This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 862605

EDITORIAL

Welcome to the first issue of the ICRAD Newsletter!

International Coordination of Research on infectious Animal Diseases (ICRAD) is an ERA-NET co-fund action, including 31 funding organizations from 20 countries. This action aims to bring together the scientific community and funders of the EU to highlight the most important infectious animal diseases that affect EU member states.

The scope for this ERA-NET has been developed under the SCAR Collaborative Working Group on Animal Health & Welfare Research (CWG AHW), which seeks to build further on two previous successful ERA-NETS (EMIDA, ANIHWA).

The first year of ICRAD has been challenging, especially because of the sudden appearance of the Covid-19 pandemic. Nonetheless, we are very pleased to be able to say that the ICRAD community pulled together in time of need and showed solidarity and responsibility second to none. Moreover, due to the extraordinary goodwill and positive attitude of the scientific community, we managed to launch our first call and fund a total of 19 quality project – an impressive feat for both funders and applicants.

The first year of ICRAD was very encouraging, and we hope and believe that we can maintain the high standard already set. Our community is open for all stakeholders to join, and we hope that you will follow us on our continued journey. Whether you are a researcher who wants to join a project in one of our future calls or a funder that is contemplating joining our network, please feel free to contact us at any time.

You can read more about the funded projects on our website (www.icrad.eu) where you can also find information on the next calls ICRAD plan to launch, as well as information about the network and other network activities.

Per Mogensen
ICRAD project manager

Jens Nielsen
ICRAD coordinator

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ICRAD
International Coordination of Research in Animal Diseases

PROJECT DESCRIPTION

The animal health policy of European Union (EU) is based on fight against transmissible animal diseases, some of them causing epidemics and infect humans (zoonoses). EU animal health policy works by the motto "prevention is better than cure", and covers all animals kept for food, farming, sport, companionship, entertainment and in zoos. It also covers wild animals where there is a risk of transmitting disease to other animals or to humans.

The disease' threats to the livestock industry have increased steadily over the past decades due to globalisation, increased farming intensification with changed husbandry and management structure, climate changes, changes in the weather conditions and changes in wild life management. These factors contribute to the risk of spread and evolution of pathogens

The Standing Committee on Agricultural Research (SCAR) Collaborative Working Group on Animal Health and Welfare Research (CWG AHW) has shown high commitment and successfully delivered two European initiatives: ERA-NETs on Emerging and Major Infectious Diseases of Animals (EMIDA: 25 funding organisations, 26 projects funded and 45 million Euro invested) and on Animal Health and Welfare (ANIHWA: 33 funded projects and 30 million Euro invested). Research supported through these ERA-NETs addressed some of major animal diseases (e.g. bovine tuberculosis, bluetongue) and issues (antimicrobial resistance, AMR). In addition, additional activities undertaken by ERA-NETs included development of databases, developing and maintaining strategic research agendas, gap analyses, and bibliometric surveillance showing increases collaboration on animal health research in EU.

The International Collaboration of Research on Animal Diseases (ICRAD) aims at:

- supporting cross-cutting research to improve public health, and animal health and welfare, with associated benefits towards the environment and the economy.
- Connecting research partners with different but complementary scientific and technological expertise to maximise resources and share risks, costs and skills. The partnership between industrial and academic researchers, where appropriate, will improve and accelerate the development of technological solutions for the benefit of animal health and welfare.

Research and innovation co-funded through ICRAD would seek concerted approach towards the development of novel and improved instruments to address and control infectious diseases, particularly regarding novel detection, intervention and prevention strategies to:

- increase preparedness and ability to respond to emerging and endemic livestock threats
  - o by improving control of specific infectious animal diseases, in particular those where the role of wildlife and vectors are prominent, by further understanding of the epidemiology, ecology and means of surveillance and control
  - o by providing new generic tools, systems for better prevention and improved preparedness to react to infectious animal disease outbreaks, in particular by designing and developing new or improved vaccines, diagnostic and surveillance tools and vaccination/immuno-stimulation strategies
  - o by improved translation of key knowledge on host and pathogen interaction and pathogen transmission into pathways for means of prevention, detection and control of animal infectious diseases
- contribute to the reduction of antimicrobial and antiparasitic use in livestock and to minimising the development of resistance for the benefit of animal and public health
- contribute to animal welfare by better prevention of diseases and renewed animal management and farming systems, and
- on a larger scale, contribute to food security and competitive and sustainable livestock systems, by reducing the burden of disease and reducing impact on international animal trade.

