

WOAH Collaborative Centre Reports Activities 2023

Activities in 2023

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Centre Information

Title of WOA Collaborating Centre	ELISA and Molecular Techniques in Animal Disease Diagnosis
Address of WOA Collaborating Centre	Animal Production and Health Laboratory, Joint FAO/IAEA Centre of Nuclear Techniques in Food and Agriculture, Department of Nuclear Sciences and Applications, International Atomic Energy Agency, IAEA Laboratories Seibersdorf, Friedensstrasse, Seibersdorf, A-2444, Austria.
Tel.:	+431260028380
E-mail address:	V.WIJEWARDANA@IAEA.ORG
Website:	https://www.iaea.org/about/animal-production-and-health-section
Name Director of Institute (Responsible Official):	Dongxin Feng, Director, Joint FAO/IAEA Centre of Nuclear Techniques in Food and Agriculture, International Atomic Energy Agency, Vienna, Austria
Name (including Title and Position) of Head of the Collaborating Centre (WOAH Contact Point):	Viskam Wijewardana, Laboratory Head Animal Production and Health Laboratory
Name of the writer:	Viskam Wijewardana

TOR1 AND 2: SERVICES PROVIDED

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

Category	Title of activity	Scope
Training, capacity building (true)	Training Course for Veterinary Diagnostic Laboratory Network Partners on Multiparametric Detection of Pathogens Causing Major Transboundary Animal Diseases and Zoonoses	To enhance partners' capabilities within the Veterinary Diagnostic Laboratory Network (VETLAB Network) to utilise molecular and serological assays for the differential diagnosis and syndromic surveillance of significant transboundary and zoonotic animal diseases.
Diagnosis, biotechnology and laboratory (true)	Molecular epidemiology and genome sequencing study - samples	396 new samples for molecular characterization and gene sequencing have been received from laboratories in resource-limited settings. These samples cover a range of pathogens, including PPRV, NDV, Rabies, AIV, Poxviruses (LSDV, SPPV, GTPV, PCPV, ORFV), ASFV, RHDV, RVFV, Mccp, and various metagenomic analyses.
Vaccines (true)	Irradiated vaccines development	Irradiated inactivate ASF virus to develop a vaccine against ASF
		To enhance the capabilities of the Veterinary Diagnostic Laboratory Network (VETLAB Network)

