trial for virus search in unspecified samples was performed.

Dedicated DNA-chips for e.g. AIV typing were developed.

Work package 4.3
DIVA Diagnostics

Aim
Validation of DIVA diagnostics and implementation of DIVA diagnostics for existing vaccines. Creating a DIVA network to improve cooperation in science leading to improvement of DIVA diagnostics. Genetic differentiation of infected from vaccinated animals is an important new strategy for disease control.

Achievements
Significant work was undertaken to improve DIVA diagnostic methods across Europe including the redevelopment of a 'home-made' test to detect antibodies to FMDV, which led to the availability of a ready-to-use, stable kit suitable for any laboratory.

Work package 4.4
Pen-side tests

Aim
The assessment of the use of pen-side detection systems for either nucleic acid or antigens to aid in the diagnosis of OIE (former) list A pathogens.

Achievements
Novel detection systems were evaluated and presented to all EPIZONE partners e.g. for "pen-side" detection of foot and mouth diseases.

Three antigen lateral flow devices (LFDs) have been produced and tested: a pan-FMDV, a FMDV SAT2 specific, and an SVDV LFD. The technology used allows for detection in the field and has an analytical sensitivity comparable to antigen ELISA.

In Genomic testing, various strategies have been employed to develop systems that work completely at pen-side or in a portable lab environment; which can be as simple as a small table, basic lab equipment and portable hardware.

The most complete systems designed for pen-side use are also the most advanced. Work with these systems involved two commercial collaborators, Smiths Detection and Enigma Diagnostics, they are developing so-called "black box solutions" to pen-side testing. These were tested for ASFV, pestiviruses, FMDV, AIV and NDV.

Theme 5 Intervention Strategies

Aim

To develop a platform to harmonise, standardise, improve and develop intervention strategies for epizootic diseases.

Relevance

Europe is under constant threat from a number of current and emerging epizootic diseases.

A goal is to reduce or interrupt outbreaks and provide alternatives to mass slaughter.

For many of these diseases, vaccines are either not available or not fit for purpose –i.e. vaccines need to be safe, efficacious, and preferably a DIVA strategy should be available.

Use of antivirals could limit spread of a virus in the period before immunity develops.

Impact

A unique opportunity for scientists from different veterinary fields to interact. Many never meet because they work on different animal species or different pathogens in different countries. The opportunity to have a real "technology platform" and to share high containment animal facilities and other resources.

Networking highlights

Participation in EU funded projects (ArboZoonet, ASFrisk, CSFgoDIVA, PigFlu).

Immunological tool box : bovine TLR2 and porcine MX1 (IC 5.6) available.

Establishment of core working groups (BTV,ASFV, RVFV).

Work package 5.1
Vaccine technologies

Aim

To implement well defined strategies for joint experimental vaccine trials and report on preliminary results through specific EPIZONE meetings. This will focus mainly on specific target diseases combining several vaccine technologies. Major and minor participants are identified based on the level of participation/interaction in joint activities defined by the working groups.

Achievements

New data regarding the use of baculovirus and adenovirus for delivery of interfering siRNAs against three different morbilliviruses; Peste des Petit Ruminants virus (PPRV), Rinderpest virus (RPV) and measles virus were generated.

A patent application for an oral fish vaccine. Using an innovative approach to construct alginate-covered lipoplexes (a lipid and DNA complex used to deliver genes), the project group developed an oral vaccination for trout against the devastating viral haemorrhagic septicaemia virus. The team was able to demonstrate proof of concept for the new method and reagent for delivery of the DNA vaccine, and they have shown that it works. A commercial partner was searched for further development.

Work package 5.2
Host responses to infections

Aim

(i) the harmonization of existing immunological reagents, (ii) the development of new immunological tools to analyse the immune status/immune responses and (iii) the characterization of immune correlates with protection against epizootic diseases with main emphasis on infections in cattle and pig.

Achievements

The teams involved in the African swine fever (ASF) vaccine development project were able to demonstrate that two of the three proteins known to be important for inducing antibody responses against ASF are also important for inducing T-cell responses, which are critical for protection against infection.

The development of immunological reagents to allow the study of immune responses in ruminants and pigs and the use of these tools for the in vitro characterisation of the interaction between several pathogens (e.g. African swine fever, bluetongue) or antigen delivery systems with porcine or ruminant antigen presenting cells.

In vivo evaluations of immune responses against inactivated, live attenuated or recombinant vaccines were performed.

Characterization of the role of T cells and antigen presenting cells in different infection models including CSFV, ASFV, and FMDV.