ICRAD will:

- develop a call platform allowing the continuation of coordination and support of research activities
- improve communication and collaboration between the partners of the network, between the network and similar networks in and outside of the EU, and between researchers, funders and stakeholders of animal health-related fields of activity, thus optimizing animal health science capacity
- enhance Public-Private Partnerships (PPPs) and thus increase innovative activities and the possibilities of translating scientific results to tools available for use in the field, by including private partners in the funding of the joint calls.
- keep updated the strategic research agenda (SRA) developed and updated during previous SCAR CWG AHW-related actions (EMIDA, ANIHWA, Common Agricultural and wider bioeconomy reSearch Agenda (CASA))

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Co-fund Call Results

First call of Era-Net ICRAD (International coordination of research on infectious diseases) has been a success with funding 19 Trans-national Collaborative Research Projects, including partners from 20 different countries

ID	Name	Title	Coordinator	Countries	Budget
10	NucNanoFish	Nucleic NanoVaccines for Fish	Dr Bernard Verrier	Belgium, France, Norway, United Kingdom	1469K
21	Bruce-GenoProt	A comprehensive proteogenomic analysis of Brucella to understand the epidemiology, biology, virulence mechanisms, and host-pathogen interaction	Dr Gamal Wareth	Germany, Greece, Turkey	732K
22	Plants4Nemavax	Plant-based production of glyco-engineered nematode vaccines	Prof Dr Peter Geldhof	Belgium, Netherlands, United Kingdom	774K
25	ASFVInt	Decoding a virus Achilles heel: the African swine fever virus interactome	Dr Marie-Frédérique Le Potier	France, Estonia, Germany, Spain, United Kingdom	1426K
33	NEOVACC	Novel strategies to enhance vaccine immunity in neonatal livestock	Prof Dr Simon Graham	United Kingdom, France, Norway, Sweden, Switzerland	1546K
38	RODENTGATE	Future Rodent Management For Pig And Poultry Health	Prof Dr Herwig Leirs	Belgium, Germany, Netherlands, Poland, United Kingdom	1520K
39	CAE-RAPID	Development of a rapid screening test for on-site serological diagnostics of caprine arthritis-encephalitis using individual milk samples	Dr Michał Czopowicz	Poland, Hungary, Lithuania, Norway, Switzerland	784K
45	TechPEPCon	Use of frontline technologies to screen pathogens, environment and pigs for a better disease control in swine herds	Prof Dr Hans Nauwynck	Belgium, Greece, Hungary, Italy, Poland, Russia	1052K
54	FluNuance	Virulent Non-Notifiable Avian Influenza; Determinants of virulence of emerging viruses	Prof Dr Sjaak de Wit	Netherlands, Germany, Hungary, Poland, United Kingdom	1191K
61	TCWDE	Tackling chronic wasting disease in Europe	Dr Fiona Houston	United Kingdom, France, Germany, Norway, Spain, Sweden	1639K
64	PREVENTER	Deciphering the role of influenza D virus in bovine and human respiratory diseases in Europe	Dr Mariette Ducatez	France, Belgium, Italy, Sweden, Turkey	696K
65	MUSECoV	Multi-scale Eco-evolution of Coronaviruses: from surveillance toward emergence prediction	Prof Dr Sophie le Poder	France, Italy, Spain, Poland	699K
81	FMDV_PersIstOmics	From proteogenomic host response signatures of persistent foot-and-mouth disease virus (FMDV) infection to diagnostic markers and therapeutic control	Dr Sandra Blaise-Boisseau	France, Belgium, Germany, Sweden, Turkey	1073K
82	ASF-RASH	African Swine Fever pathogenesis and immune responses in Resistant And Susceptible Hosts	Dr Sandra Blome	Germany, Belgium, Denmark, Netherlands, Switzerland	1312K
85	BM-FARM	Biomarkers and Microbiome in Farms for Antimicrobial Resistance Management	Dr Edgar Garcia Manzanilla	Ireland, France, Spain	592K
86	PIGIE	Understanding the dynamics and evolution of swine influenza viruses in Europe: relevance for improved intervention and sustainable pig production	Dr. Gaëlle Simon	France, Denmark, Germany, Italy, Spain, United Kingdom	1367K
94	Biosens4PrecisionMastitis	Channel-based biosensors to support a precision agriculture approach for improved bovine mastitis management	Prof Dr Beatriz Prieto Simón	Spain, Hungary, Latvia, Poland	688K
95	ConVErgence	Assessing swine as potential hosts for emerging Coronaviruses	Dr Paola De Benedictis	Italy, Netherlands, United Kingdom	780K
100	IFNASF	Characterization of virus- and host-specific modulation of type I IFN in African Swine Fever Virus virulence or attenuation	Dr Yolanda Revilla	Spain, Germany, Poland, Sweden	853K

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Special focus on-

ENDEMICS IN EUROPEAN COUNTRIES

In the following, a number of reports about important endemic diseases in Europe are presented. By providing animal health data, information and reports to decision-makers, professionals and healthcare workers, it also enables the European Institutions partners of ICRAD, to develop actions that may reduce the incidence and prevalence of these diseases in Europe. There is added value in having Europe-wide data and this is the aim of current Newsletter.