Training, capacity building (true)	Training Course on the Detection and Differential diagnosis of PPR and Other Small Ruminants Respiratory Diseases	and partner laboratories to diagnose and monitor Peste des Petits Ruminants (PPR) and other respiratory diseases in small ruminants
Training, capacity building (true)	Training Course for Veterinary Diagnostic Laboratory Network Partners on Next Generation Sequencing Bioinformatics and Molecular Phylogeny	To train participants on sample and library preparation, sequencing using NGS and Nanopore technology, and sequencing data analysis. Focusing on animal pathogens such as ASF, Capripox, PPR, and Avian influenza viruses
Training, capacity building (true)	Workshop on laboratory methods for peste des petits ruminants (PPR) diagnosis (Jordan)	To provide an update on the PPR global eradication programme (PPR GEP), give an overview on molecular epidemiology and diagnosis of PPR, and to strengthen or build up the laboratory capacity in various countries or regions for the detection of PPR by providing hands-on laboratory training on various diagnostics methods and sequencing
Training, capacity building (true)	Workshop on laboratory methods for peste des petits ruminants (PPR) diagnosis (Georgia)	To provide an overview of the PPR Global Eradication Programme (GEP) Secretariat activities, give an overview on the diagnosis of PPR in small ruminants, introduce differential diagnosis between PPR and similar small ruminants diseases (CCPP, Orf, BTV, FMD, Pasturella and Capripox), provide a detailed explanation and hands-on experience on the use of antibody detection, antigen detection, and Nucleic amplification (PCR) tests
Training, capacity building (true)	Regional Training Course on Detection and Characterization of Capripox Viruses: Lumpy Skin Disease Virus, Sheep Pox and Goat Pox Viruses	To strengthen Capripox diseases surveillance and control in Asia
Training, capacity building (true)	Peste des Petits Ruminants; Surveillance and Laboratory Testing Capacity Webinar (FAO Indonesia)	To train field veterinarians and laboratory diagnosticians on the diagnostics and control of peste des petits ruminants (PPR)
Training, capacity building (true)	Training course on the molecular and serological diagnosis of Peste des Petits Ruminants (PPR) FAO (ECTAD Indonesia)	To assist Indonesia in Early Warning and Rapid Detection of PPR Disease
Training, capacity building (true)	Regional Training Course on Next Generation Sequencing (NGS) using Illumina Platform	To provide theoretical and practical training on the principle and applications of the New Generation Sequencing (NGS) technologies, using the Illumina platform
Training, capacity building (true)	Virtual LSDV workshop (FAO Tunisia)	To provide an overview LSD diagnosis, investigation of LSD outbreaks, post-vaccination adverse effects, and the importance of quality control of LSDV vaccines
Training, capacity building (true)	LSDV workshop (FAO Indonesia)	To provide an overview LSD diagnosis, investigation of LSD outbreaks, post-vaccination adverse effects, the importance of quality control of LSDV vaccines and post-vaccination monitoring
Diagnosis, biotechnology and laboratory (true)	Molecular epidemiology and genome sequencing study sequence analysis	240 sequences for ASF, ND, AI, LSD, PPR, were analyzed and made publicly available on the genetic database (GenBank)..
Diagnosis, biotechnology and laboratory (true)	Evaluation of freeze-dried PCR reagents for the	To evaluate the performance of RT-PCR freeze-dried

	detection of AIV / H5 and H9	reagents and compare the results with those obtained using WOAHA described PCR test for AIV.
Diagnosis, biotechnology and laboratory (true)	Design and evaluate multiplex PCR assays for selected zoonotic pathogens, integrating nanopore sequencing for syndromic and species-based animal surveillance.	Key Points Multiplex PCR Assays: Develop and assess multiplex PCR assays targeting multiple zoonotic pathogens. Nanopore Sequencing Integration: Combine these assays with nanopore sequencing to enhance detection and analysis. Surveillance Focus: Utilize the combined technology for both syndromic surveillance (monitoring disease symptoms) and species-based surveillance (tracking specific animal hosts). Currently four assays were developed and are being evaluated for Zoonotic respiratory pathogens, zoonotic viruses of birds, bats, and porcine respiratory disease complex. Targeted viruses belong to distinct virus families (Coronavirus, Flavivirus, Lyssavirus, Orthomyxovirus, Paramyxovirus).
Diagnosis, biotechnology and laboratory (true)	Development of a pan-Lyssaiviruses LIPS serological assay	A species-independent serological assay to detect Lyssavirus Nucleoprotein antibodies. The assay was further evaluated in 2023 using available serum from 3 different phylogroups.
Diagnosis, biotechnology and laboratory (true)	Development of a Phylogroup-Specific LIPS Serological Assay for West Caucasian Bat Lyssavirus	A Species-Independent Serological Assay to Detect Nucleoprotein Antibodies Specific to West Caucasian Bat Lyssavirus
Diagnosis, biotechnology and laboratory (true)	Design and preliminary evaluation of one assay for detection of mPox virus antibodies	A species-independent serological assay to detect mPox virus antibodies.
Diagnosis, biotechnology and laboratory (true)	Whole genome sequence for pathogens characterization	Two workflows have been developed and evaluated for sequencing large DNA viruses from cell culture and clinical samples respectively. This includes sample enrichment, long-size DNA extraction, and sequencing using HIFI sequencing on the PacBio sequencer. Two analysis pipelines have been prepared for HIFI sequencing data analysis: - De Novo Assembly: Utilizing three different assemblers and comparing the outputs to select the best assembly. - Reference-Guided Assembly: Followed by the extraction of specific regions for viral subpopulation analysis.
Diagnosis, biotechnology and laboratory (true)	Identification of pathogens by metagenomics	Two data analysis pipelines were established for the metagenomic identification of pathogens, including zoonotic pathogens, using reads produced by MinION nanopore and PacBio sequencers. Both pipelines utilize a metagenomics classifier followed by visualization with Kronaplots.
Diagnosis, biotechnology and laboratory (true)	Transfer of family-based assays transferred to Senegal, Tunisia, and Zambia	The viral family based assay for Coronavirus, Flavivirus, Lyssavirus, Orthomyxovirus, Paramyxovirus were transferred to Pasteur institute of Cambodia, to the CVRI Zambia, to the LNERV Senegal and IRVT, Tunisia
Diagnosis, biotechnology and laboratory (true)	Sanger Sequencing Service for transboundary animal and zoonotic diseases	A standardized multi-step procedure for sequencing services through an external service provider; consists of instructions for sample preparation, evaluation and shipment, sequence assembly and sequence alignment, and development and interpretation of phylogenetic trees of pathogens. In 2023, 1400 samples were submitted from 13 Member State veterinary laboratories using this service. The

