OIE Collaborating Centres Reports Activities

Activities in 2018

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ToR: To provide services to the OIE, in particular within the region, in the designated specialty, in support of the implementation of OIE policies and, where required, seek for collaboration with OIE Reference Laboratories

ToR: To identify and maintain existing expertise, in particular within its region

1. Activities as a centre of research, expertise, standardisation and dissemination of techniques within the remit of the mandate given by the OIE

Disease control	
Title of activity	**Scope**
Support to control of mosquito vectors	In 2013, the European Center for Disease Prevention and Control (ECDC) launched a project to develop a tool to evaluate and compare different vector control strategies against West Nile. This project also aims to optimize the allocation of resources and improve the effectiveness of the costs of vector control in Europe. More specifically, ECDC project:- conducted a literature review to identify the best modeling approach and estimate the value of some of the main parameters; - developed a model and a desktop application of the tool prototype to evaluate and compare different vector control strategies; -developed a protocol to perform the pilot study for the validation of the modeling tool to evaluate and compare vector control strategies against West Nile Fever. In 2016, ECDC invited EU/EEA Member States, EU enlargement and Eastern European partner countries to express interest in participating in a pilot study from May to October 2017. This CC has agreed to participate in the pilot study. The study was then extended to 2018 to consolidate the collected data. The study was conducted in the municipality of Occhiobello (Ferrara, Italy), area divided into grids and in 9 squares were placed traps for adults and performed larval samples, in areas where disinfestation is applied and in areas where it is not applied. The data collected were sent to the project coordinators and will be examined together with the data provided by the other partners.
Support to control of mosquito vectors	ECDC- Project AedesRisk Field Study - In 2018 the ECDC launched a new field study on the tiger mosquito in which many countries of the Mediterranean area. The general objective of AedesRisk is the development of an instrument that supports the decision-making process related to the diseases transmitted by Aedes, in particular dengue, chikungunya and zika in Europe. The tool focuses on Aedes albopictus and will evaluate the transmission of the disease implemented as an SIR model. During the first phase of the project, Avia-GIS and IRD conducted two systematic reviews of the literature that serve as a key input to the development of the tools. Currently the mathematical model has been validated and implemented by IRD and the development of the GUI is under way at Avia-GIS. In the next phase, the goal is to have field studies that will allow the validation of the mathematical model in real settings. For Italy, the model validation study takes place in the Veneto region. The study will be carried out in the small town of Chioggia (Venice, northeasetrn Italy), which has historical monitoring to compare with. The data were sent to the coordinators who will process the results.

Cost/utility epidemiological evaluation of vector control measures	The arrival of infected travelers from endemic regions can trigger a sustained autochthonous transmission of pathogens transmitted by mosquitoes in Europe. The CC participated in a study aimed at evaluating the costs and usefulness of the control measures of the vectors that are implemented around the residence of a potentially viremic person. The proposed analysis identifies appropriate reactive measures for the containment and mitigation of future epidemics by combining epidemiological modeling with an economic health approach, considering the different arrival times of imported infections and possible delays in case notification. The estimates obtained suggest that, if the first notification occurs in the middle of the reproductive season of the mosquitoes, the combination of larvicides, adulticides and removal of the breeding sites represents the optimal strategy. In particular, we found that the interventions implemented in 2007 were convenient, with about 3200 cases avoided, 1450 DALY avoided and 13.5 million saved. In addition, larvicides have proven to be more beneficial at the beginning of summer and in warmer seasons, while adulticides should be preferred in autumn and in colder seasons. Our findings provide useful indications to support urgent decisions by public health authorities in response to emerging mosquito outbreaks.
Vector comptence of mosquitoes	In 2018, the CC collaborated in a study conducted in Australian laboratories where a colony of Aedes koreicus was developed starting from eggs produced in the IZSVe insectarium. The recent outbreaks of the chikungunya virus (CHIKV) in Europe highlight the importance of understanding the vector potential of invasive mosquitoes.The potential ability of Aedes koreicus to transmit CHIKV has been studied. The mosquitoes were infected with CHIKV and kept at two temperatures: 23 ° C and a fluctuating temperature. The rates of total CHIKV infection at 3, 10 and 14 days after feeding were low for both heat treatments (13.8% at 23 ° C, 6.2% at fluctuating T). A low percentage (6.1%, n = 65) of mosquitoes kept at a constant temperature of 23 ° C showed the spread of the virus to the wings and legs. Saliva infection, with live viruses, occurred in 2 mosquitoes. No diffusion was noted under the floating temperature regime. Based on these results we can conclude that the transmission of CHIKV by this species is possible.
OFFLU-Vaccine Composition Meeting (VCM). Antigenic and genetic characteristics of zoonotic influenza viruses and candidate vaccine viruses developed for potential use in human vaccines	The aim of the network is to identify animal influenza viruses with zoonotic potential, and to speed up production of human vaccines against zoonotic influenza or pandemic viruses that have emerged from animals and that could have a negative impact on humans. In the reporting period and in its role as OFFLU laboratory, the IZSVe has contributed to the activities of the “Consultation on the Composition of Influenza Virus Vaccines for the Northern Hemisphere” which holds its consultation meetings twice a year at the WHO headquarters and provides technical consultancies on the seasonal influenza vaccine. In particular, the CC has generated and provided the advisory group with the sequences of the HA gene of 89 viruses of the H5, H7 and H9 subtypes, which were selected as representative of the genetic diversity observed in 2018. As requested by the network of experts, cross-reactivity of 14 viral strains of the H5 subtype and of 2 viral strains of the H9 subtype raised against ferret antisera prepared from viruses selected as vaccine candidates (WHO Ferret antisera panel) was evaluated. In addition, the RC produced and shared with 4 laboratories (APHA-Weybridge, FLI, CSIRO-Australia and CDC) a ferret antisera and it homologous antigen H5N8 A/turkey/Italy/17VIR576-11/2017.

Epidemiology, surveillance, risk assessment, modelling	
Title of activity	**Scope**

Predictive models of West Nile virus dynamics	Veneto is one of the Italian regions where WNV is endemic. Using the entomological data and the human cases collected throughout the region in 2013 and 2016, in which there were numerous human cases, the CC collaborated to calibrate a mathematical model based on temperature through a Bayesian approach that simulates WNV infection in an avian population with seasonal demography. We have considered two alternative ways of reactivating the virus in the life cycle at the beginning of each vector reproductive season: in the first the virus is maintained by infected birds, in the other by previously infected infectious mosquitoes. Next, we calculated the seasonal risk curves for human infection and quantified how they translate into symptomatic cases reported. According to our results, WNV is more likely to be reactivated each year via previously infected mosquitoes. The highest probability of human infection is expected to occur in August, consistent with field observations. Our epidemiological estimates may be of particular interest to public health authorities to support decisions in terms of designing efficient surveillance plans and preventive measures.
Risk of transmission of mosquito-borne viruses to humans by blood transfusion	The virus USUTU (USUV) is a Flavivirus with a biological cycle similar to West Nile (WNV), which includes ornithophilic mosquitoes (mainly Culex) as vectors and volatiles as reservoirs. The surveillance plans activated for WNV highlighted the endemicity of USUV in northern Italy and the co-circulation of two different lines. It is therefore desirable that surveillance systems for USUVs similar to those for WNV are implemented in endemic areas. The costs to support USUV control of the blood bags of human donors will be high. But what is the risk of infection in a healthy donor? We would like to answer through the development of a mathematical model that uses published data, historical data not published and new data produced ad hoc. The main purpose is therefore to provide the health authorities with the scientific basis to support the implementation of surveillance systems for USUV. In 2018, 92 entomological positive samples were collected for USUV for which the analysis for the complete genome sequencing is underway. In the meantime, the RNA extracts of the previous years (from 2010) were selected representing the "strains" that were highlighted with the partial phylogenetic analyzes. With the genetic sequences of the various years we will proceed to extensive phylogenetic analyzes in order to investigate the evolutionary dynamics of the virus.
Surveillance of invasive mosquitoes	The invasive mosquito species Aedes japonicus japonicus was detected in northeastern Italy for the first time in 2015, at the border with Austria. After this finding, a more intensive monitoring was carried out to assess its distribution and to collect biological data. The presence of Ae. j. japonicus was checked in all possible breeding sites through collections of larvae. The monitoring started from the site of the first detection at the Austrian border and then was extended in all directions. The mosquitoes were identified morphologically and molecularly. Aedes j. japonicus was found in 59 out of 72 municipalities monitored (81.9%). The mosquito was collected mainly in artificial containers located in small villages and in rural areas. Cohabitation with other mosquito species was observed in 52.2% of the samplings. Aedes j. japonicus is well established in Italy and in only four years has colonised two Italian Regions displaying a fast spreading throughout hilly and mountainous areas. Colonisation towards south seems limited by climatic conditions and the occurrence of a large population of the larval competitor Ae. albopictus.

Animal sentinels for tick-borne diseases	A study on tick-borne diseases was concluded in 2018 with the aim of expelling if the fox could be used as a sentinel of the presence of tick-borne diseases compared to entomological surveillance. Northeastern Italy is in fact a hotspot for different pathogens transmitted to animals and humans mainly by Ixodes ricinus. We compared the results of the molecular monitoring of ticks and zoonotic pathogens over a period of six years with the monitoring of red foxes (Vulpes vulpes) in an endemic area. In the period 2011-2016, 2578 ticks were collected in 38 sites in 20 municipalities in the province of Belluno and screened for tick-borne encephalitis, Borrelia burgdorferi (sl), Rickettsia spp., Babesia spp., Anaplasma phagocytophilum and "Candidatus Neoehrlichia mikurensis" "by means of real-time PCR and sequencing. The spleen of 97 foxes, knocked down during the 2015-2017 period during sport hunting or population control programs were also examined. None of the pathogens found in ticks were detectable in foxes.The results showed that foxes cannot be used as sentinel animals to monitor tick-borne pathogens in the specific epidemiological context of north-eastern Italy.
Detection of new pathogens	Borrelia miyamotoi is a spirochete transmitted by several species of ticks ixodidae. It causes recurrent fever in humans and is currently considered an emerging pathogen. In Europe, B. miyamotoi appears to have low prevalence in ticks of the Ixodes ricinus species, but has a wide distribution. In 2018 two independent studies were conducted in the northeastern and northwestern Alps, in Italy. Three of 405 nymphs (0.74%) were positive for Borrelia miyamotoi. In particular, B. miyamotoi was found in 2/365 nymphs in the western part and in 1/40 nymphs in the eastern alpine area. The phylogenetic analysis confirmed that this isolate belongs to the European group, similar to the circulating group. The recurrent fever caused by Borrelia miyamotoi has not yet been reported in Italy, but incorrect diagnoses of tick-borne encephalitis, human granulocytic anaplasmosis or other recurrent fever can occur. Our results suggest that B. miyamotoi should be considered in the differential diagnosis of febrile patients from endemic regions of Lyme borreliosis.
Retrospective evaluation of active and passive surveillance for rabies in Italian bats between 2006 and 2018	Bats are hosts to zoonotic pathogens, including rabies related lyssaviruses (RRLYSV) which have been detected in several European countries. In Italy bats have been included within the passive national surveillance program for rabies in wildlife since the ‘80s, while active surveillance was implemented in 2008. Active surveillance has led to the detection of neutralizing antibodies directed towards European bat 1 LYSVs (EBLV-1) in 9/13 maternity colonies screened across the whole country. The first seropositive case was found in M. myotis in June 2009. M. blythii and T. teniotis species have more recently been found to be exposed to a EBLV-1 like virus, while positive colonies were found virus-free, thus suggesting a low incidence of neurological infections. Similarly, passive surveillance failed to detect LYSVs in Italian bats, likely due to the lack of investigations in target species in Europe, such as E. serotinus, M. daubentonii, M. dasycneme and M. nattereri. In recent years a closer collaboration with bat handlers has increased the number of tested samples, and this will improve passive surveillance and help to decrypt serological data obtained up to now.

Surveillance activity of great-myotis populations as reservoirs of rabies related lyssaviruses in bats	Bats have recently been associated with a number of newly recognized zoonotic agents; among these, rabies related lyssaviruses (RRLYSV) have been reported from several European countries. The CC is involved in the active surveillance of synanthropic Myotis myotis of Northern Italy, which have the peculiarity of living in buildings such as churches. In 2018, we further screened one of the five detected colonies, confirming waves of infections from an EBLV-1 like virus since 2009. By using both nuclear and mitochondrial markers, we also analyzed genetic data from five neighboring colonies of South Tyrolean M. myotis in order to assess their connectivity. Our results are consistent with the existence of a single metacolony, confirming that annual and seasonal similarities in seroprevalence found between colonies are likely due to the transmission of the virus from roost to roost associated with the movement of individuals.
surveillance of Trichinellosis in wild mammals	The regular monitoring of wild life, such as wild boar, foxes or other indicator animals is an important tool for assessing changes in disease prevalence. In order to enhance the control system in accordance with the actual public health risks we have implemented a surveillance system on wildlife hunted or found dead. During 2018, 8923 wild animals were controlled including 7764 wild boars, 776 red foxes (Vulpes vulpes), 377 mustelids and 6 others (wolf, golden jackal, long eared owl). All samples were negative confirming the low prevalence of Trichinellosis in the area.
surveillance of Echinococcus multilocularis in red foxes	After the detection od f asmall focus of alveolar echinococcosis in Bozen province, surveillance of red foxes is in place every year. In 2018, 326 fecal asamples of red foxes were tested by specific coprological test and the Taeniid eggs isolated in 72 animlas were subjected to PCR. No positives were found.

Zoonoses

Title of activity	Scope
Epidemiology of Hepatitis E (HEV) at the wildlife-livestock-human interface	Europe was traditionally considered as non-endemic for HEV, with few sporadic travel-related cases returning from endemic countries. Recently autochthonous HEV cases increased outside the endemic foci. Interestingly, locally acquired infections in these new areas were associated not only with consumption of undercooked pork (being domestic pigs the main reservoir), but also with wild boar and deer. In North-Eastern Italy the monitoring of wild boar, red deer and roe deer, detected active circulation of HEV infection only in the wild boar in a restricted area. In this area, seroprevalence was 14.73% and viral RNA prevalence 8.70%. Considering the other territories, 5 sampling areas have been defined, taking into account the distribution maps and possible natural and/or artificial barriers limiting the animal dispersal. The phylogenetic analysis of two complete viral genomes and of the ORF1 and ORF2 partial sequences of nine viruses, showed that the viruses grouped together within genotype 3 but clustered separately from previously identified subtypes, thus suggesting the identification of a novel genotype 3 subtype. The phylogenetic analysis of nine partial ORF2 sequences showed the closest similarity with wild boar/human viruses identified in central-northern Italy in 2012.

Toxoplasma in wild game meat	In 2018, in the framework of a research project on microbial safety of wild ungulate meat in North-Eastern Italy, about 500 samples of muscle from wild boar, red deer and roe deer were analyzed for Toxoplasma spp. by RFLP-PCR. 30% of muscles tested positive for Sarcocystides spp., but no positive samples for Toxoplasma were found. Characterization of the Sarcocystides species is in progress, and some cases of multiple infection seem to occur. However, the absence of Toxoplasma seems to account for a low prevalence of this zoonotic parasite in wild game in the area.

Wildlife

Title of activity	Scope
Prioritization of diseases in wildlife	Based on the results of a project aimed at prioritizing infectious diseases of wild ungulates by a research team composed of scientific experts, sociologists and statisticians, in 2017 two lists were produced: one related to non-zoonotic diseases, and the other to zoonoses. In 2018, these lists have been used to plan protocols to ensure both diagnostic appropriateness and an appropriate surveillance level for early detection.
Fox population data for disease surveillance	The red fox represents the main reservoir of wild rabies in Europe, also playing a basic role in the epidemiology of other zoonoses as Trichinella and Echinococcus multilocularis. These reasons, among others, make this carnivore a prioritary species at the animal/human interface: it is therefore worthwhile to develop and evaluate methods to acquire systematic and comparable data on fox populations. In 2018, a five-year study aimed at detecting fox population trend variations by the analysis of indices of kilometric abundance of foxes was published, and a project started to validate this approach by population genetic markers on fox feces in an area where also a hotspot of E. multilocularis has been consistently confirmed across the last years. Red fox fecal samples were collected to carry out population analysis by genetic capture-recapture means and PCR amplification protocols were developed for 21 microsatellite markers.
Management of wildlife population	Besides the knowledge of the pathogens, the efficacy of any possible control measure of wildlife diseases is related to the knowledge of the ecology and demography of the host population/s. For this purpose, IZSVe has been developing since 2014 a metadata and data management platform, aimed at collecting and collating wild population data relevant for surveillance, management and control of diseases in wildlife. An official Agreement between IZSVe and local Partners in charge for wildlife management and conservation is in force for this aim, and the wild ungulate population metadata catalogue and the geo-database of wild ungulate population data have been built according to the 2007/2/EC INSPIRE (Infrastructure for Spatial Information in Europe) Directive. The development of this platform is a continuous work in progress that has been prosecuted also in 2018. Particular attention was paid during the last year to the wild boar, due to the alert related to the spreading of African Swine Fever across Europe. Moreover, we started to extend data collection and harmonization to the red fox populations.

Diagnosis, biotechnology and laboratory

Title of activity	Scope
Diagnosis of Flaviviridae (WNV, USUV, others) in mosquitoes	During 2018, 136516 mosquitoes were identified and pooled in 2273 pool tested by PCR for Flaviviridae

Diagnosis of other vector-borne diseases	Other 1398 PCRs were performed in blood of animals and ticks to diagnose zoonotic vector-borne pathogens, including Rickettsia spp. (311), Piroplasms (375), Bartonella spp. (96), Leishmania infantum (288), Anaplasma phagocytophilum (280), tick-borne encephalitis (23), Borrelia burgorferi sl (25).
Diagnostic activities on rabies	Within the national surveillance activities for rabies for year 2018, 1756 brain samples were analyzed by using the direct Fluorescent Antibody Test (FAT); of these, 867 samples were from red foxes, 180 from bats, 251 from domestic animals and the remaining 459 samples were taken from wild animals. Samples from domestic carnivorous and from case of exposure to wild or symptomatic animals were analyzed also by rabies tissue culture infection test (RTCIT) and RTPCR. A total of 3926 sera were tested (3811 from pets, 5 from wildlife and 110 of human origin). In addition, 409 bats sera were analyzed by rapid fluorescent focus inhibition test (RFFIT). Being a reference point also for human beings, in 2018 the CC continued to offer scientific support to Italian public hospitals and health centers.
Standardization of antiviral assays to characterize drugs and virus resistance	The CC has imported and standardized a series of assays to characterize the antiviral activity of novel compounds. Collaborations with Italian and Jordan universities have allowed the CC to validate the tests using plant extracts and synthetic peptides with supposed anti-viral activity against Newcastle disease viruses and type A influenza strains of different subtypes. The different techniques are based on the neutralization of viral replication (reduction in the number of plaques), on the reduction in size of viral plaques and on indirect methods, in which the antiviral activity is evaluated as a measure of cell vitality (e.g. neutral red uptake) via an ELISA test. This set of techniques is strategic for a prompt phenotypic characterization of emerging viruses with zoonotic potential. The validation of the assays has been performed using antiviral drugs of the following classes: Adamantanes (targeting the uncoating of the virus), neuraminidase inhibitors (targeting the release of newly formed virions) and nucleoside analogs (mutagenic).
Development and validation of ovine respiratory explants for virus characterization	The CC has developed and validated the culture of respiratory explants obtained from 2-month-old lambs. Nose, trachea, bronchi and lung were cultured up to 120 hours and checked for vitality, tissue integrity and functionality every 24 hours. The explants were considered a reliable substrate for virus growth up until 72 hours post infection, as confirmed by the replication dynamics of Parainfluenza virus 3 in these tissues. The presence of the virus by immunohistochemistry indicated that the replication targeted the respiratory epithelium, confirming the suitability of the technique for the phenotype characterization of respiratory viruses.
Development and validation of an innovative assay for the titration of Zika viruses using microtiter plates	The CC has developed a variation of the traditional plaque assay for Zika viruses, to make it more scalable, affordable and less time-consuming. Compared to the traditional assay requiring 96 to 120 hours for the virus to form visible plaques, the developed assay is based on immunocytochemistry so that the plaques are visible by colorimetric revelation within 44 hours. Since the assay is carried out in VERO cells using microtiter plates, the plaques are very small but countable through a magnifying lens. These plates allow a high scalability and require small volumes of reagents compared to the traditional assay, thus reducing time and costs required to carry out the analyses.

Development and validation of human placental explants of the third trimester	The CC has developed and validated the use of placental explants for the study of Zika viruses. In collaboration with the Obstetrics and Gynecology Department of the University of Padova, placentas obtained from elective cesarean sections were cultured up to 120 hours. Issues such as bacterial contamination, reduced vitality and conservation of tissues during transport were solved by adjusting the concentration and type of antibiotics used in the culturing medium and maintaining the cold chain and the aseptic technique at all times. Immunohistochemical and histological evaluations were carried out at different times post collection of tissues to monitor the architecture and vitality of explants. Culture was considered feasible up to 72-96 hours.
Selection of the G228S mutation in the hemagglutinin of a H3N6 mallard virus is favored in ferrets with prior immunity against a H3N2 seasonal virus	The CC has been working in collaboration with the Virology Department, University of Marburg, Germany, to study the adaptive role of the G228S mutation at the level of the hemagglutinin of an avian H3N6 virus in ferrets. The mutation was characterized in terms of receptor binding preference, in terms of susceptibility to the blocking action of the ferret mucus and in terms of replication in the ferret model. Data generated through in vitro assays describe how the mutation favors the selection and hence the replication of the virus in ferrets. The mutant virus displayed significantly lower binding avidity for the avian-type receptors (Sia2,3), whereas binding to human type receptors (Sia2,6) was slightly but significantly increased. In vitro neutralization assays also proved the mutant was less sensitive than the wild type virus to the blocking action of the ferret mucus, supporting the hypothesis the virus evolved to escape this first innate immune response and get access to the upper respiratory tract epithelium.

Food safety	
Title of activity	**Scope**
Food safety and game meat	In 2017-2018, in the framework of a research project on microbial safety of wild ungulate meat in northeastern Italy, about 200 sponge bags from carcasses of red deer, roe deer and chamois were analyzed for food pathogens (Salmonella spp., Listeria monocytogenes, Escherichia coli O157) and process hygiene criteria (aerobic colony counts, enterobacteriaceae, Escherichia coli, coagulase-positive staphylococci) (156 samples in 2017 and 34 in 2018). No food pathogens were found.

Toxicological study on bioaccumulation, and depuration of titanium dioxide nanoparticles (TiO2NPs) nanoparticles in bivalve mollusks	Titanium dioxide nanoparticles (TiO2NPs) are widely used in a great variety of products (e.g pigment in cosmetics, paints, textiles, paper, plastics, food, etc.) and there is strong evidence of urban runoff water contaminated by TiO2NPs. Edible bivalve mollusks are filter feeders: by accumulating NPs, they represent a potential vector of such contaminants and at as exposure routes of NPs into the human body. A preliminary in vivo study carried out by exposing mussels (M. galloprovincialis) to TiO2NPs in a controlled artificial marine environment for a period of three weeks, showed a bioaccumulation of TiO2NPs. Chemical analysis performed by spICP-MS revealed the presence of TiO2NPs in all the mussels treated with NPs with average size and distribution comparable to the pristine administered NPs. Also mussels treated with ionic Titanium (Ti) seemed to accumulate Ti containing NPs, indicating a potential in vivo biotransformation (e.g. Ti interaction with proteins). However, NPs bioaccumulation seemed to be a reversible process: after 3 days of mussels' depuration, more than 50% of the accumulated NPs appeared to be depleted.

ToR : To propose or develop methods and procedures that facilitate harmonisation of international standards and guidelines applicable to the designated specialty

2. Proposal or development of any procedure that will facilitate harmonisation of international regulations applicable to the surveillance and control of animal diseases, food safety or animal welfare

Proposal title	Scope/Content	Applicable area
none	none	☐Surveillance and control of animal diseases ☐Food safety ☐Animal welfare

ToR: To establish and maintain a network with other OIE Collaborating Centres designated for the same specialty, and should the need arise, with Collaborating Centres in other disciplines

ToR: To carry out and/or coordinate scientific and technical studies in collaboration with other centres, laboratories or organisations

3. Did your Collaborating Centre maintain a network with other OIE Collaborating Centres (CC), Reference Laboratories (RL), or organisations designated for the same specialty, to coordinate scientific and technical studies?

Yes

Name of OIE CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose

EURLP European Reference Laboraroy for Parasitoses	Rome	☐Africa ☐Americas ☐Asia and Pacific ☒Europe ☐Middle East	Collaboration on diagnosis and surveillance of zoonotic agents
Federal Research Institute for Animal Health Friedrich-Loeffler-Institute (OIE CC for Zoonoses)	Greifswald	☐Africa ☐Americas ☐Asia and Pacific ☒Europe ☐Middle East	OFFLU VCM Consultation on the Composition of Influenza Virus Vaccines for the Northern Hemisphere
Federal Research Institute for Animal Health Friedrich-Loeffler-Institute (OIE CC for Zoonoses, OIE RL for rabies)	Greifswald	☐Africa ☐Americas ☐Asia and Pacific ☒Europe ☐Middle East	Testing of rabies Lateral flow devices (LFDs) to better assess their diagnostic performance

4. Did your Collaborating Centre maintain a network with other OIE Collaborating Centres, Reference laboratories, or organisations <u>in other disciplines</u>, to coordinate scientific and technical studies?

Yes

Name of OIE CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
ANSES, OIE RL for rabies (PT organiser)	Nancy	☐Africa ☐Americas ☐Asia and Pacific ☒Europe ☐Middle East	1. Participation to EU proficiency tests for rabies serology (FAVN) 2. Testing of rabies Lateral flow devices (LFDs) to better assess their diagnostic performance (FAT and lateral flow assays)

Animal Health and Veterinary Laboratories Agency now called Animal and Plant Health Agency-APHA (OIE RL for avian influenza and Newcastle disease (PT organiser)	Surrey	☐Africa ☐Americas ☐Asia and Pacific ☒Europe ☐Middle East	Participation to the EU proficiency test for the diagnosis of avian influenza and Newcastle Disease
The National Centre for Foreign Animal Disease (NCFAD) of the Canadian Food Inspection Agency (OIE RL for Avian Influenza and for Bovine Spongiform Encephalopathy (BSE))	Winnipeg	☐Africa ☒Americas ☐Asia and Pacific ☐Europe ☐Middle East	The purpose is to enhance and strengthen health promotion and research capacities by collaborating in diagnostic and vaccine developments for influenza viruses; training of research personnel; sharing of viruses, reagents, facilities
Medical Research Council University of Glasgow Centre for Virus Research - CVR (OIE CC Viral Genomics and Bioinformatics)	Glasgow	☐Africa ☒Americas ☒Asia and Pacific ☒Europe ☐Middle East	OIE-ad hoc group on high throughput sequencing, Bioinformatics and computational Genomics (HTS-BCG)
Istituto Zooprofilattico Sperimentale della Lombardia e dell’Emilia Romagna “Bruno Ubertini”- IZSLER (OIE CC Veterinary Biologicals Biobank)	Brescia	☐Africa ☐Americas ☐Asia and Pacific ☒Europe ☐Middle East	OIE-ad hoc group on high throughput sequencing, Bioinformatics and computational Genomics (HTS-BCG)

Australian Animal Health Laboratory CSIRO Livestock Industries (OIE CC Laboratory Capacity Building)	Victoria	☐Africa ☐Americas ☒Asia and Pacific ☐Europe ☐Middle East	OIE-ad hoc group on high throughput sequencing, Bioinformatics and computational Genomics (HTS-BCG)
Animal Health and Veterinary Laboratories Agency now called Animal and Plant Health Agency (APHA) - OIE RL for avian influenza and Newcastle disease	Surrey	☐Africa ☐Americas ☐Asia and Pacific ☒Europe ☐Middle East	OFFLU VCM Consultation on the Composition of Influenza Virus Vaccines for the Northern Hemisphere
CSIRO Newcomb CSIRO Australian Animal Health Laboratory (AAHL) (OIE CC Diagnostic Test Validation Science in the Asia-Pacific Region) - PT organiser	Victoria	☐Africa ☐Americas ☒Asia and Pacific ☐Europe ☐Middle East	OFFLU VCM Consultation on the Composition of Influenza Virus Vaccines for the Northern Hemisphere Participation to the OFFLU proficiency test for the diagnosis of avian influenza and Newcastle Disease
China Animal Health and Epidemiology Center (CAECH) (Multi-national OIE CC Veterinary Epidemiology and Public Health)	Qingdao	☐Africa ☐Americas ☒Asia and Pacific ☐Europe ☐Middle East	OFFLU VCM Consultation on the Composition of Influenza Virus Vaccines for the Northern Hemisphere
National Avian Influenza Reference Laboratory Animal Influenza Laboratory of the Ministry of Agriculture (OIE RL for Highly Pathogenic Avian Influenza and Low Pathogenic Avian Influenza)	Harbin	☐Africa ☐Americas ☒Asia and Pacific ☐Europe ☐Middle East	OFFLU VCM Consultation on the Composition of Influenza Virus Vaccines for the Northern Hemisphere

ToR: To place expert consultants at the disposal of the OIE.

5. Did your Collaborating Centre place expert consultants at the disposal of the OIE?

No

ToR: To provide, within the designated specialty, scientific and technical training to personnel from OIE Member Countries

6. Did your Collaborating Centre provide scientific and technical training, within the remit of the mandate given by the OIE, to personnel from OIE Member Countries?

Yes
a) Technical visits: 4
b) Seminars: 63
c) Hands-on training courses: 25
d) Internships (>1 month): 2

Type of technical training provided (a, b, c or d)	Content	Country of origin of the expert(s) provided with training	No. participants from the corresponding country
a	Setting up tissue culture infection test, storage of reagents, maintenance of positive controls and neuroblastoma cell cultures	Italy	3
a	Avian influenza: sequencing, diagnostic workflow, typing of virus strains, shipping and documents required for submission of samples, clades H5 classification	United Kingdom	1
b	Symposium on infectious diseases at the Bat-Human Interface	Italy	45
b,c	FAO Programme de Sécurité Sanitaire Mondiale dans la lutte contre les zoonoses et le renforcement de la santé animale en Afrique. Formation des agents du Laboratoire Centrale Vétérinaire de Diagnostic de Conarky (LCVD)	Guinea	10

b,c	FAO Training for rabies diagnosis: Hands-on training on Rabies diagnostic techniques	Liberia	8
c	Knowledge and tools to perform phylogenetic analyses for avian influenza and submit sequences to public databases	Bangladesh	2
c	Knowledge and tools to perform phylogenetic analyses and submit sequences to public databases (for avian influenza and rabies)	Ghana	2
c	Training on laboratory quality systems (ISO/IEC 17025), biosafety and biosecurity measures for molecular diagnostic methods applied to avian influenza analyses and submit sequences to public databases (for avian influenza and rabies)	Nigeria	2
c	Twinning OIE IZSVe - NVRI Nigeria: training on the epidemiology of avian influenza	Nigeria	1
d	Cellular and molecular biology techniques for rabies	Italy	1
d	Surveillance and control of animal diseases: avian influence and West Nile disease	Italy	1

ToR: To organise and participate in scientific meetings and other activities on behalf of the OIE

7. Did your Collaborating Centre organise or participate in the organisation of scientific meetings on behalf of the OIE?

No

ToR: To collect, process, analyse, publish and disseminate data and information relevant to the designated specialty

8. Publication and dissemination of any information within the remit of the mandate given by the OIE that may be useful to Member Countries of the OIE

a) Articles published in peer-reviewed journals: 22

1. Cafarchia C, Iatta R, Danesi P, Camarda A, Capelli G, Otranto D. Yeasts isolated from cloacal swabs, feces, and eggs of laying hens. Med Mycol. 2018 May 11. doi: 10.1093/mmy/myy026.
2. Capelli G, Genchi C, Baneth G, Bourdeau P, Brianti E, Cardoso L, Danesi P, Fuehrer HP, Giannelli A, Ionică AM, Maia C, Modrý D, Montarsi F, Krücken J, Papadopoulos E, Petrić D, Pfeffer M, Savić S, Otranto D, Poppert S, Silaghi C. Recent advances on Dirofilaria repens in dogs and humans in Europe. Parasit Vectors. 2018 Dec 19;11(1):663.
3. Costa PL, Brazil RP, Fuzari AA, Latrofa MS, Annoscia G, Tarallo VD, Capelli G, Otranto D, Brandão-Filho SP, Dantas-Torres F. Morphological and phylogenetic analyses of Lutzomyia migonei from three Brazilian states. Acta Trop. 2018 Nov;187:144-150.
4. Capua, I., Mercalli, A., Romero-Tejeda, A., Pizzuto, M.S., Kasloff, S., Sordi, V., Marzinotto, I., Lampasona, V.,

Vicenzi, E., De Battisti, C., Bonfanti, R., Rigamonti, A., Terregino, C., Doglioni, C., Cattoli, G., & Piemonti, L. Study of 2009 H1N1 pandemic influenza virus as a possible causative agent of diabetes. The Journal of clinical endocrinology and metabolism, Sep 7 2018, doi:10.1210/jc.2018-00862 [doi]
5. Ciocchetta S, Prow NA, Darbro JM, Frentiu FD, Savino S, Montarsi F, Capelli G, Aaskov JG, Devine GJ. The new European invader Aedes (Finlaya) koreicus: a potential vector of chikungunya virus. Pathog Glob Health. 2018 May;112(3):107-114.
6. Danesi P, Ravagnan S, Johnson LR, Furlanello T, Milani A, Martin P, Boyd S, Best M, Galgut B, Irwin P, Canfield PJ, Krockenberger MB, Halliday C, Meyer W, Malik R. Molecular diagnosis of Pneumocystis pneumonia in dogs. Med Mycol. 2017 Nov 1;55(8):828-842.
7. Dantas-Torres F, Latrofa MS, Ramos RAN, Lia RP, Capelli G, Parisi A, Porretta D, Urbanelli S, Otranto D. Biological compatibility between two temperate lineages of brown dog ticks, Rhipicephalus sanguineus (sensu lato). Parasit Vectors. 2018 Jul 9;11(1):398.
8. Da Rold G, Ravagnan S, Soppelsa F, Porcellato E, Soppelsa M, Obber F, Citterio CV, Carlin S, Danesi P, Montarsi F, Capelli G. Ticks are more suitable than red foxes for monitoring zoonotic tick-borne pathogens in northeastern Italy. Parasit Vectors. 2018 Mar 20;11(1):137.
9. Lelli, D., Prosperi, A., Moreno, A., Chiapponi, C., Gibellini, A.M., De Benedictis, P., Leopardi, S., Sozzi, E., & Lavazza, A. Isolation of a novel Rhabdovirus from an insectivorous bat (Pipistrellus kuhlii) in Italy. Virology Journal, 2018, 15, 37.
10. Leopardi, S., Holmes, E.C., Gastaldelli, M., Tassoni, L., Priori, P., Scaravelli, D., Zamperin, G., & De Benedictis, P. Interplay between co-divergence and cross-species transmission in the evolutionary history of bat coronaviruses.. Infection, genetics and evolution : journal of molecular epidemiology and evolutionary genetics in infectious diseases, Elsevier B.VJan 20, 2018, 58, 279-289. doi:S1567-1348(18)30012-1.
11. Magliano A, Scaramozzino P, Ravagnan S, Montarsi F, DA Rold G, Cincinelli G, Moni A, Silvestri P, Carvelli A, DE Liberato C. Indoor and outdoor winter activity of Culicoides biting midges, vectors of bluetongue virus, in Italy. Med Vet Entomol. 2018 Mar;32(1):70-77.
12. Marcondes CB, De Mello CF, Bastos AQ, Montarsi F, Alencar J, Santos-Mallet J. Description of the egg of Hulecoeteomyia koreica (Edwards) (Diptera: Culicidae) using scanning electron microscopy. Zootaxa. 2018 Jun 29;4442(1):194-200.
13. Marini G, Rosà R, Pugliese A, Rizzoli A, Rizzo C, Russo F, Montarsi F, Capelli G. West Nile virus transmission and human infection risk in Veneto (Italy): a modelling analysis. Sci Rep. 2018 Sep 18;8(1):14005.
14. Minicante SA, Carlin S, Stocco M, Sfriso A, Capelli G, Montarsi F. Preliminary Results On the Efficacy of Macroalgal Extracts Against Larvae of Aedes albopictus. J Am Mosq Control Assoc. 2017 Dec;33(4):352-354.
15. Morganti G, Gavaudan S, Canonico C, Ravagnan S, Olivieri E, Diaferia M, Marenzoni ML, Antognoni MT, Capelli G, Silaghi C, Veronesi F. Molecular Survey on Rickettsia spp., Anaplasma phagocytophilum, Borrelia burgdorferi Sensu Lato, and Babesia spp. in Ixodes ricinus Ticks Infesting Dogs in Central Italy. Vector Borne Zoonotic Dis. 2017 Nov;17(11):743-748.
16. Otranto D, Dantas-Torres F, Napoli E, Solari Basano F, Deuster K, Pollmeier M, Capelli G, Brianti E. Season-long control of flea and tick infestations in a population of cats in the Aeolian archipelago using a collar containing 10% imidacloprid and 4.5% flumethrin. Vet Parasitol. 2017 Dec 15;248:80-83.
17. Pichler V, Bellini R, Veronesi R, Arnoldi D, Rizzoli A, Lia RP, Otranto D, Montarsi F, Carlin S, Ballardini M, Antognini E, Salvemini M, Brianti E, Gaglio G, Manica M, Cobre P, Serini P, Velo E, Vontas J, Kioulos I, Pinto J, Della Torre A, Caputo B. First evidence of resistance to pyrethroid insecticides in Italian Aedes albopictus populations 26 years after invasion. Pest Manag Sci. 2018 Jun;74(6):1319-1327.
18. Ravagnan S, Tomassone L, Montarsi F, Krawczyk AI, Mastrorilli E, Sprong H, Milani A, Rossi L, Capelli G. First detection of Borrelia miyamotoi in Ixodes ricinus ticks from northern Italy. Parasit Vectors. 2018 Mar 20;11(1):130.
19. Riccardo F, Monaco F, Bella A, Savini G, Russo F, Cagarelli R, Dottori M, Rizzo C, Venturi G, Di Luca M, Pupella S, Lombardini L, Pezzotti P, Parodi P, Maraglino F, Costa AN, Liumbruno GM, Rezza G; The Working Group. An early start of West Nile virus seasonal transmission: the added value of One Heath surveillance in detecting early circulation and triggering timely response in Italy, June to July 2018. Euro Surveill. 2018 Aug;23(32).
20. Serra-Cobo J, López-Roig M, Lavenir R, Abdelatif E, Boucekkine W, Elharrak M, Harif B, El Ayachi S, Salama AA, Nayel MA, Elsify A, El Rashedy SG, De Benedictis P, Mutinelli F, Zecchin B, Scaravelli D, Balhoul C, Zaghawa A, Hassan HY, Zaghloul AH, Bourhy H. Active sero-survey for European bat lyssavirus type-1 circulation in North African insectivorous bats. Emerg Microbes Infect. 2018 Dec 13;7(1):213. doi: 10.1038/s41426-018-0214-y.
21. Stefanetti V, Morganti G, Veronesi F, Gavaudan S, Capelli G, Ravagnan S, Antognoni MT, Bianchi F, Passamonti F. Exposure of Owned Dogs and Feeding Ticks to Spotted Fever Group Rickettsioses in Central Italy. Vector Borne Zoonotic Dis. 2018 Aug 21. doi: 10.1089/vbz.2018.2303.
22. Trentini F, Poletti P, Baldacchino F, Drago A, Montarsi F, Capelli G, Rizzoli A, Rosà R, Rizzo C, Merler S, Melegaro A. The containment of potential outbreaks triggered by imported Chikungunya cases in Italy: a cost utility epidemiological assessment of vector control measures. Sci Rep. 2018 Jun 13;8(1):9034.

b) International conferences: 26

1. Beato, M., Fusaro, A., Zamperin, G., Milani, A., Cavicchio, L., Schivo, A., Mantovani, C., Monne, I., Vio, D., Schiavon, E., Giorgiutti, M., Castellan, A. & Mion, M. (2018). Novel European Swine Influenza genotypes identified in Italy between 2013 and 2017. 4th International Symposium on Neglected Influenza Viruses, (p. 34). 18-20 April 2018, Brighton, UK
2. Bellinati, L. , Ceglie, L., Natale, A., Zuliani, F., Monne, I., Schivo, A., Zecchin, B., Bonfanti, L., Amato, L., Cunial, G., Obber, F., Bregoli, M., Citterio, C. (2018). Detection and genotyping of hepatitis E virus in wild ungulates from North-Eastern Italy. ESVV-EPIZONE 2018, 11th International Congress for Veterinary Virology. 27-30 August 2018, Vienna, Austria
3. Bertola M., Gradoni F., Da Rold G., Longo A., Mazzaro M., Piva R. 2, Tomasello F., Mazzon L., Capelli G., Montarsi F. Occurrence of potential malaria vectors in north-eastern Italy. E-SOVE Conference, Palermo, Italy 22-26 ottobre 2018.
4. Bonfante, F., Mazzetto, E., Gervasi, M., Veronese, P., Tran, M., Giaquinto, C., De Benedictis, P., Capua, I. & Terregino, C. (2017). Zika virus replication at the placental interface: the role of non-neutralizing immunity. 10th European Congress on Tropical Medicine and International Health (ECTMIH), 16-20 October 2017, Antwerp, Belgium
5. Carlin S., Accordi S., Michelutti A., Martini S., Drago A., Vitale M.L., Borgato P., Capelli G., Montarsi F. Management of mosquito control using two methods to prevent infestation of catch basins. E-SOVE Conference, Palermo, Italy 22-26 ottobre 2018.
6. Carlin S., Gradoni F., Michelutti A., Ravagnan S., Montarsi F. Entomological survey of potential malaria vectors in north-east Italy. In: ECE 2018, XI European Congress of Entomology, Book of abstracts. Napoli, Italy, 2-6 July 2018.
7. Cavicchio, L., Fusaro, A., Zamperin, G., Milani, A., Schivo, A., Mantovani, C., Monne, I., Vio, D., Schiavon, E., Mion, M. & Beato, M.S. (2018). I virus dell'influenza suina in Nord Italia: co-circolazione di diversi genotipi ed eventi di riassortimento. Atti della Società Italiana di patologia ed allevamento dei suini XLIV Meeting Annuale, (p. 345). 15-16 March 2018, Montichiari (BS)
8. Cavicchio, L., Rizzo, G., Amato, L., Vieria, T.J., Forzan, M., Ustulin, M., Monne, I., Vio, D., Bonfanti, L. & Beato, M.S. (2018). Norovirus in faeces of healthy pigs in North-East Italy. 10th European Symposium of Porcine Health Management (ESPHM), Proceedings, (p. 502). 9-11 May 2018, Barcelona, Spain
9. Fassina, C., Leopardi, S. & Piras, G. (2017) Attività di recupero dei Chirotteri in Veneto: nuovi interessanti dati per l’anno in corso. VIII Convegno dei Faunisti Veneti, 21-22 October 2017, Sedico (BL), Italy
10. A. Fusaro, G. Zamperin, A. Milani, L. Cavicchio, Rizzo G., A. Schivo, Pagliari M., C. Mantovani, I. Monne, M.S. Beato. Swine Influenza: novel European genotypes identified in North East Italy. 2nd National Congress of the Italian Society for Virology. 28-30-November 2018, Roma, Italy
11. Gallocchio, F., Biancotto, G., Moressa, A., Arcangeli, G., Toffan, A., Pascoli, F. & Ricci, A. (2018). Titanium dioxide nanoparticles and edible mussels: a potential consumers’ exposure to nanoparticles? EFSA JOURNAL, Supplement, (p. 126). 18-21 September 2018, Parma, Italy
12. Lelli, D., Prosperi, A., Chiapponi, C., Faccin, F., Papetti, A., Boniotti, B., Vaccari, G., Leopardi, S., Decaro, N., De Benedictis, P., Bonilauri, P., Sozzi, E., Moreno, A. & Lavazza, A. (2018). A passive surveillance for emerging viruses in bats in Italy implications for public health and biological conservation. 13th Conference of the European Wildlife Disease Association (EWDA) Abstract book, (p. 32). 27-31 August 2018, Larissa, Thessaly, Greece
13. Leopardi, S., Nouvellet, P., Priori, P., Zecchin, Ba., Zecchin, B., Salomoni, A., Mancin, M., Scaravelli, D. & De Benedictis, P. (2018). Unraveling the Role of Myotis myotis in the Ecology and Transmission of Rabies-Related Lyssaviruses (RRLVs). 9-12 November 2018, The Seventh International Meeting on Emerging Diseases and Surveillance, International Society for Infectious Diseases, IMED 2018 Vienna, Austria
14. Leopardi, S., Zecchin, B., Priori, P., Ciullo, S., Scaravelli, D. & De Benedictis, P. (2017). Disease dynamics of EBLV1 in colonies of Myotis myotis in northern Italy. IV IV Congresso Nazionale di Ecopatologia della Fauna SIEF - Società Italiana di Ecopatologia della Fauna, 11-13 October 2017, Domodossola, Italy
15. Leopardi, S., Zecchin, B., Priori, P., Scaravelli, D., Mancin, M., Zecchin, B. & De Benedictis, P. (2018). Disease ecology of lyssaviruses in the greater mouse-eared bat from South Tyrol (Italy). 13th Conference of the European Wildlife Disease Association (EWDA) Abstract book, (p. 29). 27-31 August 2018, Larissa, Thessaly, Greece
16. Marini F., Caputo B., Pombi M., Travaglio M., Montarsi F., Drago A., Rosà R., Manica M., Della Torre A. (2018) The dispersal of Aedes albopictus females in temperate areas and its relevance in the containment of exotic arbovirus outbreaks. In: E-SOVE the 21st Conference of European Society of Vector Ecology, Program and Abstracts. Palermo, Italy, 22-26 October 2018, 93.
17. Mazzetto, E., Zanardello, C., Beato, M., Schiavon, E., Terregino, C., Monne, I. & Bonfante, F. (2018). Attachment of IDV to the respiratory tract of cattle, small ruminants, swine and horse: a call for increased surveillance. 4th International Symposium on Neglected Influenza Viruses, (p. 29). 18-20 April 2018, Brighton, UK
18. Michelutti A., Montarsi F., Borella S., Mazzucato M., Fornasiero D., Capelli G., Mulatti P. Preliminary Assessment of the role of mosquitoes biodiversity in West Nile virus transmission dynamics. E-SOVE Conference, Palermo, Italy 22-26 ottobre 2018.
19. Montarsi F., Martini S., Drago A., Carlin S., Barbujani M., Barasetti G., Qualizza D. Di Gennaro D., Di Fant M, Palei M, Capelli G. Current distribution of the invasive mosquito Aedes japonicus (Diptera; Culicidae) in Italy. E-

SOVE Conference, Palermo, Italy 22-26 ottobre 2018.
20. Montarsi F., Ravagnan S., Carlin S., Da Rold G., Porcellato E., Palei M., Russo F., Capelli G. Entomological surveillance for West Nile virus in north-eastern Italy and its importance for public health. E-SOVE Conference, Palermo, Italy 22-26 ottobre 2018.
21. Montarsi F., Carlin S., Da Rold G., Ravagnan S., Porcellato E., Toniolo F., Michelutti A., Gradoni F., Napolitano G., Ianniello M., Capelli G. (2018) The Significance of the Entomological Surveillance in the Prevention of Vector-Borne Diseases. In: IMED 2018 International Meeting on Emerging Diseases and Surveillance, Vienna, Austria, 09-12/11/2018.
22. Rizzo, G., Cavicchio, L., Amato, L., Vieria, J.T., Forzan, M., Ustolin, M., Monne, I., Vio, D., Bonfanti, L. & Beato, M.S. (2018). Identificazione di Norovirus GII in feci di suini allevati nel nord Italia. Atti della Società Italiana di patologia ed allevamento dei suini XLIV Meeting Annuale, (p. 381). 15-16 marzo 2018, Montichiari (BS)
23. Severini F., Toma L., Di Luca M., Lia R.P., Otranto D., Montarsi F., Carlin S., Ballardini M., Pautasso A., Triglia G., Serini P., Della Torre A. (2018) Pyrethroid susceptibility status of Aedes albopictus and Culex pipiens populations across italy. In: ECE 2018, XI European Congress of Entomology, Book of abstracts. Napoli, Italy, 2-6 July 2018, 54.
24. Scaravelli, D., Priori, P., Ladurner, E., Drescher, C., Leopardi, S. & De Benedictis, P. 2017Approcci multidisciplinari alla conservazione di specie a rischio: le colonie di grandi Myotis in Alto Adige. VIII Convegno dei Faunisti Veneti, 21-22 October 2017, Sedico (BL), Italy
25. Zecchin, B., Lo, F.T., Diallo, A.A., Seck, M.T., Minoungou, G., Moctar, S., Ouedraogo-Kaboré, A., Lo, M.M., Diop, M., Traore, E., Mbengue, M., Ba, R.O., Moussa, D., Ndiaye, Y.S., Zamperin, G., Schivo, A., Salviato, A., Marciano, S., Fusaro, A. & Monne, I. (2018). Influenza A(H9N2) virus: a new emerging threat in West Africa. 10th International Symposium on Avian Influenza "Avian Influenza in Poultry and Wild Birds", (p. 201). 15-18 April 2018, Brighton,UK
26. Zecchin, B., Schivo, A., Bellinati, L., Milani, A., Fusaro, A., Ceglie, L., Natale, A., Bonfanti, L., Cunial, G., Obber, F., Bregoli, M., Citterio, C., Monne, I. (2018). Genetic Characterization of genotype 3 Hepatitis E Viruses identified from wild boars in north-eastern Italy. 2nd National Congress of the Italian Society for Virology. 28-30 November 2018, Rome, Italy

c) National conferences: 15

1. Bertola M., Gradoni F., Da Rold G., Longo A., Mazzaro M., Piva R. 2, Tomasello F., Mazzon L., Capelli G., Montarsi F. Occurrence of potential malaria vectors in north-eastern Italy. E-SOVE Conference, Palermo, Italy 22-26 ottobre 2018.
2. Carlin S., Accordi S., Michelutti A., Martini S., Drago A., Vitale M.L., Borgato P., Capelli G., Montarsi F. Management of mosquito control using two methods to prevent infestation of catch basins. E-SOVE Conference, Palermo, Italy 22-26 ottobre 2018.
3. Cavicchio, L., Fusaro, A., Zamperin, G., Milani, A., Schivo, A., Mantovani, C., Monne, I., Vio, D., Schiavon, E., Mion, M. & Beato, M.S. (2018). I virus dell'influenza suina in Nord Italia: co-circolazione di diversi genotipi ed eventi di riassortimento. Atti della Società Italiana di patologia ed allevamento dei suini XLIV Meeting Annuale, (p. 345). 15-16 March 2018, Montichiari (BS)
4. Fusaro A., G. Zamperin, A. Milani, L. Cavicchio, Rizzo G., A. Schivo, Pagliari M., C. Mantovani, I. Monne, M.S. Beato. Swine Influenza: novel European genotypes identified in North East Italy. 2nd National Congress of the Italian Society for Virology. 28-30-November 2018, Roma, Italy
5. Gallocchio, F., Biancotto, G., Moressa, A., Arcangeli, G., Toffan, A., Pascoli, F. & Ricci, A. (2018). Titanium dioxide nanoparticles and edible mussels: a potential consumers' exposure to nanoparticles? EFSA JOURNAL, Supplement, (p. 126). 18-21 September 2018, Parma, Italy
6. Gallocchio, F., Biancotto, G., Moressa, A., Arcangeli, A., Toffan, A., Pascoli, F. & Ricci, A. (2018).Nanoparticelle e bivalvi: prove sperimentali di accumulo e depurazione. VII° Convegno SIRAM - Società Italiana di Ricerca Applicata alla Molluschicoltura, 16-17 November 2018, Protici (Napoli), Italy
7. Gradoni F., Carlin S., da Rold G., Ravagnan S., Russo F., Palei M., Martini S., Di Luca M., Capelli G., Montarsi F. (2018) Occurrence of potential malaria vectors in north-east Italy. In: XXX Congresso Nazionale Società Italiana di Parassitologia (SoIPa) - Mutamenti ambientali e parassiti. Milano, Italia, 26-29 giugno 2018, 156.
8. Malandruccolo C., Bellini R., Arnoldi D., Rizzoli A., Severini F., Toma L., Di Luca M., Lia R.P., Otranto D., Montarsi F., Carlin S., Ballardini M., Pautasso A., Triglia G., Serini P., Della Torre A. (2018) Pyrethroid susceptibility status of Aedes albopictus and Culex pipiens populations across Italy. In: XXX Congresso Nazionale Società Italiana di Parassitologia (SoIPa) - Mutamenti ambientali e parassiti. Milano, Italia, 26-29 giugno 2018, 161.
9. Montarsi F., Martini S., Drago A., Carlin S., Barbujani M., Barasetti G., Qualizza D. Di Gennaro D., Di Fant M, Palei M, Capelli G. Current distribution of the invasive mosquito Aedes japonicus (Diptera; Culicidae) in Italy. E-SOVE Conference, Palermo, Italy 22-26 ottobre 2018.
10. Michelutti A., Cagnin V., Pasqualotto S., Vio D., Dellamaria D., Trevisiol K., Obber F., Citterio C., Danesi P. (2018) Trichinella britovi and wildlife: epidemiological situation in north-east Italy. In: XXX Congresso Nazionale Società Italiana di Parassitologia (SoIPa) - Mutamenti ambientali e parassiti. Milano, Italia, 26-29 giugno 2018, 111.
11. Michelutti A., Dellamaria D., Trevisiol K., Vio D., Bregoli M., Obber F., Danesi P., Celva R., Citterio C., Capelli G.

(2018) Echinococcus multilocularis and other cestodes in red fox (Vulpes vulpes) populations of north-eastern Italy. XI COngresso Italiano di Teriologia. Firenze, Italy, 20-22 giugno 2018, 13.
12. Simonato G., Frangipane di Regalbono A., Dotto G., Danesi P., Tessarin C., Pasotto P., Pietrobelli M. (2018) Surveillance of zoonotic parasites in assisted therapy animals. In: XXX Congresso Nazionale Società Italiana di Parassitologia (SoIPa) - Mutamenti ambientali e parassiti. Milano, Italia, 26-29 giugno 2018, 217.
13. Rizzo, G., Cavicchio, L., Amato, L., Vieria, J.T., Forzan, M., Ustolin, M., Monne, I., Vio, D., Bonfanti, L. & Beato, M.S. (2018). Identificazione di Norovirus GII in feci di suini allevati nel nord Italia. Atti della Società Italiana di patologia ed allevamento dei suini XLIV Meeting Annuale, (p. 381). 15-16 marzo 2018, Montichiari (BS)
14. Scaravelli, D., Priori, P., Ladurner, E., Drescher, C., Leopardi, S. & De Benedictis, P. (2017) Approcci multidisciplinari alla conservazione di specie a rischio: le colonie di grandi Myotis in Alto Adige. VIII Convegno dei Faunisti Veneti, 21-22 October 2017, Sedico (BL), Italy
15. Zecchin, B., Schivo, A., Bellinati, L., Milani, A., Fusaro, A., Ceglie, L., Natale, A., Bonfanti, L., Cunial, G., Obber, F., Bregoli, M., Citterio, C., Monne, I. (2018). Genetic Characterization of genotype 3 Hepatitis E Viruses identified from wild boars in north-eastern Italy. 2nd National Congress of the Italian Society for Virology. 28-30 November 2018, Rome, Italy

d) Other
(Provide website address or link to appropriate information): 16
1.NRL and OIE Collaborating Centre for diseases at the Animal/Human Interface(IZSVE)
http://www.izsvenezie.com/reference-laboratories/diseases-at-the-animalhuman-interface/

2.NRL and FAO Reference Centre for Rabies (IZSVE)
http://www.izsvenezie.com/reference-laboratories/rabies/

3.NRL and OIE Reference laboratory for Avian Influenza and Newcastle disease (IZSVE)
http://www.izsvenezie.com/reference-laboratories/avian-influenza-and-newcastle-disease/

4.IZSVe’s section on fish, crustacean and mollusc pathology
https://www.izsvenezie.com/reference-laboratories/fish-crustacean-and-mollusc-pathology/

5.IZSVe’s section on bats (Italian)
https://www.izsvenezie.it/temi/animali/pipistrelli/

6.National reference centre for animal assisted intervention (pet therapy)
http://www.izsvenezie.com/reference-laboratories/pet-therapy/

7.OFFLU - OIE/FAO Network of Expertise on Animal Influenza
http://www.offlu.net

8.Global Collaboration on H5N8 and Related Influenza Viruses
https://www.gisaid.org/collaborations/global-collaboration-on-h5n8/

9.“End Rabies Now” https://endrabiesnow.org/

10.GARC - Global Alliance for Rabies Control
https://rabiesalliance.org/

11.ZikAction - Preparedness, research and action network on maternal-paediatric axis of Zika virus infection in Latin America and the Caribbean
http://penta-id.org/news.html

12.Interreg V A Italy-Austria "BIO CRIME"
http://www.biocrime.org/

13.FP7 - Infect-ERA, TORRENT Towards a combined post-exposure prophylaxis and successful treatment of rabies in humans.
http://www.infect-era.eu/4th-call-2016

14.COST Action CA17108 (AIM) Aedes Invasive Mosquitoes
http://www.aedescost.eu/

15.CHAFEA/2016/BTSF/03: Organisation and implementation of training activities on controls of movements of

dogs and cats
http://www.foodinfo-europe.com/training-programs/modc2017-2019

16.WHO Rabies Bulletin Europe
www.who-rabies-bulletin.org/