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Nuclear Techniques in Food and Agriculture

Animal Production & Health Newsletter



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To Our Readers



Left: Producing training video for sample collection during CCHF outbreaks; Right: Cattle in Njala, Sierra Leone, June 2023

Dear colleagues,

As SARS-CoV2 COVID-19 is drifting into memory, it is important to remember that other diseases with pandemic potential are taking centre stage e.g., Highly Pathogenic Avian Influenza H5N1 and African Swine Fever. The emphasis of the Animal Production and Health Section therefore continues to fall on the early and rapid diagnosis and control of transboundary animal and zoonotic diseases. One such project is the IAEA flagship ZODIAC programme that is providing technical advice, support and guidance to Member States as well as engaging in research that will enable the mining, tracing, and characterization of harmful

pathogens through the four Coordinated Research Projects (CRPs) on “Enhancing laboratory preparedness for the detection and control of emerging and re-emerging zoonotic diseases”, under ZODIAC, for Africa, Europe and Central Asia, the Americas and the Caribbean, and Asia and the Pacific. The main objective of these CRPs is to empower the national and regional disease surveillance programmes in each of the four regions to identify potential sources of pathogen spill-over to humans and identify emerging-and/or re-emerging pathogens with zoonotic risk.

The Animal Production and Health Section, furthermore, continues its efforts in developing early, rapid and confirmatory diagnostic tests for zoonotic and transboundary animal diseases. As an example, a novel multiplex real time PCR-based assay for the detection and differential diagnosis of abortive disease caused by important bacterial zoonotic agents (brucellosis, Q fever, listeriosis and leptospirosis) was developed, laboratory validated and transferred to Botswana, Indonesia, Lesotho, and Senegal.

In addition, the Animal Production and Health Section continues its 'One Health' focus on enhancing food security by supporting sustainable livestock production systems in developing countries. This is to be achieved by strategic and applied research, technology transfer and capacity building. The three principal components of the subprogramme are animal nutrition, animal reproduction, breeding, and genetics, and animal health. Animal production and health problems are identified, and solutions developed by strategically applied isotopic, nuclear, nuclear-based, and nuclear-derived tools, in conjunction with conventional technologies to:

- Characterize and optimally utilize the nutritional value of locally available feed and feed resources to enhance energy conversion whilst protecting the environment and minimizing greenhouse gas emissions;

- Enhance animal reproduction and breeding through the introduction of artificial insemination, embryo transfer and productive breed selection, and the characterization of livestock genetic make-up to drive the integration of locally adapted animal breeds with trait selected exotic breeds to satisfy the increasing demand for more and better-quality animals and animal products; and
- Assess and reduce the risk of transboundary animal and zoonotic diseases to livestock and livestock owners through the implementation of early and rapid diagnosis and control technologies and their use in national and international control and eradication programmes.

The above activities are complemented by tools developed using bio-informatic and geo-visualization information systems not only to manage animal diseases, but also to assist decision makers to take early and informed actions. The FAO/IAEA Veterinary Diagnostic Laboratory (VETLAB) Network with its iVetNet IT platform and database is instrumental in the development, validation and dissemination of these IT platform technologies, know-how and expertise worldwide.



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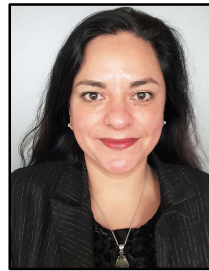
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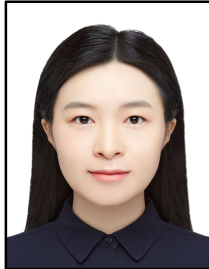
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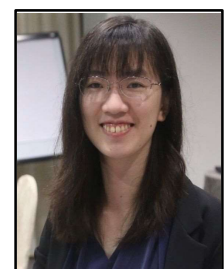
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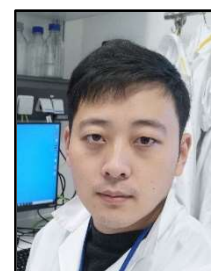
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VETLAB
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02/2023

Joint FAO/IAEA Programme
Nuclear Techniques in Food and Agriculture

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VETLAB is an initiative of the
Joint FAO/IAEA Centre

To the readers

Among the tasks of the Veterinary Diagnostic Laboratory (VETLAB) Network, the promotion and strengthening of the research capacity of partners laboratories is a key task, now more than ever. In the recent past, the world has experienced the emergence and spread of a new pandemic, likely originating in the animal reservoir. Furthermore, new microorganisms with pathogenic or pandemic potential are frequently discovered, known animal diseases are spreading worldwide affecting areas previously disease-free. The antimicrobial resistance in bacteria is also spreading, causing human and economic losses. Research and innovation are needed to better understand and face these challenges and are essential components of a medium to long term strategy for disease prevention and control. Strengthening research and promoting innovation also mean building capacity and preparedness in the veterinary laboratories, at the forefront in the battle against transboundary animal and zoonotic diseases. This is also one of the main scope of ZODIAC, the IAEA initiative focusing on zoonotic diseases at the animal-environment-human interface. VETLAB Network and ZODIAC aim to provide innovative, cost-effective solutions for the early detection, monitoring and surveillance for transboundary animal and zoonotic diseases. Diagnostic tests and technologies need to be sustainable and affordable, particularly for laboratories operating in low- and middle-income countries, where disease diagnosis and surveillance are most needed. The VETLAB Network provides a unique opportunity for expanding and strengthening North-South and South-South research cooperation.

VETLAB Highlights

Poxviruses coinfection in Nigeria

Lumpy Skin disease (LSD) and pseudocowpox (PCP) are two cattle diseases with common clinical signs, with PCP being also zoonotic. Sometimes, they can be present together in the same geographical locations, creating diagnostic challenges without proper laboratory tools. In 2020, the NVRI in Nigeria and APHL investigated LSD outbreaks in Nigerian cattle herds. They used a high-resolution multiplex melting (HRM) assay to differentiate poxviruses and characterized the Capripoxviruses and Parapoxviruses involved. Among the samples tested, 45.2% were positive for LSDV, and 11.9% showed co-infection with LSDV and PCPV. Phylogenetic analysis revealed two clusters of Nigerian LSDVs based on the RPO30 gene. Besides, the Nigerian PCPVs had identical B2L sequences and were closely related to the B2L of PCPVs from Zambia and Botswana. This study highlights the importance of differential diagnosis and molecular characterization of viral isolates.

Spread of Peste des Petits Ruminants Virus Lineage IV in West Africa

Monitoring the transboundary spread of peste des petits ruminants (PPR) virus is an essential part of the global efforts towards the eradication of PPR by 2030. There is growing evidence that Lineage IV is becoming the predominant viral lineage, replacing Lineage I and II in West Africa. As part of a regional investigation, samples collected in Burkina Faso, Côte d'Ivoire, Guinea, Ghana and Mauritania were screened for the presence of PPRV, revealing the presence of lineage IV viruses in all five countries for the first time. These data will be of importance to local and regional authorities involved in the management of PPRV spread.

VETLAB supports to the differential diagnosis of respiratory diseases in small ruminants in African and Asian partner laboratories

The VETLAB Network has played a crucial role in supporting, developing, validating, and disseminating diagnostic tools for detecting and monitoring Peste des Petits Ruminants (PPR) and other respiratory diseases in small ruminants. This initiative aligns with the Peste des Petits Ruminant Global Eradication Programme (PPR GEP). The network has facilitated the transfer of knowledge and tools, enabling multiple VETLAB partners to incorporate multiparametric detection of respiratory diseases in small ruminants into their routine screening protocols. With VETLAB support, four partner laboratories recently utilized multiplex tools to detect PPRV, MCCP (Mauritania), or MCCP alone (Nepal, Tanzania) or PPR alone (Burkina Faso). APHL confirmed these results and conducted pathogen characterization through sequencing.

PPR Ring Trial Organized by APHL, Seibersdorf

The most recent PPR interlaboratory comparison test (2022) is nearly completed with the majority of participants having submitted their results. The results will be analysed in the coming weeks and a report will be compiled and shared. An invitation for the next trial will be sent out in November 2023.



02/2023

VETLAB

Network Bulletin



VETLAB Capacity Building Initiatives

enhance the capacities of VETLAB Network partners in utilizing nuclear-derived/molecular assays and serological assays for the differential diagnosis and syndromic surveillance of significant transboundary and zoonotic animal diseases.

Training Course for VETLAB Network Partners on the Diagnosis of Peste des Petits Ruminants and Respiratory Diseases of Small Ruminants; 16 to 27 October 2023, Tunis, Tunisia The purpose of the event is to enhance the capacities of the VETLAB Network and partner laboratories involved in the Peaceful Uses Initiative peste des petits ruminants (PPR) project, in support of the PPR Global Eradication Programme.

This training is only available to selected VETLAB partners from Africa.

In addition, three other similar courses are

planned for September 2023 (in Georgia), October 2023 (in Jordan), and December 2023 (in Nigeria). All these training courses are organized in collaboration with the FAO PPR secretariat, and a detailed list of targeted countries is available upon request.

Training Course for VETLAB Network Partners on Next Generation Sequencing Bioinformatics and Molecular Phylogeny; 20 November to 1 December 2023, Seibersdorf Austria The aimed at enhancing the capacities of VETLAB Network partners in utilizing new sequencing technologies and bioinformatics tools for the characterization and molecular surveillance of major pathogens responsible for transboundary animal diseases and zoonoses.

This training is exclusively available to selected VETLAB partners who are already utilizing or in the process of using NGS (Next-Generation Sequencing) or outsourcing NGS sequencing work.

Forthcoming Events

Coordination Meeting of the VETLAB Network with Directors of African and Asian Veterinary Laboratories, 21 to 25 August 2023, Vienna, Austria The event aims to update partners on the activities of the VETLAB Network and discuss the main challenges and gaps in diagnosing animal and zoonotic diseases.

Training Course for VETLAB Network Partners on Multiparametric Detection of Pathogens Causing Major Transboundary Animal Diseases and Zoonoses; 25 September to 6 October 2023, Seibersdorf, Austria. The event aims to

VETLAB Networking Activities

The National Veterinary Laboratory (LANAVET) in Cameroon is actively engaged in Antimicrobial Resistance (AMR) Surveillance:

AMR surveillance activities (sampling and testing)

In Cameroon, between 2021 and early 2022, a comprehensive Antimicrobial Resistance (AMR) surveillance program was conducted in five of the ten regions of the country targeting the main production areas for food animals (poultry, pigs, and ruminants) through active surveillance (70%) and passive surveillance (30%). The study's primary and most frequently encountered organisms were *Escherichia coli* and *Salmonella* spp., isolated from fecal samples. Over 50% of the *Salmonella* isolates were susceptible to all tested antibiotics.

For *Escherichia coli*, resistance percentages were higher for ampicillin (45%) and enrofloxacin (25%). Strains isolated from poultry and pigs exhibited 100% resistance to tetracycline. About 49.3% of the tested *E. coli* isolates were resistant to at least one antibiotic, with 7.5% showing resistance to 50% of the antibiotics tested. *Staphylococcus aureus* isolates were resistant to 50% of the antibiotics tested.

LANAVET participated in three proficiency tests (in 2021 and twice in 2022) organized by the Institute Pasteur of Dakar-Senegal in collaboration with the African Society for Laboratory Medicine (ASLM). For these three sessions, LANAVET scored Very Good results (More than 86% concordance).

There are two Food and Agriculture Organization-Assessment Tool for Laboratories and Antimicrobial Surveillance Systems (FAO-ATLASS) certified international Assessors in LANAVET. In addition, two expert missions were carried out in Cameroon (2021) and Congo (2022).

Three LANAVET staff were also involved in the training "Qualifying Workforce for AMR Surveillance in Africa and ASIA" (QWAR5 training) organized by ASLM in collaboration with The Fleming Fund and the Denmark Technical University (DTU): 2 AMR microbiology experts and 1 AMR epidemiology expert trained and certified.



Collecting samples from poultry and pigs for AMR testing



Lab testing (culture and antimicrobial sensitivity testing)

WOAH PPR Reference Laboratory Network

The WOAH Reference Laboratory network for peste des petits ruminants (PPR) provides regularly updated information on protocols, vaccines, reference material, training, proficiency tests, diagnostic services and expertise available to the community. All laboratories carrying out PPR diagnostic are encouraged to join this network. For more information: <https://www.ppr-labs-oie-network.org>

FAO Proficiency tests on Rift Valley Fever (RVF)

FAO, in collaboration with Centre de coopération internationale en recherche agronomique pour le développement (CIRAD-France), will organize a Proficiency test on Rift Valley Fever (RVF) in 16 countries in West, Central and East Africa. Each participating laboratory (either central or regional) will receive by September 2023, one serological and/or one molecular panel to be tested, depending on the routine tests used in the participating laboratory.

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Forthcoming Events

Regional Training Course on Serological Diagnostics (RAF5089)

Carla Bravo de Rueda

A regional training course at the Office National de Recherches et de développement de l'élevage (ONARDEL), Nouakchott, Mauritania, is planned to take place from 10 to 14 July 2023. The purpose of this event is to train participants on serological techniques for zoonotic and animal diseases and enhance national and regional capacity in the surveillance, detection and control of emerging or re-emerging animal and zoonotic diseases.

Ten African countries will be participating in this event. They will be trained in the use of ELISA for the diagnostic of FMDV and RVF. This training will have a theoretical and laboratory component. Trainers from the Pasteur Institute Dakar, Senegal, will be demonstrating the use of the ELISA technique in diagnostics and the importance of accurate results and reporting.

Midterm Coordination Meeting of the Regional Project on Integrated Soil Cropping Livestock Production Systems (RAF5090)

Victor Tsuma

Food and nutrition security in many African countries is hampered by among other things, poor uptake of modern agricultural technologies and unsustainable production systems. Consequently, farm level production is relatively low with negligible level of added value compared to other parts of the world. The Joint FAO/IAEA Centre is supporting a regional project to evaluate, develop and implement models using an integrated soil, crop, and livestock production system approach, where nuclear science and technology would be applied for increasing agricultural productivity while addressing climate change and its impact at the farm level. A project midterm coordination meeting is planned for 30 October to 3 November 2023 in Cairo, Egypt to:

- Enable individual country counterparts present for discussion views, experiences, and current project status on implementation of integrated soil-crop-livestock production system (ISCLPS);
- Share and discuss technologies and strategies needed for successful implementation of ISCLPS;

- To review organizational and/or institutional support and way forward for the successful implementation of the ISCLPS.

More than 40 soil, crop and livestock experts drawn from government ministries, research institutions, national agricultural development boards and universities from at least 13 African countries are expected to attend.

Regional Training Course on Validation of Diagnostic Techniques According to ISO 17025 (RLA5085)

Carla Bravo de Rueda

A regional training course on diagnostics test validation using analytical and quantitative parameters under the ISO 17025 standards, will take place at the IAEA Headquarters in Vienna, Austria from 14 to 18 August 2023.