		contribution of the sequencing service has been acknowledged in 11 scientific publications in peer-reviewed journals published by member states.
Vaccines (true)	Irradiated vaccines development	Development of permissive cell lines that has a higher capacity of producing viral vaccines and able to produce adjuvants

TOR3: HARMONISATION OF STANDARDS

2. Proposal or development of any procedure that will facilitate harmonisation of international regulations applicable to the main focus area for which you were designated

Proposal title	Scope/Content	Applicable area
Organization of inter-laboratory comparison for PPRV	34 laboratories in 31 countries in Africa, Asia, and Europe participated to the ring trial for PPR virus and antibody detection	Laboratory expertise

3. In exercising your activities, have you identified any regulatory research needs* relevant for WOA?H?

No

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

Yes

Name of WOA?H CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
WOA?H CC Diagnostic Test Validation Science in the Asia-Pacific Region CSIRO Australian Animal Health Laboratory (AAHL)	Australia	Asia and Pasific	Diagnostic tests validation
Viral Genomics and Bioinformatics University of Glasgow Centre for Virus Research (CVR), Glasgow	United Kingdom	Europe	Bioinformatics and genome analysis

TOR4 AND 5: NETWORKING AND COLLABORATION

5. Did your Collaborating Centre maintain a network with other WOA?H Collaborating Centres, Reference laboratories, or organisations in other disciplines, to coordinate scientific and technical studies?

Yes

Name of WOA?H CC/RL/other organisation(s)	Location	Region of networking Centre	Purpose
WOA?H RL for Avian influenza, FLI Region: Europe	Germany	Europe	Avian influenza detection and typing
WOA?H RL for Brucellosis, Servicio Nacional de Sanidad y Calidad Agroalimentaria	Argentina	Americas	Brucella reference material

(SENASA)			
WOAH CC for Quality Control of Veterinary Vaccines, PANVAC	Ethiopia	Africa	Trainings and workshops, scientific collaboration
WOAH RL for PPR, CIRAD Region: Europe	France	Europe	PPRV Trainings and laboratory activities
WOAH RL for PPR, The Pirbright Institute Region: Europe	United Kingdom	Europe	PPRV research and technology transfer
WOAH RL for Contagious bovine pleuropneumonia, BNVL	Botswana	Africa	Rapid laboratory diagnoses, quality control
WOAH RL for Avian influenza, National Veterinary Services Laboratory, USDA	UNITED STATES OF AMERICA	Americas	avian influenza detection and typing
WOAH RL for Avian influenza and Newcastle disease, IZSve	Italy	Europe	avian influenza and Newcastle disease detection and typing
WOAH RL for Lumpy skin disease Sciensano Groeselenberg 99 1180 Ukkel	Belgium	Europe	Sequencing Platforms Comparison for Direct Sequencing of LSDV from Clinical Samples