BELGIUM

Nationwide BVD eradication by EAR-NOTCH sampling

Infection due to bovine viral diarrhoea virus (BVDV) is endemic in most cattle-producing countries throughout the world. The economic loss due to the presence of the virus in herds is huge. The key elements of a BVDV control programme are biosecurity, elimination of persistently infected animals and surveillance. An official eradication programme started in Belgium from January 2015 onwards, based on testing ear notches sampled during the official identification and registration process of calves at birth. This program was co-created by the veterinary services and the agricultural sector.
The research project BOVIDI, funded by the Belgian Federal Public Service Health, Food Chain Safety and Environment, was led by Sciensano and Ghent University over the period 2010-2014. The results of this project highlighted the importance of BVDV-control at herd level. The BVD ear notch analysis allows the detection of the BVDV antigen and was promising for identification of immunotolerant persistently infected (IPI) new-born calves. Positive animals were removed from the herd by euthanasia or slaughtering. The beef sector acknowledged this outcome and negotiated with the public services a nationwide mandatory eradication program to start early 2015.
Five years after the implementation of the eradication program, the presence of IPI animals in Belgium has drastically decreased. While 5295 IPI calves were born in 2015 (corresponding to 0.54% of births), in 2019 only 384 positive calves were counted (barely 0.04% of births).
The success story of the BVDV eradication program was only possible by an innovative sampling technique in combination with the goodwill of the sector. The last steps in the program will be to tighten measures in order to catch the last infected animals. One of the main causes of introduction of the virus in a farm is the purchase of a "Trojan cow".

The Belgian ICRAD-partners

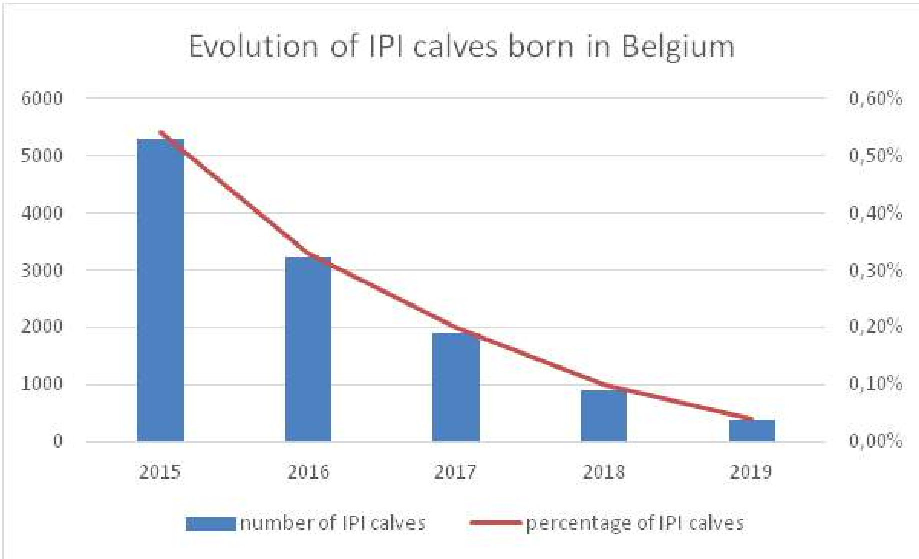

Figure 1. Evolution of the number and percentage of IPI calves born in Belgium

ESTONIA

ASF in Estonia – continuing threat to wild boar and domestic pig

ASF was first detected in Estonian wild boar population in September 2014. One wild boar piglet was found dead in South-Part of Estonia, in Valga district, 6 km from Latvian border. The ASF case was confirmed by the National Veterinary and Food Laboratory and by the EU reference laboratory for ASF. ASF virus, detected in Estonia, belongs to genotype II that is currently circulating in the Eastern European countries. The possible source of infection was movement of infected wild boar from infected area in Latvia. After the first ASF wild boar case, the disease started to spread from the southern part of Estonia to the middle part and by 2017 ASF was spread to the whole territory of Estonia except the island Hiiumaa which is still – in the year 2020 - ASF free.
The first domestic pig farm was affected in July 2015, almost one year after the first case was diagnosed in wild boar. Infected farm was a backyard farm with one pig and it was situated in the southern part of Estonia, close to the area where the first ASF positive wild boar was found. The possible source of the infection was human behaviour and ASF virus circulation in the wild boar population close to the farm. From 2015 until 2017, a total of 27 domestic pig ASF outbreaks were detected in Estonia. Most of the domestic pig outbreaks (16 out of 27) were less than 5 km away from the ASF positive wild boar finding (found dead wild boar). The presence of ASF virus in wild boar populations was the main