Twenty Latin-American and Caribbean (LAC) countries will be participating in this event. They will be trained on the use of statistical methods to calculate diagnostic parameters such as: Sp, Se, cut off, measure of uncertainty, etc. This training will have a hands-on calculation module using real data from LAC laboratories. Additionally, the participants will acquire knowledge on the required steps to accredit their diagnostic tools according to the World Organization for Animal Health (WOAH) standards. Trainers from the WOAH Reference laboratory for diagnostic test validation science at the Australian Centre for Disease Preparedness will take part of this event.

Coordination Meeting of the Veterinary Diagnostic Laboratory Network (VETLAB Network) with Directors of African and Asian Veterinary Laboratories

Charles Lamien

The purpose of the event is to update partners on the activities of the VETLAB Network, and to discuss the main challenges and gaps in diagnosing animal and zoonotic diseases, will take place at the IAEA Headquarters in Vienna, Austria from 21 to 25 August 2023.

The meeting will be held in parallel with the second research coordination meeting of the VETLAB Coordinated Research Project (CRP) D32036 to allow interactions between the laboratory directors and the CRP experts and their critical assessment of the CRP progress.

Second Research Coordination Meeting on the Application of Advanced Molecular Characterization Technologies Through the Veterinary Diagnostic Laboratory (VETLAB) Network (D32036)

Ivancho Naletoski, Charles Lamien

The second coordination meeting for the Coordinated Research Project (CRP) D32036 has been scheduled for the 21 to 25 August 2023, at the IAEA Headquarters in Vienna, Austria.

Fifteen partners of the CRP (4 agreement holders, 3 technical partners and 8 research partners) will attend the meeting. The discussions will focus on the progress of the development of the standard operating procedures (SOPs) for sample preparation, submission and data processing (bioinformatics) for the service based Whole Genome Sequencing (WGS). The meeting will be held simultaneously with the annual meeting of the Directors of the VETLAB Network laboratories in order to review their priorities.

First Research Coordination Meeting on Innovative Nuclear and Related Molecular Approaches for Detection and Characterization of Antimicrobial Resistance in Animal Production Environment (D32043)

Kathiravan Periasamy, Giovanni Cattoli

This is the first meeting of the new Coordinated Research Project (CRP) on innovative nuclear and related molecular approaches for detection and characterization of antimicrobial resistance in animal production environment. The meeting will take place at the IAEA Headquarters in Vienna, Austria, from the 30 October to 3 November 2023.

The purpose of the event is to discuss and finalize work plans of individual research contracts under the CRP that focusses on developing farm-level sampling and analytical methodologies for AMR detection and assess the efficacy of alternatives to antibiotic growth promoters (AGPs) as feed additives in animal production settings. Eight research contract holders, three research agreement holders, three technical contract holders and invited observers are expected to attend the meeting.

First Research Coordination Meeting on Enhancing Laboratory Preparedness for the Detection and Control of Emerging and Re-emerging Zoonotic Diseases — ZODIAC in Asia and the Pacific

Charles Lamien

The first research coordination meeting for the Coordinated Research Project (CRP) D32039 on enhancing laboratory preparedness for the detection and control of emerging and re-emerging zoonotic diseases — ZODIAC in Asia and the Pacific, is planned for 7 to 11 August 2023 in Seoul, Republic of Korea, at the Korea Atomic Energy Research Institute (KAERI).

The purpose of the event is to discuss research plans on multiplex serology, environmental sampling strategies and next generation sequencing pipelines for environmental sample analysis.

Regional Training Course on Next Generation Sequencing (NGS) using Illumina Platform (RAS5085)

Ivancho Naletoski, Charles Lamien

The training course has been tentatively scheduled for 10 to 14 September 2023 in Dhaka, Bangladesh. Counterparts from the laboratories of the Asian region will receive theoretical and practical lectures on the principles and application of the New Generation Sequencing (NGS) technologies, using the Illumina platform.

The course will cover: i) Sample preparation and inactivation [a) host nucleic acids (NA) removal; b) extraction of NAs; c) biological safety of extracted NAs for international; d) use / benefit of specific procedures (RNA based capture, SISPA etc.); e) PCR amplification-based procedures for specific pathogen (primers used for FMD or LSDV)]; ii) Library preparation; iii) Illumina platform setup and run and iv) Suggestions on bioinformatic workflows (Linux based approach and Galaxy platform approach) for Illumina platform based NGS.

The knowledge and skills obtained at the training course are expected to significantly facilitate participation of the laboratories in the serviced based NGS (optimized under the Coordinated Research Project D32036 and will be free of charge for the end

user laboratories). The training will be supported by 3 international experts from advanced veterinary laboratories.

Training Course for Veterinary Diagnostic Laboratory (VETLAB) Network Partners on the Diagnosis of Peste des Petits Ruminants and Respiratory Diseases of Small Ruminants

Charles Lamien

The training course VETLAB Network partners on the diagnosis of peste des petits ruminants and respiratory diseases of small ruminants will be held 23 October to 3 November in Tunis, Tunisia.

The purpose of the event is to strengthen the capacities of the VETLAB Network and the Peaceful Uses Initiative peste des petits ruminants (PPR) project partner laboratories in implementing diagnostic tests related to different phases of the PPR Global Eradication Programme.

Regional Training Course on the use of the iVetNet Information Platform in the Implementation and Maintenance of the ISO 17025 Standard (RAS5085)

Ivancho Naletoski

iVetNet is an online information platform developed by the Animal Production and Health Section (APH) under the past Coordinated Research Project (CRP) D32032. It contains multiple modules for collection and storage of records relevant for ISO 17025, such as personal records, infrastructure and equipment records, and modules for exchange of validated standard operating procedures with QA/QC records. These are reviewed through a system of queries and reports to help the quality management of the local laboratories to monitor and coordinate the quality management system.

Records of the local laboratories are linked to the module for planning and implementation of the APH subprogramme to link the institutions and the laboratory staff to specific activities of the subprogramme (such as events, procurement, publications etc.). Such a link enables for exchange of information between the APH subprogramme and the counterpart laboratories, as well as between individual laboratories.

Recently, iVetNet was placed on the high security IAEA NUCLEUS information resource portal and approved by the Division of Information Technology (MTIT) of IAEA which allows for registration of external users via the Nucleus portal.

The training course on iVetNet has been tentatively scheduled for 12 to 16 November 2023 in Qatar. The participants at the training course will receive detailed, step-by-step information on the use of iVetNet at the local laboratories.

The training course will be supported by one experienced expert and the technical officer of the project.

Training Course for Veterinary Diagnostic Laboratory (VETLAB) Network Partners on Multiparametric Detection of Pathogens Causing Major Transboundary Animal Diseases and Zoonoses

Charles Lamien

A training course for VETLAB Network partners on multiparametric detection of pathogens causing major transboundary animal diseases and zoonoses will take place from 25 September to 6 October 2023 at the APH Laboratories in Seibersdorf, Austria. The purpose of the event is to strengthen the VETLAB Network partners' capacities for using nuclear-derived/molecular assays and serological assays for the differential diagnosis and syndromic surveillance of major transboundary and zoonotic animal diseases.

Third Research Coordination Meeting on Improvement of Diagnostic and Vaccine Tools for Emerging and Re-emerging Animal Health Threats (D32035)

Carla Bravo de Rueda

The meeting, whose purpose is to review the results from the development of irradiated vaccines, and to discuss challenges encountered and future steps for the contract holders, will take place virtually from 9 to 13 October 2023.

Six contract holders from the following member states: Kenya, Pakistan, Cameroon, Indonesia and Ethiopia will take part in the event and will be sharing their advances in the development of new vaccines against: peste des petits ruminants (PPR), Fowl cholera, Mastitis, Newcastle and

Gumboro and Pox virus. One research agreement holder from Austria will show how lactic acid bacteria can modulate the immune response in vaccinated animals.

Regional Training Course on Diagnostic Techniques for African Swine Fever Virus (RLA5085)

Carla Bravo de Rueda

A regional training course on the use of quantitative PCR and ELISA for the diagnostic of African Swine Fever (ASF), is planned to take place at the Laboratório Federal de Defesa Agropecuária (LFDA-MG) in Minas Gerais, Brazil, from the 16 to 20 October 2023.

Twenty Latin-American and Caribbean countries will be participating in this event. The training will have a theoretical and laboratory component. National Institute of Agricultural and Food Research and Technology (INIA), Center for Research in Animal Health (CISA) trainers will be using well characterized ASFV samples panels.

Regional Training Course on Capturing and Sampling Wildlife Animals (RER5027)

Ivancho Naletoski

The training course for the counterparts of the European member states is planned for 9 to 13 October 2023 in Serbia. The course will cover: i) Theoretical presentation of international regulations and recommendations for capturing of wild animals, ii) Practical presentations of experts about strategies of capturing different wildlife animal species (bats, wild ruminants, wild carnivores, rodents, wild pigs), iii) Practical presentation of placing appropriate traps for different wildlife animal species, iv) Practical presentation of handling (including sedation) of captured wildlife animals and v) Practical presentation of collecting appropriate samples from captured wildlife animals. Domestic and international experts will support the implementation of the training course.

Regional Training Course on Molecular Characterization of Brucella (RLA5085)

Carla Bravo de Rueda

A regional training course on culture and characterization of the genus *Brucella* species circulating in Latin America and the Caribbean (LAC) is planned to take place in San Jose, Costa Rica, from 27 November to 1 December 2023.

Twenty LAC countries will be participating in this event. They will be trained in the use of molecular tools for the characterization of the multiple *Brucella* strains. This training will have a theoretical and laboratory component. Participants will be using their national milk samples which will allow them to identify what current bacterial strains are circulating in LAC.

Training Course for Veterinary Diagnostic Laboratory (VETLAB) Network Partners on Next Generation Sequencing Bioinformatics and Molecular Phylogeny

Charles Lamien

Training Course for VETLAB Network partners on next generation sequencing bioinformatics and molecular phylogeny will be held from the 20 November to the 1 December 2023 at the APH Laboratories in Seibersdorf, Austria.

The purpose of the event is to strengthen the VETLAB Network partners' capacities for using new sequencing technologies and bioinformatics tools in the characterization and molecular surveillance of major pathogens causing transboundary animal diseases and zoonoses.

FAO and IAEA Training Courses on Diagnosis of Peste des Petits Ruminants and Respiratory Diseases of Small Ruminants

Giovanni Cattoli, Charles Lamien

In the framework of the peste des petits ruminants (PPR) Global Control and Eradication Strategy, through the close collaboration between the Joint FAO/IAEA Centre, the FAO PPR Secretariat and the IAEA coordinated Veterinary Diagnostic Laboratory (VETLAB) Network, and with the support of the Peaceful Uses Initiative (PUI) Project "Creating veterinary laboratory preparedness among Member States in line with the global strategy for the control and eradication of PPR using nuclear and nuclear-derived techniques", funded by the Japanese government, five training courses on the detection and differential diagnosis of PPR will be organized between September and December 2023.

Information on the exact dates and locations will be shared shortly.

Past Events

Regional Training Courses on the Generic Verification of New SOPs in Incheon, Korea and Sofia, Bulgaria under ZODIAC Initiative (INT5157)

Ivancho Naletoski

Two regional training courses on the generic verification of the newly introduced standard operating procedures in the local laboratories were organized at the Korea Atomic Energy Research Institute in Incheon, Korea from the 6 to 10 February 2023 for the Asian counterpart ZODIAC National Laboratories (ZNLs); and at the National Diagnostic and Research Veterinary Medical Institute in Sofia, Bulgaria from the 15 to 19 May 2023 for the European counterpart ZNLs. These regional training courses are a continuation of the series of similar courses in different geographical regions.

The course included theoretical and practical exercises of the basic parameters for verification of the serological and molecular diagnostic procedures, as well as the statistical procedures to verify the diagnostic parameters of the assays.

Twenty-five participants from 17 countries attended the course in Bulgaria (Albania, Azerbaijan, Belarus, Bosnia and Herzegovina, Cyprus, Greece, Latvia, Lithuania, Malta, Montenegro, North Macedonia, Portugal, Romania, Serbia, Slovakia, Tajikistan and Türkiye).



Statistical data analysis of the obtained results at the regional training courses in Sofia, Bulgaria

Twenty-four participants from 17 countries attended the course in Korea (Bahrain, Cambodia, Indonesia, Iran, Iraq, Jordan, Kuwait, Malaysia, Mongolia, Oman, Pakistan, Philippines, Qatar, Sri Lanka, Syria, Thailand and Vietnam).



Practical exercises at the regional training courses in Incheon, Korea

The course in Korea was supported by two international experts from the Faculty of Veterinary Medicine in Skopje, North Macedonia and from the Australian Centre for Disease Preparedness (ACDP) in Geelong, Australia. The course in Bulgaria was supported by two international experts from the Croatian Veterinary Institute Zagreb, Croatia and from the Istituto Zooprofilattico Sperimentale delle Venezie in Legnano, Italy.

IV International Seminar on Animal and Plant Health (SISA 2023) ‘Science and Innovation for One Health’

Giovani Cattoli

The National Center for Animal and Plant Health in CUBA (CENSA) organized the IV International Seminar on Animal and Plant Health (SISA 2023) from 8 to 12 May 2023. The scientific programme of the event, with the central topic "Science and Innovation for One Health", included sessions related to: Environment & health interconnection; Integrated health surveillance based on the One Health approach; Soil and plant health: its impact on sustainable agri-food systems; Reduction and management of health emergency risks; Knowledge and innovation management for food and nutrition security.

One Animal Production and Health (APH) team member was invited to this event for a keynote speech. The presentation, titled "Animal health laboratories in limited resource settings – bringing early disease detection and surveillance to where they are most needed", opened the session dedicated to "Integrated surveillance of risks at the human-animal-environment interface". Almost 400 participants were registered for this event, with a lot of participants from the Latin America and Caribbean region. The event was an opportunity to present the activities conducted in the APH areas as well as promote and raise visibility on the main initiatives on transboundary animal and zoonotic diseases, such as VETLAB Network and ZODIAC.

Regional Training Courses (with certification) on the Verification and Calibration of Bio-safety Cabinets in Local Laboratories (RAF5082 and INT5157 Pillar 1 of the ZODIAC Initiative)

Ivancho Naletoski

Regional training courses with certification were held at the Animal Production and Health Laboratories in Seibersdorf, Austria, from the 6 to 8 February 2023, on the verification and calibration of bio-safety cabinets in the local laboratories. Participants had an opportunity to practice and understand the procedures needed for the above-mentioned activities. Authorized experts led the course and oversaw the examination of participants. All the participants successfully passed and received a certificate which proves their competence to install and verify bio-safety cabinets for the period of 2 years. Future re-certification will be required.



Location of the laboratories with staff certified for verification and calibration of bio-safety cabinets

Twenty-four participants from African counterpart laboratories attended the course, one from each of the invited member states (Algeria, Angola, Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Ivory Coast, Democratic Republic of Congo, Eritrea, Eswatini, Ethiopia, Ghana, Libya, Mauritius, Namibia, Senegal, Seychelles, Sierra Leone, Tanzania, Tunisia, Zambia and Zimbabwe).