TOR6: EXPERT CONSULTANTS

6. Did your Collaborating Centre place expert consultants at the disposal of WOA?H?

Yes

NAME OF EXPERT	KIND OF CONSULTANCY	SUBJECT
Charles E. Lamien	In-person	Third Meeting of the Standing Group of Experts on African Swine Fever (SGE ASF) for Africa, 1 - 3 August 2023, Abidjan, Ivory Coast (Presented talk on "R&D and Capacity Building Activities of the Joint FAO/IAEA Centre on ASF Diagnosis and Surveillance Through the VETLAB Network")

TOR7: SCIENTIFIC AND TECHNICAL TRAINING

7. Did your Collaborating Centre provide advice/services to requests from Members in your main focus area?

Yes

Provide access to genome sequencing technology by facilitating access to- and support for- sequencing service providers as well as by sequencing samples upon request of member states.

Provide technical assistance and troubleshooting for ELISA and molecular techniques to national veterinary diagnostic laboratories.

Coordinate and support activities of a global network of national diagnostic veterinary laboratories.

Facilitate access to reference material, maintenance and calibration of laboratory equipment, and external quality assurance for laboratories operating in limited resourced settings.

8. Did your Collaborating Centre provide scientific and technical training, within the remit of the mandate given by WOA, to personnel from WOA Members?

Yes

a) Technical visit : 1

b) Seminars : 350

c) Hands-on training courses: 200

d) Internships (>1 month) : 3

TYPE OF TECHNICAL TRAINING PROVIDED (A, B, C OR D)	CONTENT	COUNTRY OF ORIGIN OF THE EXPERT(S) PROVIDED WITH TRAINING	NO. PARTICIPANTS FROM THE CORRESPONDING COUNTRY
C	Provided training on Multiparametric Detection of Pathogens Causing Major Transboundary Animal Diseases and Zoonoses	Africa and Asia region	31
C	Provided training on the Detection and Differential diagnosis of PPR and Other Small Ruminants Respiratory Diseases	Africa	20
C	Provided training on on Next Generation Sequencing Bioinformatics and Molecular Phylogeny focusing of major animal pathogens	Africa and Asia region	15
C	Provided training on laboratory methods for peste des petits ruminants (PPR) diagnosis (Jordan)	Jordan, Turkey and Egypt	13
C	Provided training on laboratory methods for peste des petits ruminants (PPR) diagnosis (Georgia)	Armenia, Azerbaijan, Georgia, Kyrgyzstan, Tajikistan, Uzbekistan, and Mongolia	15
C	Provided training on the Detection and Characterization of Capripox Viruses: Lumpy Skin Disease Virus, Sheep Pox and Goat Pox Viruses	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	19
C	Provided training on Next Generation Sequencing (Illumina platform)	Asia	38
C	and serological diagnosis of Peste des Petits Ruminants (PPR) (collaboration with FAO Indonesia)	Indonesia	49
A	Technical visit on molecular assays validation, sample preparation and genome sequencing	Myanmar	2
D	Provided training on Next Generation Sequencing (IonTorrent platform) and Minion, (Nanopore)– focusing on data analysis	Senegal, Tunisia	3
B	Provided training on the diagnostics and control of peste des petits ruminants (PPR) (collaboration with FAO Indonesia. Provided training on LSD diagnosis, investigation of LSD outbreaks, post-vaccination adverse effects, the importance of quality control of	Indonesia	350

LSDV vaccines and post-vaccination monitoring (collaboration with FAO Indonesia)

TOR8: SCIENTIFIC MEETINGS

9. Did your Collaborating Centre organise or participate in the organisation of scientific meetings related to your main focus area on behalf of WOA?H