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risk factor for domestic pig farms to become infected. The last ASF outbreak in domestic pigs was in September 2017. There have been no ASF outbreaks in domestic pigs during the last three years.
National ASF surveillance plans cover both wild boar and domestic pigs. Since 2018, wild boar ASF test results have been different from the previous results. Between 2014 and 2017, we found many virus positive wild boar. However, since 2018 we have found mainly antibody positive wild boar. In 2019, we have found only 6 virus positive wild boar (last finding was in February 2019) and 64 antibody positive wild boar. Eradication of ASF is based on European Commission strategy of management of ASF in European Union. In addition to continuous sampling and testing, a lot has been done to improve biosecurity in pig farms and also during hunting. Also raising awareness of ASF among hunters and public. Co-operation with hunters has been crucial: controlling wild boar population and also collecting and removing carcasses of dead wild boar.

Hele-Mai Sammel
Head of Department /Department of Animal Health and Welfare, Veterinary and Food Board of the Republic of Estonia

FRANCE

When global warming favors avian type C botulism…

During the recent past years, northern and central Europe countries faced regular summer heat wave and extreme drought. Paris, the French capital city, is no exception. On July 25th 2019, a historical temperature record of 42.3oC was registered by the weather station located in the Montsouris public garden. In 2020, a new heat wave hit the city: the temperature exceeded 35oC across seven consecutive days (between the 6 and the 12th of August). If high temperature can directly wear down humans and animals, it can also affect animal health through other detrimental effects. A decrease in the water level and an increase in the water temperature were observed in the surrounding ponds and lakes close to the city only a few days after the beginning of the heat wave. In Enghien lake, the water temperature reached 28oC. The low level of oxygen in the lake led to the death of a great number of fishes. A few days later, ducks and swan carcasses were found around the lake. Similarly, 90% of the Swan population living in the Bois de Boulogne died during this past summer. What was the reason for so many deaths in the avian population? Botulism, a disease affecting the nervous system through the action of a powerful toxin synthetized by the bacteria Clostridium botulinum. Whereas the bacteria remain quite inactive under normal conditions through the production of resistant spores, hot water and low oxygen favor its activation. Eight types of toxins (A, B, C1, C2, D, E, F, G) could be synthesized by the four families of Clostridium botulinum (I, II, III, IV). Human botulism is mainly associated with the toxins of type A, B, E (and rarely with the toxins C, and F), while animal botulism is mainly associated with the toxins of type C (avian) and D (bovine). The toxin generally penetrates the organism after direct ingestion. Later, the toxin prevents the acetylcholine liberation in the synapse, leading to a muscular paralysis. In the different bird species, death is generally caused by asphyxia due to an impaired function of the respiratory muscle or to the incapacity of the animal to keep its head out of the water. How can the proliferation of avian botulism be prevented? If acting against global warming, it is a paradigm, few direct and immediate solutions have been envisaged to reduce the spreading of the disease in wildlife and livestock. Removal of mud present in ponds and increase of the water supply can slow down the oxygen decrease in artificial lakes and ponds. Prohibiting walking on the shores of infected lakes during heatwaves can also prevent the diffusion of the bacteria to other ponds. If the human digestive barrier is only weakly permissive to the Type C toxin, it remains of interest to strictly control the progression of the disease to limit the number of human cases.