Peste des Petits Ruminants; Surveillance and Laboratory Testing Capacity Webinar

William Dundon

Requested from counterparts in Indonesia and in collaboration with FAO, a webinar was organised on the 5 April 2023 to train field veterinarians and laboratory diagnosticians on the diagnostics and control of peste des petits ruminants (PPR). The agenda comprised of talks by

Animal Production Health Laboratory team members in Seibersdorf, Austria. Topics included: Peste des petits ruminants (the disease, the virus, and epidemiology), molecular diagnostics, serology, building capacity on PPR and small ruminant respiratory diseases in Asia and Africa (VETLAB Network) with Q & A sessions following each talk. Over 350 participants took part in the Webinar which provided simultaneous translation into Indonesian.

Regional Training Course on Detection and Characterization of Capripox Viruses: Lumpy Skin Disease Virus, Sheep Pox and Goat Pox Viruses (RAS5085)

Ivancho Naletoski

The regional training course on detection and characterization of capripox viruses (lumpy skin disease virus, sheep pox and goat pox viruses) was organized at the Kuwait Institute of Scientific Research in Safat, Kuwait, from 21 to 25 May 2023. Nineteen participants attended from Brunei Darussalam, Indonesia, Iran, Jordan, Lao P.D.R., Mongolia, Myanmar, Nepal, Oman, Pakistan, Palestine, Philippines, Sri Lanka, Syria, Thailand, United Arab Emirates and Vietnam.

Participants were trained in the serological (ELISA based) and molecular (PCR based) techniques for detection of the capripox viruses in field samples, as well as in the advanced molecular techniques for characterization of the capripox viruses (application of Sanger sequencing for phylogenetic analysis). The course included theoretical lectures on differentiation of wild-type, vaccinal and recombinant strains of the lumpy skin disease virus.



Practical exercises during the regional training course on the detection and characterization of capripox viruses in the laboratories of the Kuwait Institute of Scientific Research

The course was supported by five experts (two during the online lectures and three at the training course) from the Pirbright Institute, United Kingdom.

Virtual Workshops for the Assessment of the Existing Bio-risk Management Systems in Counterparts Laboratories (INT5157; RAS5085; RAF5085 and RLA5085)

Ivancho Naletoski

Three virtual workshops were organized to finalize the assessment of the existing bio-risk management systems in the counterparts' laboratories and the ZODIAC National Laboratories (ZNLs). Participants presented details on the existing bio-risk management systems, including: i) detailed plans of ground floors of the laboratories and their organizational structure; ii) workflows from reception, to- and within- the laboratory rooms and to storage or utilization; iii) biosafety procedures in place in the local laboratories and the scheme of the biological risk management system (if one is implemented).

One hundred and sixteen participants from 48 countries attended the workshops (34 from Africa, 42 from Asia, 26 from Europe and 14 from Latin America).

Six international technical experts performed the assessments at the workshops (2 at each workshop). Based on the assessments, the technical experts at the course compiled recommendations and procedures needed to develop solid bio-risk management systems, compliant with the existing international standards and recommendations.

National Training Course on Livestock Feed Analysis and Ration Formulation in Sierra Leone (SIL5022)

Victor Tsuma

The national training course was held at Njala University, Sierra Leone, from the 20 February to 3 March 2023, attended by 13 participants consisting of staff from Njala University, Milton Margai Technical University, Ministry of Agriculture, and the Sierra Leone Agricultural Research Institute (SLARI). The trainees were from various parts of the country, working in different sectors of the animal industry. Prof. Adugna Tolera, from the School of Animal and Range Sciences, Hawassa University, Ethiopia, was the expert trainer, providing guidance, material and skills to the trainees.

During the 10 day training course, lectures, demonstrations, practicals and hands-on training on livestock feed analysis and ration formulation were conducted, incorporating a participatory learning approach, including farm visit and interaction with members of the Sierra Leone Livestock Rearers Organization, the ultimate end-users of the project

outputs. The course content included theory and practice of livestock feed analysis and ration formulation; local animal feed resource mapping, identification, analysis and incorporation into livestock feeding diets; development and adoption of standard operating procedures for livestock feed analysis and ration formulation; and identification of gaps and needs assessment of an animal nutrition laboratory.



The expert trainer Prof. Adugna (front row third from left) and the project counterpart Prof. Suluku (front row sixth from left) with members of the Sierra Leone Livestock Rearers Organization

Joint Training on Genomics and Bioinformatics with FAO Region Asia Pacific and Joint FAO/IAEA Centre (MAL5034)

Carla Bravo de Rueda

A training course on genomics and bioinformatics of Avian Influenza at the Malaysia Genome and Vaccine Institute (MGVI) took place from 22 to 26 May 2023. Participants were trained in the use of the Nanopore platform using a multiplex approach for the diagnostics of all Avian Influenza viruses. Experts from the Institut Pasteur Cambodia and the University of Hong Kong supported this event. Scientists from DIC Wates (Indonesia) and Kaeri Institute (Korea) were also invited by the host institution strengthening their regional bonds.



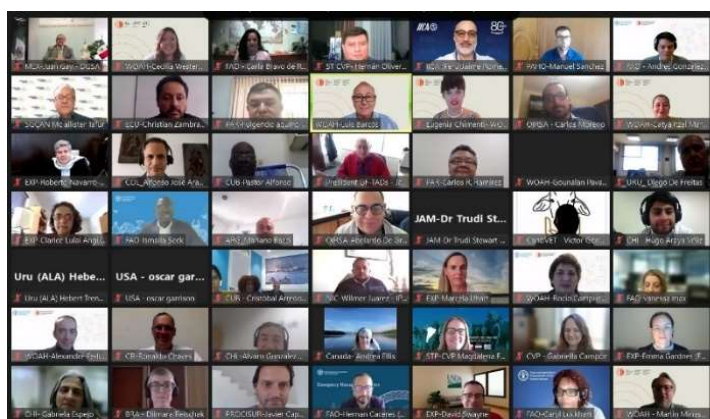
Institut Pasteur Cambodia scientist starting the laboratory training

First Meeting of the Standing Group of Experts on Avian influenza

Carla Bravo de Rueda

The Joint FAO/IAEA Centre participated in the FAO–World Organisation for Animal Health (WOAH, previously OIE) Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs) Standing Group of Experts on Avian Influenza (SGE-AI) for Latin America and the Caribbean (LAC) region.

The first virtual meeting held on 13 December 2022 was attended by more than 100 participants, and provided recommendations for prevention, preparedness, and control of Avian Influenza in LAC.



Participants attend the first virtual meeting

Highly Pathogenic Avian Influenza in Latin America and the Caribbean: Ask the Experts Webinar

Carla Bravo de Rueda

On 30 March 2023 the FAO Animal Production and Health division (NSA) and Regional Office for Latin America and the Caribbean (FAO RLC) in Rome, Italy, in collaboration with the Joint FAO/IAEA Centre in Vienna, Austria, organized an event to tackle questions about Highly Pathogenic Avian Influenza (HPAI) diagnosis in Latin America and Caribbean (LAC) with the aim to provide technical assistance to all veterinary laboratories in LAC and help solve doubts about the incursion of HPAI in the region and its control methods

The event was held in Spanish, and the target audience for the webinars were animal health laboratory staff, there were around 100 participants.



The Joint FAO/IAEA Centre with FAO RLC moderating the session

The following Spanish speaking HPAI experts were key speakers at the webinar: Dr. Dilmara Reischak WOA Reference Laboratory-Technical Head, LFDA-SP Brazil; Dr. Monserrat Agüero García National Reference Laboratory -Technical Director, LCV MAPA, Madrid, Spain; Dr. Azucena Sánchez National Reference Laboratory -Serology diagnostics, LCV MAPA, Madrid, Spain; Dr. Maria Jose Ruanor National Reference Laboratory - Molecular diagnostics, LCV MAPA, Spain; Dr. Aitor Nogales Gonzalez Senior scientist, CISA-INIA, Valdeolmos, Madrid, Spain; Dr. Pedro Bluhm Assistant professor, Pontificia Universidad Catolica de Chile, Chile; Giovanni Cattoli Laboratory head- Joint FAO/IAEA Centre Seibersdorf, Austria; Dr. Ariel Pereda Coordinator Instituto Nacional de Tecnología Agropecuaria (INTA), Buenos Aires, Argentina; Dr. Christian Mathieu Servicios Agropecuarios y Ganaderos, SAG, Chile; Prof. Christopher Hamilton-West Associate Professor Head of Department, University of Chile; Dr. Jose Luis Gonzalez Researcher/Epidemiologist, Wageningen Bioveterinary Research, The Netherlands.

[Click here to watch the video](#)

Flood Emergency Pakistan: International Virtual Training on Serological and Molecular Techniques for Animal Disease Diagnosis

Carla Bravo de Rueda

The event was organized jointly by the Nuclear Institute for Agriculture and Biology (NIAB), Faisalabad, Pakistan, and the Joint FAO/IAEA Centre in Vienna, Austria, in response to the 2022 floods emergency in Pakistan. The Animal Production and Health Laboratory (APHL) in Siebersdorf, Austria, responded to the member state’s needs on developing a tailored training on serological and molecular techniques for animal disease diagnosis. The virtual event was held from 19 to 23 December 2022.

Approximately 100 participants from diverse veterinary institutions across Pakistan were present in the meeting. Pakistani and Seibersdorf scientists gave lectures about peste des petit ruminants (PPR), capripox and methods of diagnostics such as qPCR and ELISA.

Regional Introductory Meeting in Mauritius for the Strengthening of Biosecurity Practices in the Diagnostics of FMDV, AI, Brucella, PPR, RVF, CCHF and Rabies (RAF5089)

Carla Bravo de Rueda

The event, hosted by the Livestock and Veterinary Division (LVD) in Mauritius was held from 20 to 24 March 2023. The purpose of this event was to emphasize the importance of biosafety and biosecurity during diagnostics procedures. The meeting focused on biosafety practices and essential diagnostic tools needed for early diagnostics of zoonotic diseases. Experts used interactive learning tools that engaged participation from everybody. The technical officer analyzed LVD's laboratory workflow and helped them with the animal health laboratory design for future renovations. This meeting helped us to establish a baseline for each national laboratory part of RAF5089. We also fine-tuned our workplan for the upcoming years.



The technical officer, PMO and one of the experts visiting the Ministry of Agro-Industry and Food Security

In addition, there was a visit to the Ministry of Agro-Industry and Food Security by the Technical Officer, Project Management Officer (PMO) and one of the experts to give recommendations and suggestions on how to improve control and prevention of animal and zoonotic diseases. Fourteen counterparts from Benin, CAR, Eritrea, Eswatini, Libya, Mauritania, Mauritius, Seychelles were present.

The meeting was supported by experts from MRI Global, USA and FAO consultant, previously Australian Centre for Disease Preparedness staff.

Second Meeting of the Standing Group of Experts on Avian Influenza

Carla Bravo de Rueda

The Joint FAO/IAEA Centre participated in the FAO–World Organisation for Animal Health (WOAH, founded as OIE) Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs) Standing Group of Experts on Avian Influenza (SGE-AI) for the Latin America and the Caribbean (LAC) region organized on 19 to 21 April 2023 in Mexico City, Mexico.

The meeting was attended by 26 Delegates of the Americas, 3 non-Members of the Americas, 10 representatives of international, regional and sub-regional organizations and representatives of the private sector; and provided recommendations for prevention, preparedness, and control of the disease in the region.



Attendees at the Standing Group of Experts on Avian Influenza

The Technical Officer additionally visited the renovated BSL3 facilities at the National Service of Health, Safety and Food Quality (SENASICA), Mexico, wherein discussions focused on the inputs of the United States-Mexico Commission for the Prevention of Foot and Mouth Disease and other Exotic Animal Diseases (CPA) on the control of Avian Influenza at national level and possible future collaborations at regional level.

Regional Training Courses on Detection and Characterization of Brucellosis in Animals (RAS5085)

Ivancho Naletoski

A regional training course on detection and characterization of brucellosis in animals was organized at the Indonesian Research Center for Veterinary Science in Bogor, Indonesia, from 12 to 16 June 2023. The course covered theoretical and practical classes in i) etiology, pathogenesis,

clinical signs, epidemiology, and control of Brucellosis; ii) practical classes on sampling, sample preparation / transportation; iii) the most updated molecular (PCR based), serological (ELISA) and other related techniques for laboratory screening / detection and techniques for typing of *Brucella* spp. (MLVA-16). Twenty-six participants from 21 countries of the Asian region have attended the course. The course was supported by three experts from the National Agency for Food Safety, Environment and Work (ANSES) from Maisons-Alfort, France, a World Organisation for Animal Health (WOAH) and EU reference laboratory for brucellosis.



Participants at the regional training course on Brucellosis in Bogor, Indonesia

Regional Training Course on qPCR Diagnostic for Brucella and Crimean Congo Haemorrhagic Fever (RAF5089)

Carla Bravo de Rueda

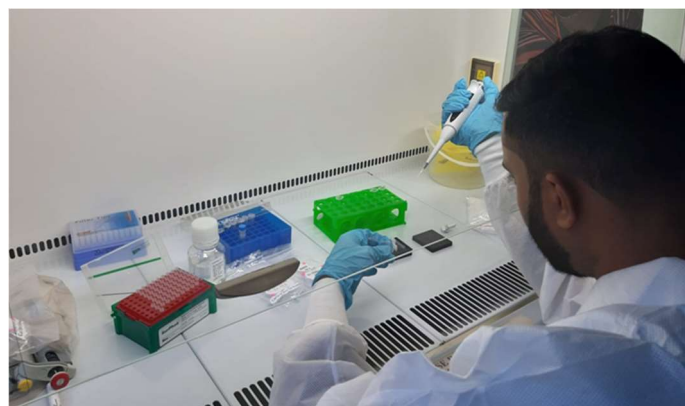
A regional training course on qPCR Diagnostic for Brucella and Crimean Congo Hemorrhagic Fever was organized from 16 to 20 June 2023 at Njala University, Sierra Leone.



Participants at the regional training course

Ten African countries participated in this event. They were trained in the use of quantitative PCR for the diagnosis of Brucella and Crimean Congo Hemorrhagic Fever. This training had a theoretical and laboratory component. Trainers from the Friedrich Loeffler Institute (FLI), Germany, used milk and blood samples to teach participants nucleic acid extraction and all necessary information to perform qPCR at good quality standards. As part of a pre-

training coordination effort, the technical officer calibrated and set up the required equipment for the training in addition to an evaluation of the solar powered operational system which had to undergo a review for the success of this training.



Participant performing qPCR in the laboratory

Training on African Swine Fever Diagnosis - Bringing Technology to the Disease Hot Spot

Agathe Auer

From 14 to 16 June 2023, the Iringa Laboratory in Tanzania served as the venue for the Participatory Training Course, emphasizing field sample collection, storage, shipment, and diagnostic methodologies for African Swine Fever (ASF) organised by FAO and the Joint FAO/IAEA Centre Animal Production and Health Laboratory (APHL).