Yes

NATIONAL/INTERNATIONAL	TITLE OF EVENT	CO-ORGANISER	DATE (MM/YY)	LOCATION	NO. PARTICIPANTS
International	High Pathogenicity Avian Influenza	Second meeting of the GF-TADs Standing Group of Experts on Avian Influenza (SGE-AI)	2023-04-19	Mexico	39

TOR9: DATA AND INFORMATION DISSEMINATION

10. Publication and dissemination of any information within the remit of the mandate given by WOA?H that may be useful to Members of WOA?H

a) Articles published in peer-reviewed journals:

21

- Tully, M., Batten, C., Ashby, M. et al. The evaluation of five serological assays in determining seroconversion to peste des petits ruminants virus in typical and atypical hosts. *Sci Rep* 13, 14787 (2023). <https://doi.org/10.1038/s41598-023-41630-3>
- Ahmed S, El-Fatah Mahmoud MA, Nemr WA, Abdel-Rahman EH, El-Shershaby A, Fouad EA, Liaqat F, Wijewardana V. Detection of immune effects of the Mannheimia haemolytica gamma irradiated vaccine in sheep. *Vet Res Commun.* 2023 Aug 29. doi: 10.1007/s11259-023-10207-w.
- Liaqat F, Kangethe RT, Pichler R, Liu B, Huber J, Wijewardana V, Cattoli G, Porfiri L. 2023. Determination of Vaccine Immunogenicity Using Bovine Monocyte-Derived Dendritic Cells. *J. Vis. Exp.* (195), e64874, doi:10.3791/64874
- Bagheri S, Mitra T, Paudel S, Abdelhamid MK, Könnnyü S, Wijewardana V, Kangethe RT, Cattoli G, Lyrakis M, Hess C, Hess M, Liebhart D. Aerosol vaccination of chicken pullets with irradiated avian pathogenic Escherichia coli induces a local immunostimulatory effect. *Front Immunol.* 2023 May 16;14:1185232. eCollection 2023. doi:10.3389/fimmu.2023.1185232
- Wijewardana V, Ulbert S, Cattoli G. Editorial: Irradiation technologies for vaccine development. *Front Immunol.* 2023 Jan 9;13:1075335. eCollection 2022. doi:10.3389/fimmu.2022.1075335
- Shen Z, Liu B, Zhu Z, Du J, Zhou Z, Pan C, Chen Y, Yin C, Luo Y, Li H, Chen X. Construction of a Triple-Gene Deletion Mutant of Orf Virus and Evaluation of Its Safety, Immunogenicity and Protective Efficacy. *Vaccines* 2023,11,909. doi.org/10.3390/vaccines11050909
- Du J, Liu B, Wang T, Zhu Z, Yin C, Luo Y, Liu Y, Chen X. (2023). A non-toxic recombinant bivalent chimeric protein rETXm3CSAm4/TMD as a potential vaccine candidate against enterotoxemia and braxy. *Vaccine*, 41(6), 1232–1238. doi.org/10.1016/j.vaccine.2022.11.021
- Beyit AD, Meki IK, Barry Y, Haki ML, El Ghassem A, Hamma SM, Abdelwahab N, Doumbia B, Ahmed Benane H, Daf DS, Sidatt ZEA, Ould Mekhalla L, El Mamy B, Gueya MOB, Settyapalli TBK, Ouled Ahmed Ben Ali H, Datta S, Cattoli G, Lamien CE, Dundon WG. Avian influenza H5N1 in a great white pelican (*Pelecanus onocrotalus*), Mauritania 2022. *Vet Res Commun.* 2023 Mar 17. doi:10.1007/s11259-023-10100-6
- Auer A, Panzarin V, Monne I, Crimmaudo M, Angot A, Gourlaouen M, Lamien CE, Cattoli G. Comparative assessment of lyophilized and wet reagents for the molecular detection of H5N1 high pathogenic avian influenza virus and H9N2 low pathogenic avian influenza virus. *J Virol Methods.* 2023 Apr;314:114686. doi:10.1016/j.jviromet.2023.114686