Dr Sophie Gay, French National Research Agency

GREECE

Brucellosis in Greece

Brucellosis is a serious and highly contagious zoonosis that primarily affects small ruminants and bovines. In Greece it is more known by the name Melitaios Fever (Malta Fever). Brucellosis causes economic losses due to milk reduction and abortions, it constitutes an important occupational disease (breeders, employees in slaughterhouses, veterinarians etc). Greece has the most abundant population of goats in the European Union (EU) and, given the importance and severity of the disease, in 1977 a programme for the control of brucellosis came into force. This involved vaccinations of young sheep and goats, 3-6 months old and reserved for reproduction, with the Rev-1 live vaccine.
In 1992, in the islands of Greece, the vaccination for goats and sheep ceased and the program passed to the next stage, where only blood sampling and slaughtering of positive animals was implemented, aiming to eradicate the disease. Progressively, an eradication programme was implemented in whole country. In 1998, the programme was revised due to

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an increase in the prevalence of brucellosis (the percentage of seropositive animals in the total animal population). Greece was divided into two zones (see fig. 1) which implement two different policies and they are still in force.
The current programme for the control and eradication of brucellosis is described in detail in the 3339/117339/04-11-2016 Ministerial Decision. In general, the programme is described as follows:

a) In the mainland and three islands (Vaccination Zone-VZ), where the prevalence is still fairly high, mass vaccination of young and all female animals older than three months was introduced once in their life. In male animals older than six months of age an annual blood sampling and control is performed.

b) In Eradication Zone (EZ, green islands on the map) only serological testing of animals aged over six months with the Rose Bengal test, and CFT are implemented. Vaccination against brucellosisis is strictly prohibited. The farms are classified as M +, M1, M2 and M4 with M+ being the infected herd, M1 the unknown health status and M4 the officially free farm.

c) It is strictly forbidden to move animals from the VZ to the EZ, as well as to move animals which have not been vaccinated within VZ. Infected animals are slaughtered separately from healthy animals, taking all necessary biosecurity measures to prevent the spreading of infection. In cases where the percentage of infection on a sheep and goat farm is equal to or greater than 50%, then a stamping out policy of all animals is applied.

National control and eradication programme of brucellosis in sheep and goats co-funded by the European Commission and it is published in the web page: https://ec.europa.eu/food/funding/animal-health/national-veterinary-programmes_en.
The national brucellosis programme in bovines includes only serological testing of animals over twelve months old and in three Regional Units (RU) there is additional vaccination with RB-51 vaccine. In some mountainous areas a similar S&G control programme is implemented to all female semi-wild bovines over the age of four months old with Rev-1 vaccine.
Regarding B. melitensis field strains isolated in Greece, the genotyping data of the strains were compared to genotypes from MLVA data available in the database at the website (http://mlva.u-psud.fr/brucella/), and Neighbour Joining cluster analysis was performed. The MLVA 16 phylogenetic cluster analysis revealed that, in Greece, the East Mediterranean lineage is widely distributed. Nevertheless, this clade seems well established because 7 different MLVA 16 genotypes for 20 isolates were observed. Actually these genetic clones are micro variants because they are the result of mutations of the hyper variable minisatellite loci. Our results provide data for the European surveillance and help to increase information about brucellosis in Europe. This genetic characterization is the first step forward to draw the proper risk maps for brucellosis in Mediterranean area and will enable us to better tackle this zoonosis.

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Mr Aristomenis Katsiolis, DVM, MSc
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Small ruminant Subclinical Mastitis in Greece

Subclinical mastitis (SCM) is a serious problem of sheep industry both in Greece and worldwide. It causes important economic losses because animals do not have clinical symptoms; however milk production is decreased. It has been found that in flock / animals with subclinical mastitis the quality of milk is affected and this has consequences on cheese making. Moreover, SCM is a constant threat to the emergence of clinical mastitis in the flock. Sheep's milk with subclinical mastitis reaches the bulk tank and ultimately the consumer. The disease is multi-factorial and significantly affects animal welfare.

According to ELOGAK - ELGO (results from 2015-2019), the percentages of milk sample analyzes that was out of limits (specifications) (according to CFU/ml) ranged: a) in ewes from 0.37% (November – December 2018) to 4.04% (September – October 2017) and it was around 1% during 2018-2019, b) in goats from 0.10% (November – December 2017) to 3.27% (January – February 2016) and it was around 2% during 2018-2019. However, there were certain prefectures with >400 x103 CFU/ml every year from 2015-2019 (3-5 prefectures). It was reported that the Total Viable Count from raw sheep milk samples in Epirus - Greece fulfills the microbiological criteria of EU Legislation in a percentage of approximately 97% (https://doi.org/10.1016/j.anaerobe.2011.05.002). However, it was found (https://doi.org/10.3168/jds.2017-14075) that the prevalence of SCM was 0.260 in a filed study with milk samples from 2198 ewes in 111 farms with total population of 35925 ewes in all 13 administrative regions of Greece. Furthermore, the main etiological agents were staphylococci (S. aureous and Coagulase Negative Species- CNS), which accounted for 0.699 of all isolated recorded. The prevalence of SCM within farms ranged from 0.000 to 0.850 (median value among farms: 0.250). The verification of a predictive model for SCM revealed that ≥ 0.760 of infected farms were located in areas predicted as high risk for parameters of SCM or slime staphylococcal SCM (https://doi.org/10.1016/j.vetmic.2018.11.021).

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The diagnosis of SCM demands specific bacteriological tests that require special laboratories and time. Several indirect tests have been investigated, such as the California mastitis test, the measurement of somatic cells and the determination of certain enzymes that are considered inflammation markers, mainly in individual samples and less or not at all in the bulk tank milk. Additional research is needed to find a right combination of rapid indirect tests that allow the safe diagnosis of SCM at farm level initially (bulk tank milk) and individual animals. It is very important to develop rapid and reliable tests to allow the self-check of farmer, to quickly identify the problem and to seek help from experts, because there are no clinical symptoms that the sheep breeder can see to be alarmed and ask for help.

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RUSSIA

COVID-19 (surveillance, control, research activities)

In Russia, the very first case of Covid-19 was officially registered on January 31, 2020. The first carriers of the virus were found in the Tyumen region and the Trans-Baikal Territory among Chinese citizens. But for some reasons the index case of Covid-19 was traced back to a man who arrived from Milan (diagnosed on February 27).
In order to ensure the sanitary and epidemiological safety of the population on the territory of the Russian Federation, a self-isolation regime was imposed on March 29, 2020. Moscow imposed mandatory lockdown.
According to the Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing, the peak incidence of COVID-19 in Russia was on May 11, when the number of infected people was 11 656 people detected per day.
After the publication of the first genome-wide sequence of the new coronavirus, the State Research Center "Vector" developed the first two diagnostic PCR kits in 5 days, and by January 24 they began to be produced and supplied to regional laboratories.
Currently, no studies on the susceptibility of domestic animals to SARS-CoV-2 have been conducted in Russia.

Endemics (surveillance, control, research activities)

African swine fever

The ASFV introduced the country on the North Caucasus. The first case of ASF has been registered in November 2007 in the wild boar population. The disease quickly spread to domestic pigs kept in unprotected holdings in the region and spread further northward affecting both domestic pigs and wild boar.
Since its introduction, more than 900 outbreaks in domestic pigs and more than 600 notifications of ASF in wild boar have been submitted to the OIE. The disease affected most of the regions. More than 1 million pigs were killed and destroyed. The economic damage caused by ASF in the RF in 2008-2020 amounted to 500 million euro.

From the beginning, the ASF epidemic is characterized by distant human-mediated spread followed by a local epidemic. The main factors facilitating such spread were inappropriate control of the movement of infected animals and contaminated pork products, a large number of backyards, the practice of swill feeding and free-ranging and low level of preparedness of regional veterinary services.
The plan of control and eradication is aimed at eliminating unprotected small pig holdings (mainly backyards) and reduction of wild boar population density.
The surveillance of ASF in domestic pigs and wildlife is in place but its results are not available. The routine active monitoring of ASF in wild boar does not imply testing for antibodies, so there is no information about the current immune status of the wild boar population. Since 2007 the biological properties of the virus have not changed substantially.
Despite all measures taken the diseases is still present both in the domestic (mainly in unprotected backyards) and wild boar populations and has a pattern of local epidemics in different regions. Currently, there are several clusters of ASF in Russia dispersed from the Kalinigrad region to the Russian Far East.
The Federal Research Center for Virology and Microbiology is a leader in ASF research in the country which efforts are currently aimed at developing of vaccine and other preventing means for ASF (diagnostic\monitoring techniques and tools), molecular epidemiology and risk assessment.

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Classical swine fever

The Russian Federation has remained status of a country where CSF is limited to several specific zones for a long time. Since 2013 CSF has been registered annually, particularly with involvement of wild boar with a predominant territorial localization in the Far East. Up to 5 CSF outbreaks are registered yearly in domestic pigs and wild boar in the central European part of Russia as well as in the Russian Far East bordering China (the isolate belongs to genotype 2.1 of CSFV, which is spread across the territory of China).

A possible reason might be that small pig holders sometimes ignore vaccination which leads to new CSF outbreaks.

Prevention and control measures are regulated by a document entered in force in 1990. From 2012 to the present, endemic clusters has been forming in the western and eastern border regions of the Russian Federation (2013–2019). The circulation of CSFV remains in a part of the immunized pig population, which is due to insufficiently formed immunity.

This can be considered as an indicator of the need to improve measures to control CSE in the country and in the above-mentioned border regions. An update of the relevant legislation is needed.

Due to the lack of substantiated surveillance and control programs for CSF in wild boar, the pathogen is rooting in the affected population. The unsystematic use of vaccines against CSF in the population of domestic and wild pigs can lead to a "silent" circulation of the virus in a vaccinated but not fully immune population.

Research activities to study the problem of CSF in the territory of the Russian Federation are carried out by leading research centers: Federal Research Center of Virology and Microbiology and FGBU ARRIAH.

Tuberculosis

In Russia, tuberculosis is recorded mainly in cattle. According to statistical veterinary reports, in the Russian Federation over the past 5 years, there has been a slightly decreasing trend in the number of bovine tuberculosis outbreaks. But at the same time, there has been an increase in the number of cases (sick animals). The incidence rate increased from 0.005% to 0.06% in 2015 and 2019 respectively. This is due to the involvement of large industrial-type dairy cattle farms in the epidemic process.

In 2015 and 2016, 11 outbreaks were registered with a total number of sick cattle at 1019 and 535 animals, respectively. In 2017, 12 outbreaks were registered (1209 heads). In 2018, tuberculosis was detected in 7 farms in 209 animals. In 2019, 8 outbreaks of tuberculosis of cattle were recorded in Lipetsk, Omsk, Kaluga, Irkutsk, Oryol, Tula, Samara and Saratov regions where 1285 bTB positive heads of cattle have been identified.

In 2019, 25881.892 thousand tuberculin skin tests were carried out in cattle. As a rule, M. bovis is detected, rarely M. tuberculosis. The last case of M. tuberculosis detection in cattle was recorded in 2019 in the Irkutsk region.

Prevention and control measures are carried out in accordance with the current sanitary and veterinary legislation, which foresee culling of positive PPD-tuberculin animals. Vaccination is not implemented in Russia.

Monitoring studies on the spread of tuberculosis in wildlife are not carried out (except for those kept in captivity). There is no surveillance program of bTB in wild animals in the country.

Scientific research on bovine tuberculosis problems in the European part of Russia is carried out by the laboratory of mycobacteriosis of the Federal State Budgetary Scientific Institution FSC VIEW RAS. All publications of the research team available are presented only in Russian-language journals.

Scientific research on tuberculosis in the Asian part of Russia is carried out by the veterinary department of the Federal State Budgetary Scientific Institution "Omsk Agrarian Scientific Center" in the laboratory for epizootology and control measures for tuberculosis.

Brucellosis

Endemicity of brucellosis in Russia is closely related to the main epidemiologically significant susceptible species - cattle and small ruminants' populations unevenly distributed across the country.

The peaks of registration in animals fall in the second quarter of the year (cattle herding to pastures and conducting mass tests).

In recent years (2015-2019), 2,373 outbreaks of brucellosis in cattle, 184 – in small ruminants, 22 – in horses and 6 – in pigs were identified demonstrating an increase in the number of bTB-positive cattle (14.0%) and small ruminants (52%).

Epidemics of brucellosis in cattle are mainly reported in the North Caucasian regions (63.5% of cases), the Southern regions (19.9%) and the Volga Federal District (7.4%).

Brucellosis in small ruminants is mainly registered in two federal districts - the North Caucasus (36.8%) and the Southern territories (26.3%).

The largest number of cases of brucellosis in human, as in previous years, was found in the North Caucasus (278 cases, 70.0% of the total number of cases) and the Southern regions (60 cases, 15.1%).

In total, in 2019, 376 outbreaks of bovine brucellosis were

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identified (6,678 heads), and 38 outbreaks were identified in small ruminants (950 heads). In addition, 2 cases of brucellosis were detected in pigs in the Altai Territory, 623 cases were identified in deer and 2 outbreaks were identified in horses (93 heads).
Control of the spread of brucellosis in animal populations is based on serological methods of diagnosis and vaccination.
In 2019, 20,205,059 tests of cattle and 6,115,927 tests of small ruminants were carried out.
It is important to mention that the differentiation of Br. abortus, Br. melitensis,
Br. suis, Br. canis is not implemented.
For the specific prophylaxis of brucellosis in cattle and small ruminants, vaccines based on Br. abortus No. 19 and No. 82, respectively are used. So, in 2019, 1,612,491 cattle and 1,227,766 small ruminants were vaccinated.
In 2019, a number of brucellosis outbreaks were recorded in two regions: in the republics of Dagestan (11 cases, source of infection - cattle) and Kalmykia (7 cases, source of infection - small ruminants).
Due to the illegal trade of animals and products derived from infected animals, the risk of human brucellosis remains high. In 2019, 397 newly diagnosed cases of brucellosis in humans were identified, which is the maximum in the last 5 years.
In 2020, 14 outbreaks of animal brucellosis were identified, including: 4 - in the Republic of Kalmykia; 1 - in the Tambov region; 2 - in the Karachay-Cherkess Republic; 3 - in the Republic of North Ossetia (Alania); 1 - in the Penza region; 3 - in the Rostov region.
Monitoring to assess the spread of brucellosis in wildlife is not carried out, programs are not developed. Control over the spread of brucellosis is carried out only in captive or domesticated wild animals (e.g., Siberian stag, deer).
Scientific research on the problem of brucellosis is carried out by the veterinary department of the Federal State Budgetary Scientific Institution "Omsk ANC" in the laboratory for the specific prevention of brucellosis. All publications of the research team are presented only in Russian-language journals.

Foot and mouth disease

An important feature of foot and mouth disease in Russia is that it is not endemic due to the lack of appropriate conditions but because of the constant threat of the introduction of this disease from neighboring countries.
In 2018, five outbreaks of FMD type "O" were registered in February in the Trans-Baikal Territory. Only cattle in backyards located on the territory of rural settlements bordering Mongolia were infected.
In 2019, there were 17 FMD outbreaks (type “O”) in the Far East. In the Primorsky and Khabarovsk territories, the disease was recorded only in pigs, including large pig farms. In the Trans-Baikal Territory, the disease was detected in cattle and small ruminants.
In 2020, a large (90 cases) FMD outbreak in cattle (type “O”) was registered in the Trans-Baikal Territory.
The unclear situation on FMD in neighboring states and in the countries that have close economic, economic, socio-cultural, and tourist relationships with Russia is of importance for the Russian Federation.
To prevent the disease an “anti-FMD buffer zone” has been established and successfully functioning along the southern Russian border (from Primorsky to Krasnodar Territories), where mass vaccination of cattle and small ruminants is routinely and systematically implemented. The vaccination is carried out against the currently circulating FMDV serotypes (A, O, Asia-1).
The territories of the Russian Federation bordering China, Mongolia, Kazakhstan, Azerbaijan and Georgia are included in the zone of risk of FMD introduction.
Monitoring of FMD is carried out using serological and immunological methods for:
- confirmation of the clinical diagnosis of foot and mouth disease when examining pathological material from animals suspected of the disease;
- assessing the immune status of vaccinated cattle and small ruminants in the anti-FMD buffer zone;
- confirmation of “FMD-free without vaccination” status of regions (in accordance with OIE recommendations).
Scientific research on FMD in the Russian Federation is carried out in the reference laboratory for the diagnosis of foot and mouth disease of the FGBI ARRIAH (“Federal Center for animal health”). In addition, the Federal State Budgetary Scientific Institution "Institute of Experimental Veterinary Medicine of Siberia and the Far East" of the Siberian Branch of the Russian Academy of Sciences is participating in the project on improving vaccines against foot and mouth disease.

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5	MAAELUMINISTEERIUM (MEM)	Estonia
6	AGENCE NATIONALE DE LA RECHERCHE (ANR)	France
7	Bundesministerium für Ernährung, Landwirtschaft und Verbraucherschutz (BMEL)	Germany
8	Bundesanstalt für Landwirtschaft und Ernährung (BLE)	Germany
9	FORSCHUNGSZENTRUM JULICH (GMBH FZJ)	Germany
10	ELLINIKOS GEORGIKOS ORGANISMOS - DIMITRA (DEMETER)	Greece
11	NEMZETI ELELMISZERLANCBIZTONSAGI HIVATAL (NEBIH)	Hungary
12	DEPARTMENT OF AGRICULTURE, FOOD AND THE MARINE (DAFM)	Ireland
13	MINISTERO DELLA SALUTE (MoH)	Italy
14	ISTITUTO ZOOPROFILATTICO SPERIMENTALE DELL'ABRUZZO E DEL MOLISE G CAPORALE (IZSAM)	Italy
15	VALSTS IZGLITIBAS ATTISTIBAS AGENTURA (VIAA)	Latvia
16	MINISTERIE VAN LANDBOUW, NATUUR EN VOEDSELKWALITEIT (MINLNV)	The Netherlands
17	NORGES FORSKNINGSRAD (RCN)	Norway
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20	AGENCIA ESTATAL DE INVESTIGACION (AEI)	Spain
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29	MINISTRY OF SIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION (MSHE)	Russia
30	LIETUVOS RESPUBLIKOS ZEMES UKIO MINISTERIJA (ZUM)	Lithuania
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