Bringing ASF Diagnosis to the Front Lines: On-site Nucleic Acid Extraction and real time PCR Amplification of ASFV at an Iringa Abattoir, Tanzania

A pivotal part of the training programme was a hands-on activity conducted in an abattoir in Iringa, an area recently impacted by ASF outbreaks. Here, we introduced and implemented the onsite application of a portable qPCR device for real-time ASF detection, involving the comprehensive process of sample collection, nucleic acid

extraction, and on-the-spot real-time PCR performance. This initiative was particularly significant given Tanzania's estimated domestic pig population of 2.1 million and the persistent challenge of ASF. The primary objective of our training programme was to strengthen the first line of defence—early detection—to effectively manage the disease and curtail its spread. In the past, ASF diagnosis confirmation was constrained to laboratories considerably distant from typical outbreak epicentres, resulting in delayed responses and potential biosecurity breaches. This training underscored that the application of qPCR technology at the disease hot spots could effectively address this challenge, enabling more rapid diagnoses and prompt implementation of biosecurity measures.

This initiative was the result of a productive collaboration between the Joint FAO/IAEA Centre, FAO Tanzania, FAO-HQ in Rome, and the Tanzania Veterinary Laboratory Agency. The comprehensive three-day course drew participants from a diverse range of institutions, including local laboratories and the Ministry of Livestock and Fisheries. The programme encompassed theoretical lectures, discussions, field trips, and substantial hands-on practice. The successful completion of this collaborative effort marks an encouraging step forward in enhancing Tanzania's ability to diagnose ASF promptly and enforce necessary biosecurity measures.

Regional Training Course on Vaccine Selection and Control Strategies of Avian Influenza in the Latin American and Caribbean Region (RLA5085)

Carla Bravo de Rueda

On 26 May 2023 the FAO/IAEA Joint Center under the regional project RLA5085 organized a virtual training course to cover best practices on the selection of vaccines and vaccination strategies against Avian Influenza in the Latin American and Caribbean (LAC) region.

The training course was held in Spanish and more than 400 participants registered for this event which focused on the importance of vaccine selection and vaccination strategies against Avian Influenza virus.

The invited experts presenting were: Dr. Roberto Navarro López (Mexico), Director of the United States-Mexico Commission for the Prevention of Foot and Mouth Disease and other Exotic Animal Diseases (CPA), National Service of Agrifood Health, Safety and Quality (SENASICA); and, and Dr. José L. Gonzales (Bolivia) from the Epidemiology and Risk Assessment at Wageningen Bio-veterinary Research (WUR), Netherlands, an FAO reference centre for veterinary epidemiology.

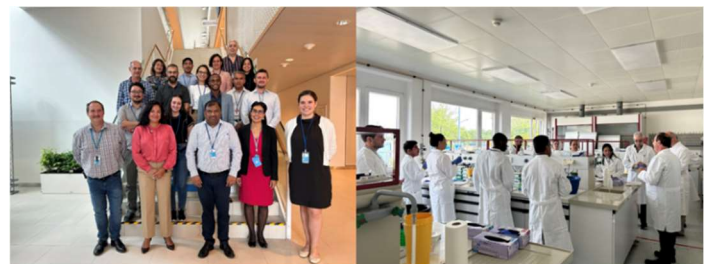
[Click here to watch the video](#)

Regional Training Course on Genome-Wide Typing and Sequencing for Assessment of Genetic Disease Resistance in Aquaculture (RLA5086)

Kathiravan Periasamy

Aquaculture is one of the fastest growing food production sectors and is expected to grow further in order to secure food for the growing human population. The culture of rainbow trout (*Oncorhynchus mykiss*) is one of the main aquaculture activities in the Latin America and the Caribbean (LAC) region, being the second largest producer in the world after Asia. Aquaculture is developed mostly by rural communities with low economic resources. Consequently, many countries in the region lack adequate infrastructure; qualified personnel; epidemiological surveillance; and adequate sanitary controls. The region is experiencing increasing mortality rates in trout farming due to the entry of border pathogens such as infectious pancreatic necrosis virus (IPNV). Applications of nuclear and related techniques such as the application of genomic selection approaches will contribute to improved breeding practices that helps improve trout's resistance against IPNV.

A regional training course on “Genome-wide typing and sequencing for assessment of genetic disease resistance in aquaculture” was organized from 29 May to 9 June 2023 at the Animal Production and Health Laboratory in Seibersdorf, Austria, under the Regional Technical Cooperation Project “RLA5086: Decreasing the mortality rate of rainbow trout associated with infectious pancreatic necrosis virus and emerging diseases using molecular and OMIC techniques”.



Participants of the RLA5086 regional training course on trout genomics and pathogen sequencing

A total of 13 participants from eight countries (Argentina, Brazil, Chile, Ecuador, Mexico, Panama, Peru and Uruguay) attended the training course. Dr. Mohamed Salem from the Department of Animal and Avian Sciences served as an expert for the training course. The scientific programme of the course consisted of specialized lectures, practical trainings on wet-laboratory and data analytic techniques on the following main topics:

- Application of genomic technologies for breeding and trait improvement in aquaculture.
- Genome-wide typing of single nucleotide polymorphic (SNP) markers using DNA microarray platform.
- Genome wide association study (GWAS) to identify genomic regions of interest for breeding trout against IPNV.
- Genomic prediction techniques for practical breeding of rainbow for genetic disease resistance.
- Sequencing pathogen genomes using nanopore technologies.
- Introduction to bioinformatics data analysis on genotype extraction and genome sequence assembly.

International Centre for Genetic Engineering and Biotechnology (ICGEB) Workshop on Genomic Approaches for Understanding Vector-Borne Diseases

Viskam Wijewardana

A recent visit to an Animal Production and Health Laboratories (APHL) counterpart in Sri Lanka, involved in Coordinated Research Project D32037 and Technical Coordination Project SRL5049 on developing an irradiated gastrointestinal parasite vaccine against *H. contortus*, was made to assist with methods developed at APHL for assessing the efficacy of a field trial study using the vaccine. During the visit, we had the opportunity to present our work on irradiated vaccines with an emphasis on using irradiation as a tool for identifying new virulence antigens in *T. evansi* infections at an IGEBC conference, 22 to 24 March 2023 organised by the hosting department. New connections with attending participants at the conference were established with the hope of future collaborations. At the department, qPCR methods that would assist in identifying host blood and intestinal parasites were established, and a qPCR panel on the identification of host immune responses during immunisation and infection was validated. Several co-publications resulting from this work are in the pipeline.



Participants at the ICGEB workshop

3rd International Symposium on Brucellosis hosted by China National/WOAH/FAO Reference Laboratory for Animal Brucellosis

The Animal Production and Health Laboratory delivered a keynote speech at the International Symposium on Brucellosis and Academic Events in Celebration of the 70th Anniversary of China Institute of Veterinary Drug Control (IVDC), the National/WOAH/FAO Reference Laboratory for Brucellosis from 10 to 11 January 2023, in Beijing, China. Prominent academicians, experts and scholars in this field from the global WOAH Brucellosis Reference Laboratory, research institutes for brucellosis around the world were invited by the conference as keynote speakers who gave presentations on hotspot, challenges and recent progress in brucellosis field, including epidemiology status of brucellosis in China and abroad, novel diagnosis technology and vaccine development, mechanism of brucellosis immunity and pathogenesis, and clinical practical advice on brucellosis prevention and control. APHL delivered data and future prospects on irradiated vaccines against Brucellosis and other livestock pathogens.

Stories

Innovative Nuclear and Related Molecular Approaches for Detection and Characterization of Antimicrobial Resistance in Animal Production Environment (D32043)

Kathiravan Periasamy and Giovanni Cattoli

Antimicrobial resistance (AMR) is an important global health concern and is considered to be a silent pandemic causing more than one million deaths annually. Antimicrobial drugs are used in farm animals for therapeutic, prophylactic and growth promotion purposes. Emergence and transmission of AMR in animal production systems is a major issue, considering the fact that more than two-thirds of antibiotics sold globally are used on animals. National AMR surveillance programmes have mostly focused on the detection of AMR in human health and in animals for food safety purposes, but little attention has been given to animal production facilities. Active surveillance of AMR in animal production settings is constrained by lack of guidelines, harmonized sampling protocols and cost-effective technologies for detection and characterization of AMR. Most analytical methods are focussed on detection of AMR/ARGs (antimicrobial resistance genes) in selectively cultured bacteria, but it is important to note many microbial species are non-culturable/difficult to grow. Stable isotope and molecular/genomic techniques offer powerful culture-independent approaches to detect potential antimicrobial resistance in farm animal environment samples. Antimicrobial agents have long been used at sub-therapeutic levels in livestock feed as growth promoters to improve production efficiency. Although such antibiotic growth promoters (AGPs) have provided benefits to livestock industry, their use contribute to the emergence of resistance among microbes in the gut environment. Hence, identifying effective alternatives to AGPs will be an important approach to reduce antimicrobial usage in animal production settings.

The IAEA is launching a new five-year Coordinated Research Project (CRP) on innovative nuclear and related molecular approaches for detection and characterization of antimicrobial resistance in animal production environment. Three major animal production systems i.e. pig, chicken and cattle will be targeted. The CRP will help to develop validated/harmonized protocols for sampling and analysis of farm environment samples, distribution characteristics of drug resistance among infectious agents affecting livestock, scientific data on performance of candidate alternative

substances to AGPs in animal production and strategies/guidelines on optimal husbandry practices that improve biosecurity and mitigate AMR in animal farm premises. The overall objective of the CRP is to enable member states (MS), especially developing countries to use innovative nuclear and related approaches for enhancing the efficiency and effectiveness of national AMR surveillance programmes and promoting good husbandry practices to mitigate AMR in animal production settings. The specific research objectives include (i) to develop, evaluate and validate farm-level sampling methods (e.g., bioaerosol, water, feed, feces, etc.) for detection of AMR in high and low-input animal production environments (ii) to establish AMR distribution characteristics in high and low input animal production environments using nuclear, molecular and microbiological techniques (iii) to assess the efficacy of alternatives to antibiotic growth promoters (AGPs) as feed additives in animal production settings (iv) to establish scientific evidence on development and transmission of AMR at animal-human-environment interface (v) to evaluate and optimize phenotyping and genotyping methodologies related to drug resistance in animal infections other than bacteria (e.g., anthelmintic resistance, acaricide resistance, antifungal resistance, etc.) and (vi) to pilot and recommend good husbandry practices or antimicrobial stewardship that aim to reduce the risk of emergence and occurrence of AMR in farm animal settings.



Two-thirds of antibiotics sold globally are used on farm animals. Emergence of antimicrobial resistance in animal production systems and its transmission to humans is a global health issue.

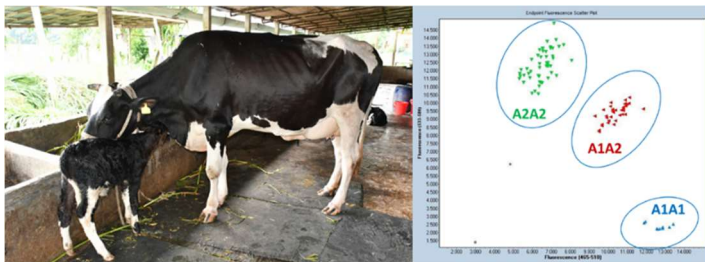
The CRP will comprise of 8 Research Contract (RC) holders from developing countries, three Technical Contract (TC) holders and three Research Agreement (RA) holders from laboratories engaged in advanced AMR research. Each selected research contract holder will be awarded a seed grant of USD 10000/year for a period of five years. Nuclear techniques involving isotopes such as ⁶⁰Cobalt (develop irradiated para probiotics as AGPs), Deuterium (novel AMR phenotyping in difficult to grow bacteria), ¹³Carbon and ¹⁵Nitrogen (stable isotope labelled amino acid approaches for antibiotic sensitivity testing) and molecular/genomic techniques (polymerase chain reaction, sequencing, and next generation sequencing, etc.) will be utilized to achieve the objectives.

Research Activities of the Animal Production and Health Laboratory

Animal Genetics

Development and validation of a cost-effective DNA test to identify cows producing A1/A2 milk (D31030)

Cow milk is composed of several solids that includes fat, protein, lactose and minerals. The three major milk proteins observed in milk are alpha casein, beta casein and kappa caseins. Various forms (variants) of each of these casein proteins are known to be present in milk, produced from different breeds/populations of cows. Of these, variations in beta casein have been reported to have significant implications on human health. Beta casein is produced by bovine CSN2 gene and has 209 amino acid residues. A change at amino acid position 67 result in A1 (histidine) and A2 (proline) beta casein variants. Consumption of milk containing A1 beta casein has been reported to cause discomfort (e.g., post dairy digestive discomfort PD3 symptoms) in certain individuals due to several fold increase in the release of betacasomorphin 7, delayed gastro-intestinal transit and associated gastro-intestinal inflammation. Considering the human health significance, there has been interest in several FAO/IAEA member states to implement dairy cattle breeding that targets selection of cows that produce A2 milk.



A crossbred Holstein cow (left) and clustering of A1/A2 genotypes using competitive allele specific PCR (right)

During 2023, Animal Production and Health Laboratory (APHL) initiated the development of a simple, cost-effective DNA test that can help farmers and breeders to differentiate cows that produce A1 and A2 milk. Oligonucleotide primers were designed to perform targeted sequencing of bovine beta casein gene (CSN2) and profile the variants existing in cattle across Asia, Africa and Latin America. More than 1200 cows were sequenced to identify the beta casein variants and establish their distribution across >65 breeds of Asian zebu, African zebu, African taurine, zebu x taurine crossbreds, Latin American Creole and commercial European taurine cattle. Analysis of CSN2 sequence data is currently in progress. A competitive allele specific polymerase chain reaction based (PCR) assay based

on FRET (Fluorescence Resonance Energy Transfer) chemistry was designed to genotype A1/A2 polymorphism. The assay development was successful and validation of the DNA test on various real time PCR platforms is in progress.

Genomic analysis of crossbred dairy cattle in Southern Africa to estimate genetic admixture and identify optimal genotype for local production system (CRPD31028)

The Southern African Development Community (SADC) region largely falls within the sub-tropics, where environmental conditions for livestock farming are harsh. Small holder dairy cattle farming in the region is characterized by scarcity of resources such as feed and water and low levels of productivity. A SADC small holder dairy project was initiated as a collaborative effort involving researchers from South Africa, Botswana and Zimbabwe. Small holder farmers predominantly use specialized temperate dairy cattle breeds such as the Holstein for crossbreeding and increase milk productivity. However, such breeds demand high levels of management and nutrition, failure which results in a deterioration in performance, especially in fitness traits. Under the IAEA Coordinated Research Project, Agricultural Research Council of South Africa collaborated with Animal Production and Health Laboratory (APHL) to identify the optimal crossbred dairy cattle genotype for the small holder production system in the region. As part of this effort, large number of crossbred dairy cattle managed by small holder farmers in the SADC region were sampled to estimate the genetic admixture levels in taurine x zebu crossbreds. Genetic admixture levels were utilized to evaluate the genetic composition and associate them with production and reproduction traits. More than 1200 crossbred dairy cattle were recorded for their production performance and genotyped using 60K DNA microarray. The crossbred dairy cattle genotypes were compared with reference populations of purebred Holstein and Nguni cattle to estimate the admixture levels. The results of the study will be utilized to formulate strategies for selection and breeding of cattle for increased productivity.