- Franzo G, Zerbo HL, Ouoba BL, Dji-Tombo AD, Kindo MG, Sawadogo R, Chang'a J, Bitanyi S, Kamigwe A, Mayenga C, Lo MM, Ndiaye M, Ba A, Diop GL, Anahory IV, Mapaco LP, Achá SJ, Kouakou VK, Couacy-Hymann E, Gacheru SG, Lichoti JK, Kasivalu JK, Njagi ON, Settyapalli TBK, Cattoli G, Lamien CE, Molini U, Dundon WG. A Phylogeographic Analysis of Porcine Parvovirus 1 in Africa. *Viruses.* 2023 Jan 11;15(1):207. doi:10.3390/v15010207
- Paudel S, Hess C, Kamal Abdelhamid M, Lyrakis M, Wijewardana V, Kangethe RT, Cattoli G, Hess M. Aerosol delivered irradiated Escherichia coli confers serotype-independent protection and prevents colibacillosis in young chickens. *Vaccine.* 2023 Feb 10;41(7):1342-1353. doi:10.1016/j.vaccine.2022.12.002
- Molini U, Yabe J, Meki IK, Ahmed Ben Ali HO, Settyapalli TBK, Datta S, Coetzee LM, Hamunyele E, Khaiseb S, Cattoli G, Lamien CE, Dundon WG. Highly pathogenic avian influenza H5N1 virus outbreak among Cape cormorants (*Phalacrocorax capensis*) in Namibia, 2022. *Emerg Microbes Infect.* 2023 Jan 12:2167610. doi:10.1080/22221751.2023.2167610
- Omoniwa DO, Meki IK, Kudi CA, Sackey AK, Aminu M, Adedeji AJ, Meseko CA, Luka PD, Asala OO, Adole JA, Atai RB, Atuman YJ, Settyapalli TBK, Cattoli G, Lamien CE. Poxvirus Infections in Dairy Farms and Transhumance Cattle Herds in Nigeria. *Viruses.* 2023 Apr 25;15(5):1051. doi:10.3390/v15051051
- Chang'a JS, Bitanyi SS, Kamigwe A, Magidanga B, Guo S, Makoroma P, Francis G, Jumbe J, Jeremiah M, Nyakilinga D, Mwashia M, Msangi K, Cattoli G, Franzo G, Molini U, Dundon WG. Molecular characterization of porcine circovirus-2 and -3 in pigs in Tanzania. *J Vet Med Sci.* 2023 May 3. doi:10.1292/jvms.23-0031
- Omoniwa DO, Meki IK, Kudi CA, Sackey AK, Aminu M, Adedeji AJ, Meseko CA, Luka PD, Asala OO, Adole JA, Atai RB, Atuman YJ, Settyapalli TBK, Cattoli G, Lamien CE. Poxvirus Infections in Dairy Farms and Transhumance Cattle Herds in Nigeria. *Viruses.* 2023 Apr 25;15(5):1051. doi:10.3390/v15051051
- Song H-Y, Chen F, Park HR, Han JM, Ji HJ, Byun E-B, Kwon Y, Kim M-K, Ahn KB, Seo HS. Low-dose radiation therapy suppresses viral pneumonia by enhancing broad[] spectrum anti-inflammatory responses via TGF- β production. *Front. Immunol.* 14:1182927. doi: 10.3389/fimmu.2023.1182927
- Couacy-Hymann E, Berete K, Odoo T, Zerbo LH, Mathurin KY, Kouakou VK, Doumbouya MI, Balde A, Ababio PT, Ouoba LB, Guigma D, Drobo AD, Guitti M, Johnson SAM, Blavo DLM, Cattoli G, Lamien CE, Dundon WG. The Spread of Peste Des Petits Ruminants Virus Lineage IV in West Africa. *Animals (Basel).* 2023 Apr 6;13(7):1268. doi:10.3390/ani13071268
- Auer A, Bortolami A, Berguido FJ, Bonfante F, Terregino C, Natale A, Fincato A, Colitti B, Rosati S, Lamien CE, and Cattoli G. The Luciferase Immunoprecipitation System (LIPS) Targeting the Spike Protein of SARS-CoV[]2 Is More Accurate than Nucleoprotein-Based LIPS and ELISAs for Mink Serology. *Transboundary and Emerging Diseases* Volume 2023, Article ID 1318901, doi.org/10.1155/2023/1318901
- Ankhanbaatar U, Auer A, Ulziibat G, et al. Comparison of the Whole-Genome Sequence of the African Swine Fever Virus from a Mongolian Wild Boar with Genotype II