Indicators of protective immunity were analysed and different vaccination strategies were evaluated. Samples were processed from pigs after inoculation with low and high virulence ASFV isolates and from pigs which were protected against lethal challenge. These have been shared among participants in UK, France, Spain, Germany and Denmark to measure chemokine responses in PBMC by quantitative RT-PCR and by chemotaxis assays. The data will help to identify correlates of virus pathogenicity.

Harmonisation of ASFV vaccination and challenge protocols, of clinical scoring systems and shared expertise and samples between institutes.

Microarray data in pigs were published. It compiles PBMC results from pigs infected with two CSFV-strains of different virulence. Further experiments verified the use of microarrays in the characterization of immune responses in BIV and BFV infected antigen presenting cells in vitro and in ASFV and CSFV infected pigs.

Work package 5.3
Adjuvants and Immunomodulators

Aim
To integrate and standardise a diverse group of activities relating to a number of different molecular immunomodulators, adjuvants and carrier systems. A specific aim was to establish the best methods for augmenting and controlling vaccine efficiency with specific respect to the possibilities and challenges offered by innate host response factors in the window after infection (or after conventional vaccination) and until specific immunity is achieved. The final aim was to achieve an objective evaluation of best approaches in various target animals, including production animals, also fish, companion animals and zoo animals.

Achievements
Testing cytokines in pigs and relating such to pig herd disease status.

Collaboration in the fish field on using recombinant expression systems for vaccination against fish viruses. Fish models were also used for investigating delivery systems for small RNA.

Collaborative work on the mapping of RVFV epitopes using synthetic peptides was performed.

Work package 5.4
Antivirals

Aim
To evaluate and select potent antiviral agents, characterize their mode of action and to perform (joint) in vivo safety and efficacy studies. Collaboration efforts between work package participants and between different work packages are envisaged to increase exchange of information, reagents and protocols.

Achievements
An improved siRNA-delivery against PPRV, ASFV and VHSV and in an in vitro model for the evaluation of small molecules against ASFV and FMDV.

Two antiviral mechanisms (siRNA and small molecules) were evaluated in in vivo studies against PPRV and CSFV and a proof of principle was achieved for CSFV, serving as an in vivo treatment model for the reduction of infection in the target animal by an antiviral agent.

For the first time it was shown that selective inhibitors of in vitro CSF virus replication are able to significantly reduce, and possibly prevent, virus replication in CSF infected pigs, offering an entirely novel approach towards the eradication of epizootic animal diseases.

Theme 6 Epidemiology and surveillance

Aim
To make epidemiological and surveillance data of epizootic diseases available for partner institutes, to improve understanding of the epidemiology of these diseases so that better surveillance and control strategies can be developed.

Relevance
Effective surveillance and knowledge of the epidemiology of a disease are essential foundations to planning and implementing prevention and control strategies. It is through excellent epidemiology and surveillance activities

that we can identify, track and control disease threats, which, due to globalisation and the burgeoning international trade of livestock, are of escalating importance.

Impact

This project enhanced Europe's ability to prepare, prevent and manage the growing threat from highly transmissible transboundary diseases. The network was able to collect data in a standardised way and generate basic biological data, and realised the power of sharing data and information across member states.

Highlights

A geographic information system (GIS) as a tool for epidemiological analysis.

The fish pathogens database.

Work package 6.1
Surveillance and Epidemiology of emerging viral diseases in aquaculture

Aim

The Establishment of a database for pathogen collections to be used for molecular epidemiology, sequencing and phylogenetic studies of VHSV and IHNV isolates. To generate quantitative data on diseases in aquaculture and implementation of GIS. The diagnosis and epidemiology of the emerging koi herpes virus disease and the development of serological methods for detection of antibodies against VHS and IHN.

Achievements

For aquaculture surveillance and epidemiology of viral haemorrhagic septicaemia virus, infectious haematopoietic necrosis virus, and Koi herpes virus was established, varying from 8 options for implementing Geographic Information System (GIS), harmonization of methods for diagnosis and sequencing to sharing information of isolates and newly developed methods by databases.

A major achievement was made by generating quantitative data on the notifiable diseases VHS and IHN and including these in a geographic information system (GIS) as a tool for epidemiological analysis. Geographic coordinates of all fish farms have this far been obtained from Denmark, Sweden, Poland, Italy and in part from Germany.

For the first time serological methods in aquaculture were validated and standardised, viruses from in and around the EU were sequenced, and innovative ways were used to collect and store comprehensive data on fish diseases around the world.

The collation of data using tools like the worldwide questionnaire and the GIS (Geographical Information Systems) mapping.

The EPIZONE questionnaire on the epidemiology of KHV was sent to more than 65 countries and revealed that KHV had already been detected in 30 countries and was slowly spreading around the globe. In addition to this epidemiological data, the group also distributed some recommended molecular diagnostics methods and provided advice on the containment of KHV.

Perhaps the aquaculture group's most enduring outcome however is the fish pathogens database (www.fishpathogens.eu). As a freely available online resource, the database offers a high quality, managed dataset on significant viral pathogens, including isolate and sequence data, for use in molecular epidemiological studies. Launched in 2009, the database can produce tables, maps or graph-based outputs, and currently includes information on VHSV and IHNV. Datasets for several other fish pathogens such as infectious salmon anaemia virus and koi herpes virus are in development.

Work package 6.2
Field Epidemiology & Surveillance of AI and APMV

Aim
The improvement and harmonisation of EU surveillance programmes and creation of a sequence database for AI and APMV.

Achievements
For avian influenza viruses and avian paramyxoviruses EU surveillance programmes were improved and harmonised.

A sequence database 'FLUZONE' for avian influenza and 'PARAZONE' for avian paramyxovirus, including that of isolates in the repositories of partner laboratories was established. In addition to "field epidemiology", transmission of disease can also be studied under experimental conditions.

A sequencing ring trial for APMVs was carried out.

Working on avian influenza (AI) and avian paramyxoviruses (APMV), the research teams gathered together a huge collection of virus samples and isolates from across Europe, sequenced them to determine their genomic structures, and deposited the reference material with GISAID, the Global Initiative on Sharing Avian Influenza Data. GISAID is the world's premier repository for AI data and was established to foster international cooperation.

Identifying novel genotypes of APMV in Africa, and establishing that the highly pathogenic avian flu outbreaks in France, Germany and Poland in 2006 and 2007 were caused by at least two separate introductions of genetically distinct viruses. They also identified the migratory and resident wild duck reservoirs for the virus subtypes responsible for other European outbreaks of highly pathogenic avian influenza.

Work package 6.3
Experimental Epidemiology

Aim
Quantification of key transmission parameters of FMDV and SVDV and possibly other important epizootic infections.

Achievements
Improved design of transmission experiments has been achieved not only through collaboration between partners and the distribution and sharing of conducted experiments, but also through interdisciplinary close collaboration between virologists and modellers. This collaboration increased the understanding of how data is

generated through the experiments and is used in transmission models.

In year 4 analyses of FMDV experiments continued and the analysis of SVDV experiments was initiated.

A bio security questionnaire to be used in pig farms in areas with SVDV outbreaks was distributed and completed.

Determination of the transmission parameters for foot-and-mouth disease (FMD) using data from previous FMD experiments, and the estimation of the transmission rates between species (for example sheep to pigs), for which very little information was available.
Such parameters are indispensable for simulation modelling of disease spread.

Work package 6.4
Molecular Epidemiology

Aim
To develop expertise, technology and standard procedures for molecular epidemiology of epizootic diseases. To set up a network of websites hosting interactive banks of sequences.

Achievements
Standardization and harmonisation of molecular epidemiology analysis, including foot and mouth disease, swine fever, rinderpest, peste des petits ruminants, bluetongue, Rift Valley fever and also bacterial diseases such as contagious bovine pleuropneumonia. This should enable the studies on genetic relationships between pathogens. To support this, two web-based molecular epidemiology servers were used.

This work package ended after year 3 of the project.

Theme 7 Risk Assessment

Aim

To advance the discipline of risk assessment through the standardisation of methods and the collection of appropriate data.

Relevance

Risk assessments are the formally recognised tools for predicting the risk of different pathogens and different diseases coming into an area through specific routes. Assessing the risk of introduction of an epizootic disease in Europe, and its potential consequences, should be an integral part of any surveillance programme. Despite the availability of the OIE guidelines, there remain differences in the approaches used by organisations, and different countries within Europe, when undertaking risk assessments. In addition, criteria for determining whether or not data are appropriate for risk assessments do not exist.

Impact

Promoting a common European approach to risk assessment and advancing the discipline using the collaborative power of EPIZONE has broadened the awareness across scientific disciplines.
Although risk assessment continues to be a small part of the EPIZONE Network of Excellence, interest in the topic has increased over the last 4 years.

Highlights

An interactive expert elicitation exercise (interactive session) on ‘’Major Epidemic Threats” was organised by theme 7 at the 4th annual meeting to gather the opinions of experts and scientists with related expertise, on the future epidemic threats to the EU. The data were analysed and this analysis includes a stratification of opinions by experts’ region, area of expertise and length of time working in their particular area of expertise. (A report is available as download on the EPIZONE website)

A detailed description of the database on epizootic disease outbreaks has been prepared for decision-makers who could provide the required data (in partner countries).

Interaction with other themes within the network was improved, with a joint Risk Assessment (Theme 7) and Epidemiology (Theme 6) workshop being held.

Work package 7.1
Standardisation of import risk assessment

Aim

To further coordinate efforts for an agreeable, practical, cost-efficient and harmonised approach to import risk assessment (IRA) for highly contagious diseases in swine and poultry through 1) establishing "best practice guidelines", 2) identifying needs and quality standards for epidemiologic information, 3) identifying needs and inclusion quality criteria for experimental data, livestock industry data and knowledge about risk management options 4) contributing to the formation of a European network for exotic animal disease risk research.

Achievements

A quantitative review of existing risk assessments showed that a substantial proportion failed to comply with the best practice guidelines or any other international guidelines, and many were actually incomplete. In response the team developed a quality assurance technique to rate and improve risk assessments, and better meet the needs of European authorities.

An online database on epizootic disease outbreaks was established. Manuals for administrators and users were developed and made available to the data base users. To integrate access to sequence and typing data, the field descriptions were expanded by including a field that allows the identification of the database where the sequence information relating to a record is stored.

A detailed description of the database has been prepared for decision-makers who could provide the required data (in partner countries).

The partners agreed to try to obtain historic data from their countries for the database (FMD: 2001, rabies: several years; avian influenza: 2006).

The map server and geographical visualisations of disease data ("mapping tools") were implemented and tested by the partners.

Work package 7.2
European online database on epizootic diseases as an early warning System

Aim
European Online Data Base on Epizootic Diseases as an early warning system.

Achievements
A multi-lingual web-application of the clinical decision support system (Danish, German, Italian, and English). The application represents a big step forward towards a pan-European tool enabling veterinarians to submit the field data needed to detect CSF on farms, and has the potential to be transferred to other diseases.

Data were collected on two main areas:
-qualitative spatial data for Crimean Congo Haemorrhagic Fever (CCHFV) for use within a GIS risk assessment and
-data relating to the potential use of genomic data for risk assessments related to vector-borne diseases.

Retrieve surveillance data for diseased and non-diseased animals from existing national databases and link the information on the isolated pathogens to sequence databases. The resulting 'European Online Database on Epizootic Diseases' was a triumphant illustration of not only the difficulties of assessing data across borders but also of the potential benefits of being able to do so.

Laboratories throughout Europe can use the new database, which includes an EPIZONE-designed mapping tool, to share and map epidemiological data.

The significant potential of the surveillance database as an instrument for risk assessment and early warning has been recognised by the Directorate-General for Health and Consumer Protection which has commissioned the team leader's laboratory to develop a similar tool for classical swine fever for the EU.

Work package 7.3
Decision support system for CSF

Aim
To validate a clinical decision-support system (CDSS) developed in the Netherlands on an individual animal level, for early diagnosis of Classical Swine Fever (CSF), using the input of the WP 7.3 partners.

Achievements
Validation of the sensitivity of the CDSS. A preliminary conclusion is that the CDSS is able to detect infected pigs 5 to 15 days post inoculation, depending on the virulence of the CSF virus strain used, in pigs of 5-10 weeks of age.

A web application (in Dutch) of the CDSS at farm level was designed, making it
possible for a broad audience of veterinarians to submit data on clinically suspected situations on pigs farms, using a protocol.

Work package 7.4
Impact of environmental effects on the risk of the occurrence introduction of epizootic diseases in Europe: Identification and prioritisation.

Aim
This work package aims to continue with the theme of developing risk assessment approaches to assess the impact of climate change on the risks of vector-borne livestock viruses in the EU. Specifically the objectives are:

-To build a qualitative GIS-based model for the impact of climate change on the risk of incursions of Crimean-Congo haemorrhagic fever virus (CCHFV) in livestock in the EU;
-To consider the data requirements and feasibility of developing a GIS-based qualitative risk assessment model for the impact of climate change on one other tick-borne or mosquito-borne livestock virus, e.g. African swine fever virus, Rift Valley fever virus or West Nile virus;
-To review the potential application of genomic approaches to assist in risk assessments for the impact of climate change on the host-pathogen-vector interaction.

Achievements

Establishment of the GIS model for CCHF in Europe. Data have been obtained for the distribution of the main tick vector (Hyalomma marginatum) in southern Europe together with livestock densities and presence/absence data for vertebrate hosts such as hares. Those data have been added to the GIS model their layer combined to give an indication of high risk areas.

A model-building workshop was held at VLA in October 2009. The release assessment focussed on the introduction of CCHFV-infected ticks attached to migratory birds from CCHF-endemic parts of sub-Saharan Africa. It has been agreed to focus on five species of birds. Those species represent ground-dwelling migrants which are abundant summer visitors in southern Europe or northern Europe.

A review has been undertaken to consider the application of genomic approaches for understanding the impact of climate change on the host-pathogen-vector interaction. That work concluded that genomic approaches may allow a paradigm shift in how risk assessments for vector-borne livestock viruses will be developed in the future with emphasis on looking at combinations of genes in the host, pathogen and vector.

Internal Call programme

EPIZONE's method of choice to stimulate new collaborations, filling gaps in its existing research agenda, and ultimately consolidating its future, was its strategic Internal Call (IC) programme.
Kicking off in 2007, the Internal Call programme provided up to 12 months of funding for selected integration activities within established research projects as well as new and original research pursuits within EPIZONE's scientific themes. The projects, which had to involve a minimum of four EPIZONE partners, had to show a clear integrative approach and could also include non-research activities such as those related to facilities or resources — for example bio safety labs or high containment units. The focus of the call changed each year covering topics such as serological diagnostics, joint animal experiments, emerging diseases, and molecular epidemiology. In total, EPIZONE approved 12 projects during the three-year internal call programme.

IC 1.3 Top 200 EPIZONE FAQ.

The purpose of this FAQ (frequently asked questions) project was to support researchers and other visitors of the EPIZONE website and member area finding answers to the 200 most asked questions about all possible EPIZONE related themes and subjects. Top 200 FAQ was a great example of a practical integrative activity. This project developed a FAQ database covering 200 of the most commonly asked questions related to EPIZONE and epizootic disease research. The comprehensive FAQ became an integral part of EPIZONE's public website enabling researchers and other online visitors to quickly and easily find answers across several subject areas.

IC 2.5 Formaldehyde replacement

Many research institutes rely on formaldehyde as disinfectant. However, as a toxic and carcinogenic substance, its on-going use has raised questions about personal and environmental safety, and may in future be banned. This project used a well-attended workshop to evaluate current experiences with formaldehyde alternatives aiming to look into validation of some possible replacements. The project results are available as download report on the EPIZONE internet site.

IC 4.5 Serological methods to detect koi herpes virus (KHV) antibodies in carp.

In 2006, the production of common carp (Cyprinus carpio) in Europe was 125 000 tons,
while the same year China produced 2 590 000 tons. Aquaculture production is the fastest growing animal industry in the world and has a high socio-economic impact in especially Asia and Europe. Therefore, protection from emerging diseases in aquaculture should be given high priority.
The objective of this project was to develop, validate and implement serological techniques (seroneutralisation, immunofluorescence, ELISA) for detection of antibodies against Koi herpes virus (KHV) in carp. Using three KHV susceptible cell lines, the project team compared the three methods for sensitivity, specificity and applicability under standard laboratory conditions, and validated the techniques through inter-laboratory proficiency testing.

IC 4.6 Implementing a Europe-wide surveillance network for exotic equine encephalitis viruses (EEV)

This project developed serological tools for three alphaviruses —eastern EEV, western EEV, and Venezuelan EEV — and for Japanese encephalitis virus. The team also reviewed and tested existing molecular diagnostic assays for alphaviruses to improve and harmonise them, and produced a quantitative real time polymerase chain reaction (qPCR) technique for Venezuelan EEV.

IC 4.7 Molecular epidemiology of foot-and-mouth disease virus (FMDV) in Asia

In response to the growing threat from FMDV to the livestock industries of both Europe and China major advances have been made in the range of molecular tools used to characterise the virus. To better coordinate and standardise the use of such tools between international laboratories, the IC 4.7 project team, which included both European and Chinese scientists, developed an online database of recommended primer panels (www.epizone-iah.net), and disseminated a robust set of sequencing protocols. To further harmonise the intercontinental research efforts, the project team also proposed a single framework of nomenclature to describe the important contemporary FMDV lineages.

IC 5.5 Improved immunology toolbox

This project expanded the toolbox of antibodies available to study immune responses in swine and cattle — important in the development and testing of vaccines. The project team generated new monoclonal antibodies for bovine and porcine immune response proteins, tested and distributed those antibodies throughout EPIZONE along with optimised protocols for their use.

IC 5.6 Prime boost strategies for African swine fever

The working group on African swine fever virus (ASFV) carried out joint experiments to evaluate different prime boost strategies for delivering ASFV antigens to pigs, and to test the ability to confer protection against lethal

virus challenge. The results confirmed that a proportion of pigs could be protected by DNA vaccination in the absence of an antibody response, although relatively high viraemia (virus in the bloodstream) was detected. Boostering with either recombinant MVA (modified vaccinia Ankara virus) or proteins did not improve protection.

IC 5.7 Rift Valley fever network

To identify gaps in knowledge and reagent collections, and to standardise animal challenge models and diagnostic tests, this project group founded a pan-European network of researchers working on Rift Valley fever virus (RVFV). The first outputs from the European Network for the Coordination of Rift Valley Fever Animal Experimentation and Diagnostics (ENCRAD) included a database of samples, and qPCR and ELISA ring trials for standardisation of diagnostic tests. Such work, according to Theme 5 Leader, Linda Dixon, is crucial to prevent research duplication and to improve Europe's preparedness against this perilous disease.
"This livestock disease, which can also cause serious disease in people, is a growing problem in Africa and there is a real danger that it will be introduced into Europe.
Europe is poorly prepared for the introduction of RVFV, licensed vaccines are lacking and diagnostic tests and models for vaccination trials have not been standardised. These were all key targets for the RVFV network."

IC6.5 WILDSURV harmonisation

Several viruses causing important animal diseases which are currently studied in EPIZONE institutes, have important wildlife reservoirs. Well known examples are Aujeszky's disease virus (ADV), Classical swine fever virus (CSFV), Avian Influenza virus (AIV) and Rabies virus. Since wildlife may come in contact with domestic food producing animals, an increasing number of European countries are implementing wildlife surveillance programmes for threatening viruses. The currently running programmes are often different between countries. For comparison of results, a harmonisation of these programmes (sampling strategies and sample numbers, diagnostic techniques, interpretation of results etc.) is urgently needed.
WILDSURV focused on the urgently needed harmonisation of wildlife surveillance programmes. After investigating current surveillance programmes for classical swine fever virus (CSFV) in wild boar, and for lyssavirus (rabies) in foxes, raccoon dogs, and bats, the project team created an optimised lyssavirus surveillance protocol for bats and a draft surveillance protocol for CSFV. They also developed a number of recommendations, which were provided to the European Food safety authority (EFSA), to enhance harmonisation of surveillance programmes for classical rabies in foxes and raccoon dogs.

IC 6.6 Epidemiology and surveillance of bluetongue serotype 8 in Europe

IC 6.6 was a continuation of the consortium of EPIZONE epidemiologists which was formed in 2006 when the bluetongue virus (BTV)-8 epidemic hit NorthWest Europe. Using the outbreak data from Belgium, France, Luxembourg, Germany and the Netherlands acquired during 2006 and 2007, the project team created a shared database and conducted a full multivariable epidemiological analysis of the spatiotemporal relationships between bluetongue incidence and possible risk factors. They also generated risk maps for the infected region and each country, and evaluated existing surveillance programmes. The theme leader for surveillance and epidemiology, Claes Enøe, said that a major outcome of their analysis, which had not been possible without the EPIZONE collaboration, was that animal density was the most important risk factor for the incidence of BTV-8 in Northwest Europe. "The outcomes and work that was done in the bluetongue group were absolutely fantastic. It's a really good example of what you can actually do if you share data from different sources across different countries".

IC 6.7 Establishing transmission dynamics of bluetongue serotype 8 in northern Europe.

The ''BT-DYNVECT' project continued its work of IC 6.6 by collecting and sharing data related to culicoides (biting midges) and the outbreaks of bluetongue virus. The project examined the ecology of the biting midges and evaluated the efficacy of vaccination campaigns. At its conclusion the project had firmly established a network of BTV specialists from within EPIZONE as well as external partners, and expanded the EPIZONE database for BTV. As with its predecessor, IC6.6 clearly showed that collaboration between different institutes and groups can result in scientific output that may significantly help policy makers in BTV surveillance.

IC 6.8 Comparative dynamics of bovine viral diarrhoea virus (BVDV) and the newly detected bovine pestivirus (BVDV-3)

The IC 6.8 project group examined the clinical aspects of BVDV-3 infection including the signs, antibody response and virus shedding, as well as undertaking a comparative study of the pathogenesis. The group found that there were similar clinical signs between BVDV- 1 and BVDV 3, although there was a shorter duration for BVDV -3 infection, and differences in antigen/antibody levels between BVDV -1 and BVDV -3 infections. To further integrate the work, the research team also distributed valuable samples of the newly detected pestivirus to the EPIZONE partners institutes.

8 - Dissemination of knowledge

Several Work Packages clearly had the intention to generate knowledge directly or indirectly related to control and diagnosis of epizootic diseases. Many different initiatives have been started to combine fragmented knowledge. Most of the generated knowledge will be available and therefore exploitable in many different ways. Release into the public is and will be dependent on the kind of generated knowledge. For scientific dissemination of knowledge a remarkable amount of peer reviewed publications were produced and there are more submitted for review or still in preparation.

Exploitable knowledge

Table 13: Exploitable knowledge

Exploitable knowledge	Sector of application
145 Scientific papers published in **peer reviewed** journals,	**Scientists**
(**Publications of) workshops** of significant impact for decision making bodies or authorities are present.	Decision making bodies, Governmental organisations
Information on animal diseases, collected and finalized by several members of the consortium, is now available on the website.	public
The **expert database and top200faq** on the EPIZONE public website are a point of information for all user groups within and outside the EPIZONE platform. Intended target audiences can find useful information and experts in a quick and effective way.	public
Sequences of avian influenza viruses and avian paramyxoviruses released into the public databases and available for an extremely wide audience.	Scientists
Databases of available expertises, reference materials, virus strains, and scientists make this knowledge easily exploitable.	Scientists, decision making bodies
The database structure and the programme from the **"European online database on epizootic diseases as an early warning system"** can be used for similar data bases serving epidemiological or risk assessment purposes.	Scientists Governmental bodies
On the long term, devices for a **clinical decision-support system for early detection of classical swine fever** will be available on herd-level for non-profit organisations like the OIE or FAO, and many others.	Non-profit organisations OIE Decision making bodies Veterinarians in the field
The audit form Standardisation is a useful **tool to review import risk assessments**. The questions posed are highly relevant and based on international guidelines for peer review of import risk analysis studies.	EFSA OIE Decision making bodies Governmental organisations
Where possible contacts with companies are foreseen in order to **exploit diagnostic tests or products**. To this end, products will become available for all interested parties.	Scientists Industry
Report Workshop 'Formaldehyde replacement': Abstracts, Conclusions and Recommendations'. (website download: report EPIZONE Formaldehyde replacement)	Institutes Scientists

Exploitable knowledge	Sector of application
Penside methods developed in EPIZONE are being tested by the partners for practical application in the field. Cooperation with various commercial concerns, including Smiths Detection, Optigene and Tetracore for the **development of assays that will be made into products to serve the marketplace.**	Industry Scientists
Furthermore, **SOPs on penside methodology** (extraction using FTA and 3MM papers) for general and specific applications for the creation and improvement of penside SOPs.	Industry scientists
A project will be funded by OIE for the use and validation of LAMP as a sensitive and specific penside test in developing countries.	OIE Scientists
Concerning flavivirus and alphavirus antigens produced in insect drosophila cells at IPP, a **patent entitled « SNAP-based method for obtaining high yield of recombinant protein** » was submitted to the European Patent Office in December 2010 (IPP). These antigens could be made available to veterinary diagnostic companies, for future development of commercial ELISA kits	Industry
FMDV sequencing and analysis. It is clear that continued collaborative initiative will be required to most efficiency maximise our efforts to **understand the global epidemiology of FMDV**. A number of potential funding streams have been identified that might be appropriate to fund continued work in this area: (i) BBSRC China-partnering awards (to continue collaboration between IAH and LVRI), (ii) FAO project proposals to develop tailored molecular diagnostic tests in different FMD endemic regions of the world, and (ii) an EMIDA proposal (EPI-SEQ) to work on viral evolution (led by VAR).	FAO Scientists Governmental organisations
The **liposome/alginate method for oral immunization of fish** developed in a collaboration between CIRAD, and CISA-INIA is the subject of a **joint patent application** by the two partners.	Industry
A study on how to modify double and single stranded RNAs in order to increase or decrease their ability to **promote immune stimulation** especially antiviral immune defences. Such small RNAs may have the potential to be used as molecular defined adjuvants for inducing a specific, well-described level of stimulation.	Scientists
Fluctuations in cytokine serum concentrations may be used as a measure of other stressors than infection, and low doses of cytokines may be given to **improve animal welfare** – this was investigated in pigs	Governmental organisation
Immunoglobulins for passive immunization have merits for **protection against enteric and other pathogens**, as described by SVA.	Scientist Industry
Recommendations to international bodies like OIE as a result of efforts within the Network will be of benefit for controlling epizootic diseases.	OIE Governmental organisations
A patent application was done: PCT/EP2008/064155 Alonso C., Hernáez B. y Escribano J.M. (INIA-Algenex) New antiviral peptides from African swine fever virus which prevent the binding of the virus to dynein.	Industry
The ELISA ring trial for RVFV provided important insights into the diagnostic specificity and sensitivity of two commercially available ELISAs (both from BDSL). The **ID-VET ELISA is now commercially available** and the **ARC-OVI ELISAs are expected to be available soon**. From this, we conclude that the ENCRAD ELISA ring trial stimulated the marketing of these novel ELISAs. (Rift valley)	Industry Scientists

Dissemination of knowledge

Table 14: Dissemination of knowledge

Type	Target audience	Countries addressed	Size of audience	Work package responsible/ involved
EU Press release	Media , general public, policy makers	Europe, China, Turkey	Circa 500	3.1
Invitation to the Press	Media , general public, scientists, policymakers	Europe China, Turkey	Circa 1000	2.1/ all work packages
Media/magazines/news papers	Veterinarians, EU parliament Scientists, farmers, general public	Europe China, Turkey	>20.000	2.1/4.1
Conferences, seminars, workshops (scientific, including oral presentations and poster	Research scientists, industry, veterinarians, policymakers	Global, Asia, Europe Australia, Canada, Africa, USA	>20.000	2.1
Exhibitions/conferences (World expo, European food science day, EU conference)	Research scientists, general public, policy makers,EU parliament EC officials, press	global	>20.000	1.1 2.1
EPIZONE website/ vetsweb	Scientists, Policymakers, industry, General public, EC parliament	global	>>50.000	1.2
Posters	Research scientists, industry, policymakers, general public	EU, China, Turkey	>6000	1.2
Flyers/leaflets/brochure	Scientists, veterinarians, policymakers, general public	EU, China, Turkey, global	>1500	1.2
Direct emailing	CVO's, Policy makers	global	Circa 500	1.1 1.2
Newsletter	Scientists, stakeholders (industry, policymakers, EU, OIE, WHO, veterinarians)	Global, Europe, Asia, Australia, USA, Canada	>4000	1.2/ all work packages

Publishable results

145 Peer revied papers have been published during the funding period. Besides those 145 there are additional papers already submitted waiting for publication and more papers in preparation.

From A-Z, published papers from all work packages during the funding period

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9 - EPIZONE Partners

NETHERLANDS	Central Veterinary Institute of Wageningen UR Lelystad, The Netherlands,	(CVI)
GERMANY	Friedrich-Loeffler-Institute,	(FLI)
UNITED KINGDOM	Institute for Animal Health,	(IAH)
UNITED KINGDOM	Animal Health Veterinary Laboratories Agency,	(AHVLA)
FRANCE	Agence Nationale de Sécurité Sanitaire,	(ANSES)
DENMARK	National Veterinary Institute, Technical University of Denmark,	(DTU Vet)
SWEDEN	Statens Veterinarmedicinska Anstalt,	(SVA)
FRANCE	Centre de coopération Internationale en Recherche Agronomique pour le Développement,	(CIRAD)
SPAIN	Center of Animal Health, National Institute for Agriculture and Food Research and Technology,	(CISA-INIA)
ITALY	Istituto Zooprofilattico Sperimentale delle Venezie,	(IZS-Ve)
CHINA	Lanzhou Veterinary Research Institute,	(LVRI)
POLAND	National Veterinary Research Institute,	(NVRI)
TURKEY	FMD Institute Ankara,	(SAP)
BELGIUM	Veterinary and Agrochemical Research centre, VAR-CODA-CERVA,	(VAR)
GERMANY	Hannover Veterinary School,	(HVS)
ITALY	Instituto Zooprofilattico Sperimentale della Lombardia e dell' Emilia Romagna Brescia,	(IZSLER)
CHINA	Harbin Veterinary Research Institute,	(HVRI)
ITALY	Food and Agriculture Organization,	(FAO)
NETHERLANDS	Digital Value,	(DiVa)

Coordinator's representative: Professor Wim van der Poel,

Central Veterinary Institute of Wageningen UR

The Netherlands

Contact
Web: www.epizone-eu.net
E-mail: epizone.cvi@wur.nl
Phone: +31 320 23 88 83

Mission of EPIZONE
EPIZONE is an EU funded Network of Excellence for Epizootic Disease Diagnosis and Control to improve research on preparedness, prevention, detection, and control of epizootic diseases within Europe to reduce the economic and social impact of future outbreaks of foot-and-mouth disease, classical swine fever, avian influenza, and other relevant epizootic diseases like bluetongue and african swine fever, through increased excellence by collaboration.

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