Optimizing sampling methodology and molecular analysis of bioaerosols in animal farm environments for detection and characterization of bacteria and AMR

Antimicrobial resistance (AMR) in bioaerosols present in animal farms is a growing concern due to its potential implications for human and animal health. Bioaerosols, which are airborne particles containing microorganisms, can act as vehicles for the transmission of antibiotic-resistant bacteria. Understanding the dynamics and occurrence of AMR in bioaerosols within animal farm settings is crucial for developing effective strategies to mitigate the spread of antibiotic resistance in farms and at the animal-environment-human interface.

The Animal Production and Health Laboratory (APHL), in collaboration with the University of Veterinary Medicine Vienna (VETMED), has initiated a programme aimed at optimizing sampling and analysis of bioaerosols for detection and characterization of bacteria and AMR in pig and cattle farm environments. The objective is to assess the occurrence and transmission of AMR in different animal production systems, with a specific focus on the bioaerosol, wastewater, and fecal routes of AMR and ARG (antibiotic resistance genes) transmission. This will be achieved through the use of microbial and molecular technologies.

As part of this research programme, a pilot trial was conducted in a selected pig farm to test the efficacy of two bioaerosol samplers (impactor vs filter) and to optimize the sampling time and location. Bioaerosols were collected using petri dishes placed in the Andersen 6-stage Cascade Impactor and glass fiber filters through a medium volume sampler. A total of 45 colonies were randomly selected from different stages of the air sampler, with varying sampling times. Additionally, 29 colonies were obtained from sewage faecal samples and cultured on non-selective media for species identification using 16S rRNA sequencing. Figure 1 displays the results of the families of selected colonies, revealing 11 from *Rothia nasimurium* from the family of *Micrococcaceae*, which is a member of the normal flora found in the oral and intestinal tracts of humans, pigs, and rodents. The second most frequently identified species were *Staphylococcus* spp. and *Acinetobacter* spp., which are known airborne inhalable pathogens. In contrast, the majority of bacteria identified in faecal and wastewater samples were *Escherichia coli* and *Aeromonas* spp. Bacterial colonies from *Moraxellaceae* and *Enterobacteriaceae* families were present in both bioaerosol and sewage samples. The preliminary results indicate the presence of a common bacterial community in the selected farm, which will facilitate the development of a comprehensive AMR monitoring plan, as well as identifying the ideal sampling time and location for data collection. Further analysis of AMR characterization and molecular analysis is currently underway.

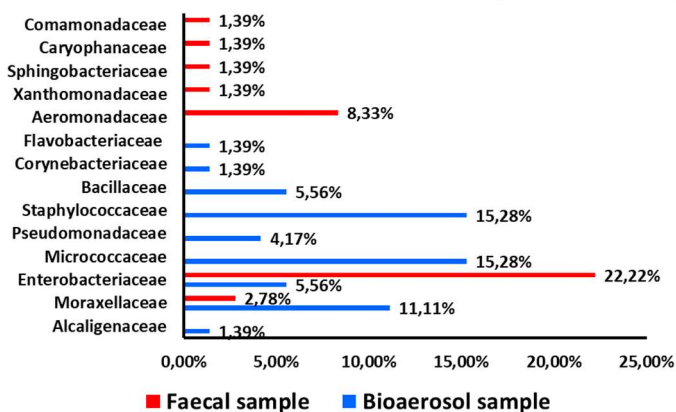


Figure 1. Family of selected bacterial colonies present in bioaerosol and faecal samples collected from a pig farm

Animal Health

Video protocols on “In-vitro Methods to Evaluate Animal Vaccines”

It is vital to develop the correct tools to help prevent and control transboundary animal diseases (TAD) and zoonotic diseases, therefore providing support and relief to many communities. One of these tools is represented by vaccines, which have provided protection against many TADs and zoonotic diseases. While there are many vaccines developed and currently in use for this purpose, there are many other infectious diseases that are lacking effective vaccines. Therefore, research and development are very much needed, especially to counteract an exponential global surge of animal diseases.

The classic of way measuring the efficacy of vaccines during its development stage is by conducting animal challenge studies. These challenge studies are costly, are ethically challenging and have an intense bio risk. The recent advances in immunology and related sciences have paved the way to understand the immune parameters that coincides with protection of animals upon vaccination which are termed “correlates of protection”. Therefore, by measuring such correlates of protection “in vitro” the potency of a vaccine could be estimated without conducting challenge studies.

To achieve this goal, it is important that the global scientific community work together and generate trustworthy data which can inform vaccines producers on which are the promising prototypes to develop further. Unfortunately, sometimes laboratory methods and measurements can be challenging and hard to interpret, thus hampering the possibility for other scientists to replicate correctly the methods developed by others.

To address this issue, the “Journal of Visualized Experiments” also known as JoVe, has launched a collection of articles on “In-vitro Methods to Evaluate Animal Vaccines” (<https://app.jove.com/de/methods-collections/2069>), where in addition to the published manuscript, JoVe’s team will produce a high-quality video showing step by step the method described in the publication (Figure 2), representing an enormous added value to the network of laboratories in Member States working on research and development of new vaccines.

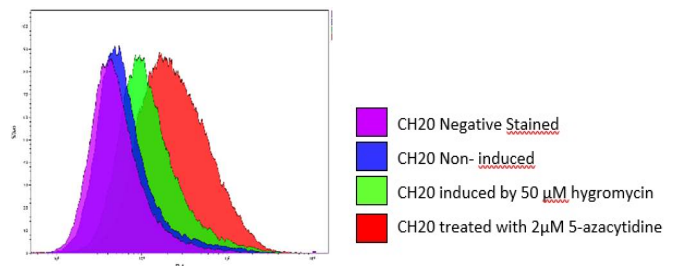


Figure 2. Example of video produced by JoVe

The FAO/IAEA Joint Center has recently published an article describing the method “Determination of Vaccine Immunogenicity Using Bovine Monocyte-derived Dendritic Cells” (<https://www.jove.com/de/t/64874/determination-vaccine-immunogenicity-using-bovine-monocyte-derived>). The hope is that many other groups will also submit their proposed technique to JoVe, benefiting not only from a publication but also from a “domestic” video production that can be then shared with the wider community. Member state laboratories who are interested can reach out to the Animal Production and Health Laboratory (APHL) to receive a copy of this video.

Cell lines with increased virus production for diagnostic and vaccine development

In our previous research, our objective was to enhance the production of Peste des Petits Ruminants Virus (PPRV) for vaccine development purposes. To achieve this, we introduced the PPRV receptor, SLAM, into Vero cells in order to increase their susceptibility to infection. However, we encountered a challenge with the stability of SLAM expression, which required the presence of hygromycin-induced stress. Through the analysis of the SLAM expression element, we discovered that the expression of SLAM was potentially impeded by methylation of its promoter, specifically the cytomegalovirus (cmv) promoter. Our hypothesis was that the induction of the anti-hygromycin element could disrupt the sealed region of the cmv promoter, allowing for increased transcriptional activity and subsequent elevation of SLAM expression. To validate our hypothesis, we utilized CRISPR dCas9-TET2 demethylation tools specifically designed to target the methylated SLAM promoter. Additionally, we employed the demethylation drug 5-azacytidine to inhibit the methylation process. Our findings showed that the expression of SLAM was indeed activated by 5-azacytidine, indicating the involvement of promoter methylation in the regulation of SLAM expression. Consequently, targeted demethylation of SLAM using CRISPR dCas9-TET2 tools is expected to significantly enhance SLAM expression, increase the sensitivity of Vero cells to PPRV infection, and ultimately facilitate vaccine development.



Detection of membrane SLAM protein expression in CH20 cells by flow cytometry. Compared to the hygromycin-induced group, treatment with the demethylation drug (2 μ M 5-azacytidine) reduced the methylation level of the slam promoter and enhanced slam expression.

Cloning and stable expression of Swine and Bovine GMCSF in mammalian cell lines for potential adjuvant study

A vaccine consists of two main components: antigens and adjuvants. Antigens are typically derived from pathogens and elicit an adaptive immune response. Adjuvants, on the other hand, are added to vaccines to stimulate and enhance the immune response in terms of its magnitude and durability.

In recent years, there has been significant progress in identifying adjuvants and developing vaccines. Cytokines have been widely utilized as adjuvants and therapeutic agents in the treatment of human diseases. Among various adjuvants investigated, Granulocyte monocyte colony stimulating factor (GM-CSF) has been shown as a promising cytokine adjuvant candidate for enhancing antitumor immunity in both mice and humans, augment the immune response induced by vaccines, particularly when used in DNA or peptide-based vaccines. Studies have shown GM-CSF as an adjuvant for HIV-1, influenza, and Hepatitis B, Hepatitis C virus and HSV-2 vaccination. However, the potential of GM-CSF as an adjuvant in livestock vaccines remains largely unexplored. Concurrently, irradiation technology has been considered as a viable alternative tool for vaccine development. This technology can generate "metabolically active, non-replicating" microorganisms, providing enhanced safety, efficacy, and accessibility compared to chemical vaccines. Studies have shown that irradiated vaccines can induce a robust protective immune response by activating both humoral and cellular immunity, aligning with GM-CSF's ability to stimulate both innate and adaptive immune responses. Consequently, we hypothesize that the combination of GM-CSF as an adjuvant with irradiated vaccines may have synergistic potential to enhance vaccine efficacy.

In this study, we generated expression plasmids for Swine GMCSF, Bovine GMCSF, Swine IL4, and Bovine IL4. These plasmids were constructed by cloning the cDNA of GMCSF or IL4, along with a secretory signal peptide, Myc, and HisTag, into the pcDNA3.1 vector containing a drug resistance gene (Fig. 3a). The plasmids' sequences were confirmed by Sanger sequencing. To establish stable

expression of GM-CSF, the PK15 and ESH-L cell lines were transfected with the plasmids containing Swine GM-CSF and Bovine GM-CSF separately using electroporation, followed by drug expansion of surviving cells. Different cell lines have different drug tolerances. WPK15-Swine GM-CSF were treated with a leukocyte activation cocktail containing a protein transport inhibitor (Brefeldin A). Flow cytometry assay using an anti-Myc antibody showed obvious difference in the levels of Swine GM-CSF in the transfected cells among negative control and different treated transfected cells (Figure 3b). This result indicates successful expression of a secreted fusion protein with Myc.

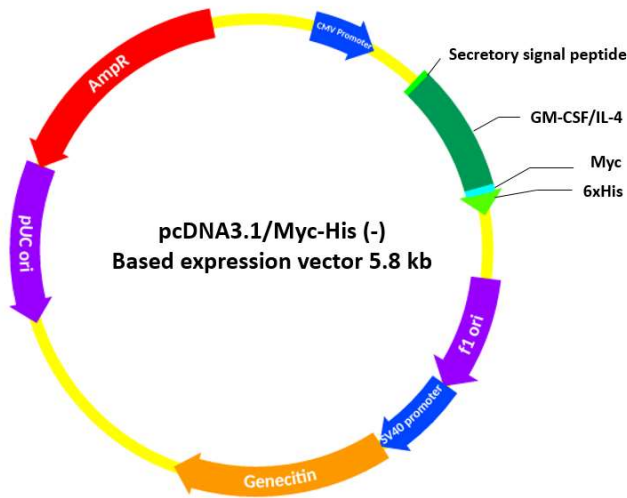


Figure 3a. The common schematic diagram of the GM-CSF or IL-4 mammalian cells' expression plasmids

To further validate the expression of GM-CSF, we plan to perform Western blotting, Enzyme-linked immunosorbent assay (ELISA) with a specific antibody against GM-CSF to detect the secreted GM-CSF in the cell supernatant, real-time quantitative RT-PCR, and assess the biological activity of purified GM-CSF. Additionally, the combination of GM-CSF with interleukin-4 (IL-4) was used to facilitate the differentiation of adherent monocytes from peripheral blood into monocyte-derived dendritic cells (MoDCs) *in vitro*. In future experiments, we plan to use the same methodology to express three other cytokines and utilize the purified GM-CSF and IL4 to induce the generation of MoDCs. Furthermore, we aim to cultivate related virus such as PCV-2 in the transfected cells and irradiate them. This combination will allow us to study GM-CSF as an adjuvant in conjunction with an irradiated vaccine, which has the potential to significantly reduce both time and costs involved in vaccine production.

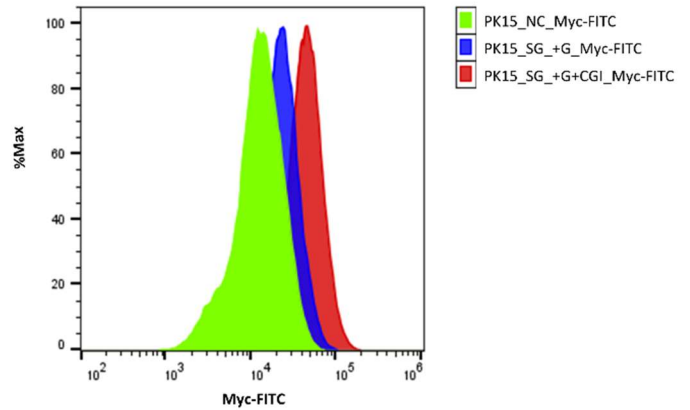


Figure 3b. Compare between cytokines cocktail plus Golgi Inhibitor treated PK15 Swine GM-CSF transfected cells (red histogram) with 1500ug/uL Genecitin selection drug pressure, non-inhibitor added PK15 Swine-GM-CSF transfected cells (blue) with 1500ug/mL Genecitin, and non-transfected cells (yellow). All the samples used primary antibody that mouse originated against Myc peptide, and secondary antibody anti-whole IgG conjugated FITC.

Cross-species serological detection of Lyssavirus antibodies based on luciferase immunoprecipitation system

Rabies virus (RABV) belongs to the genus Lyssavirus. It causes a significant zoonosis that accounts for thousands of human deaths yearly. Lyssaviruses are genetically similar and can cause disease in humans with clinical signs and symptoms similar to RABV. Currently, only RABV Ab ELISA kits are available for Lyssaviruses surveillance, and although species-independent, they can only effectively detect rabies-specific binding antibodies. Therefore, there is a need for a more sensitive, species-independent pan lyssavirus assay for the detection of lyssaviruses. Animal Production and Health Laboratory (APHL) has developed a serological luciferase immunoprecipitation system (LIPS) assay based on the highly conserved nucleoprotein (PanLyssaV-LIPS-N) for serological surveillance of lyssaviruses. This assay is very sensitive and can detect antibodies raised against all four phylogroups of lyssaviruses and across different host species (Figure 4).

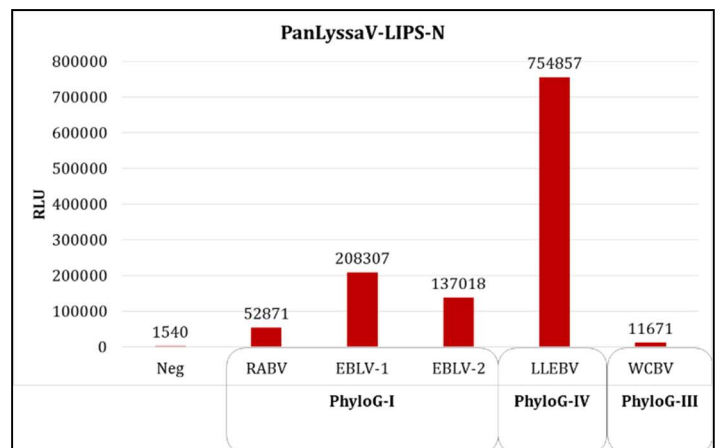


Figure 4. Bar graph showing the detection of Lyssavirus antibodies across three phylogroups using PanLyssaV-LIPS-N assay.

Poxvirus Infections in Dairy Farms and Transhumance Cattle Herds in Nigeria

Lumpy Skin Disease (LSD) and pseudocowpox (PCP) are viral diseases of cattle that can present similar clinical signs in certain circumstances, leading to misdiagnoses when proper differential diagnosis tools are unavailable.

In collaboration with the National Veterinary Research Institute, Nigeria, the Association of Public Health Laboratories (APHL) investigated suspected LSD outbreaks in cattle herds in Nigeria in 2020. Forty-two samples from 16 outbreaks were analyzed using a high-resolution melting assay developed at APHL. The results revealed that 19 samples (45.2%) tested positive for LSDV, and five (11.9%) were co-infected with LSDV and PCPV.

The LSDV samples were further characterized using four gene segments, while the partial B2L gene of PCPV was analyzed. The GPCR, EEV, and B22R gene sequences of Nigerian LSDV samples showed 100% similarity, indicating a common lineage. However, the RPO30 phylogeny revealed two clusters within Nigerian LSDV samples. Some Nigerian LSDVs clustered with LSDV isolates from Africa, the Middle East, and Europe, while others formed a unique subgroup.

Regarding PCPV, the B2L gene sequences of Nigerian PCPVs were 100% identical and clustered with PCPV isolates from cattle and reindeer, particularly those from Zambia and Botswana. This study also documented the first co-infection of LSDV and PCPV in Nigeria.

Overall, the study highlighted the diversity of LSDV strains in Nigeria and the occurrence of co-infection with PCPV. Therefore, accurate laboratory diagnosis and surveillance are crucial for managing these viral diseases in cattle populations.

The results of this study were published in the peer-reviewed journal "Viruses" (doi.org/10.3390/v15051051).

Molecular Characterization of Lumpy Skin Disease from Recent Outbreaks Asia and Africa.

Lumpy skin disease (LSD) is a viral disease that affects cattle and buffaloes, transmitted by blood-feeding vectors, causing significant morbidity and varying mortality rates.

Since the incursion of LSD in South-East Asian countries in 2019, Animal Production and Health Laboratory (APHL) has been supporting several countries in characterizing their local LSDV isolates through targeted gene sequencing and, more recently, whole-genome sequencing. Recent sequencing efforts have focused on LSDV isolates from Sri Lanka, Mongolia, Thailand, and Indonesia. Using high-fidelity (HIFI) long-read sequencing technology, APHL has generated accurate and complete reference genomes for different types of circulating LSDVs. These reference sequences were then used to assemble additional LSDV reads generated through short-read sequencing technology.

The analysis of complete genomes has revealed that LSDV samples from Sri Lanka cluster together with LSDVs from Nepal, Myanmar, Bangladesh, and India, indicating a common introduction source. Interestingly, these Sri Lankan LSDVs were identical to historical LSDV strains collected in Kenya before the 1960s. Moreover, LSDV samples from Mongolia, Thailand, and Indonesia showed similarities to recombinant-like LSDVs previously identified in China, Hong Kong, Vietnam, and previously sequenced LSDVs from Thailand.

APHL has also received and analyzed LSDV samples from Lesotho and Senegal. Sequencing of the RPO30, GPCR, EEV glycoprotein gene, and B22R genes confirmed that LSDV samples from these countries are identical to conventional field LSDVs found in Africa, Europe, and the Middle East.

Altogether, these sequencing efforts by APHL have provided valuable insights into the genetic characteristics and relationships among LSDV strains from different regions, extending our knowledge of LSDV spread and evolution.

Molecular Characterization of African Swine Fever Viruses

The Animal Production and Health Laboratory (APHL) supported the molecular characterization of African Swine Fever Virus (ASFV) isolates from recent outbreaks in Indonesia, Mali, Tanzania, and Zambia between 2022 and 2023. Characterizing these isolates using p72, p54, 9RL, and CD2v genes, revealed interesting findings. The Tanzanian ASFVs from 2022 were identified as belonging to ASFV genotype II and serogroup 4. The ASFVs from Mali in 2022 belong to ASFV genotype I. On the other hand, the ASFVs from Zambia in 2023 could not be definitively assigned to a specific genotype. Still, they were found to share a common ancestor with genotype I based on analysis of the partial p72 gene.

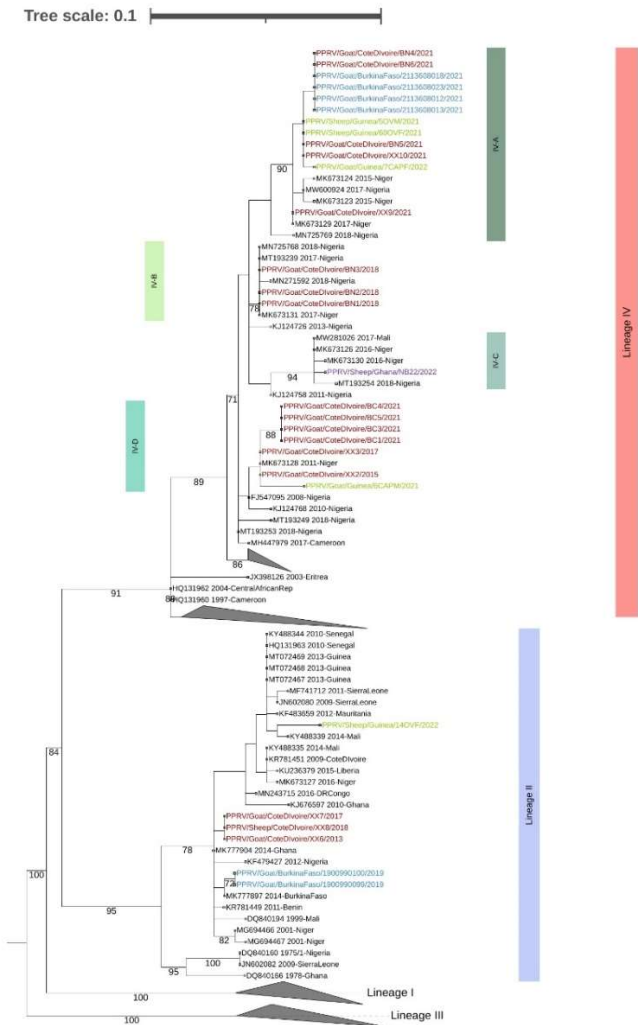
Peste des petits ruminants

The Spread of Peste Des Petits Ruminants Virus Lineage IV in West Africa

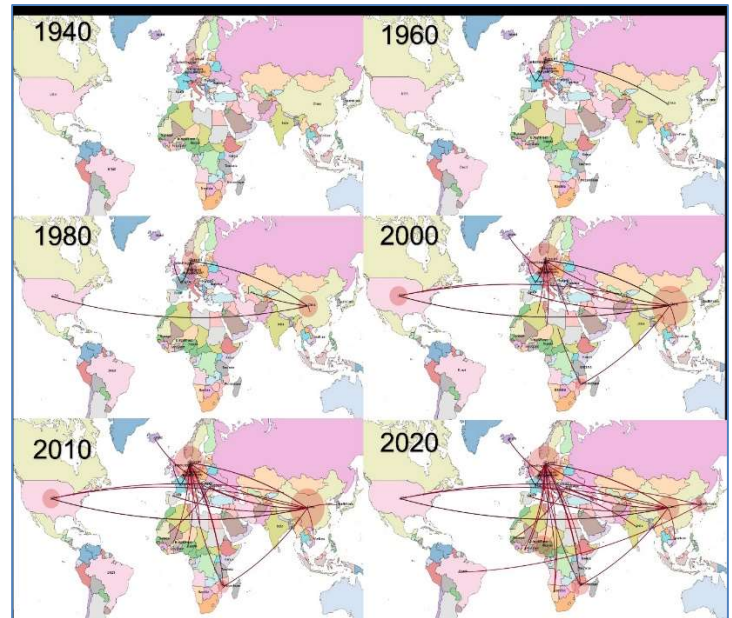
Monitoring the transboundary spread of peste des petits ruminants (PPR) virus is an essential part of the global efforts towards the eradication of PPR by 2030. There is growing evidence that Lineage IV is becoming the predominant viral lineage, replacing Lineage I and II in West Africa. As part of a regional investigation, samples collected in Burkina Faso, Côte d'Ivoire, Guinea and Ghana were screened for the presence of PPRV. A segment of the nucleoprotein gene from positive samples was sequenced, and phylogenetic analysis revealed the co-circulation of Lineage II and IV in Burkina Faso, Côte d'Ivoire and Guinea, and the identification of Lineage IV in Ghana.

These data will be of importance to local and regional authorities involved in the management of PPRV spread. The results of this study were published in the peer-reviewed journal "Animals" (doi: 10.3390/ani13071268.).

partial VP2 sequences originating from eight African countries (Burkina Faso, Côte d'Ivoire, Kenya, Mozambique, Namibia, Nigeria, Senegal, and Tanzania) during the period 2011 to 2021 were analyzed within the context of global PPRV1 variability. The observed pattern largely reflected what has been observed in high-income regions, i.e., 27a-like strains were more frequently detected than less virulent NADL-8-like strains. A phylogeographic analysis supported this observation, highlighting that the African scenario has been largely shaped by multiple PPRV1 importation events from other continents, especially Europe and Asia. The existence of such an international movement coupled with the circulation of potential vaccine-escape variants requires the careful evaluation of the control strategies to prevent new strain introduction and persistence. The results of this study were published in the peer-reviewed journal "Viruses" (doi: 10.3390/v15010207).



ML phylogenetic tree of the partial N gene sequences (219 nt) from the positive amplicons from this study combined with similar sequences available in GenBank



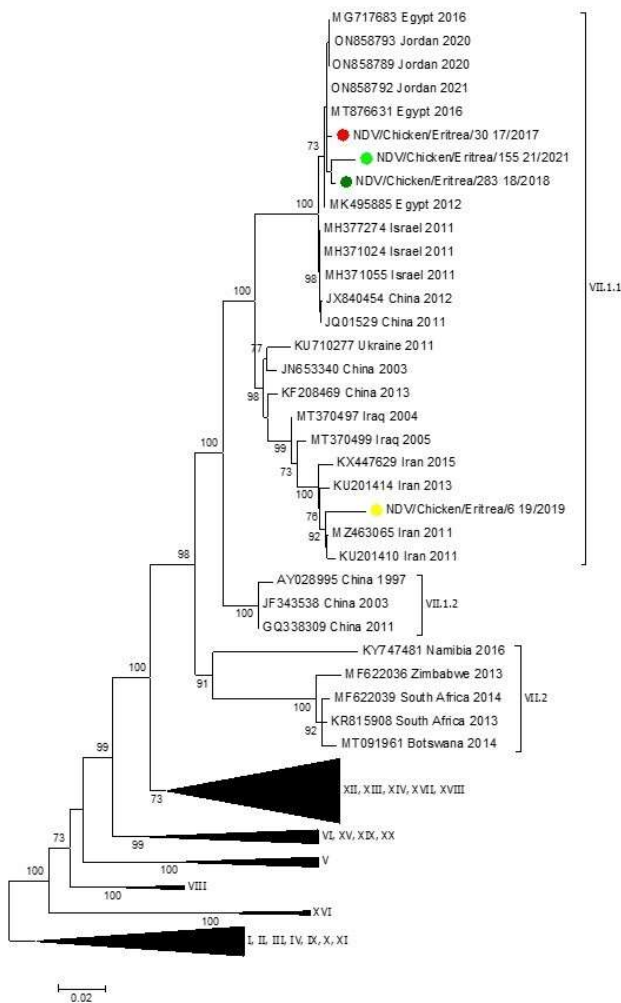
Phylogeographic reconstruction of PPRV1 migration among countries over time. Each picture represents a different decade. The edges connecting the countries have been color-coded from black to red based on the estimated age.

Porcine Parvovirus

Porcine parvovirus 1 (PPV1) is recognized as a major cause of reproductive failure in pigs, leading to several clinical outcomes globally known as SMEDI. Despite being known since the late 1960s its circulation is still of relevance to swine producers. Additionally, the emergence of variants such as the virulent 27a strain, for which lower protection induced by vaccines has been demonstrated, is of increasing concern. Even though constant monitoring of PPV1 using molecular epidemiological approaches is of pivotal importance, viral sequence data are scarce especially in low-income countries. To fill this gap, a collection of 71

Newcastle Disease Virus, Eritrea

Sequence and phylogenetic analysis of the fusion protein (F) gene from 10 Newcastle disease virus positive samples collected between 2017 and 2021 in Eritrea revealed that they all belonged to subgenotype VII.1.1. However, the sequences were heterogenous with eight showing the highest nucleotide sequence identity with F gene sequences from viruses identified in Egypt and Jordan and two with viruses from Sudan. This study is the first of its kind in Eritrea and suggests different origins of the VII.1.1 subgenotype viruses circulating in the country. As such, it has implications for the control of Newcastle disease within the poultry population in Eritrea.



ML phylogenetic tree of the complete F gene sequence (1662 bp) gene sequence from the NDVs sampled in Eritrea combined with similar sequences available in GenBank

Capacity Building

Individual Training

Ms. Lucie Reine Marie Michelle from Centre national de recherche appliquee au developpement rural (FOFIFA), Antananarivo, Madagascar was at Animal Production and Health Laboratory (APHL) for a fellowship training on “Cryopreservation of bull semen and advanced evaluation of post-thaw motility and morphometry” for six weeks (20 March to 28 April 2023) under TC fellowship (FS-MAG5027-2202256).

Ms. Mame Nahe Diouf from ISRA/Laboratoire National d’Elevage et de Recherches Veterinaires, Dakar, Senegal Ouagadougou, was at Animal Production and Health Laboratory (APHL) for a Scientific Visit on “Genetic evaluation and strategies for implementing livestock breeding programmes in Senegal” for one week (13 to 17 February 2023) under TC fellowship (SV-SEN5042-2000163).

Coordinated Research Projects (CRPs)

Project Number	Title	Project Officers
D31030	Improving Efficiency of Animal Breeding Programs Using Nuclear Related Genomic Information – Practical Applications in Developing Countries	V. Tsuma K. Periasamy
D31031	Nuclear and Related Techniques to Measure the Impact of Type of Feeding and Production System on Greenhouse Gas (GHG) Emissions and Livestock Productivity	V. Tsuma
D32034	Use of Stable Isotopes to Trace Bird Migrations and Molecular Nuclear Techniques to Investigate the Epidemiology and Ecology of the Highly Pathogenic Avian Influenza - Phase II	I. Naletoski G. Viljoen
D32035	Improvement of Diagnostic and Vaccine Tools for Emerging and Re-emerging Animal Health Threats	C. Bravo de Rueda V. Wijewardana
D32036	Application of Advanced Molecular Characterization Technologies Through the Veterinary Diagnostic Laboratory Network (VETLAB Network)	I. Naletoski
D32037	Novel Test Approaches to Determine Efficacy and Potency of Irradiated and Other Vaccines	V. Wijewardana C. Bravo de Rueda
D32038	Enhancing laboratory preparedness for the detection and control of emerging and re-emerging zoonotic diseases – ZODIAC in the Americas and the Caribbean	C. Lamien G. Cattoli
D32039	Enhancing laboratory preparedness for the detection and control of emerging and re-emerging zoonotic diseases – ZODIAC in Asia and the Pacific	C. Lamien G. Cattoli
D32040	Enhancing laboratory preparedness for the detection and control of emerging and re-emerging zoonotic diseases – ZODIAC in Europe and Central Asia	C. Lamien G. Cattoli
D32041	Enhancing laboratory preparedness for the detection and control of emerging and re-emerging zoonotic diseases – ZODIAC in Africa	C. Lamien G. Cattoli

Submission of Proposals

Research contract proposal forms can be obtained from IAEA, the National Atomic Energy Commissions, UNDP offices or by contacting a Project Officer. The form can also be downloaded from <http://cra.iaea.org/cra/index.html>

Improving Efficiency of Animal Breeding Programs Using Nuclear Related Genomic Information – Practical Applications in Developing Countries (D31030)

Victor Tsuma and Kathiravan Periasamy

The Coordinated Research Project (CRP) aims to enable use of nuclear and related genomic technologies in Member States to enhance the efficiency of national breeding programmes for increased milk productivity and dairy animal adaptability to the production environment.

Specifically, the CRP aims to a) develop nuclear and related genomic tools/resources such as radiation hybrid maps and DNA microarrays for tropical dairy species, and b) identify genomic regions of importance for milk and adaptability traits in local dairy animal populations, c) establish strategies to incorporate genomic information for selection and breeding of dairy animals, and d) develop and validate radiolabelled biomarker assays for early pregnancy diagnosis in cattle. Three major dairy animal species viz. cattle, buffalo and camel have been targeted. Eleven research contracts awarded to institutes in 10 developing countries from Africa, Asia and Latin America are progressing with year two project activities, having successfully implemented those of year one.

Nuclear and Related Techniques to Measure the Impact of Type of Feeding and Production System on Greenhouse Emissions and Livestock Productivity (D31031)

Victor Tsuma

This Coordinated Research Project (CRP) aims to enable the Member States (MS) of the IAEA, particularly in developing countries, to use nuclear and related technologies and resources to optimize livestock feeding practices that reduce greenhouse gas (GHG) emissions and help mitigate climate change. Specifically, the CRP aims to a) evaluate nitrogen and energy supplementation strategies in cattle feeding to mitigate enteric and manure GHG emission, b) to develop and/or validate nuclear and related tools/resources for nutrition related GHG mitigation in cattle production, and c) to provide MS with tools and mechanisms to monitor livestock GHG emissions. Targeted are dairy cattle production systems. The 10 research contracts awarded to institutes in 10 developing countries from Africa, Asia and Latin America successfully carried out year one project activities and are now implementing the second year work plans.

Use of Stable Isotopes to Trace Bird Migrations and Molecular Nuclear Techniques to Investigate the Epidemiology and Ecology of the Highly Pathogenic Avian Influenza Phase II (D32034)

Ivancho Naletoski

The aim of this Coordinated Research Project (CRP) is to evaluate the origin of wild birds that carry Avian Influenza (AI) and other potentially dangerous pathogens at their stopover places and match the obtained results with the knowledge obtained through conventional migration monitoring approaches.

Stable isotopes (SI) are promising huge potential when the origin (migration) of individual wild birds is required, because the probability of capturing a labelled bird with specific characteristics (disease carrier) using conventional methods is negligible.

Knowledge and experience obtained through the previous project (D32030 - Use of Stable Isotopes to Trace Bird Migrations and Molecular Nuclear Techniques to Investigate the Epidemiology and Ecology of the Highly Pathogenic Avian Influenza) will be of great value for the success of this project.

The use of SI in migration studies of wild animals, including wild birds, primarily in environmental protection studies and conservation activities, has attracted the attention of the scientific community; however, this technique can also be used in epidemiological studies that target long-range transmission of animal pathogens.

The development and maintenance of the IAEA Global Network of Isotopes in Precipitation (GNIP) became a significant facilitator of these studies, as it offered geo-spatial reference values for correlation of the SI ratios in the animal tissues (especially metabolically inert tissues like beaks, claws and feathers) and the SI ratios in the environment (especially open waters).

During the first phase of this CRP, several important steps in the linking of SI ratios of feather samples (bird migrations) with the epidemiology of AI were established. Achievements of project D32030 have shown not only that the isotope assignment works, but also have delivered a full package of techniques that will strengthen and supplement (SI component) the official wild bird monitoring programmes of Member States.

In the current project, the partners will focus on two critical issues:

- a) detecting birds that carry avian influenza viruses and eventually other dangerous pathogens, and
- b) evaluating stable isotope ratios in feathers of these birds (only the pathogen carriers) to understand their origins and migration pathways.

The third Research Coordination Meeting is foreseen for November 2023.

Improvement of Diagnostic and Vaccine Tools for Emerging and Re-emerging Animal Health Threats (D32035)

Carla Bravo de Rueda and Viskam Wijewardana

Vaccination has proven to be the best preventive measure against infectious diseases. Despite significant successes, there are several limitations to the currently practiced approaches. In veterinary medicine, the application of vaccines by injection frequently limits their use for small ruminants and poultry. This practice requires well-trained staff taking care to practice the utmost hygiene and maintain vaccine cold chain. Further, also in poultry rearing it is not easy to inject individual birds. In addition to that, injected vaccines rarely induce production of specific mucosal antibodies (IgA) covering the mucosal tissues in the nose, mouth and lungs, which are the primary site of multiplication for bacteria or viruses before they provoke a systemic infection. Such IgA antibodies can efficiently be induced by 'mucosal' vaccines, i.e. formulations that are

applied to the nose, mouth or eyes. These mucosal vaccines, especially eye drop vaccines, have the big advantage in requiring small volumes as the vaccine dose. Therefore, the application can be done by village vaccinators and the cold chain will be relatively easy to maintain.

Recent experiments on formulating such mucosal vaccines have presented a number of challenges: a) low viscosity leading to spills; b) unsuitable components for freeze drying; and c) the process of formulating the components appropriately. Among the latest development of this Coordinated Research Project is the research on Fowl cholera (FC) caused by *Pasteurella multocida* conducted in Ethiopia. When the irradiated FC vaccine was administered to chickens through intranasal and intraocular routes, a 100% protection was observed, as compared to a much lower rate with intramuscular injection. This work is now published in the major research journal "Frontiers in Immunology". Pakistan has improved their viral vaccine production titres significantly using a Celcradle system and have also shown efficacy of their ocular vaccines by improving its immune response. This work has been published in international conferences and symposiums and has been submitted as manuscript. Indonesia has shown progress on the irradiation of the bacteria with maintenance of metabolic activity. Kenya has shown progress on pathogens detection by PCR and has initiated students' programmes. The next research coordination meeting will be in October 2023.

Application of Advanced Molecular Characterization Technologies Through the Veterinary Diagnostic Laboratory Network (VETLAB Network) (D32036)

Ivancho Naletoski and Charles Lamien

The Animal Production and Health Section (APH) of the Joint FAO/IAEA Centre has established a free-of-charge Sanger sequencing service for all counterparts of the subprogramme. So far, over 4000 samples have been submitted for Sanger sequencing by 30 counterpart laboratories (mainly partners in the VETLAB Network) and the results were published in 27 articles in peer reviewed journals.

The APH intends to upgrade this service with additional workflows which should enable counterparts' access to service-based Whole Genome Sequencing (WGS) including the possibility for metagenomic analysis.

Such workflows need to be validated, primarily for biological inactivation of the field samples prior to submission, as well as regarding the quality of the DNA / RNA extracted from the field samples. Additionally, standardized bio-informatic package for processing of the

raw data and further phylogenetic analysis needs to be validated and verified for use by the counterpart community. In order to perform these activities, a new Coordinated Research Project (CRP) was developed and approved by the management of IAEA. Priority targets for this CRP will be the established users of the Sanger sequencing service of APH. However, the final objective of the CRP is to further disseminate the validated workflows to the wider counterparts' community.

Novel Test Approaches to Determine Efficacy and Potency of Irradiated and Other Vaccines (D32037)

Viskam Wijewardana and Carla Bravo de Rueda

The aim of this Coordinated Research Project (CRP) is to complement the evaluation efforts of irradiated and other novel vaccines, as well as application of innovative tools, to determine the immune response and design immunological tools for quality control and efficacy. The overall expected outcomes are a) new in vitro procedures for vaccine efficacy testing replacing or reducing animal challenge trials based on in vitro assays ideally employing irradiated antigens, b) evaluation of immune marker mRNA qPCR and gene expression assays, c) cytokine protein assays like ELISPOTS or ELISA, and d) cell-based quantification assays that employ flow cytometry etc.

This CRP will require the inputs from the side of each participant for us to be able to understand the immune response delivered by the specific vaccine and the basic methods of their evaluation. It is expected that these new procedures will in the future help vaccine producing labs to perform better quality control of their products. They will allow a higher confidence in the results due to a more technical approach. Six research contracts (Cameroon, Ethiopia, Indonesia, Iran, Sri Lanka, Tunisia), 5 agreements (Ethiopia, United Kingdom, China, Germany and Argentina) and 1 technical contract (Italy) has been awarded under this CRP.

Emerging data from ongoing experiments done through research contracts reveal isolated strains of pathogens from local environments could be use as vaccine candidates. The technical contract holder (Italy) has identified a novel adjuvant that could be used in mucosal vaccines. They will use this adjuvant to enhance vaccine responses against Avian Influenza.

Enhancing Laboratory Preparedness for the Detection and Control of Emerging and Re-emerging Zoonotic Diseases (D32038, D32039, D32040 & D32041)

Multiple zoonotic diseases have impacted public health, peoples' livelihoods, and the global economy in the last few decades. The COVID-19 pandemic is the most recent severe threat, which will have a long-term and far-reaching influence on the population and economy worldwide.

Surveillance and early detection tools and technologies are the critical links in the chain of disease control. They enable the rapid discovery of source and movement of pathogens as well as analysis, planning, and decision-making through the design and implementation of preventive or control measures.

Nuclear, nuclear-derived and -related techniques are reliable tools that can help scientists to investigate, prevent, detect, and contain outbreaks of zoonotic diseases. In addition, the IAEA has considerable experience in assisting the Member States in building their capacity to detect and characterize pathogens early and diagnose diseases rapidly and accurately. Moreover, the IAEA has developed or contributed to developing early detection and characterization tools, nowadays recognized as international testing standards.

Over the last few decades, technological development has enabled miniaturization and multiplexing of diagnostic assays, thus opening new windows in understanding the ecology and evolution of zoonotic pathogens. Next-generation sequencing, nanopore sequencing, and metagenomics-based approaches will enable novel pathogen characterization and discovery and will help to find potential reservoirs, vectors and additional susceptible hosts for known zoonotic pathogens.

ZODIAC in the Americas and the Caribbean (D32038)

Charles Lamien and Giovanni Cattoli

The ZODIAC CRP for the Americas and the Caribbean aims to develop and validate immunological and molecular tools under Pillar 2 of the ZODIAC project. In this way empowering national and regional disease surveillance programmes in the Americas and the Caribbean to identify potential sources of pathogen spill over to humans and identify emerging- and/or re-emerging pathogens with zoonotic risk.

Priority diseases	Examples	Research areas
Respiratory viruses	<i>Influenza A, Zoonotic Coronaviruses</i>	Increased (-targeted) surveillance at the A-H interface; sampling procedures
Arboviruses	Zika, Dengue	Early detection, monitoring and surveillance in the animal reservoirs and vectors, point-of-care testing
Emerging zoonoses	<i>Hantaviruses, Arenaviruses</i>	Increased surveillance at the A-H interface; sampling procedures, point-of-care testing
Endemic zoonoses	<i>Rabies, Brucellosis</i>	Increased surveillance at the A-H interface; point-of-care testing

TARGETED DISEASES/PATHOGENS

ZODIAC in Asia and the Pacific (D32039)

Charles Lamien and Giovanni Cattoli

The ZODIAC CRP for Asia and the Pacific aims to develop and validate immunological and molecular tools under Pillar 2 of the ZODIAC project. In this way empowering national and regional disease surveillance programmes in Asia and the Pacific to identify potential sources of pathogen spill over to humans and identify emerging- and/or re-emerging pathogens with zoonotic risk.

Priority diseases	Examples	Research areas
Respiratory diseases	<i>Influenza A viruses, Coronaviruses, Henipaviruses</i>	Increased (-targeted) surveillance at the A-H interface; sampling procedures
Arboviral diseases	<i>Tick-borne, mosquito-borne, and those transmitted by Culicoides and sand flies caused by Filoviruses</i>	Early detection, monitoring and surveillance in the animal reservoirs and vectors, point-of-care testing
Haemorrhagic fevers		Increased surveillance at the A-H interface; sampling procedures, point-of-care testing
Waterborne diseases	<i>caused by Hepatitis, Leptospira, and others</i>	
Endemic zoonoses	<i>Rabies, Brucellosis</i>	Increased surveillance at the A-H interface; point-of-care testing.

TARGETED DISEASES/PATHOGENS

ZODIAC in Europe and Central Asia (D32040)

Charles Lamien and Giovanni Cattoli

The ZODIAC CRP for Europe and Central Asia aims to develop and validate immunological and molecular tools under Pillar 2 of the ZODIAC project. On this way empowering national and regional disease surveillance programmes in Europe and Central Asia to identify potential sources of pathogen spill over to humans and identify emerging and/or re-emerging pathogens with zoonotic risk.

Priority diseases	Examples	Research areas
Vector-borne diseases	<i>Tick-borne, mosquito-borne, and those transmitted by Culicoides and sand flies, e.g., Flaviviruses (WNV, TBEV) and Bunyaviruses (Hantaviruses, CCHFV, RVFV)</i>	Early detection, monitoring and surveillance in animal reservoirs and vectors, point-of-care testing
Respiratory diseases	<i>Influenza A viruses, zoonotic coronaviruses</i>	Increased (targeted) surveillance at the vector, animal and human levels, sampling procedures
Foodborne diseases		Increased surveillance at the animal-human interface
Endemic zoonoses	<i>Rabies, anthrax, Lyme borreliosis, leishmaniasis</i>	Increased surveillance at the animal-human interface; point-of-care testing.
Endemic zoonoses	<i>Rabies, Brucellosis</i>	Increased surveillance at the A-H interface; point-of-care testing.

TARGETED DISEASES/PATHOGENS

ZODIAC in Africa (D32041)

Charles Lamien and Giovanni Cattoli

The ZODIAC CRP for Africa aims to develop and validate immunological and molecular tools under Pillar 2 of the ZODIAC project. In this way empowering national and regional disease surveillance programmes in Africa to identify potential sources of pathogen spill over to humans and identify emerging- and/or re-emerging pathogens with zoonotic risk.

Priority diseases	Examples	Research areas
Haemorrhagic diseases	Lassa fever, Marburg disease, Ebola, Crimean-Congo haemorrhagic fever, Rift valley fever	Early detection, monitoring and surveillance in animal reservoirs and vectors
(Re-) Emerging zoonoses	Zoonotic Coronaviruses, avian influenza, monkeypox	Surveillance and monitoring in animal reservoirs; NGS
Other mosquito-borne diseases	Chikungunya, West Nile, Zika, Dengue, Yellow fever	Differential diagnosis and syndromic surveillance
Rabies		Increased animal surveillance, differential diagnosis, vaccination programmes
Endemic zoonoses	Anthrax, Bovine TB, Brucellosis and zoonotic parasites	Differential diagnosis and syndromic surveillance

TARGETED DISEASES/PATHOGENS

Technical Cooperation Projects

Country TC Number	Description	Technical Officer(s)
Albania ALB5008	Improving and Enhancing National Capabilities for Early Detection of Vector Borne Diseases through the Application of Conventional and Molecular Methods	I. Naletoski
Algeria ALG5032	Strengthening the Capacity of the Central Veterinary Laboratory, Regional Laboratories and the Early Warning Laboratories in the Detection, Confirmation of Diagnosis and Surveillance of Animal and Zoonotic Diseases	I. Naletoski
Angola ANG5016	Recovering the Vaccine Production Unit and Monitoring Active Animal Immunity	V. Wijewardana C. Bravo de Rueda
Angola ANG5017	Optimizing Pasture Utilization for Improved Livestock Productivity	V. Tsuma
Burundi BDI5002	Improving Animal Production Through Enhanced Application of Nuclear and Related Techniques	C. Bravo de Rueda I. Naletoski V. Tsuma
Benin BEN5014	Improving Sheep and Pig Productivity and Livestock Traceability	V. Tsuma
Burkina Faso BKF5021	Improving Local Poultry Production Through Incorporation of Nutraceuticals in Feeds and Genetic Characterization	V. Tsuma
Burkina Faso BKF5022	Improving Local Poultry and Local Goat Productivity through Health, Diet, Reproduction, Genetic Markers for Selection and Breeding Management	V. Tsuma
Bosnia and Herzegovina BOH5003	Using Nuclear Technology in Enhancing Science Based Safety, Quality and Control Systems in Feed and Food Chains	L. Porfiri
Cameroon CMR5022	Controlling Transboundary Animal diseases with Special Emphasis on Peste des Petits Ruminants	V. Tsuma
Cameroon CMR5024	Improving Goat and Sheep Productivity in Rural Areas Using Nuclear-Derived Techniques for Genetic Marker Identification, Reproduction Harnessing and Feed Analysis	V. Tsuma
People's Republic of China CPR5025	Developing Integrated Strategies to Improve Nitrogen Utilization and Production Efficiency in Dairy Cows	G. Viljoen
Dominican Republic DOM0006	Building and Strengthening the National Capacities and Providing General Support in Nuclear Science and Technology	C. Bravo de Rueda

Country TC Number	Description	Technical Officer(s)
El Salvador ELS5014	Strengthening National Capacities for the Control of Brucellosis	I. Naletoski
Eritrea ERI5010	Increasing Small Scale Dairy Production Through Improved Feeding, Cattle Management and Higher Conception Rates, Thereby Improving Rural Livelihood and Contributing to Food Security	V. Tsuma
Grenada GRN0001	Building National Capacity through the Applications of Nuclear Technology	V. Tsuma
INT5157	Supporting National and Regional Capacity in Integrated Action for Control of Zoonotic Diseases	I. Naletoski
Côte d'Ivoire IVC5043	Applying Nuclear and DNA-Based Techniques to Improve Productivity of Local Livestock	V. Tsuma
Cambodia KAM5009	Improving Livestock Productivity and Control of Transboundary Animal Diseases	V. Tsuma K. Perisamy
Kenya KEN5038	Using Nuclear Techniques to Evaluate and Improve the Impact of Mutated Forages on the Performance of Smallholder Dairy Cows	V. Tsuma
Kyrgyzstan KIG5001	Establishing Effective Testing and Systematic Monitoring of Residues and Food Contaminants and of Transboundary Animal Diseases	I. Naletoski
Lao P.D.R. LAO5005	Reducing the Incidence and Impact of Transboundary Animal and Zoonotic Diseases	G. Viljoen
Lao P.D.R. LAO5007	Strengthening National Animal Health Laboratory Network	C. Bravo de Rueda
Lesotho LES5010	Using Nuclear and Molecular Technology to Improve Livestock Production and Health	G. Viljoen
Madagascar MAG5027	Improving Livestock Production through Artificial Insemination and Disease Control	V. Tsuma
North Macedonia MAK5011	Improving National Capacities for Early Detection and Characterization of Emerging and Re-emerging Animal Diseases with Strong Economic Consequences and Upgrade of the Bio Risk Management at the National Laboratory	I. Naletoski
Malaysia MAL5034	Strengthening National Capacity and Capability in Nuclear and Molecular Techniques in Supporting Transboundary Animal and Zoonotic Diseases of Veterinary Public Health Significance	C. Bravo de Rueda
Mexico MEX5033	Sustainable Production of Sheep and Goats in Mexico using Nuclear and Nuclear Related Techniques	V. Tsuma
Malawi MLW5004	Strengthening Capacity for the Diagnosis and Control of Mastitis in Dairy Cattle	C. Bravo de Rueda
Montenegro MNE5005	Enhancing Capacity of the National Veterinary Laboratory for Detection of Highly Contagious Animal Diseases	I. Naletoski
Mongolia MON5025	Improving Breed Characterization of Cashmere Goats to Facilitate the Establishment of Strategic Breeding Programmes	G. Viljoen
Mongolia MON5026	Improving the Diagnosis and Treatment of Transboundary Animal Diseases with Potential Pandemic Patterns	C. Bravo de Rueda
Morocco MOR5039	Strengthening National Capacities for the Control and Prevention of Viral Pandemics and Drug Resistant Pathogens	I. Naletoski
Mozambique MOZ5009	Strengthening National Capacity to Control the Incidence and Impact of Transboundary Animal and Zoonotic Diseases	G. Viljoen

Country TC Number	Description	Technical Officer(s)
Mozambique MOZ5011	Using Nuclear and Nuclear Related Techniques to Improve Animal Health and Breeding	C. Lamien
Myanmar MYA5028	Reducing the Incidence and Impact of Transboundary Animal and Zoonotic Diseases	G. Viljoen
Myanmar MYA5030	Advancing National Capacities to Detect and Respond to Transboundary Animal Diseases	C. Bravo de Rueda T.B. Settypalli
Namibia NAM5018	Strengthening Animal Health and Food Safety Control Systems	G. Viljoen
Nepal NEP5008	Reducing the Incidence of Brucellosis in Animals and Humans through Surveillance and Control	I. Naletoski
Vanuatu NHE5003	Enhancing Livestock Production and Health	V. Tsuma C. Bravo de Rueda
Nigeria NIR5041	Improving Livestock Productivity through Enhanced Nutrition and Reproduction Using Nuclear and Molecular Techniques	V. Tsuma
Pakistan PAK5052	Improving Livestock Productivity Using Nuclear and Related Techniques by Exploiting Indigenous Feed Resources while Reducing Enteric Greenhouse Gas Emissions	C. Bravo de Rueda
Papua New Guinea PAP5004	Improving Reporting of the Incidence and Prevalence of Animal Health and Diseases Using Nuclear Derived Techniques	I. Naletoski
Paraguay PAR5011	Improving the Conservation of Germplasm of High-Performance Livestock and Native Cattle	V. Tsuma
Peru PER5035	Improving Pasture Production Through Best Soil Nutrient Management to Promote Sustainable Livestock Production in the Highland Region	V. Tsuma
Palau PLW5004	Establishing Technical Capability in Animal Production and Disease Control	C. Bravo de Rueda
Congo PRC6002	Contributing to the Epidemiological Surveillance of Neglected Tropical Diseases	C. Bravo de Rueda
RAF5082	Enhancing Veterinary Diagnostic Laboratory Biosafety and Biosecurity Capacities to Address Threats from Zoonotic and Transboundary Animal Diseases (AFRA)	I. Naletoski
RAF5089	Strengthening the Capacities of National Veterinary Laboratories for the Early Warning, Control and Prevention of Outbreaks of Animal and Zoonotic Diseases (AFRA)	C. Bravo de Rueda G. Cattoli
RAF5090	Supporting Climate Change Adaptation for Communities Through Integrated Soil–Cropping–Livestock Production Systems (AFRA)	V. Tsuma
RAS0081	Supporting Human Resource Development and Nuclear Technology Including Emerging Needs	G. Viljoen
RAS5085	Using Nuclear Derived Techniques in the Early and Rapid Detection of Priority Animal and Zoonotic Diseases with Focus on Avian Influenza	I. Naletoski
RER5027	Enhancing Preparedness Capacities of the Veterinary Sector to Confront with Emerging and Re-emerging Diseases of Livestock and Wildlife	I. Naletoski
RLA5084	Developing Human Resources and Building Capacity of Member States in the Application of Nuclear Technology to Agriculture	C. Bravo de Rueda
RLA5085	Strengthening the Capacity of Official Laboratories for Monitoring and Response to an Outbreak of Priority Animal and Zoonotic Diseases (ARCAL CLXXIV)	C. Bravo de Rueda I. Naletoski

Country TC Number	Description	Technical Officer(s)
RLA5086	Decreasing the Mortality Rate of Rainbow Trout Associated with Infectious Pancreatic Necrosis Virus and Emerging Diseases Using Molecular and OMIC Techniques (ARCAL CLXXV)	C. Bravo de Rueda
Senegal SEN5042	Using Nuclear and Related Techniques in Improving the Productivity of Domestic Ruminants	V. Tsuma
Sierra Leone SIL5019	Strengthening Capacities for the Diagnosis and Control of Zoonoses to Improve Public Health Services and Livestock Production	C. Bravo de Rueda
Sierra Leone SIL5022	Enhancing Livestock Production and Artificial Insemination Programme to Increase Milk and Meat Production in Cattle	V. Tsuma
Sri Lanka SRL5049	Supporting Control of Stomach Worm Infection in Goats	C. Bravo de Rueda V. Wijewardana
Kingdom of Eswatini SWA5001	Reducing the Incidence and Impact of Transboundary Animal and Zoonotic Diseases	G. Viljoen
Syrian Arab Republic SYR5025	Enhancing the Nutritive and Reproductive Characteristics of Small Ruminants by Means of Nuclear and other Related Techniques Using Locally Available Unconventional Feed Resources	V. Tsuma
Tajikistan TAD5006	Applying Nuclear and Molecular Techniques for Diagnosis and Control of Transboundary Animal Diseases	I. Naletoski
U.R. of Tanzania URT5036	Enhancing Artificial Insemination Services and Application of Radioimmunoassay Techniques to Improve Dairy Cattle Productivity	V. Tsuma
Uruguay URU5030	Introducing Genetic Traceability Technology for Improved Food Safety	V. Tsuma
Viet Nam VIE5023	Reducing the Incidence and Impact of Transboundary Animal and Zoonotic Diseases	G. Viljoen
Viet Nam VIE5024	Strengthening Diagnosis, Surveillance, and Control of Emerging Transboundary Animal and Zoonotic Diseases with Emphasis on African Swine Fever and Severe Acute Respiratory Syndrome Coronavirus 2	G. Viljoen
Viet Nam VIE5025	Applying Nuclear Related Technology for Selecting Climate Adapted Indigenous Swine and Chicken Breeds	G. Viljoen V. Tsuma
DR Congo ZAI5027	Developing Early and Rapid Diagnosis and Control of Transboundary and Zoonotic Diseases	C. Bravo de Rueda
Zimbabwe ZIM5024	Establishing an Artificial Insemination Center to Enhance the Rebuilding of the National Herd	V. Tsuma
Zimbabwe ZIM5025	Producing Theileriaparva and Other Tick Borne Disease Vaccines	C. Bravo de Rueda

Publications

Publications in Scientific Journals

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VETLAB Network

The VETLAB Network is a global network of national veterinary laboratories coordinated by the Animal Production and Health Section (APH) and supported through IAEA and FAO programmatic activities as well as by South Africa through the African Renaissance Fund (ARF) and by the USA and Japan Peaceful Uses Initiative (PUI).

In 2023, the Diagnostic Investigation Centres - part of the veterinary laboratory network of Indonesia - joined the VETLAB Network, bringing the total number of partner laboratories to 80 in 46 African and 19 Asian countries. The VETLAB Network is working to be able to support Central and Eastern Europe, the Caribbean and Latin America countries. The laboratories work with each other and experts from the Joint FAO/IAEA Centre to use nuclear, nuclear-derived and other methods for monitoring, early detection, diagnosis and control of diseases.

Every year the VETLAB Network organizes ring trials, training courses and one meeting of the Directors of African and Asian laboratories.

In 2023, the meeting of the Directors of the partner laboratories will be organized at the IAEA Headquarters in Vienna, Austria, from 21 to 25 August. In the second semester of 2023, the VETLAB Network is also organizing

two training courses. The first one will be held at the Animal Production and Health Laboratory (APHL) in Siebersdorf, Austria, from 25 September to 6 October (title “Multiparametric Detection of Pathogens Causing Major Transboundary Animal Diseases and Zoonoses). The second one will be organized in Tunisia from 23 October to 3 November (title “Diagnosis of Peste des Petits Ruminants and Respiratory Diseases of Small Ruminants”).

In the first half of 2023, network partner laboratories in Africa and Asia have received training and support for the detection, confirmation, and control of transboundary animal diseases such as avian influenza H5N1, foot-and-mouth disease, African swine fever and lumpy skin disease. More information can be found in other sections of this newsletter. APH is issuing the VETLAB on a regular basis Network Bulletin in the hope of providing a forum for participating laboratories and other stakeholders to communicate and exchange knowledge/information, to showcase achievements and to share expertise within the VETLAB Network. The latest highlights of the VETLAB Network Bulletin can be found on pages 5 and 6 of this issue.

Impressum

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