Viruses from Asia and Europe. Pathogens. 2023;12(9):1143. DOI: 10.3390/pathogens12091143. PMID: 37764951; PMCID: PMC10536492

20. *Berguido, F.J.; Chibssa, T.R.; Loitsch, A.; Liu, Y.; Krstevski, K.; Djadjovski, I.; Tuppurainen, E.; Petrović, T.; Vidanović, D.; Caufour, P.; et al. Harnessing Attenuation-Related Mutations of Viral Genomes: Development of a Serological Assay to Differentiate between Capripoxvirus-Infected and -Vaccinated Animals. Viruses 2023, 15, 2318. <https://doi.org/10.3390/v15122318>*

21. *Du, J., Meki, I., Li, Q., Liu, Y., Zhu, Z., Pan, C., Xia, Y., Fu, L., Yang, L., Zhang, S., Yin, C., Luo, Y., Wang, T., Liu, B., & Chen, X. (2023). A non-toxic recombinant Clostridium septicum α toxin induces protective immunity in mice and rabbits. Toxicon: official journal of the International Society on Toxinology, 233, 107234. <https://doi.org/10.1016/j.toxicon.2023.107234>.*

b) International conferences:

7

1. *Lumpy Skin Disease Symposium, 14-16 March 2023 Rome, FAO-HQ (3 Talks: One on serological methods developed, on diagnostics and molecular epidemiology and on Capacity building)*

2. *IV International Seminar on Animal and Plant Health (SISA 2023) 'Science and Innovation for One Health'*

3. *GARA Africa Chapter Workshop/General Assembly, 30 November 2023 on "Capacity Development and Differential Diagnostic Tools for ASF and Other Swine Diseases" (participated online)*

4. *PPR Global Research and Expertise Network organized by FAO and WOAAH in India. 7-9 December 2023 (participated online)*

5. *Side Event on "ZODIAC – Current Status and Path Forward", 25 September 2023 Occurred during the IAEA General Conference ("Future Perspectives on the Outbreaks of Zoonotic Diseases")*

6. *3rd International Symposium on Brucellosis hosted by China National/WOAH/FAO Reference Laboratory for Animal Brucellosis*

7. *Establishment of a Regional Aquatic Animal Health Laboratory Network (RAAHLN) for Africa :: AU-IBAR FISHGOV-2, 5 - 7 December 2023, Pretoria South Africa on the experience of the Veterinary Diagnostic Laboratory (VETLAB) Network (participated online)*

8. *6th PPR Global Research and Expertise Network (PPR-GREN) annual meeting in Bengaluru, India, from November 28 to 30, 2023.*

9. *6th Meeting of the PPR Advisory Committee held on December 1-2, 2023, in Bengaluru, India.*

10. *Annual workshop of the WOAAH reference laboratory network for PPR on December 13, 2023.*

c) National conferences:

d) Other (Provide website address or link to appropriate information):

11. What have you done in the past year to advance your area of focus, e.g. updated technology?

Progress in advanced and long reads genome sequencing technology and related bioinformatic applications.

Progress in irradiation technology for pathogens inactivation and vaccines development.

12. Additional comments regarding your report: