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World Organisation for Animal Health
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Funded by the European Union

1st GF-TADs Regional Conference in the European region

Activities of the Animal Production and Health Sub-Programme (APH) of the Joint FAO/IAEA Centre, Vienna, Austria on ASF, HPAI, rabies, FMD and PPR

IAEA
Joint FAO/IAEA Centre
Nuclear Techniques in Food and Agriculture

Ivancho NALETOSKI, Technical Officer (Animal Health)
i.naletoski@iaea.org
22-25 August 2025, Belgrade, Serbia

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GLOBAL FRAMEWORK FOR THE PROGRESSIVE CONTROL OF TRANSBOUNDARY ANIMAL DISEASES

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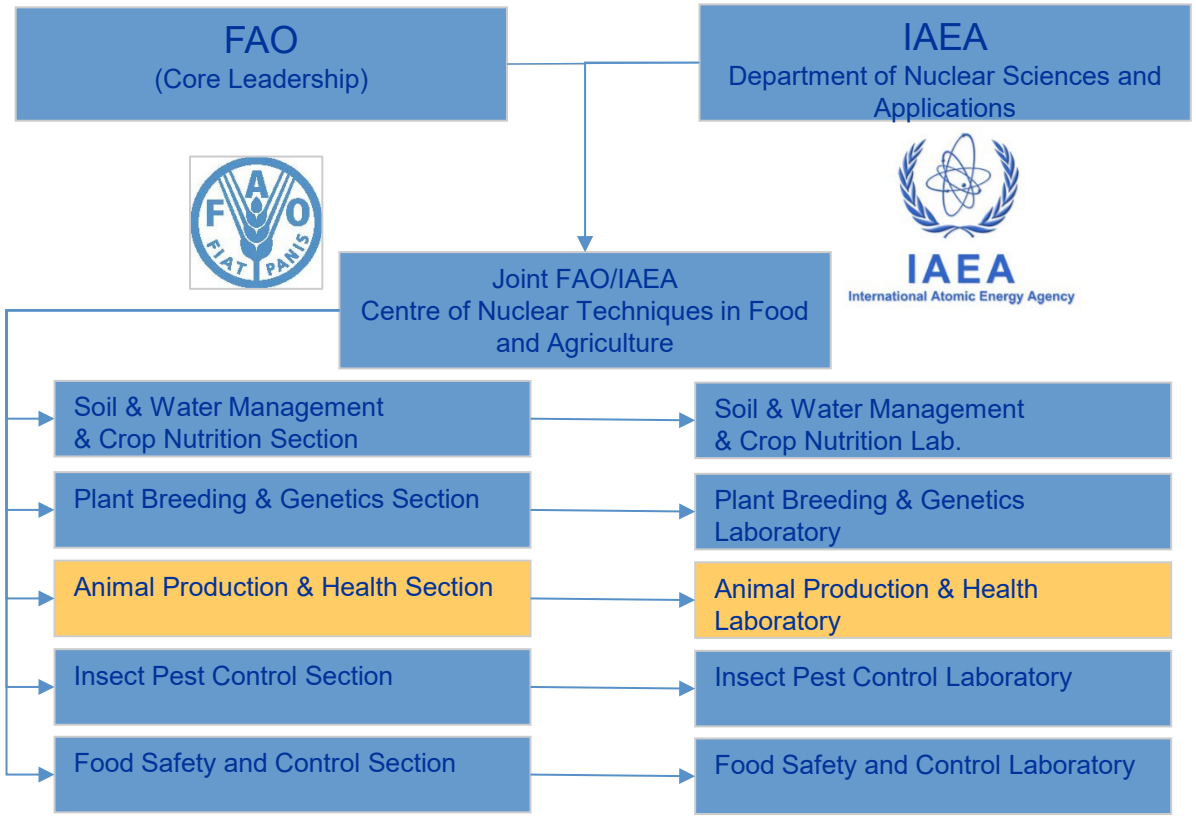
Animal Production and Health Sub-Programme of the Joint FAO/IAEA Centre Who are we?

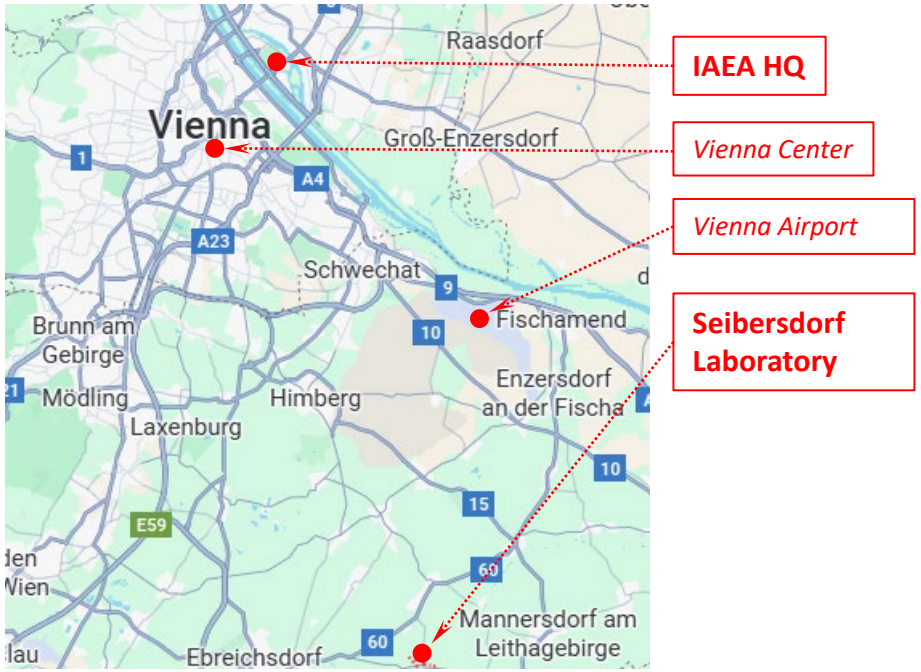
-Established 1964

-IAEA Web – Link

-FAO Web – Link

-Detailed sub-programme activities in the annex of this presentation!





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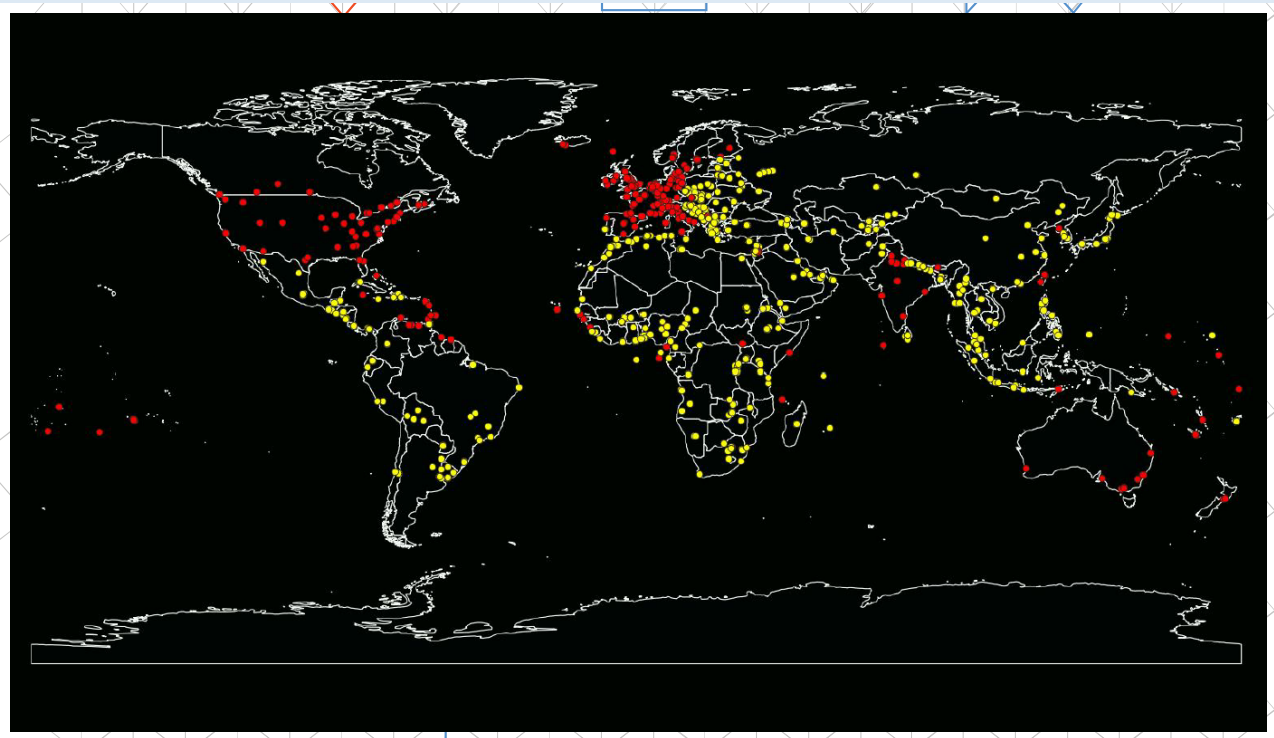
Animal Production and Health Sub-Programme of the Joint FAO/IAEA Centre Who are we?

1. Coordinated Research Projects (*Link*) - (8 in 5 years cycle)
2. Technical Cooperation Projects (*Link*) - (>70 in 2-4 years cycle; Demand driven)
   - -Fellowship trainings
   - -Scientific visits
   - -Expert missions
   - -Training courses (national and regional)
   - -Equipment delivery
3. Laboratory Networks (*Link*)
   - -VETLAB Network (*Link*)
   - -ZODIAC Network (*Link*)
4. Collaboration Centers (*Link*)
5. Flagship initiatives (*Link*)
   - -ZODIAC (*Link*)
   - -Atoms4Food (*Link*)



VETLAB Network Directors Meeting, August 2024

Joint FAO/IAEA Centre
Nuclear Techniques in Food and Agriculture

Counterparts' community:
- -2450+ institutions
- -8900+ contact persons

~40% Designated Vet. Labs
~15% Competent Vet. Authorities
~15% Veterinary Education
~30% All others with involvement in APH…

~73% Developing countries
~27% Developed countries

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Generic modules for support of the projects & counterparts laboratories

-iVetNet (*Link*)

-Cloud based Information platform with authentication to support implementation and maintenance of ISO 17025

-Roster for validated SOPs (detection, characterization, bio-risk management, records on QA/QC in vet.labs.

-Sanger Sequencing service

-The whole workflow covered (sample preparation to final interpretation)

-Promer collection and consumable package delivered to vet.labs through ongoing projects

-Completely free of charge for the counterparts' laboratories

- ~12000 sample submissions since the establishment; 60+ publications in peer reviewed journals

-Whole Genome Sequencing service (under development)

-Cloud based, with authentication, in collaboration with IZSAM Teramo - Genpat-VETLAB Platform (**Link**)

-Extraction in local laboratories (DNA pathogens), SISPA or whole genome amplification (FMD, AIV) for RNA pathogens

-WGS at IZSAM Teramo

-Generic verification of serological and molecular assays during introduction (startup) in local laboratories

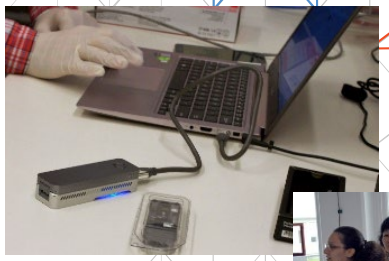
-Pre-defined step by step procedures, verified by experts from reference labs and supported with written procedures and statistical calculators

-Production of secondary standards reference materials (under development)

-Bio-risk management module

-Skeleton developed by technical experts from developed laboratories

-Written procedures under development



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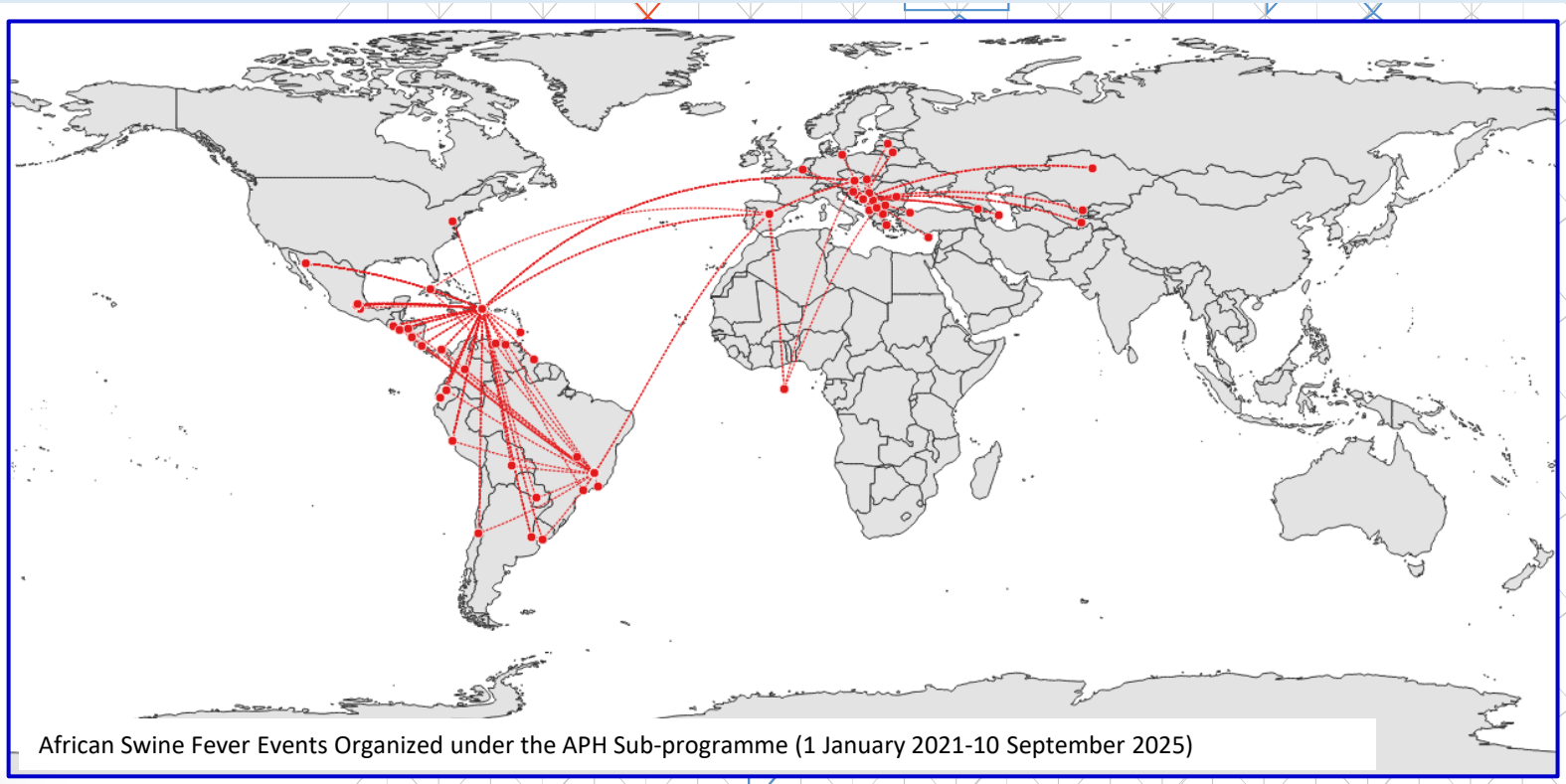
African Swine Fever Events Organized under the APH Sub-programme (1 January 2021-10 September 2025)

Type of the event	Number of Participants
Consultants Meeting (1)	1
Expert Mission (1)	3
Fellowship (1)	1
National Training Course (1)	123
Regional Training Course (1)	27
Scientific visit (2)	2
Technical Meeting (2)	38
Grand Total (9)	**195**



African Swine Fever Events Organized under the APH Sub-programme (1 January 2021-10 September 2025)

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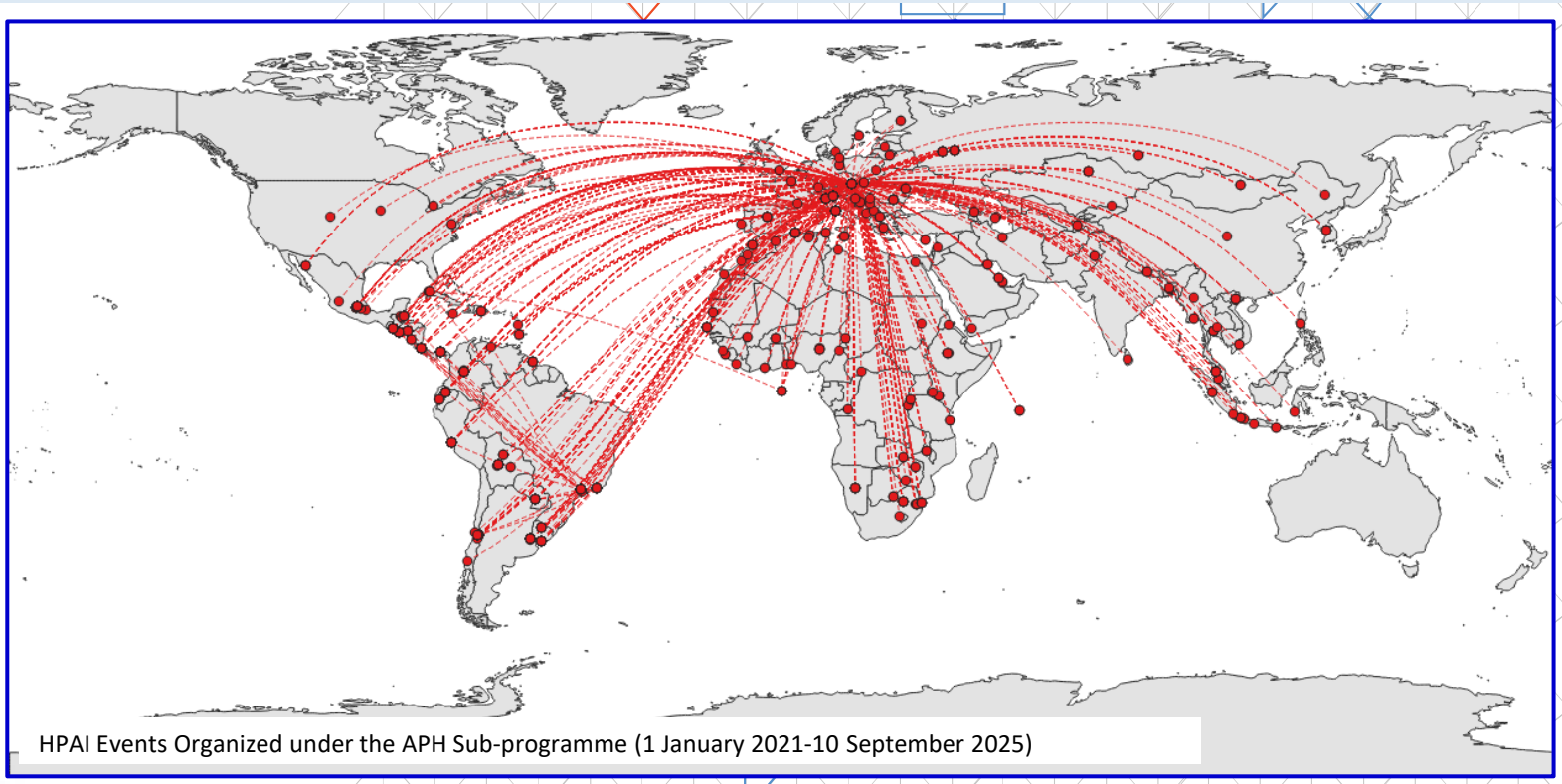
HPAI Events Organized under the APH Sub-programme (1 January 2021-10 September 2025)

Type of the event	Number of Participants
Conference (1)	21
Expert Mission (3)	3
Fellowship (3)	4
Meeting (1)	224
National Training Course (1)	1
Regional Training Course (2)	256
Research Coordination Meeting (2)	25
Scientific visit (1)	1
Sponsored Participation (1)	8
Technical Meeting (3)	227
Grand Total (18)	**770**



HPAI Events Organized under the APH Sub-programme (1 January 2021-10 September 2025)

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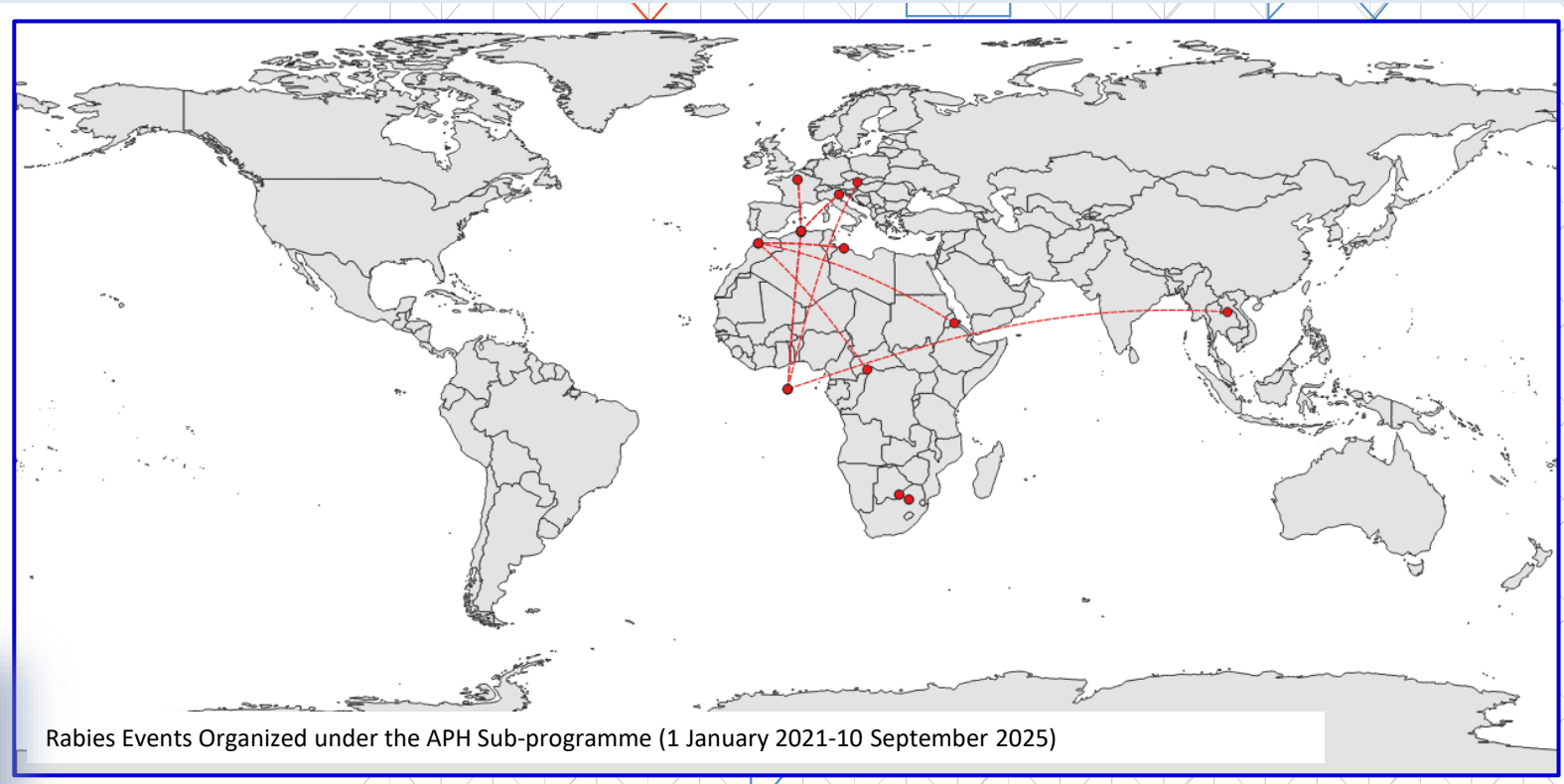
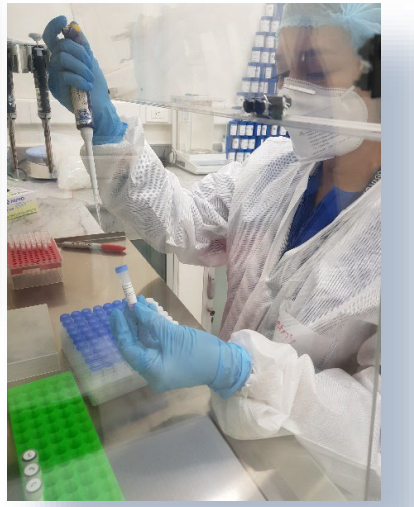
Rabies Events Organized under the APH Sub-programme (1 January 2021-10 September 2025)

Type of the event	Number of Participants
Expert Mission (1)	1
Fellowship (6)	11
National Training Course (2)	2
Grand Total (9)	**14**



Rabies Events Organized under the APH Sub-programme (1 January 2021-10 September 2025)



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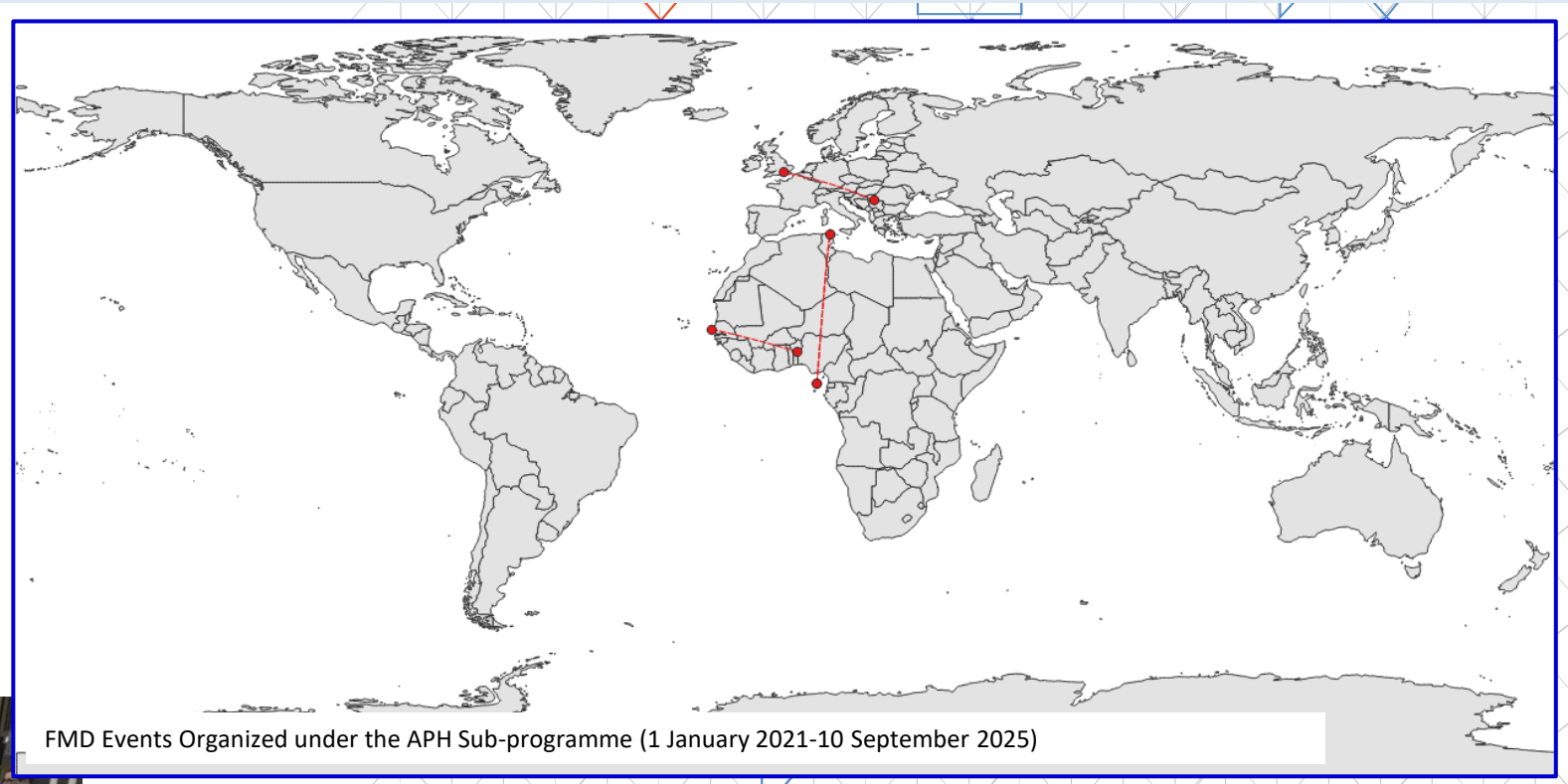
FMD Events Organized under the APH Sub-programme (1 January 2021-10 September 2025)

Type of the event	Number of Participants
Fellowship (2)	3
Side Event (1)	1
Grand Total (3)	4



FMD Events Organized under the APH Sub-programme (1 January 2021-10 September 2025)

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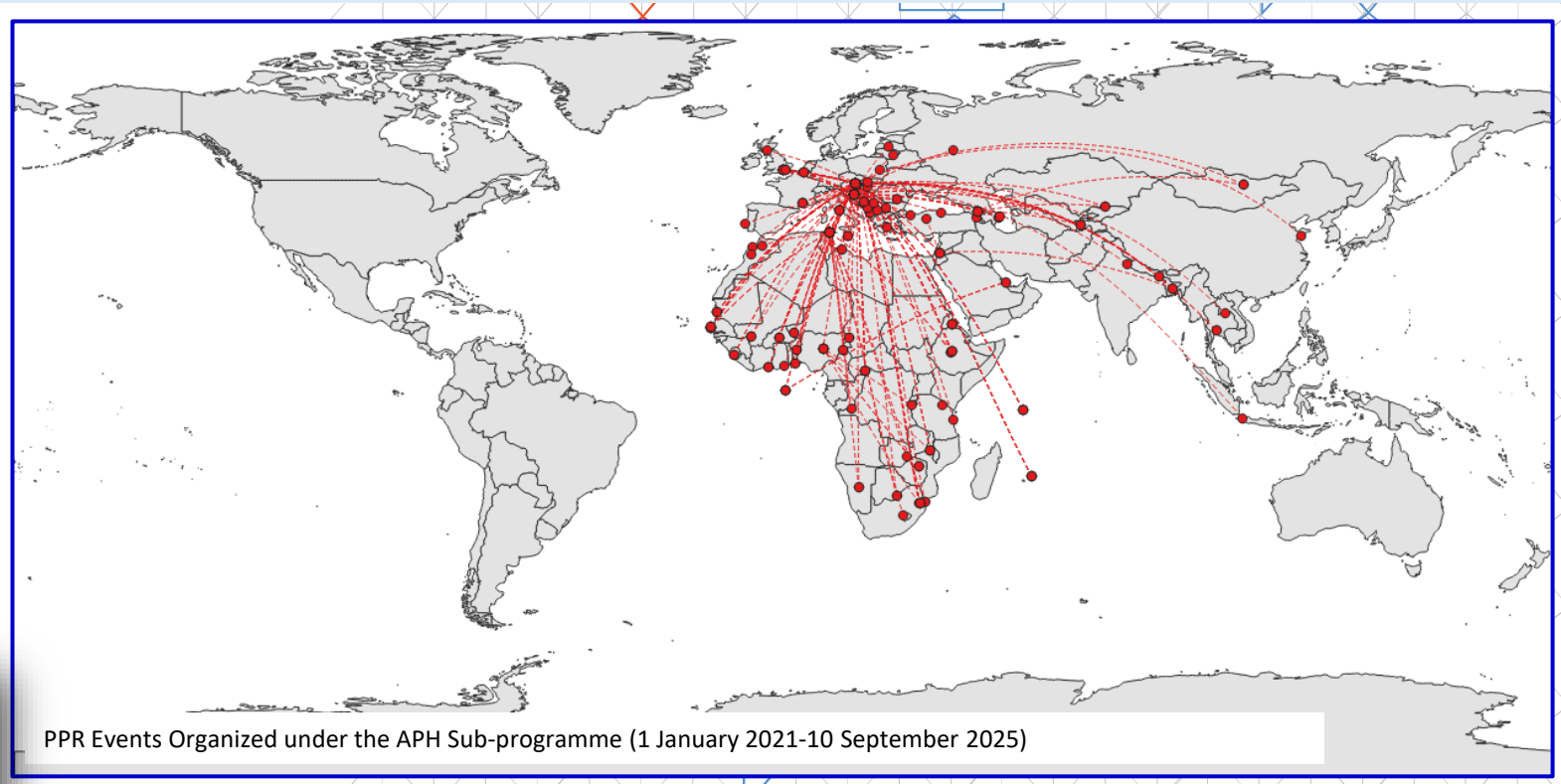
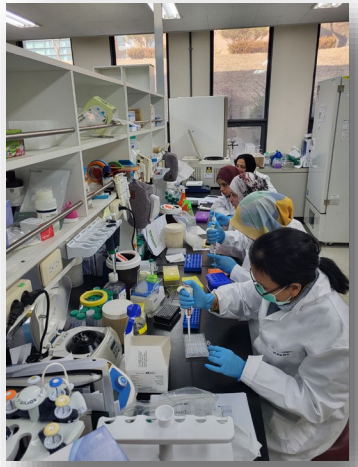
PPR Events Organized under the APH Sub-programme (1 January 2021-10 September 2025)

Type of the event	Number of Participants
Consultants Meeting (3)	10
Expert Mission (3)	3
Open Event (1)	6
Regional Training Course (3)	82
Technical Meeting (2)	61
Grand Total (12)	**162**



PPR Events Organized under the APH Sub-programme (1 January 2021-10 September 2025)



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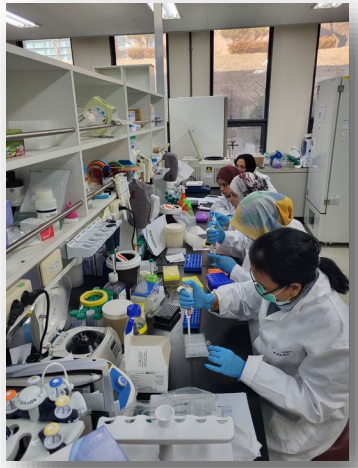
LSD / SGP Events Organized under the APH Sub-programme (1 January 2021-10 September 2025)

Type of the event	Number of participants
Fellowship	1
Technical Meeting	37
National Training Course	2
Scientific visit	1
Total events (4)	**41**



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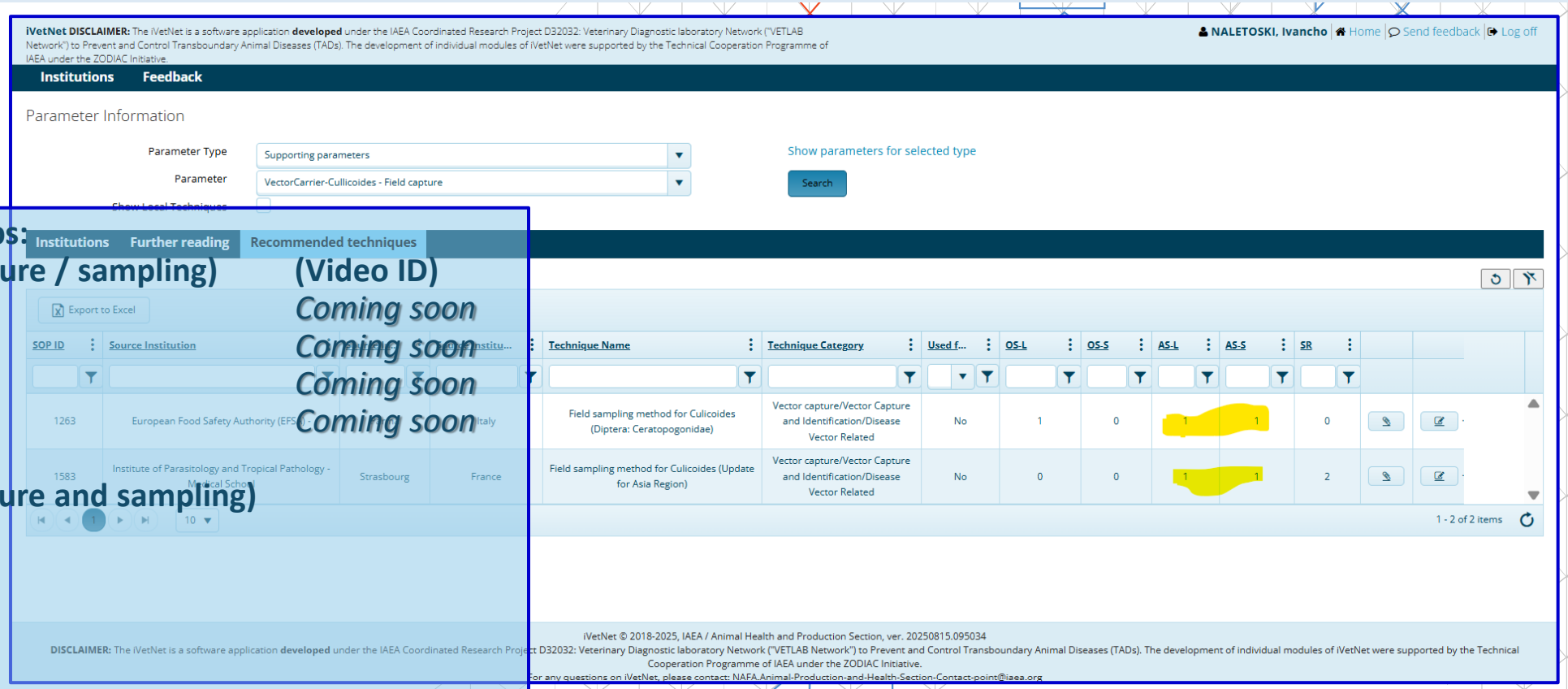
Vector / Wildlife Capture, Identification and Sampling!



Four main arthropod vector groups:

Vector group	(Video capture / sampling)	(Video ID)
-Mosquitoes	Link	Coming soon
-Culicoides	Link	Coming soon
-Sand Flies	Link	Coming soon
-Ticks	Link	Coming soon

Four main groups of wildlife (capture and sampling)

- -Carnivores Link
- -Small rodents Link
- -Bats Link
- -Wild ruminants Link

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Vector / Wildlife Capture, Identification and Sampling!

SPACE FOR HEADER 01 (First page only)
-To be defined-

Version:	x
Date of issue:	22.06.2023.
Page of pages	x/y
Copy number	X

Standard Operating Procedure for Trapping Wild Rodents and Other Small Mammals

SOP ID NUMBER

This SOP was produced by Dr Aleksandra Penezić, Department of Genetic Research, Institute for Biological Research "Siniša Stanković"; National Institute of Republic of Serbia; University of Belgrade; Belgrade, Serbia under the Technical Cooperation Project RER/5/027: Enhancing Preparedness Capacities of the Veterinary Sector to Confront with Emerging and Re-emerging Diseases of Livestock and Wildlife.

Prepared by: Aleksandra Penezić	Position: Assistant Professor	Date: June 2023.	Signature:
Reviewed by:	Position:	Date:	Signature:
Authorized by:	Position:	Date:	Signature:
Controlled by:	Position:	Date:	Signature:

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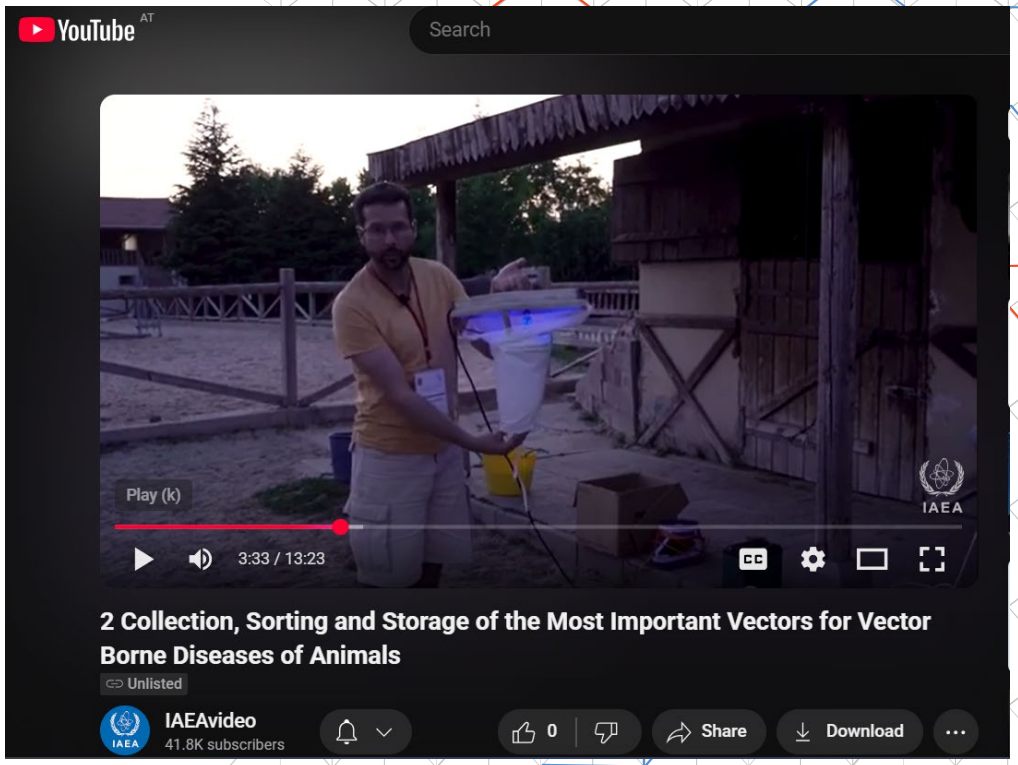
Content
1. Scope or field of application
2. Definition
3. Principle
4. Safety
5. Media, solutions, reagents and other products
6. Equipment required
7. Procedure



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Sanger Sequencing Service

-8 years active

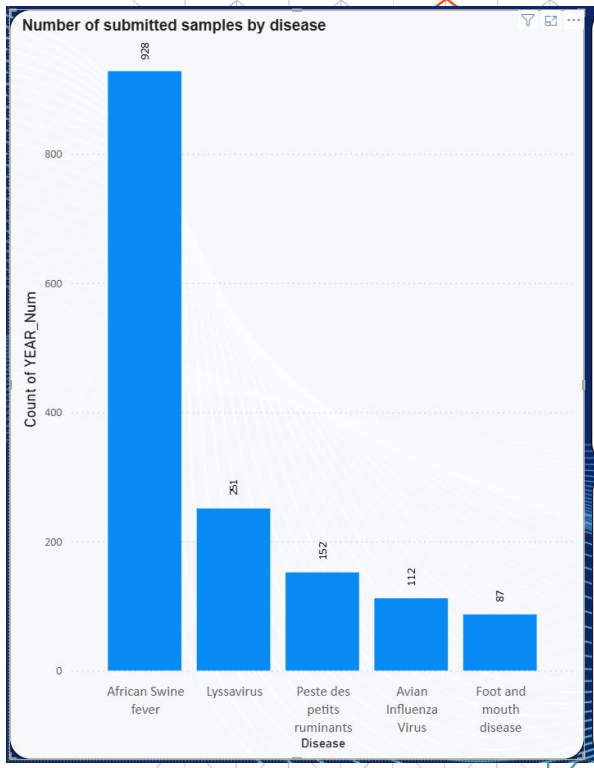
-92 registrations

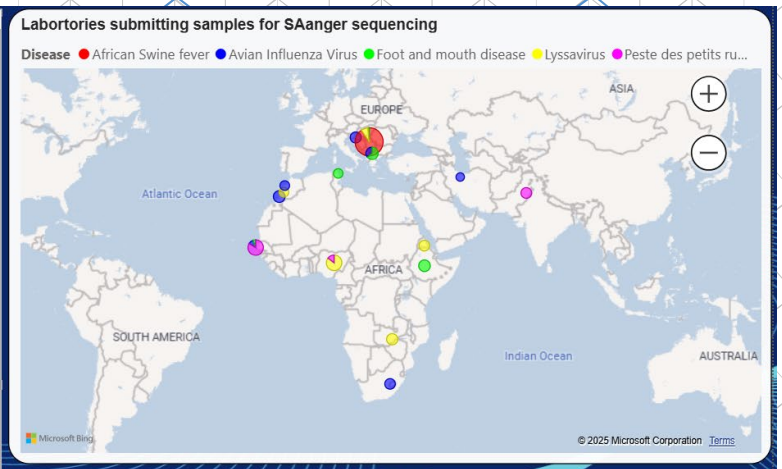
-30 countries [Africa-20; Asia-3; Europe-5; Latin America-2)]

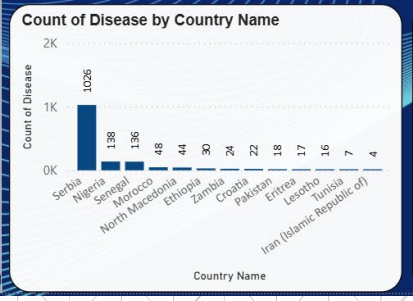
-89 Diseases (Top 5: 1.Capripox; 2.ASF; 3.FPV; 4. Lyssavirus; 5.Theileria parva)

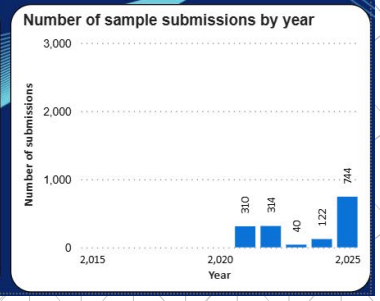
-72 Publications (62-Peer reviewed journals; 3-Presentations; 2-Proceedings; 5 IAEA Success Web Story)

Country	African Swine fever	Avian Influenza Virus	Foot and mouth disease	Lyssavirus	Peste des petits ruminants	Total
Croatia		22				22
Eritrea				17		17
Ethiopia			30			30
Iran (Islamic Republic of)		4				4
Lesotho		16				16
Morocco		40		8		48
Nigeria				118	20	138
North Macedonia		16	28			44
Pakistan					18	18
Senegal		14	8		114	136
Serbia	928		14	84		1 026
Tunisia			7			7
Zambia				24		24
Grand Total	**928**	**112**	**87**	**251**	**152**	**1 530**









Disease	2021	2022	2023	2024	2025	Total
African Swine fever	72	239			617	928
Avian Influenza Virus	42	40	22	8		112
Foot and mouth disease	50	11			26	87
Lyssavirus	70	24		56	101	251
Peste des petits ruminants	76		18	58		152
Grand Total	**310**	**314**	**40**	**122**	**744**	**1 530**

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Whole Genome Sequencing Service (through a CRP D32036)

1. Sample preparation in local laboratories
- -DNA Pathogens - extraction of DNAs
- -RNA pathogens
  - *-Specific whole genome amplification (AIV, FMD)*
  - *-SISPA (all other RNA pathogens)*
- -Procedure for WGS of field samples
- -Metagenomics

2. WGS at service provider
- -IZSAM Teramo

3. Automatic, cloud-based, bio-informatic data processing
- -Shortt Read Archives
- -Consensus WGS sequence
- -Extraction of genetic markers for specific pathogens (Specific experts for specific pathogens)
- -Access with authentication (privacy of obtained data)

4. Validation of the workflows by specific experts
- -Johns Hopkins University Applied Physics Laboratory; USA
- -School of Public Health, Hong Kong, China
- -CSIRO, Australia
- -Pirbright Institute, UK
- -Sciensano, Belgium
- -Galaxy Europe Freiburg Team, Germany
- -FLI-Jena, Germany

5. Dissemination in counterparts labs
- -Preparation of standardized SOPs for each step
- -Standardized training programme
- -Equipment and reagent supply

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Research and Development / Support to Member States Labs by the APH Laboratory Seibersdorf

APHL is a WOAH Collaborating Centre for ELISA and Molecular Techniques in Animal Disease Diagnosis

- -Research and Innovation (nuclear, nuclear-related, and molecular techniques)
- -Capacity building and technology transfer
- -Networking, data sharing, and services

R&D on ASF (*Details in Annex 3*)

- -Fourplex real-time PCR (ASFV, CSFV, Erysipelas, and Salmonella)
- -Fourplex HRM (ASFV, PCV-2, PPV, and Suid Herpesvirus-1)
- -Support Molecular Characterization of ASFV
- -Co-circulation of ASFV Genotypes with Apparently Variable Pathogenicity (*Details in Annex 2*)
- -Alternative (non-invasive) techniques for sample collection

Support to Member States Laboratories for AIV and Rabies (*Details in Annex 4*)

- -AIV (Botswana, Burkina Faso, Cameroon, Ethiopia, Ivory Coast, Kenya, Kuwait, Mauritania, Mozambique, Namibia, Nepal)
- -Rabies Bangladesh, Cameroon, Ghana, Kenya, Lesotho, Nepal
- -400 to 600 samples for diagnostic confirmation and molecular characterization
- -Support to the molecular characterization of PPRV and other respiratory diseases of small ruminants (*Details in Annex 5*)

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Additional Details of the APH Activities

Annex 1: General Presentation on the Animal Production and Health Section

Annex 2: CJN's Support in Accurate ASF Diagnosis and Comprehensive ASFV Characterization

Annex 3: Capacity Development and Differential Diagnostic Tools for ASF and Other Swine Diseases

Annex 4: Whole Genome Sequencing of Influenza and Rabies viruses

Annex 5: Building capacity on PPR and small ruminant respiratory diseases in Africa – the VETLAB Network

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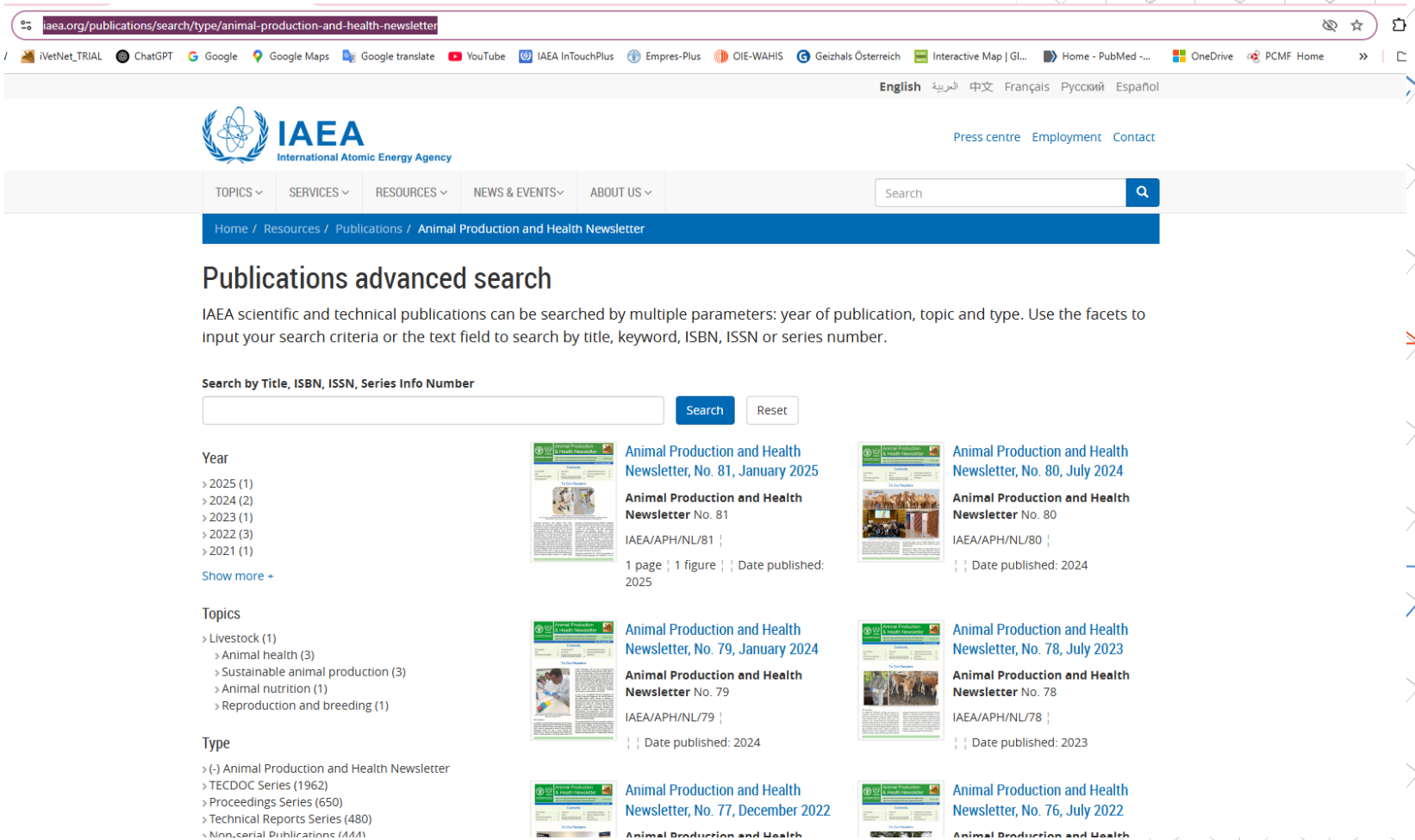
More Information: APH Newsletter

https://www.iaea.org/publications/search/type/animal-production-and-health-newsletter



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APH Team
Group Photo, May 2024

Visit of the WOAH Regional Representative for Europe Budimir Plavšić to APH, March 2025

THANK YOU

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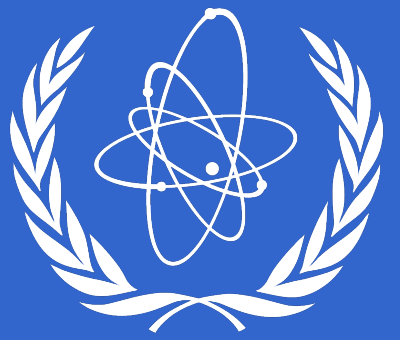
Annex 1: General Presentation on the Animal Production and Health Section

Joint FAO/IAEA Centre

Nuclear Techniques in Food and Agriculture

Joint FAO/IAEA Programme in Food and Agriculture

Animal Production and Health Section



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Nuclear Techniques in Food and Agriculture

Animal Production and Health Section

- Assist MS to improve livestock productivity through:
  1. Efficient use of locally available feed resources (Nutrition)
  2. Breed characterisation and improvement (Genetics and breeding)
  3. Appropriate breeding technologies/programmes (Reproduction)
  4. Development of proactive disease detection, surveillance and control measures (Health)

by promoting nuclear, nuclear derived and related technologies.

Modalities of Implementation

1. **Coordinated Research Projects**
2. **Technical Cooperation Projects**
   - Fellowship trainings
   - Scientific visits
   - Expert missions
   - Training courses (national and regional)
   - Equipment
3. **Laboratory Networks**
4. **Collaboration Centers**
5. **Flagship initiatives**

More than 70 Technical Cooperation projects

8 Active Coordinated Research Projects

ANIMAL PRODUCTION AND HEALTH LABORATORY (APHL)

- Equipped with an array of nuclear and derived technology platforms.
- Experts in the application of technologies in Animal Production & Health.
- Critical mass of skills to disseminate these technologies and build capacity in Member States.

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R & D in Animal Production

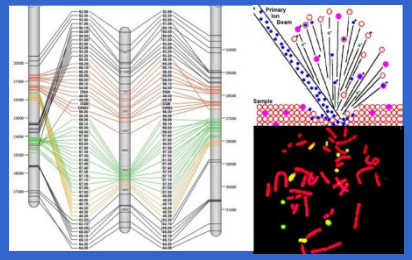


- ✓ Support MSs to protect and improve livestock biodiversity through implementation of National Action Plans on Animal Genetic Resources
- ✓ Development and transfer of nuclear and related molecular and genomic tools to improve animal productivity and adaptability
  - ✓ Electronic animal identification & Phenotype/performance recording
  - ✓ Selection of animals using conventional and genomic approaches
  - ✓ Establishing/strengthening animal genomic laboratories
  - ✓ Technical support to national livestock breeding and improvement programs
- ✓ Multiplication of superior genetics through assisted reproductive biotechnologies
  - ✓ National artificial insemination programs
  - ✓ Establishing/strengthening industrial frozen semen production units
- ✓ Nuclear and related technologies to promote sustainable animal nutrition and feeding strategies
  - ✓ Use of local feed resources
  - ✓ Minimise GHG

Gene based tools to increase livestock productivity

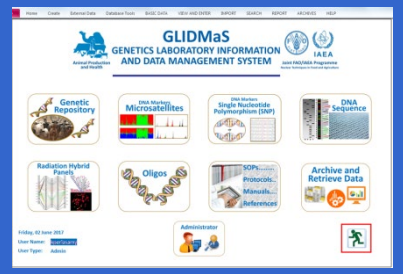
CRPs, National and Regional TC Projects

Radiation Hybrid Mapping & NGS of Livestock Genomes



Development of DNA Marker based Genetic/Genomic tools

Development of Data Capture & Management tools



Technology Transfer to Member States

Implementing Global Plan of Action on AnGR to preserve Livestock Biodiversity

Dairy cattle improvement programmes through DNA marker based technologies

Marker assisted introgression in livestock

Breeding livestock for improved genetic disease resistance

Genetic resistance to infectious diseases

- Large scale genotyping of sheep and goat under field trial for parasite resistance
- Genome wide association study (GWAS) for parasite resistance in sheep



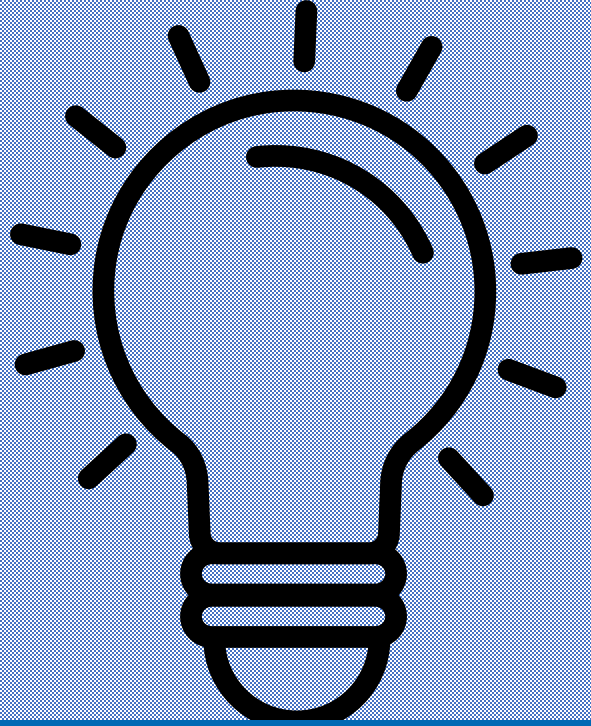
Empowering Rural Women in Sri Lanka's Dairy Industry

IAEA Helps Small-holder Farmers to Improve Twin Births and Mutton Production in Local Sheep Flocks of South India

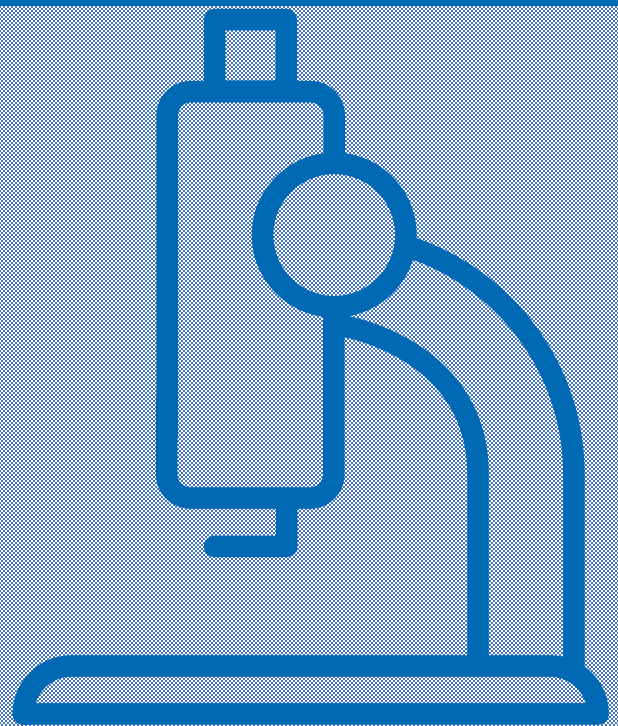
ANIMAL HEALTH

To reduce risks and burden from transboundary animal diseases (TADs) and those of zoonotic and veterinary public health importance

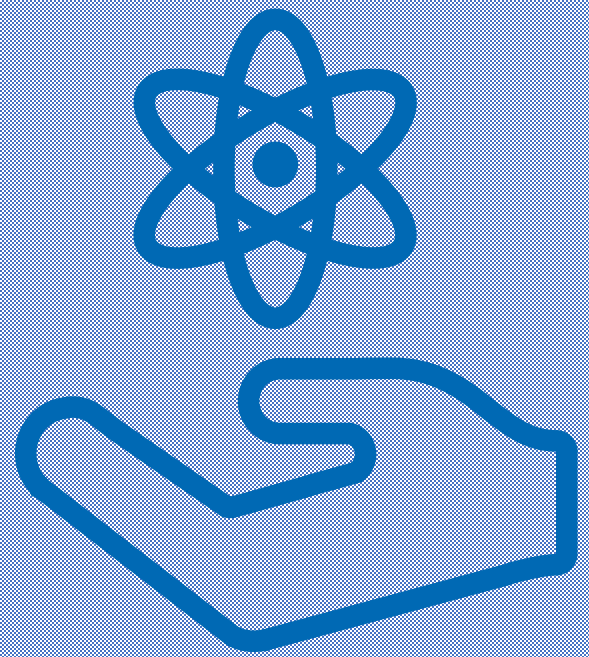
Pathogen detection and characterization



Antimicrobial resistance



Irradiated vaccines



PATHOGEN DETECTION AND CHARACTERIZATION

MOLECULAR & SEROLOGICAL

Serological platforms:

- Radioimmunoassay
- Enzyme-linked immuno-sorbent assay (ELISA)
- Gamma-irradiated virus as antigen and sera as controls

Molecular based platforms

- PCR
- Sequencing

IRRADIATED VACCINES

- For many economically devastating livestock diseases either vaccines are not available or sub-optimal (e.g. ASF).
- Irradiated vaccines are created using ionizing radiation to inactivate pathogens.
- Irradiated vaccines have several advantages over traditional ones

Workshop “Advancing Irradiated Vaccines in Africa: Innovations, Policies and the Future” Nairobi, 26 September 2025

Purpose: to explore manufacturing and the use of irradiated vaccines in Africa.

Areas of discussion: Prioritized diseases for vaccines production, key policies and regulatory aspects governing their use, rollout strategies and technical considerations related to the development, production, quality assurance and the certification of irradiated vaccines.

Participants: AU-IBAR, AU-PANVAC, FAO, ILRI, GIZ, BVI, OVI, KEVEVAPI, UNIDO and the African Development Bank

Atoms4Food:
An initiative to help countries boost food security and to tackle growing hunger by providing provide countries with ground-breaking solutions tailored to their specific needs and circumstances by harnessing the advantages of nuclear techniques along with other advanced technologies to enhance agricultural and livestock productivity, natural resources management, reduce food losses, ensure food safety, improve nutrition and adapt to the challenges of climate change.

VETLAB:
A global network of national veterinary laboratories coordinated by the Joint FAO/IAEA Centre to support MS in the use of nuclear, nuclear-derived and other methods for monitoring, early detection, diagnosis and control of transboundary animal and zoonotic diseases.

ZODIAC:
Initiative established in June 2020 to help countries prevent pandemics caused by bacteria, parasites, fungi or viruses that originate in animals and can be transmitted to humans. Using a systematic and integrated approach, ZODIAC will strengthen the preparedness and capabilities of Member States to rapidly detect and timely respond to outbreaks of such diseases.

PARTNERSHIP WITH ILRI

CURRENT ACTIVITIES

- Advisor for the IAEA coordinated research project CRP D31030 “Improving Efficiency of Animal Breeding Programs Using Nuclear Related Genomic Information – Practical Applications in Developing Countries”
- Supporting APHL in Vaccine R&D
- International Centre for Agricultural Research in Dry Areas (ICARDA) support to improve country capacities on effective implementation of community breeding programs for sheep and goat improvement in Africa
- Atoms4Food: scientist from ICARDA joined the task force

PARTNERSHIP WITH ILRI

PROPOSED ACTIVITIES

- FAO and IAEA projects
- Scaling for Impact
- R&D program on vaccine development

Joint FAO/IAEA Programme
Nuclear Techniques in Food and Agriculture

Annex 2: CJN's Support in Accurate ASF Diagnosis and Comprehensive ASFV Characterization

Joint FAO/IAEA Programme
Nuclear Techniques in Food and Agriculture

CJN's Support in Accurate ASF Diagnosis and Comprehensive ASFV Characterization

Charles Euloge Lamien
Joint FAO-IAEA Centre
International Atomic Energy Agency, Vienna, Austria

The Animal Production and Health Laboratory (APHL)

APHL is a WOAH Collaborating Centre for ELISA and Molecular Techniques in Animal Disease Diagnosis.

- We maintain good collaboration with several WOAH collaborating centers and Reference laboratories
- Trainers for all VETLAB training courses on disease diagnosis are mostly from WOAH collaborating centers and WOAH reference laboratories
- We support laboratories in implementing validated protocols to facilitate disease reporting and information sharing

APHL's Activities in Animal Disease Control

Research and Innovation (nuclear, nuclear-related, and molecular techniques)

- Molecular and serological assays;
- Sequencing and next-generation sequencing
- Molecular epidemiological studies

Capacity building and technology transfer

- VETLAB Network
- TCPs
- CRPs
- On-site training
- Fellowship training
- Group training

Networking, data sharing, and services

- The VETLAB Network
- Service (ring trials, shipment, calibration)

Building Capacity for ASF Control through the VETLAB Network

Enhancing Awareness at VETLAB Annual Meetings

- June 2015: During the Second coordination meeting for Africa, the directors were informed about the ongoing activities of APH on ASF and offered support for laboratory preparedness.
- August 2016: A session was dedicated to Supporting bioinformatics capacity and molecular epidemiology in MS laboratories, which included the molecular characterization of ASF.
- August 2017: A session focused on Laboratory preparedness for handling outbreaks and emergency situations.
- August 2018: A session was dedicated to Trends in pathogen detection and characterization, including ASF.

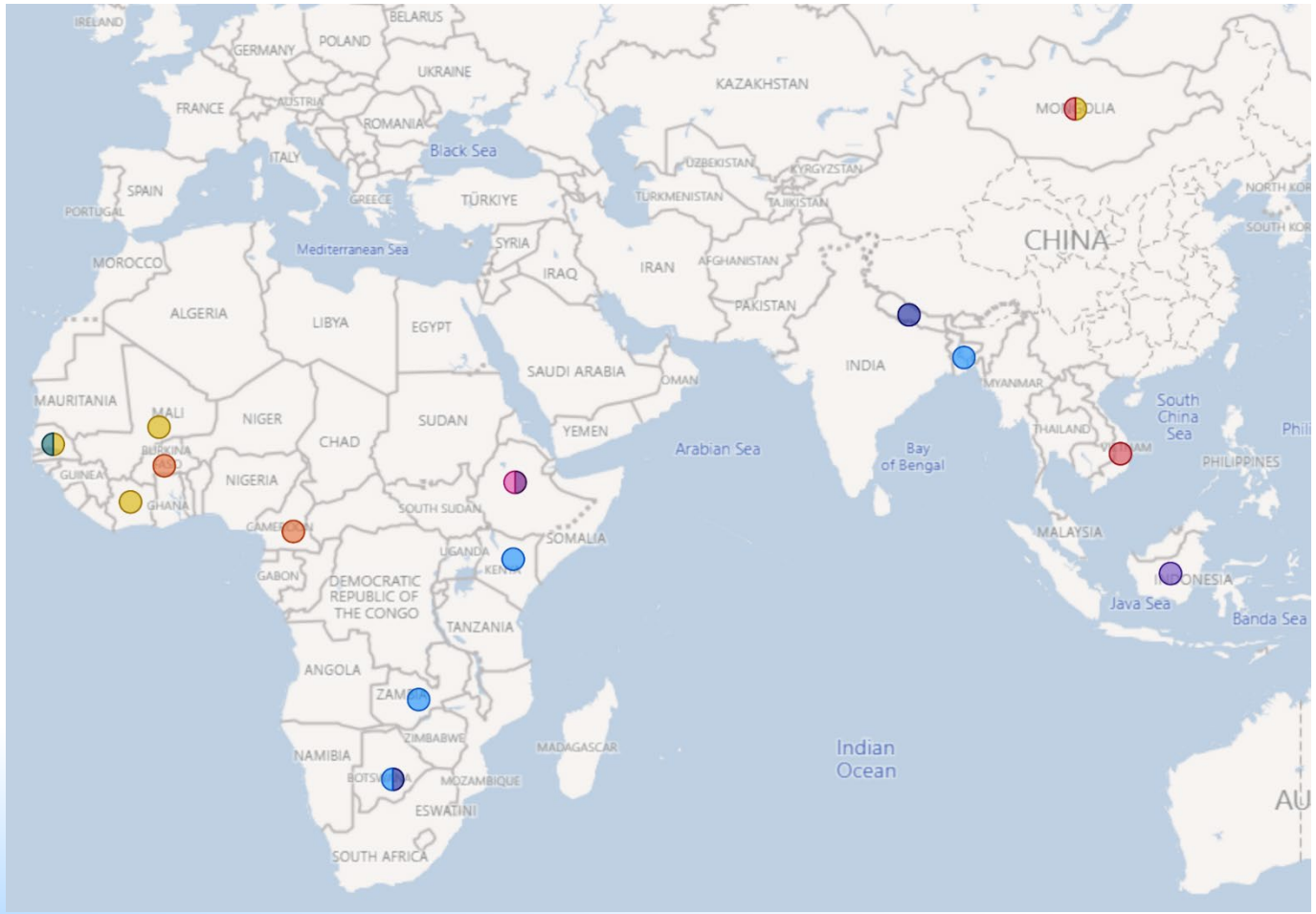
Third joint coordination meeting for Africa and Asia (August 2018)

Eighth joint coordination meeting for Africa and Asia (August 2024)

Enhancing Awareness at VETLAB Annual Meetings

- August 2019: A session focused on transboundary animal diseases, including ASF, LSD (Capripox), and equine diseases.
- November 2021: A session highlighted APHL R&D initiatives for animal and zoonotic disease surveillance and control, with coverage on ASF.
- August 2022: A session emphasized APHL R&D efforts to support animal and zoonotic disease surveillance and control, including ASF.
- August 2023: A session addressed key challenges faced by VETLAB partners and their innovative role in transboundary animal disease surveillance, monitoring, and control, featuring ASF.
- August 2024: A session explored emerging health threats and VETLAB partners' preparedness and responses to transboundary animal diseases, including ASF.

Capacity Building and Technology Transfer



ASF-related Field Support Missions

- 6 in Asia between 2015 and 2020
- 13 in Africa between 2013 and 2019
- Direct detection and differential diagnosis tools and or sequence analysis methods were transferred

- .., Eswatini, Mozamique, Ivory coast,...(2024-2025)
-

Ethiopia 2013

Senegal 2019

Capacity Building and Technology Transfer

14 courses between 2012 and 2024

Title	Year	Venue	Audience
Major Transboundary and Zoonotic Animal Diseases: Early Detection, Surveillance and Epidemiology	2012	Cameroon	Africa
Practical Approaches for Introducing New Assays for Routine Use in Veterinary Diagnostics Laboratories	2014	Austria	Africa
Transboundary Animal Diseases Diagnosis: Sequencing and Bioinformatics Analysis of Animal Pathogen Genomes (VETLAB)	2015	Austria	Africa and Asia
Transboundary Animal Diseases Diagnosis: Sequencing and bioinformatics analysis of animal pathogen genomes (VETLAB)	2018	Austria	Africa and Asia
Detection of Multiple Pathogens for the Differential Diagnosis and Syndromic Surveillance of Transboundary Animal Diseases: focus on PPR, Capripox, and ASF (VETLAB)	2019	Austria	Africa and Asia
Transboundary Animal Disease Diagnoses: Validation, Implementation, Monitoring and Quality Control for Molecular Assays	2019	Austria	Africa and Asia
Virtual Training Course on Sequencing and Bioinformatics	2021	Online	Africa and Asia
Early Diagnosis and Pathogen Characterization with a focus on Next-generation sequencing technology	2022	Austria	Africa and Asia

Austria 2018

Austria 2019

Cameroon, 2012

Austria 2014

Austria 2018

Austria 2022

Capacity Building and Technology Transfer

14 courses between 2012 and 2024

Title	Year	Venue	Audience
Training Course on Multiparametric Detection of Pathogens Causing Major Transboundary Animal Diseases and Zoonoses	2023	Austria	Africa and Asia
Training Course for Veterinary Diagnostic Laboratory Network Partners on Next Generation Sequencing Bioinformatics and Molecular Phylogeny	2023	Austria	Africa and Asia
Training Course for Veterinary Diagnostic Laboratory Network Partners on the Detection and Characterization of Pathogens Causing Major Transboundary Animal Diseases and Zoonoses	2024	Austria	Africa and Asia
Training Course for Veterinary Diagnostic Laboratory Network Partners On Next Generation Sequencing and Nanopore Sequencing Applications For the Detection and Characterization of Pathogens	2024	Austria	Africa and Asia

Austria 2023

Austria 2023

Austria 2024

Austria 2024

Capacity Building and Technology Transfer

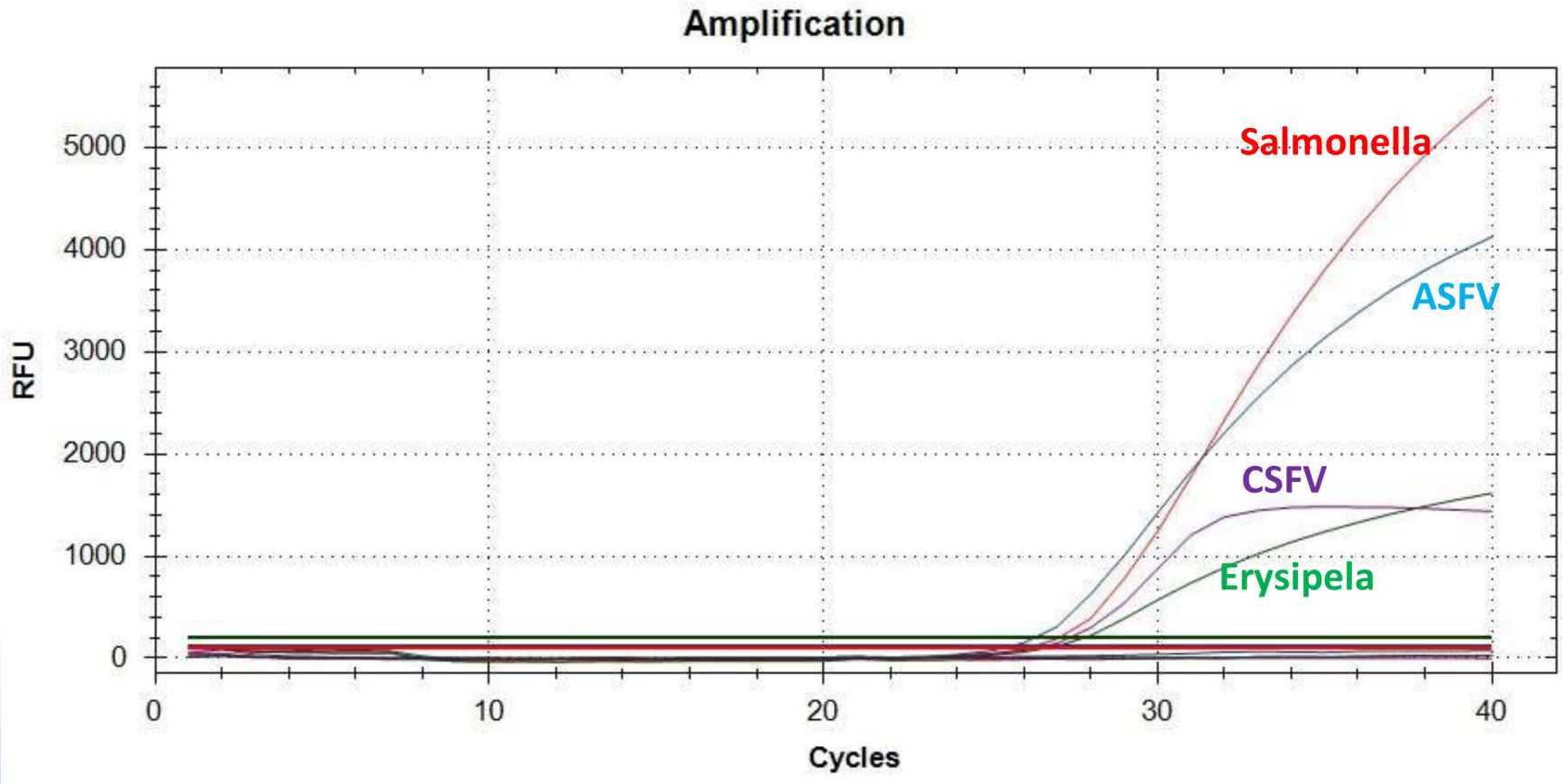
Fellowship and long-term training

- Several fellows trained for 1 to 3 months on molecular diagnosis and sequencing
  - Zambia
  - Ethiopia
  - Senegal
  - Tunisia
  - DRC
  - Lesotho
  - Botswana
  - Indonesia
  - Lao PDR
  - Cambodia
  - Vietnam
  - Morocco

- One Ph.D. was completed in Cameroon.
- Supported three PhD (2 completed -Burkina, Mongolia- 1 ongoing-Mozambique)

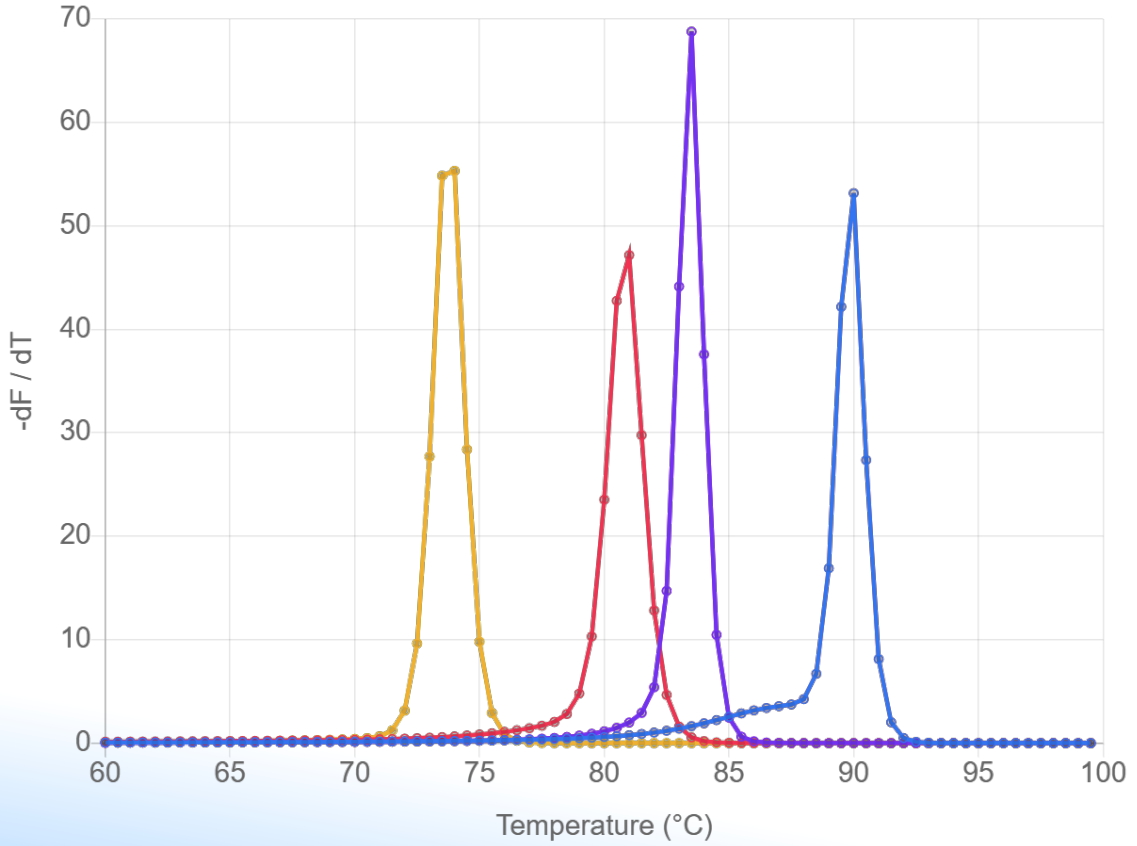
R&D: Assay development

Fourplex real-time PCR (ASFV, CSFV, Erysipelas, and Salmonella)



R&D: Assay development

Fourplex real-time PCR (ASFV, PCV-2, PPV, and Suid Herpesvirus-1)



R&D: Evaluation and Comparison of ASFV Detection Tests

Five qPCR mastermixes and three ad hoc kits were compared

Received: 2 November 2021 | Revised: 7 February 2022 | Accepted: 19 February 2022

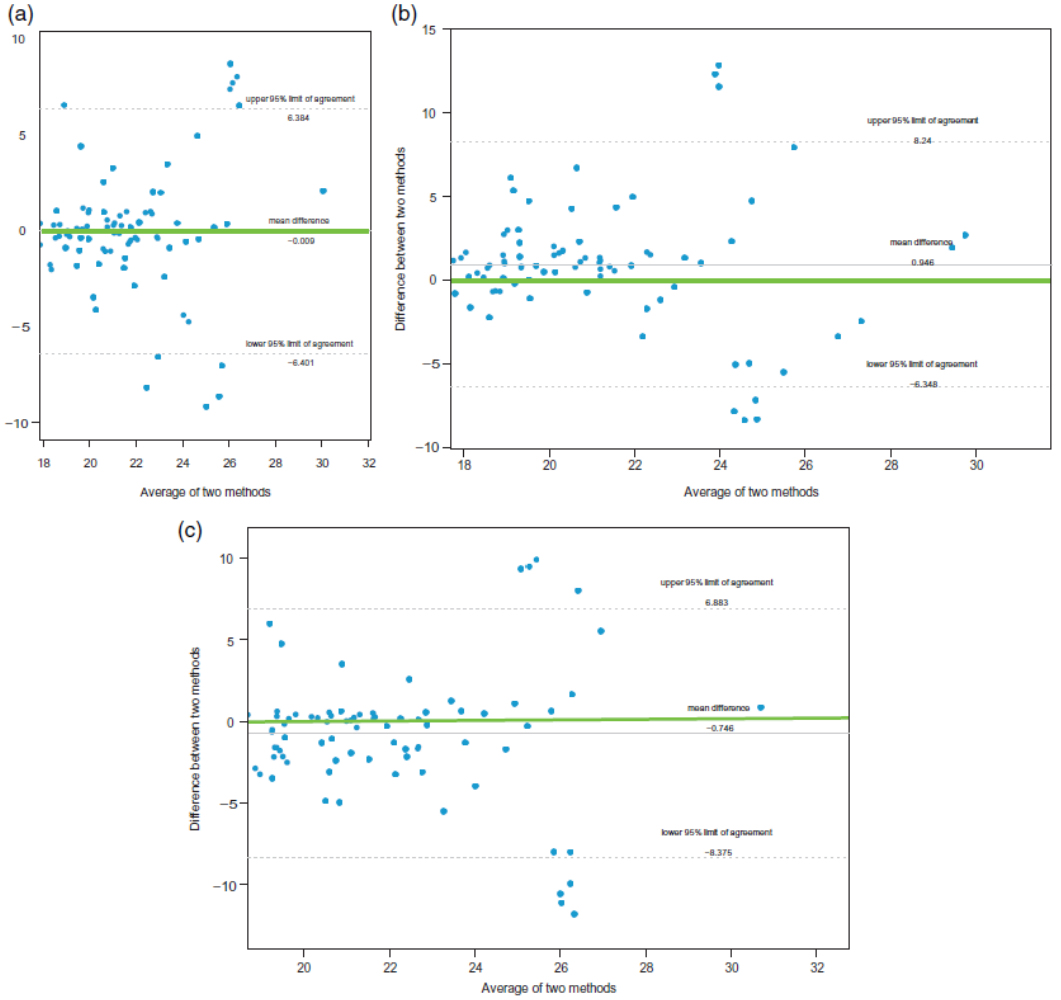
DOI: 10.1111/tbed.14491

Transboundary and Emerging Diseases WILEY

SHORT COMMUNICATION

Comparison of the sensitivity, specificity, correlation and inter-assay agreement of eight diagnostic in vitro assays for the detection of African swine fever virus

Agathe Auer[1,2] | Tirumala B.K. Settypalli[1] | Beatrice Mouille[2] | Angelique Angot[2] | Cristian De Battisti[2] | Charles E. Lamien[1] | Giovanni Cattoli[1]



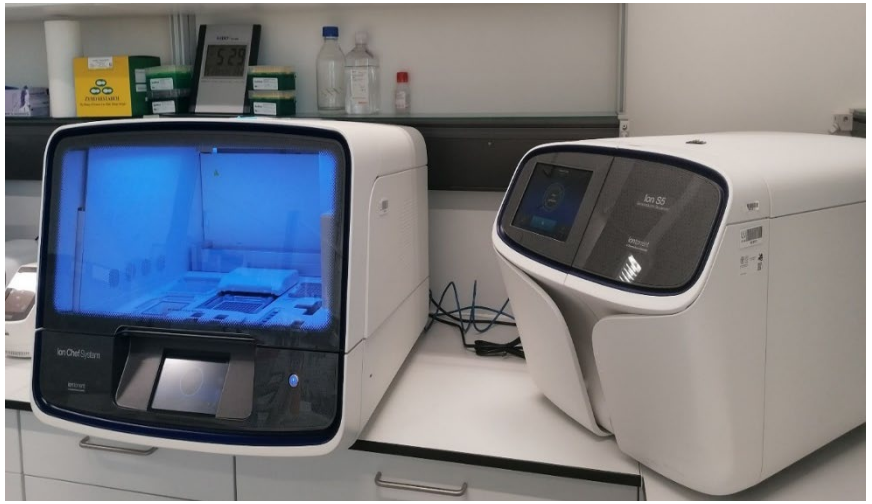
R&D: Molecular Characterization of ASFV

Support Molecular Characterization of ASFV (2020-2024)

- Senegal (Targeted sequencing)
- Mali (Targeted sequencing and WGS)
- DRC (Targeted sequencing and WGS)
- Ethiopia (Targeted sequencing)
- Burkina (Targeted sequencing and WGS)
- Namibia (Targeted sequencing)
- Nigeria (Targeted sequencing and WGS)
- Cameroon (Targeted sequencing and WGS)
- Mozambique (Targeted sequencing and WGS)
- Ivory Coast (Targeted sequencing)
- Zambia ((Targeted sequencing and WGS)
- Tanzania (Targeted sequencing and WGS)
- Mongolia (Targeted sequencing and WGS)
- Lao PDR (Targeted sequencing)
- Vietnam (Targeted sequencing and WGS)
- Indonesia ((Targeted sequencing and WGS)
- Angola (Targeted sequencing)

R&D: Whole Genome Sequencing of ASFV

Various sequencing technologies available at APHL



Ion S5

Minion Nanopore

PacBio (Sequel II instrument)

Some Highlights on the Molecular Surveillance of ASFV

Discovery of ASFV genotype XXIII in Ethiopia

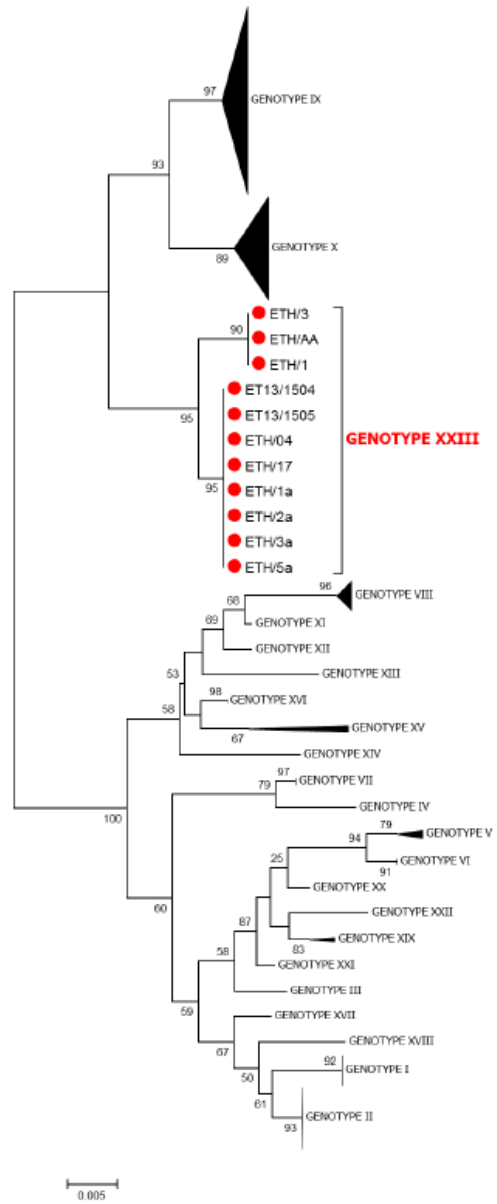
Transboundary and Emerging Diseases

Transboundary and Emerging Diseases

ORIGINAL ARTICLE

Identification of a New Genotype of African Swine Fever Virus in Domestic Pigs from Ethiopia

J. E. Achenbach[1,*], C. Gallardo[2,*], E. Nieto-Pelegrín[3,4], B. Rivera-Arroyo[3,4], T. Degefa-Negi[5], M. Arias[2], S. Jenberie[5], D. D. Mulisa[6], D. Gizaw[6], E. Gelaye[1,5], T. R. Chibssa[1,6], A. Belaye[5], A. Loitsch[7], M. Forsa[6], M. Yami[5], A. Diallo[1], A. Soler[2], C. E. Lamien[1] and J. M. Sánchez-Vizcaíno[3,4]



Some Highlights on the Molecular Surveillance of ASFV

Co-circulation of multiple ASFV genotypes and Variants in DRC

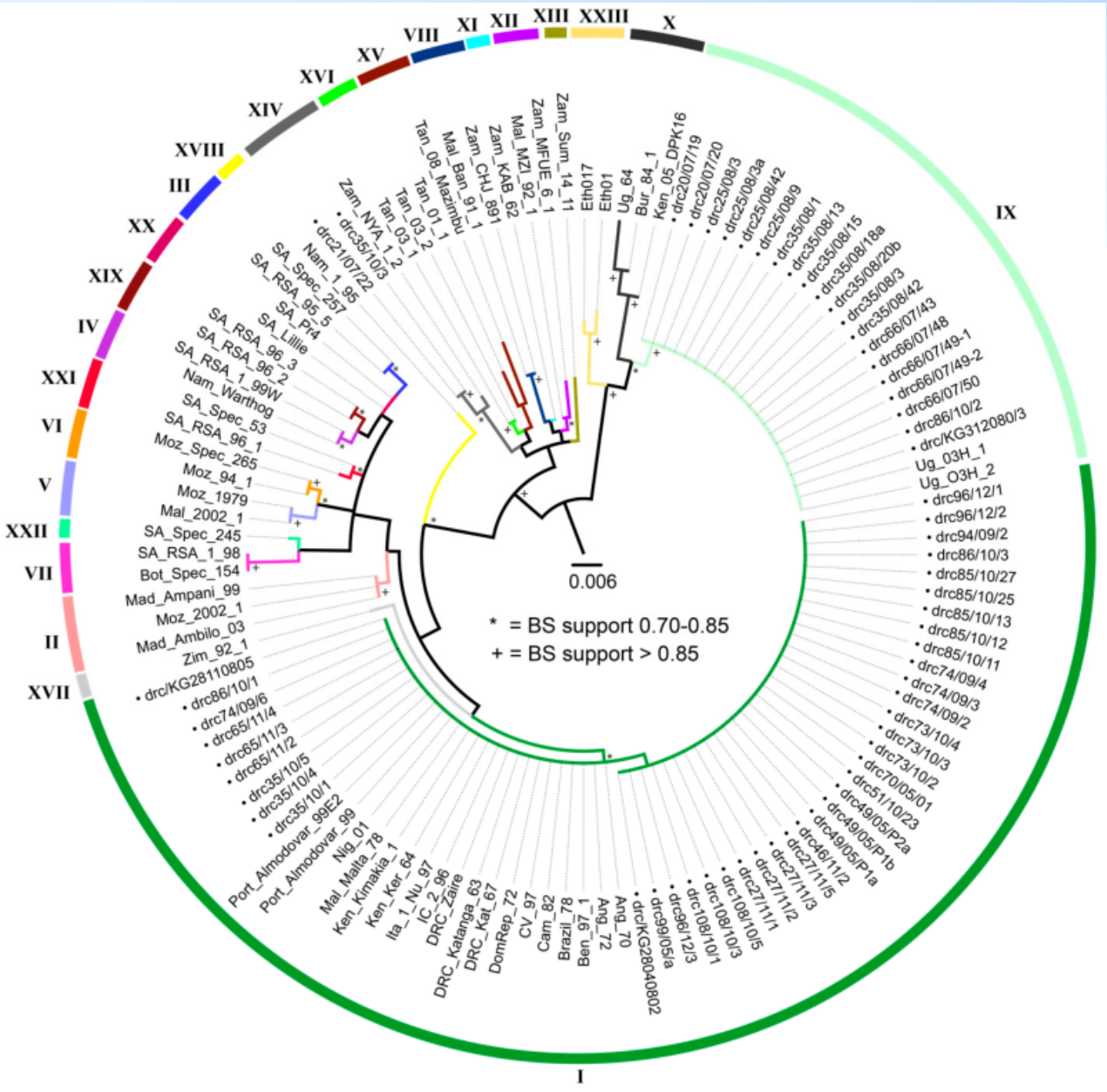
viruses

MDPI

Article

Genetic Assessment of African Swine Fever Isolates Involved in Outbreaks in the Democratic Republic of Congo between 2005 and 2012 Reveals Co-Circulation of p72 Genotypes I, IX and XIV, Including 19 Variants

Leopold K. Mulumba–Mfumu [1,2], Jenna E. Achenbach [3,*], Matthew R. Mauldin [4,7], Linda K. Dixon [5], Curé Georges Tshilenge [1], Etienne Thiry [2], Noelia Moreno [6], Esther Blanco [6], Claude Saegerman [2], Charles E. Lamien [3] and Adama Diallo [3]



Co-circulation of ASFV Genotypes with Apparently Variable Pathogenicity

Co-circulation of ASFV Genotypes with Apparently Variable Pathogenicity

Received: 19 March 2019 | Revised: 12 July 2019 | Accepted: 12 July 2019

DOI: 10.1111/tbed.13298

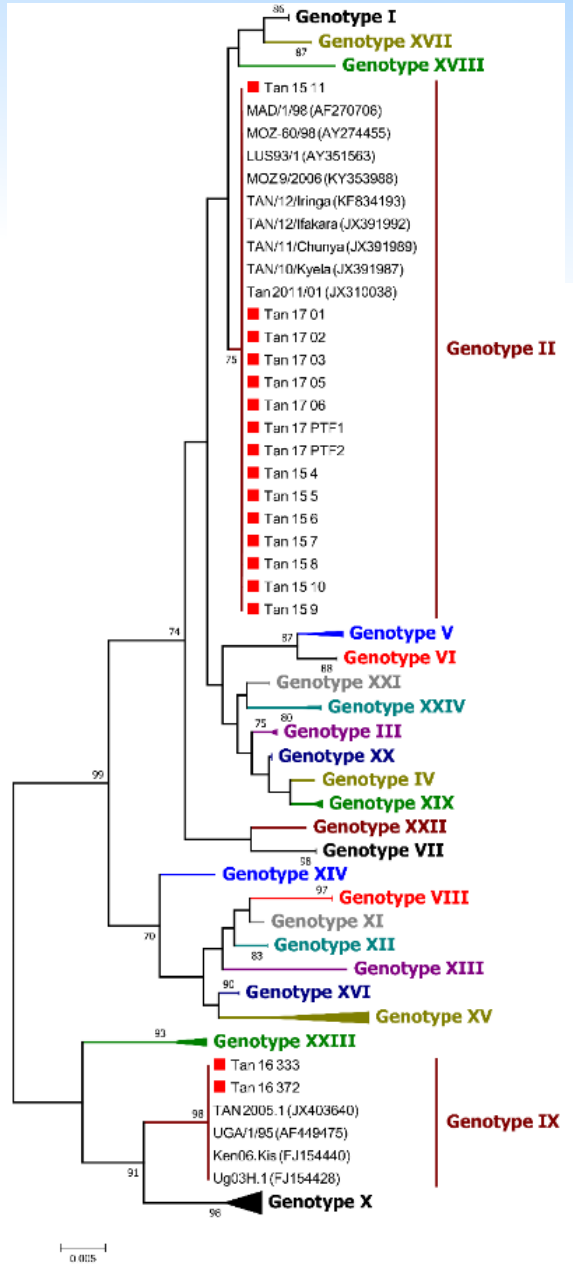
ORIGINAL ARTICLE

Transboundary and Emerging Diseases WILEY

Symptomatic and asymptomatic cases of African swine fever in Tanzania

Jelly S. Chang'a[1] | Charles Mayenga[1] | Tirumala Bharani K. Settypalli[2] | Jenna E. Achenbach[3] | Julius J. Mwanandota[1] | Bishop Magidanga[1] | Giovanni Cattoli[2] | Mashaka Jeremiah[1] | Aloyce Kamigwe[1] | Shukuru Guo[1] | Denis Kalabi[1] | Furaha Mramba[1] | Charles E. Lamien[2]

Genotype II appeared to produce higher mortality and morbidity than genotype IX



Only ASFV genotype I was reported in West Africa until 2019

ASFV genotype II emerged in West Africa in 2020

Received: 10 April 2018 | Revised: 30 November 2018 | Accepted: 3 December 2018
DOI: 10.1111/tbed.13098

ORIGINAL ARTICLE

WILEY

Re-emergence of genotype I of African swine fever virus in Ivory Coast

Emmanuel Couacy-Hymann[1] | Kouamé V. Kouakou[1] | Jenna E. Achenbach[2] | Léonce Kouadio[1] | Yao M. Koffi[1] | Hugues P. Godji[1] | Kouassi E. Adjé[1] | Jonas Oulaï[3] | Henri J. Pell-Minhiaud[4] | Charles E. Lamien[5]

Received: 8 September 2020 | Revised: 12 June 2021 | Accepted: 13 July 2021
DOI: 10.1111/tbed.14240

SPECIAL ISSUE ARTICLE

Transboundary and Emerging Diseases WILEY

Molecular characterization of African Swine fever viruses in Burkina Faso, Mali, and Senegal 1989–2016

Genetic diversity of ASFV in West Africa

Germaine L. Minoungou[1,2] | Mariame Diop[3] | Marthin Dakouo[4] | Abdoul Karim Ouattara[1,5] | Tirumala Bharani K. Settypalli[6] | Modou M. Lo[3] | Satigui Sidibe[4] | Estelle Kanyala[7] | Yaya Sidi Kone[4] | Moctar Sidi Diallo[2,*] | Anne Ouedraogo[2] | Kadiatou Coulibaly[4] | Victorine Ouedraogo[2] | Ibrahim Sow[4] | Mamadou Niang[4,8] | Jenna Elizabeth Achenbach[9] | Abel Wade[10] | Hermann Unger[11] | Adama Diallo[3,12] | Giovanni Cattoli[6] | Charles Euloge Lamien[6] | Jacques Simpore[1,5]

Sidi et al. BMC Veterinary Research (2022) 18:69
https://doi.org/10.1186/s12917-022-03166-y

BMC Veterinary Research

RESEARCH Open Access

Molecular characterization of African swine fever viruses from Burkina Faso, 2018

Moctar Sidi[1^], Habibata Lamouni Zerbo[1*], Bruno Lalidia Ouoba[1], Tirumala Bharani K. Settypalli[2], Gregorie Bazimo[1], Hamidou Sandaogo Ouandaogo[1], Boubacar N'paton Sie[1], Ilboudo Sidwatta Guy[3], Drabo Dji-tombo Adama[1], Joseph Savadogo[3], Anne Kabore-Ouedraogo[1], Marietou Guitti Kindo[1], Jenna E. Achenbach[4], Giovanni Cattoli[2] and Charles E. Lamien[2]

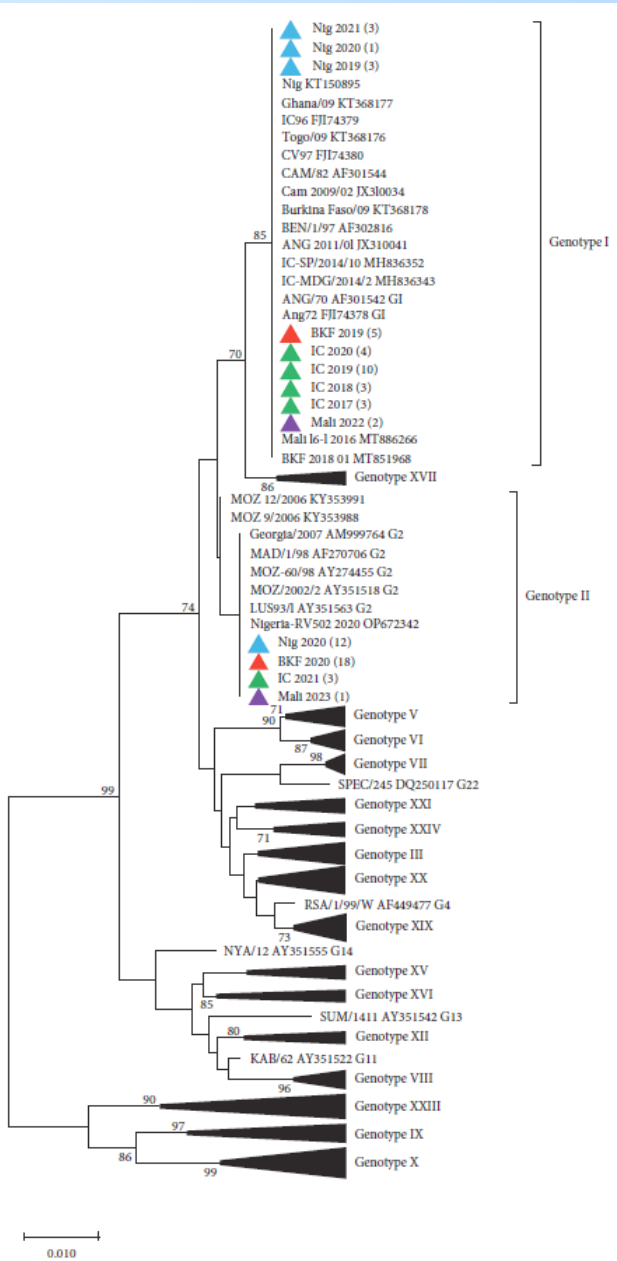
Wiley
Transboundary and Emerging Diseases
Volume 2025, Article ID 5396227, 14 pages
https://doi.org/10.1155/tbed/5396227

WILEY

Research Article

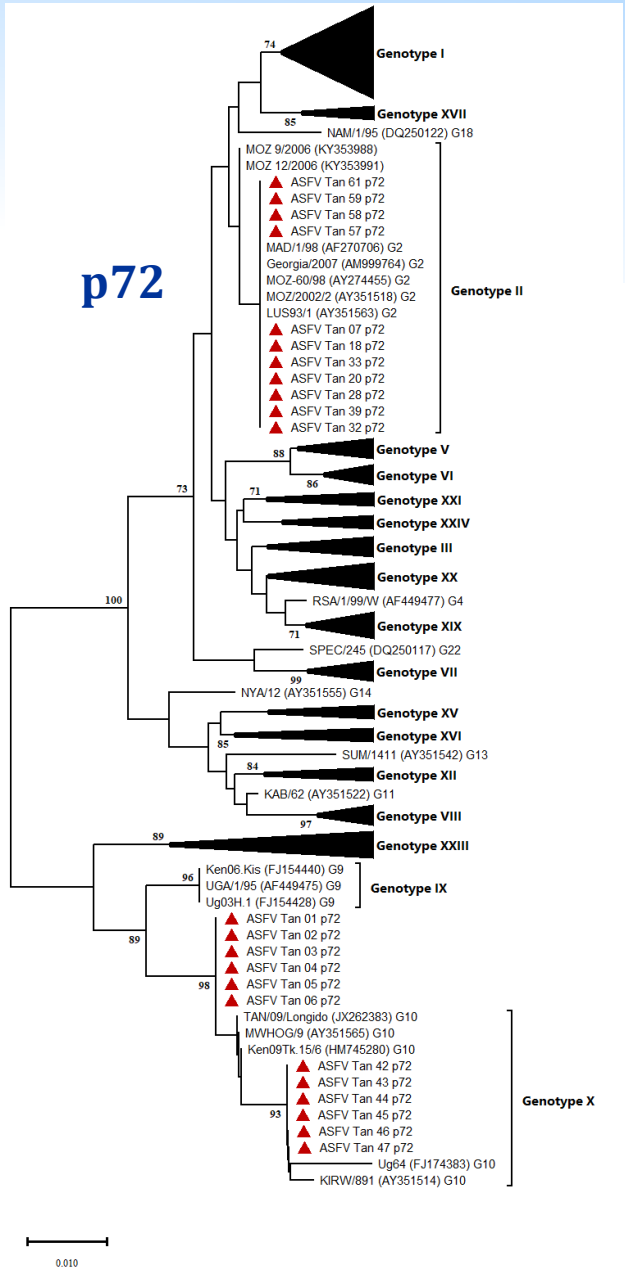
Detection of African Swine Fever Virus Genotype II in West Africa (2020) and Its Co-Circulation With Endemic Genotype I: Implications for Pig Production

Irene Kasindi Meki,[1] Adeyinka Jeremy Adedeji,[2,3] Lalidia Bruno Ouoba,[4,5] Yao Mathurin Koffi,[6] Adama Diakité,[7] Tirumala B. K. Settypalli,[1] Lamouni Habibata-Zerbo,[4] Kouamé Valère Kouakou,[6] Mohamed Adama Diakité,[7] Charles Masembe,[3] Moctar Sidi,[4†] Thierry Ouattara Douyeri,[6] Fatoumata Dembelé,[7] Helen E. Luka,[2] Sandaogo Hamidou-Ouandaogo,[4] Christiane Dembelé,[7] Rebecca Weka,[2] Gregorie Bazimo,[4] Martin Dakouo,[7] Toyin A. Olubade,[2] Mariétou Guitti-Kindo,[4] Chaka Traoré,[7] Olushola Gamra,[2] Dominique Guigma,[4] Cheick Abou Kounta Sidibé,[7] Dupe A. Hambolu,[8] Drabo Dji-tombo Adama,[4] Boubacar Madio dit Aladiogo Maïga,[7] Mary A. Ogunleye,[9] Ayokanmi Toluhi,[2] Nanven Maurice,[2] Emmanuel Couacy-Hymann,[6] Pam D. Luka,[2] Giovanni Cattoli,[1,10] and Charles E. Lamien[1]

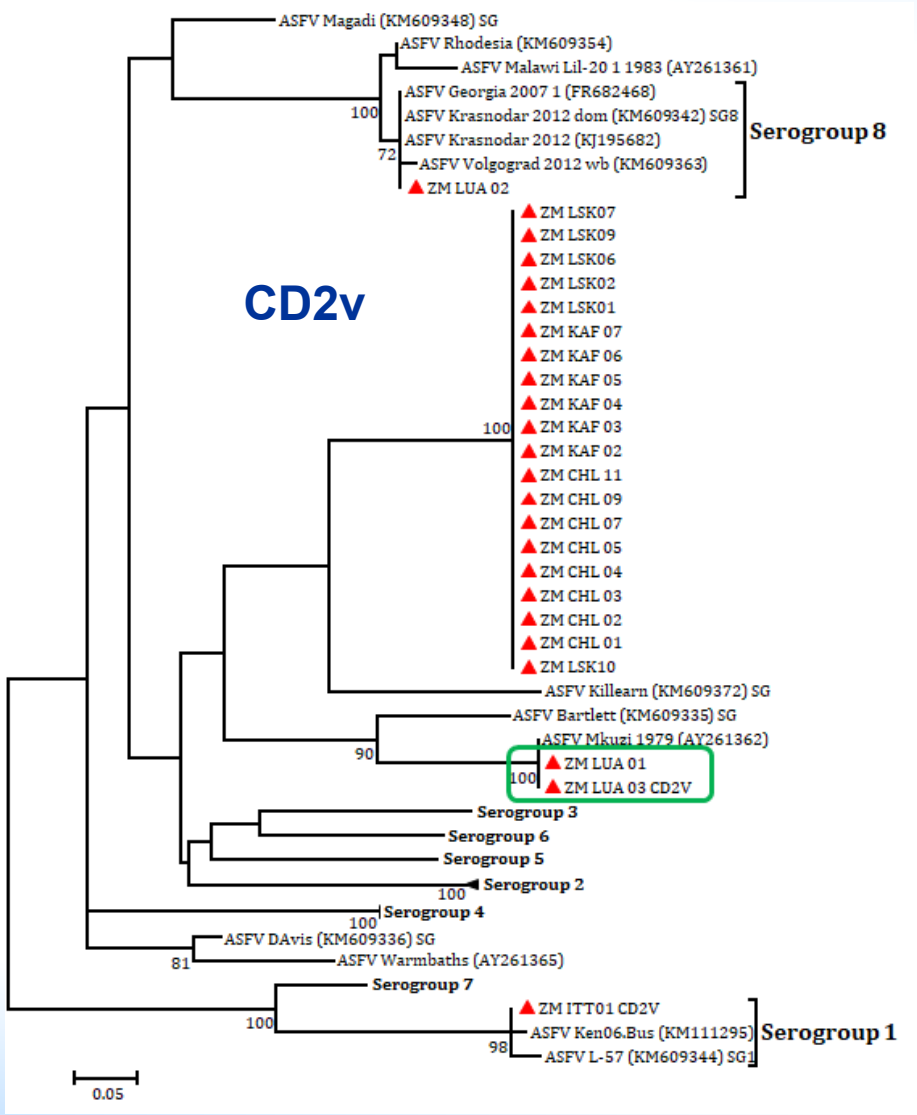


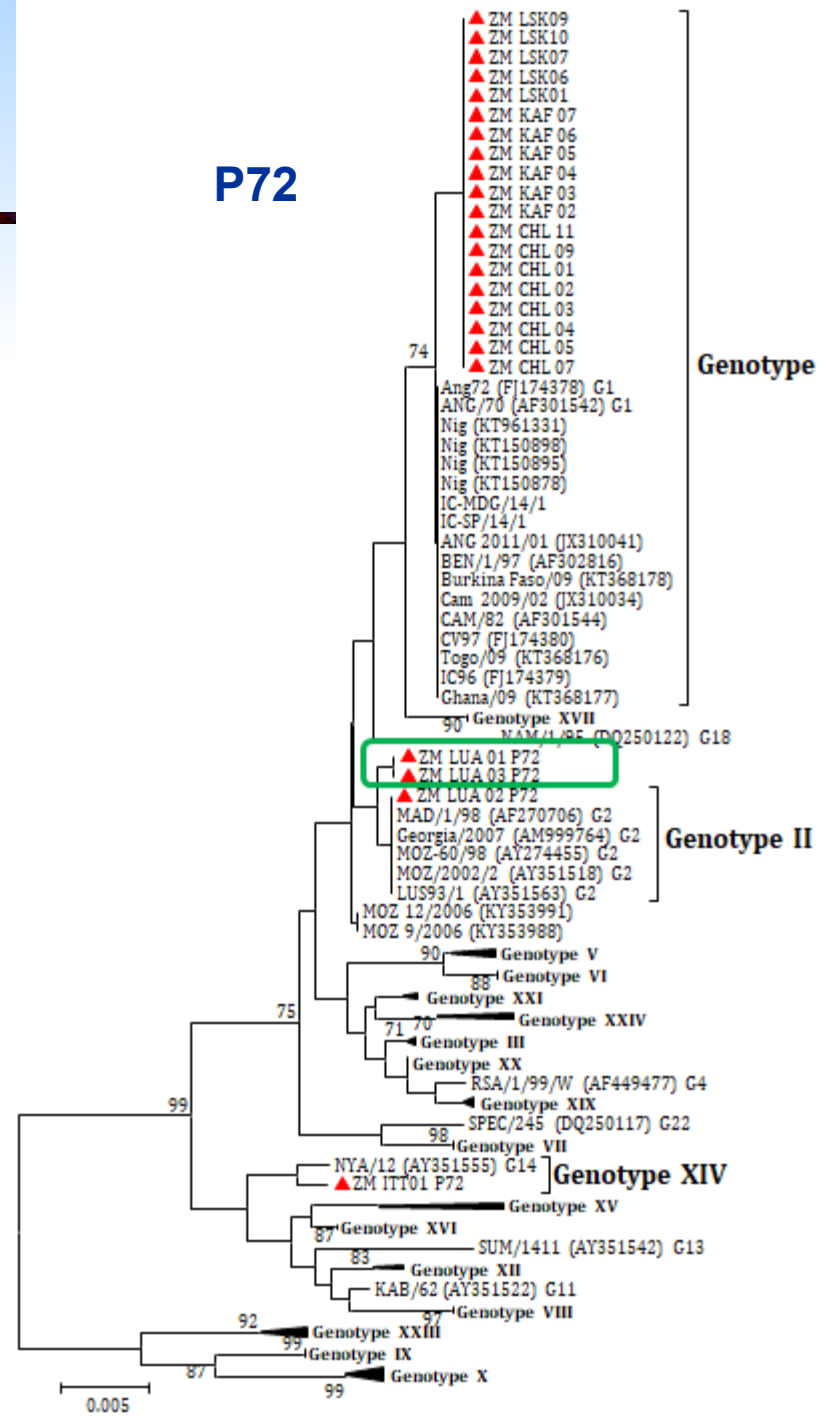
Tanzania 2023

3 genotypes in Tanzania in 2023 including a new Variant



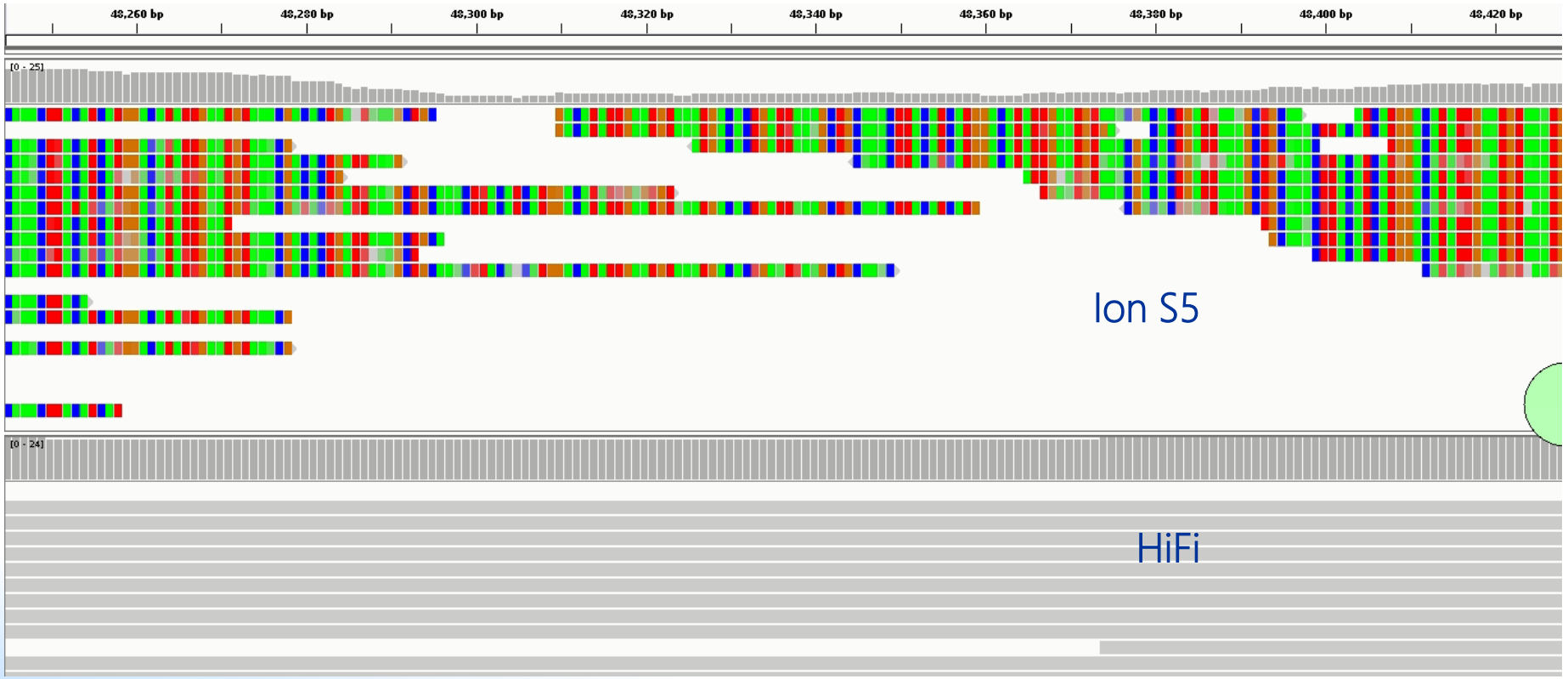
New ASFV Variant in Zambia





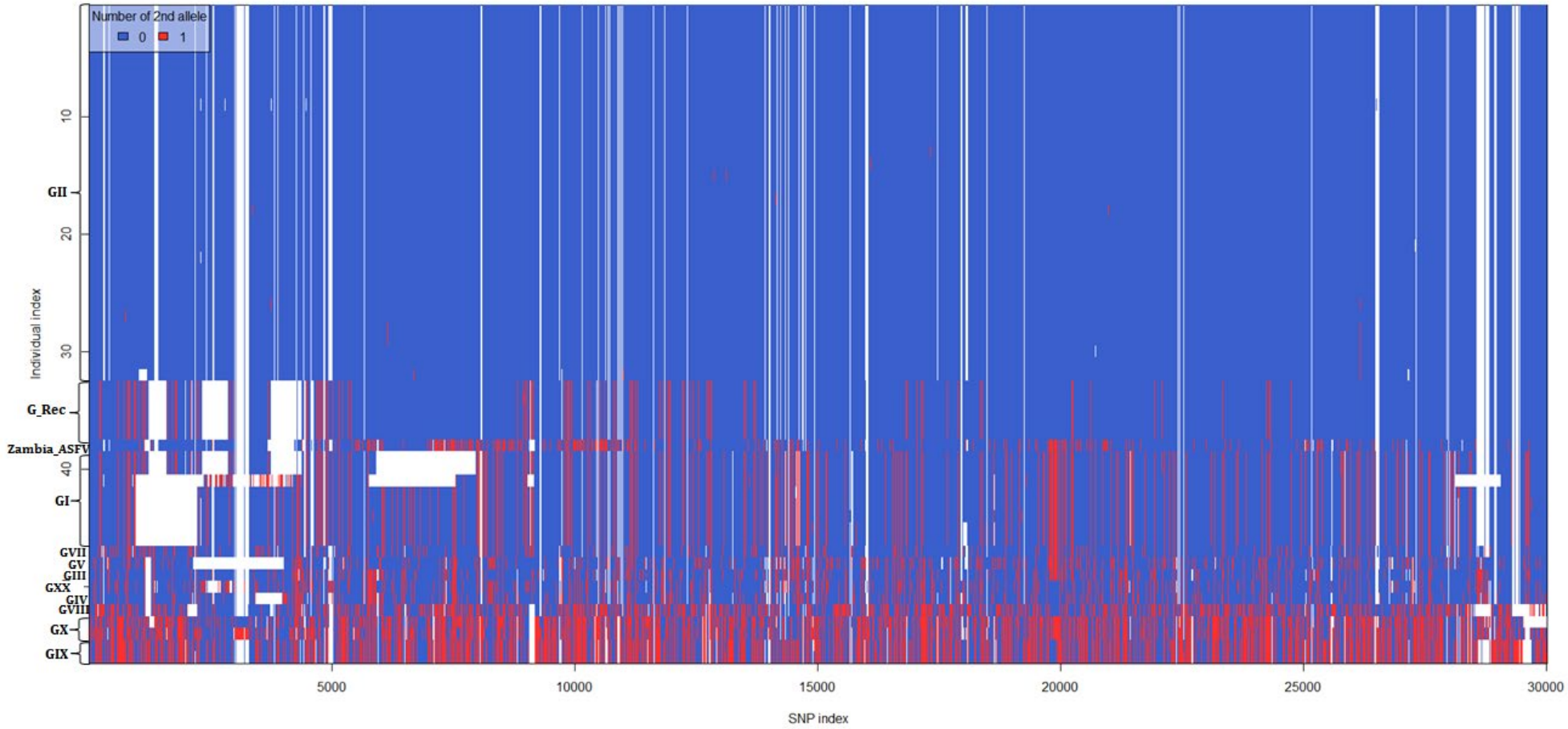
New ASFV Variant in Zambia

Fail to assemble de novo (max contig - 27 k) with Ion S5 data and no Reference available for Assembly



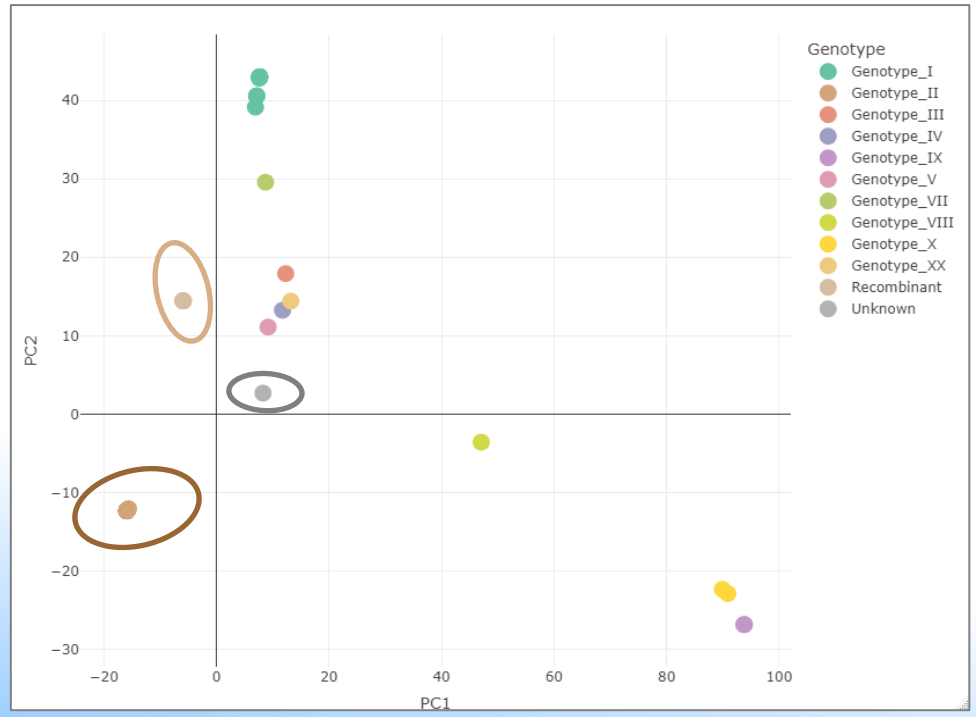
New ASFV Variant in Zambia

SNP distribution heatmap based on ASFV genomes (Zambia alignment)

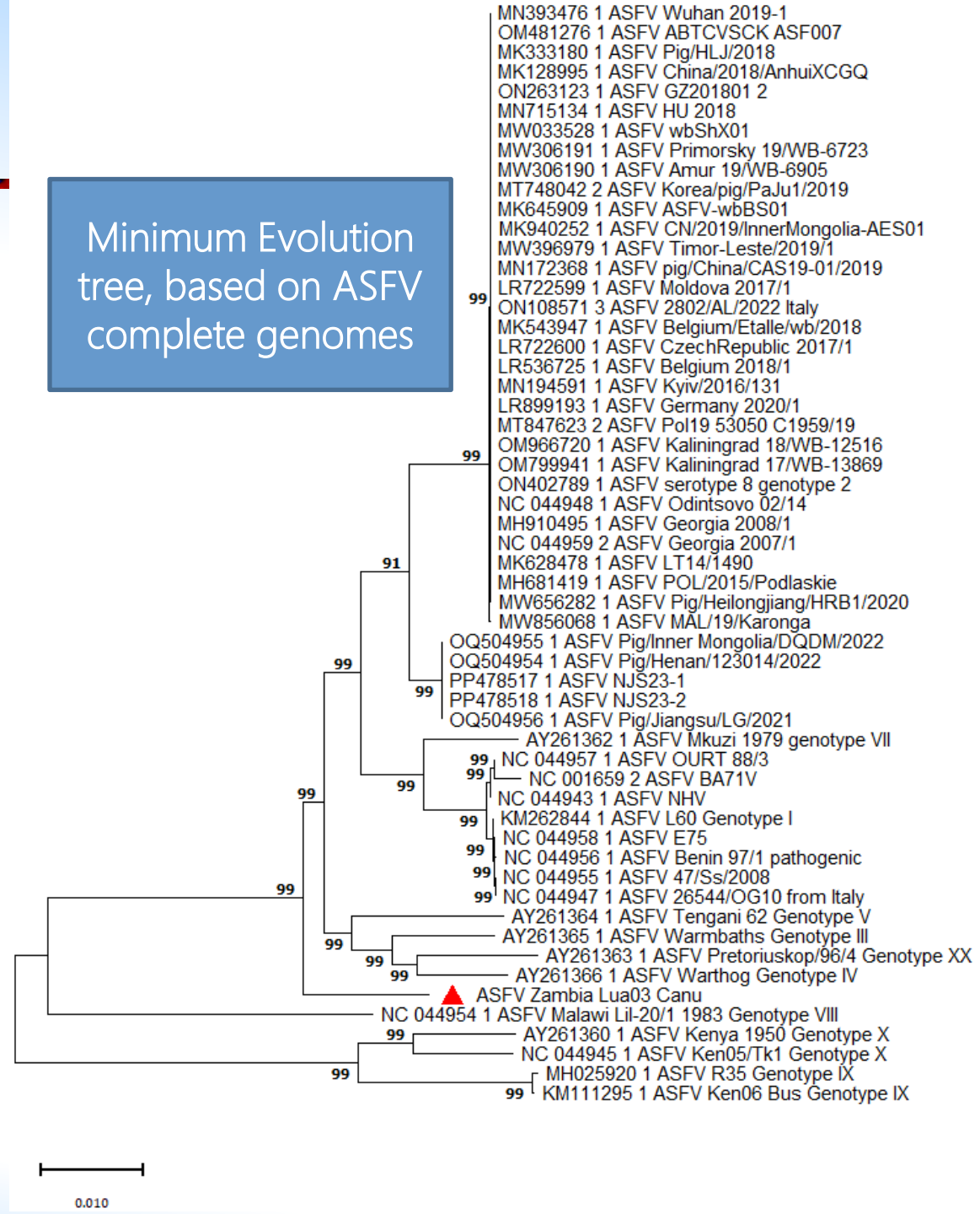


New ASFV Variant in Zambia

PCA-scatter plot based on PCA scores of the SNP data extracted from ASFV genomes alignment

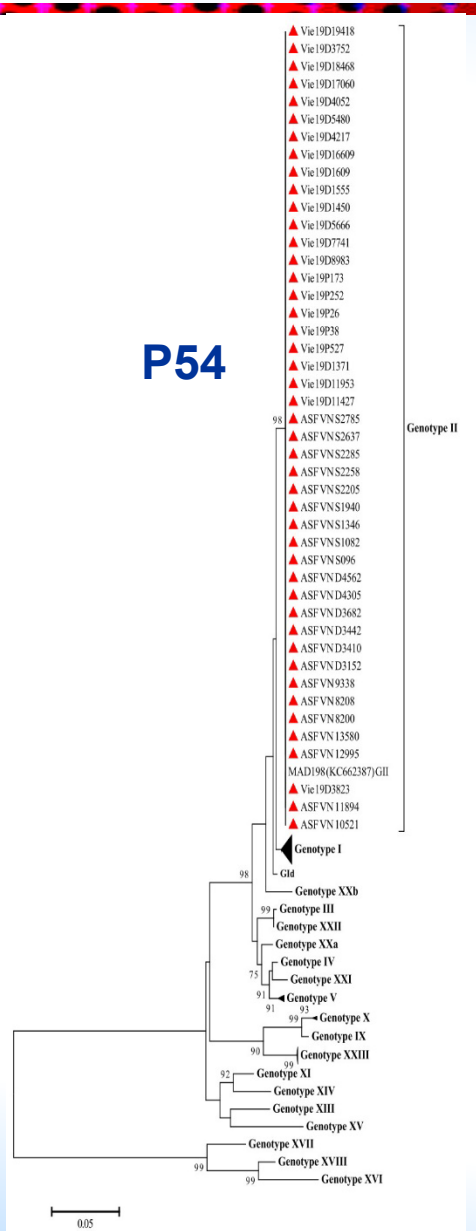


Minimum Evolution tree, based on ASFV complete genomes



Recombinant ASFV in Vietnam

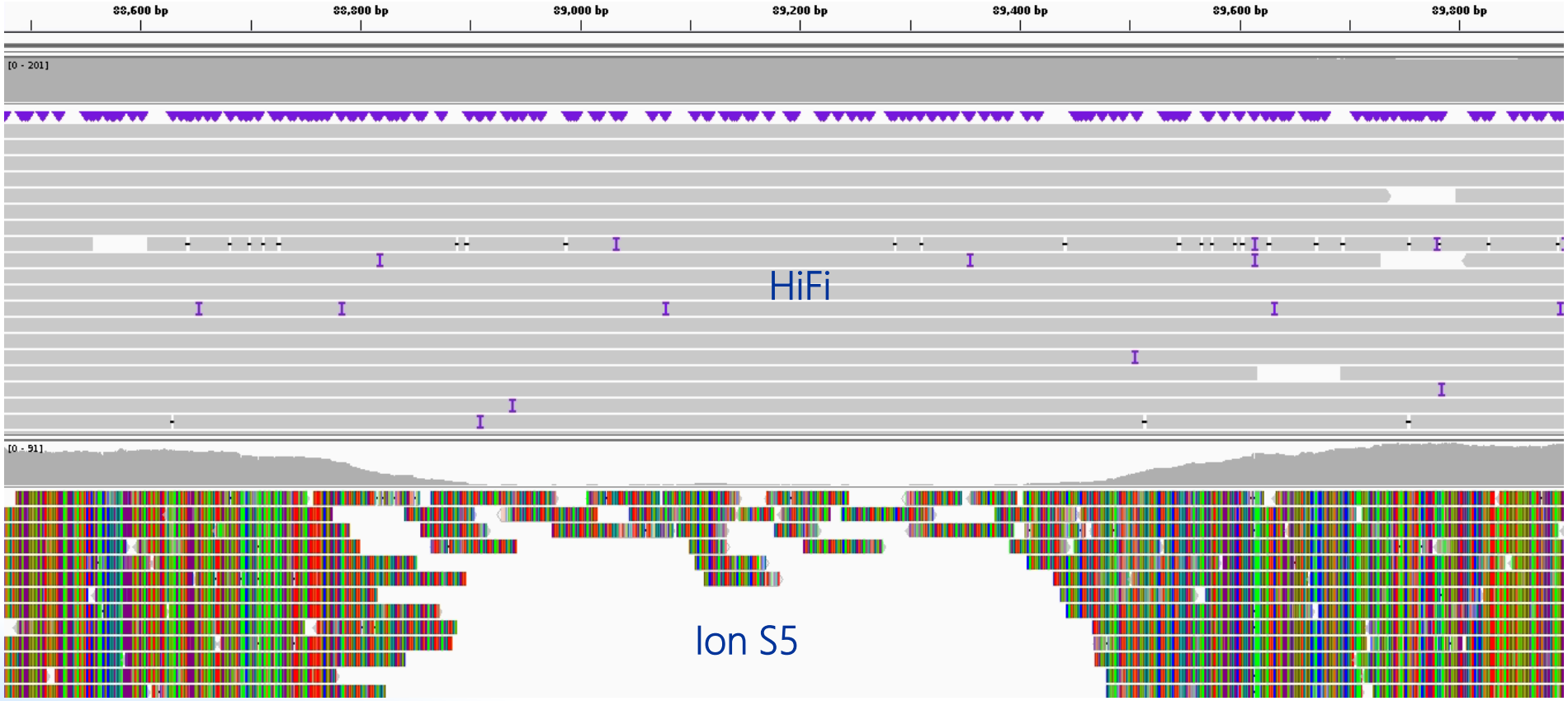
P54



P72

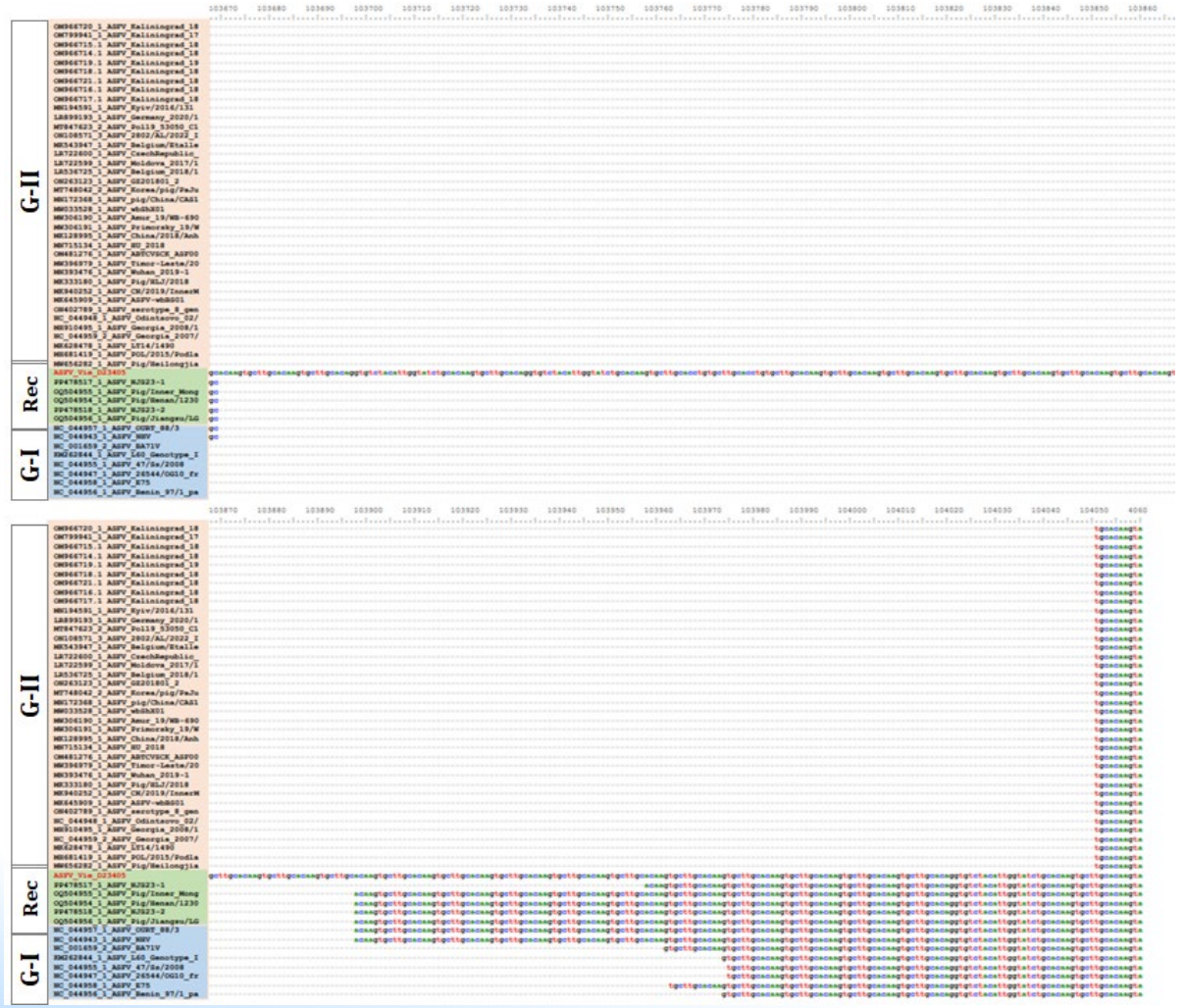
Recombinant ASFV in Vietnam

Fail to assemble de novo with Ion S5 data and no Reference available for Assembly



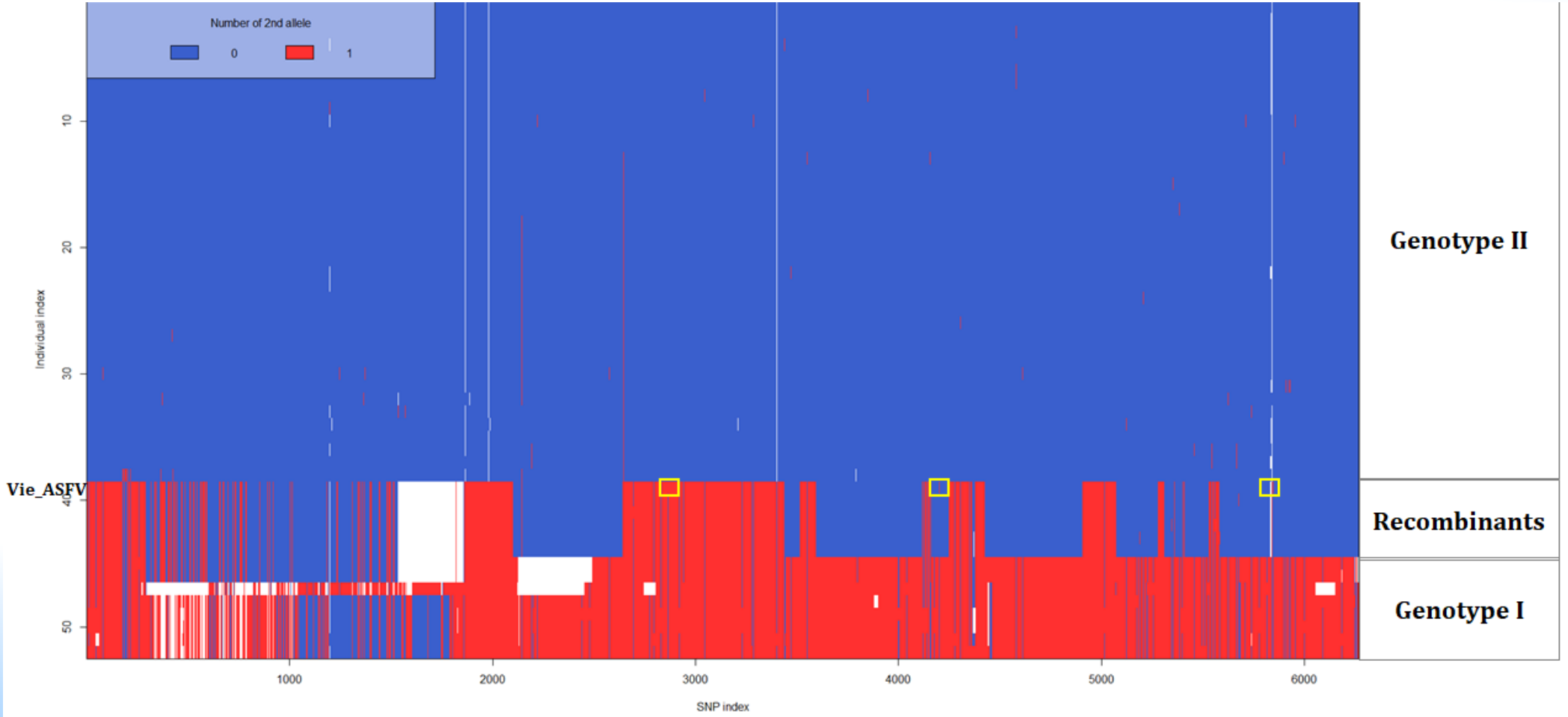
Recombinant ASFV in Vietnam

Fail to assemble de novo with Ion S5 data and no Reference available for Assembly



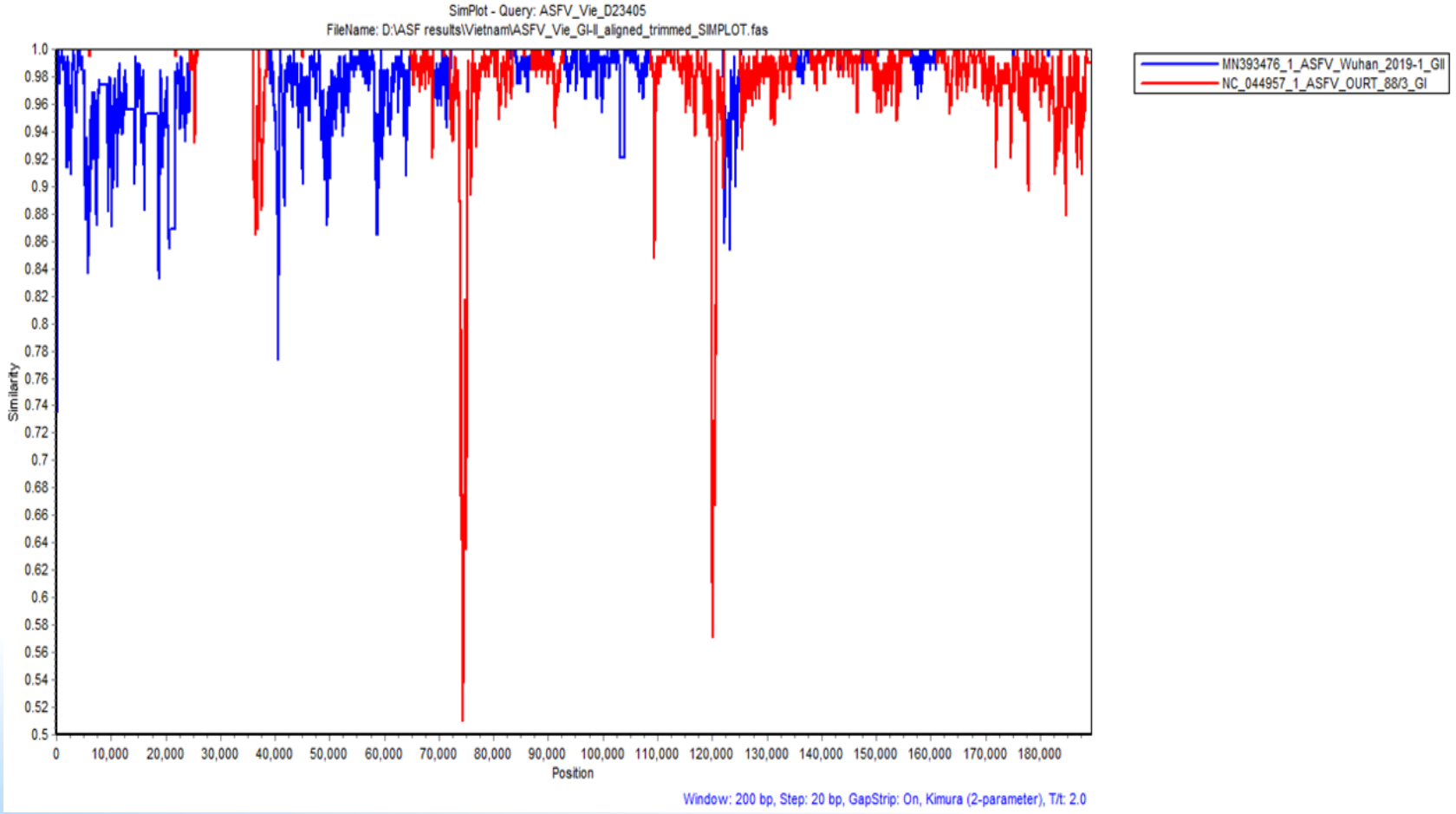
Recombinant ASFV in Vietnam

SNP distribution heatmap based on Genotype I and II ASFV genomes alignment



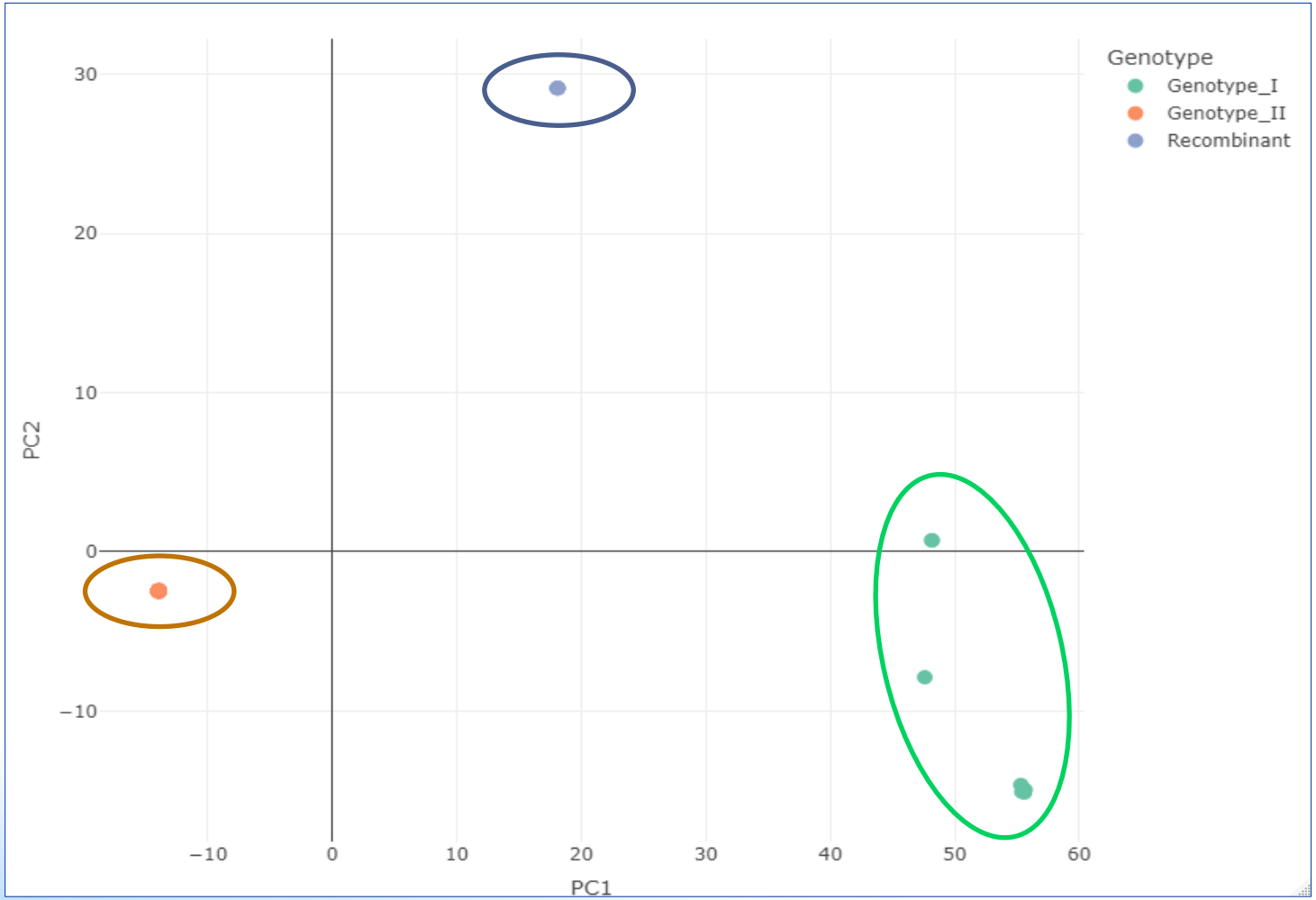
Recombinant ASFV in Vietnam

Recombination analysis of the Vietnam ASFV isolate



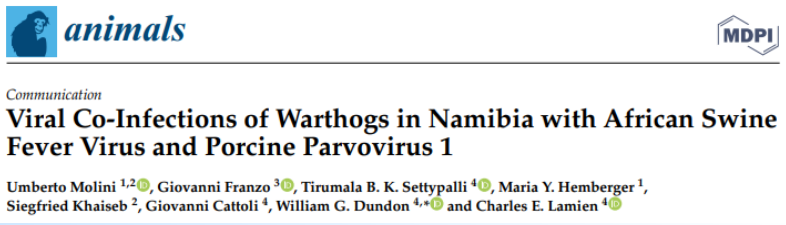
Recombinant ASFV in Vietnam

PCA-scatter plot based on PCA scores of the SNP data extracted from Genotype I and II ASFV genome alignment



Lessons learned

- Most VETLAB partner laboratories are undoubtedly capable of diagnosing ASF.
  - Currently, many labs have successfully detected and reported ASF independently.
  - These laboratories typically reach out to APHL (and FAO/WOAH reference laboratories) primarily for confirmation and further characterization.
  - For countries newly affected by ASF, prompt support with SOPs and access to appropriate controls are critical.
  - Additionally, a few labs may require urgent assistance with reagents to implement the tests.
- Continuous genetic monitoring of ASFV isolates circulating within a country or region is essential.
- It is crucial to analyze the correlation between the presence of other porcine pathogens and ASF severity.

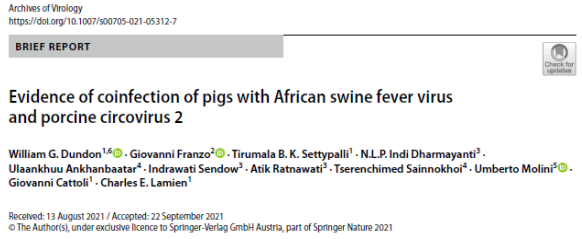

animals

MDPI

Communication

Viral Co-Infections of Warthogs in Namibia with African Swine Fever Virus and Porcine Parvovirus 1

Umberto Molini [1,2], Giovanni Franzo [3], Tirumala B. K. Settypalli [4], Maria Y. Hemberger [1], Siegfried Khaiseb [2], Giovanni Cattoli [4], William G. Dundon [4,*] and Charles E. Lamien [4]

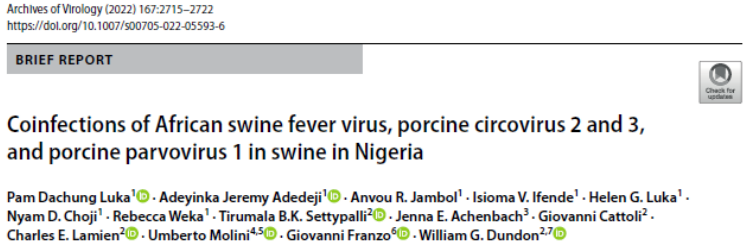

Archives of Virology
https://doi.org/10.1007/s00705-021-05312-7

BRIEF REPORT

Evidence of coinfection of pigs with African swine fever virus and porcine circovirus 2

William G. Dundon[1,6] · Giovanni Franzo[2] · Tirumala B. K. Settypalli[1] · N.L.P. Indi Dharmayanti[3] · Ulaankhuu Ankhanbaatar[4] · Indrawati Sendow[3] · Atik Ratnawati[3] · Tserenchimed Sainnokhoi[4] · Umberto Molini[5] · Giovanni Cattoli[1] · Charles E. Lamien[1]

Received: 13 August 2021 / Accepted: 22 September 2021
© The Author(s), under exclusive licence to Springer-Verlag GmbH Austria, part of Springer Nature 2021


Archives of Virology (2022) 167:2715–2722
https://doi.org/10.1007/s00705-022-05593-6

BRIEF REPORT

Coinfections of African swine fever virus, porcine circovirus 2 and 3, and porcine parvovirus 1 in swine in Nigeria

Pam Dachung Luka[1] · Adeyinka Jeremy Adedeji[1] · Anvou R. Jambol[1] · Isioma V. Ifende[1] · Helen G. Luka[1] · Nyam D. Choji[1] · Rebecca Weka[1] · Tirumala B.K. Settypalli[2] · Jenna E. Achenbach[3] · Giovanni Cattoli[2] · Charles E. Lamien[2] · Umberto Molini[4,5] · Giovanni Franzo[6] · William G. Dundon[2,7]

Our NGS Team

Sequencing

Bharani Settypalli

Sequencing

Hatem Ouled Ahmed

Molecular Epidemiology

William Dundon

Nanopore

Irene Meki

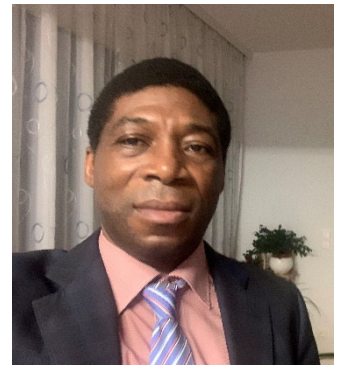
Data Analysis

Former members:

Sneha Datta (NGS data)

Jenna Achenbach (Molecular epidemiology)

Molecular Epidemiology



Charles Lamien

Acknowledgments

- All VETLAB partner Laboratories that supported these studies
- The Austrian Agency for Health and Food Safety (AGES), Austria

FAO/IAEA Agriculture and Biotechnology Laboratory

Joint FAO/IAEA Programme
Nuclear Techniques in Food and Agriculture

Thank You

Joint FAO/IAEA Programme
Nuclear Techniques in Food and Agriculture

Animal Production and Health
Subprogramme

Annex 3: Capacity Development and Differential Diagnostic Tools for ASF and Other Swine Diseases

Capacity Development and Differential Diagnostic Tools for ASF and Other Swine Diseases

Charles Euloge Lamien

Joint FAO-IAEA Centre, International Atomic Energy Agency,
Vienna, Austria

Building Capacity for ASF Control through the VETLAB Network

Enhancing Awareness at VETLAB Annual Meetings

1

June 2015

Second coordination meeting for Africa: Laboratory directors were briefed on APHL's ASF activities and offered support for preparedness

2

August 2016

Session dedicated to bioinformatics capacity and molecular epidemiology, including ASF molecular characterization

3

August 2017

Focus on laboratory preparedness for handling disease outbreaks and emergency situations

4

August 2018

Session on trends in pathogen detection and characterization, with emphasis on ASF diagnostic approaches

These annual meetings have established a consistent forum for knowledge exchange and capacity development, with ASF remaining a priority focus area across the decade.

Building Capacity for ASF Control through the VETLAB Network

August 2019 — 5

Session focused on transboundary animal diseases, including ASF, Lumpy Skin Disease (Capripox), and emerging equine diseases

6 — **November 2021**

Highlighted APHL R&D initiatives for animal and zoonotic disease surveillance and control, with special coverage on ASF diagnostics

August 2022 — 7

Emphasized APHL R&D efforts to support animal and zoonotic disease surveillance and control, including ASF molecular characterization

8 — **August 2023**

Addressed key challenges faced by VETLAB partners and their innovative role in transboundary animal disease surveillance, monitoring, and control

August 2024 — 9

Explored emerging health threats and VETLAB partners' preparedness and responses to transboundary animal diseases, with ASF as a priority

Building Capacity for ASF Control through the VETLAB Network

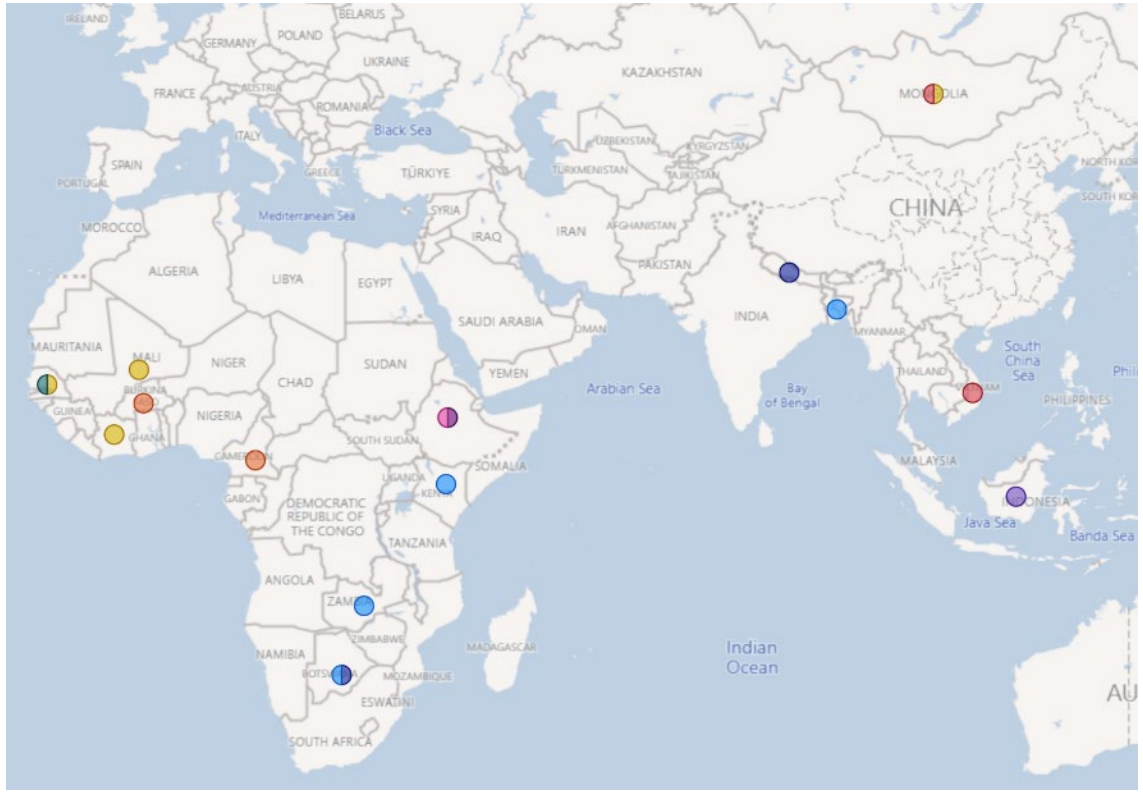
ASF-related Field Support Missions

Asia

6 field missions between 2015-2020 to provide direct technical support and technology transfer

Africa

13 field missions between 2013-2019, with ongoing support to Eswatini, Mozambique, and Ivory Coast in 2024-2025



Ethiopia 2013

Senegal 2019

Eswatini, Mozambique, Ivory Coast,…(2024-2025)

Capacity Building: Training Programs

Short-term, long-term and group trainings

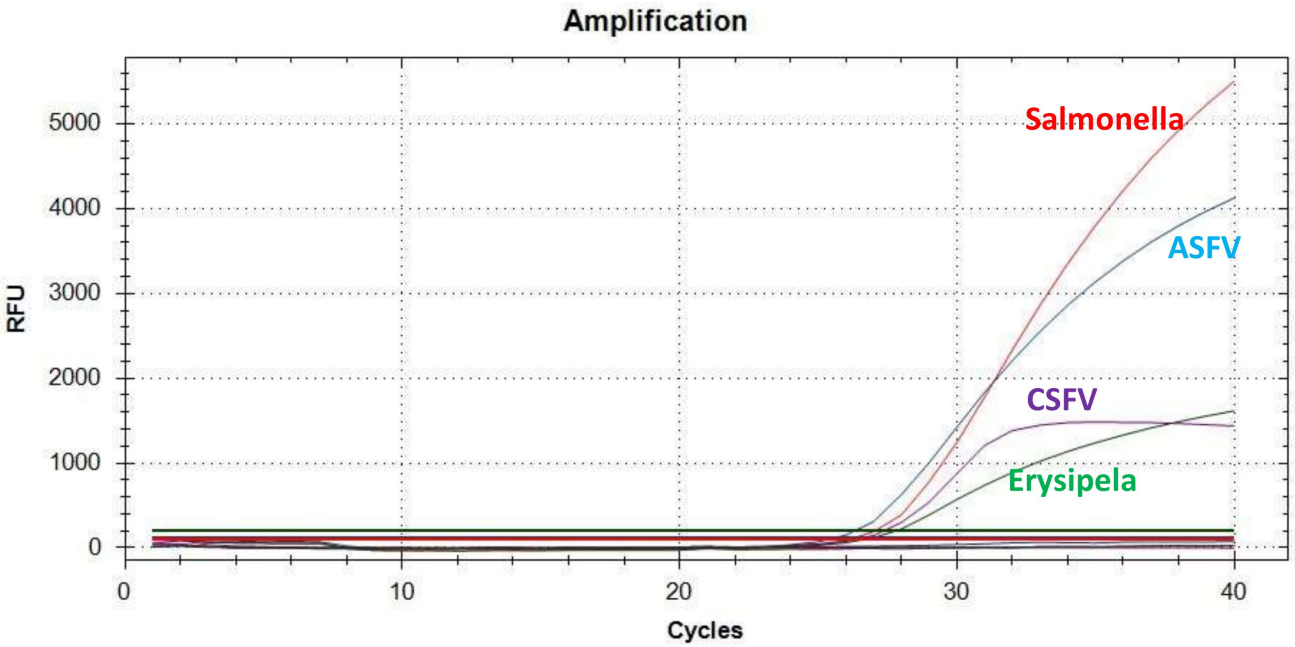
- **Several fellows trained for 1 to 3 months on molecular diagnosis and sequencing**
  - Zambia
  - Ethiopia
  - Senegal
  - Tunisia
  - DRC
  - Lesotho
  - Botswana
  - Indonesia
  - Lao PDR
  - Cambodia
  - Vietnam

- **One Ph.D. was completed in Cameroon.**
- **Supported three PhD (Burkina, Mongolia)**

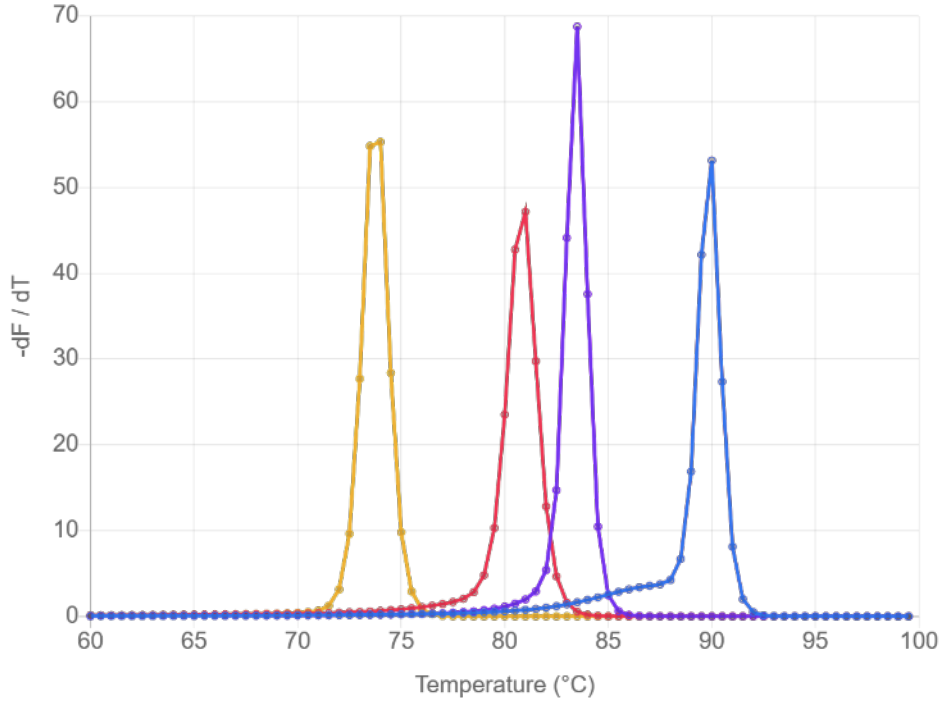
14 courses between 2012 and 2024

R&D: Assay development

Fourplex real-time PCR (ASFV, CSFV, Erysipelas, and Salmonella)



Fourplex HRM (ASFV, PCV-2, PPV, and Suid Herpesvirus-1)



R&D: Molecular Characterization of ASFV

Support Molecular Characterization of ASFV (2020-2024)

- Bangladesh
- Mongolia (Targeted sequencing and WGS)
- Lao PDR (Targeted sequencing)
- Thailand
- Vietnam (Targeted sequencing)
- Indonesia ((Targeted sequencing and WGS)

- Angola (Targeted sequencing)
- Senegal (Targeted sequencing)
- Mali (Targeted sequencing)
- DRC (Targeted sequencing and WGS)
- Ethiopia (Targeted sequencing)
- Burkina (Targeted sequencing and WGS)
- Namibia (Targeted sequencing)
- Nigeria (Targeted sequencing)
- Cameroon (Targeted sequencing and WGS)
- Mozambique (Targeted sequencing and WGS)
- Ivory Coast (Targeted sequencing)
- Zambia ((Targeted sequencing and WGS)
- Ethiopia (Targeted sequencing)
- Tanzania (Targeted sequencing)

Emergence of ASFV Genotype II in West Africa

Changing Epidemiological Landscape

Wiley
Transboundary and Emerging Diseases
Volume 2025, Article ID 5396227, 14 pages
https://doi.org/10.1155/tbed/5396227

WILEY

Research Article

Detection of African Swine Fever Virus Genotype II in West Africa (2020) and Its Co-Circulation With Endemic Genotype I: Implications for Pig Production

Irene Kasindi Meki,[1] Adeyinka Jeremy Adedeji,[2,3] Lalidia Bruno Ouoba,[4,5] Yao Mathurin Koffi,[6] Adama Diakité,[7] Tirumala B. K. Settypalli,[1] Lamouni Habibata-Zerbo,[4] Kouamé Valère Kouakou,[6] Mohamed Adama Diakité,[7] Charles Masembe,[3] Moctar Sidi,[4†] Thierry Ouattara Douyeri,[6] Fatoumata Dembelé,[7] Helen E. Luka,[2] Sandaogo Hamidou-Ouandaogo,[4] Christiane Dembelé,[7] Rebecca Weka,[2] Gregorie Bazimo,[4] Martin Dakouo,[7] Toyin A. Olubade,[2] Mariétou Guitti-Kindo,[4] Chaka Traoré,[7] Olushola Gamra,[2] Dominique Guigma,[4] Cheick Abou Kounta Sidibé,[7] Dupe A. Hambolu,[8] Drabo Dji-tombo Adama,[4] Boubacar Madio dit Aladiogo Maïga,[7] Mary A. Ogunleye,[9] Ayokanmi Toluhi,[2] Nanven Maurice,[2] Emmanuel Couacy-Hymann,[6] Pam D. Luka,[2] Giovanni Cattoli,[1,10] and Charles E. Lamien[1]

Changing Epidemiological Landscape

1 Historical Context (Pre-2019)

Prior to 2019, only ASFV genotype I had been reported in West Africa, with relatively stable epidemiological patterns

2 Emergence (2020)

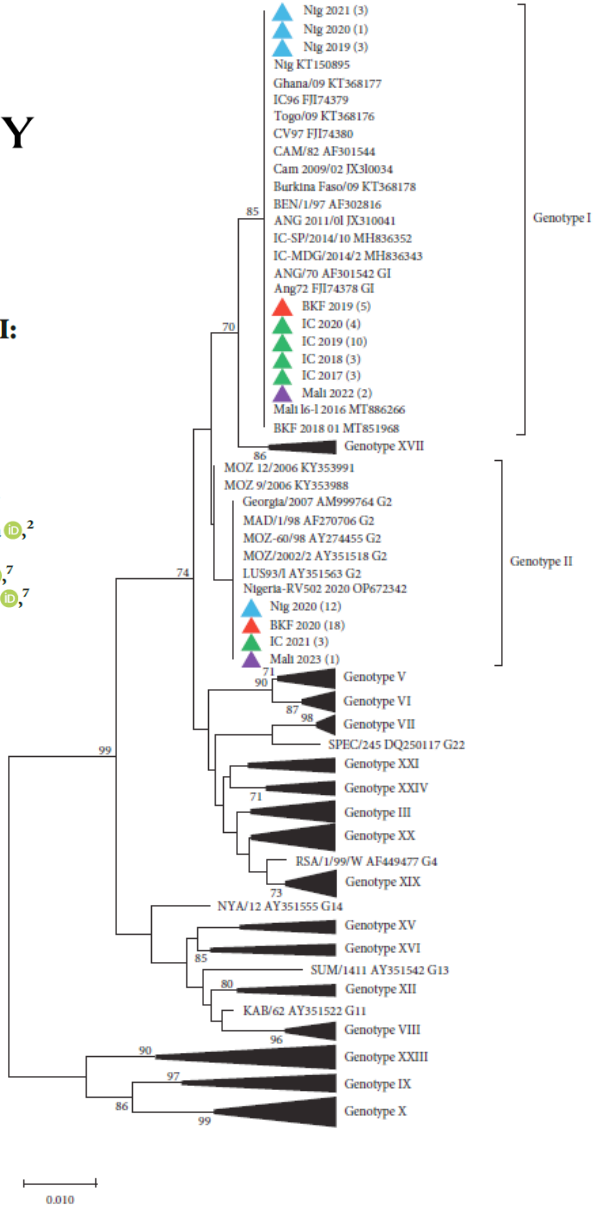
APHL's molecular surveillance detected the introduction of highly virulent genotype II into West Africa, representing a significant epidemiological shift

3 Multiple Detections

Genotype II was subsequently identified in several countries across the region, suggesting rapid spread

4 Current Situation

Both genotypes now co-circulate in parts of West Africa, creating a complex epidemiological landscape with varying clinical presentations

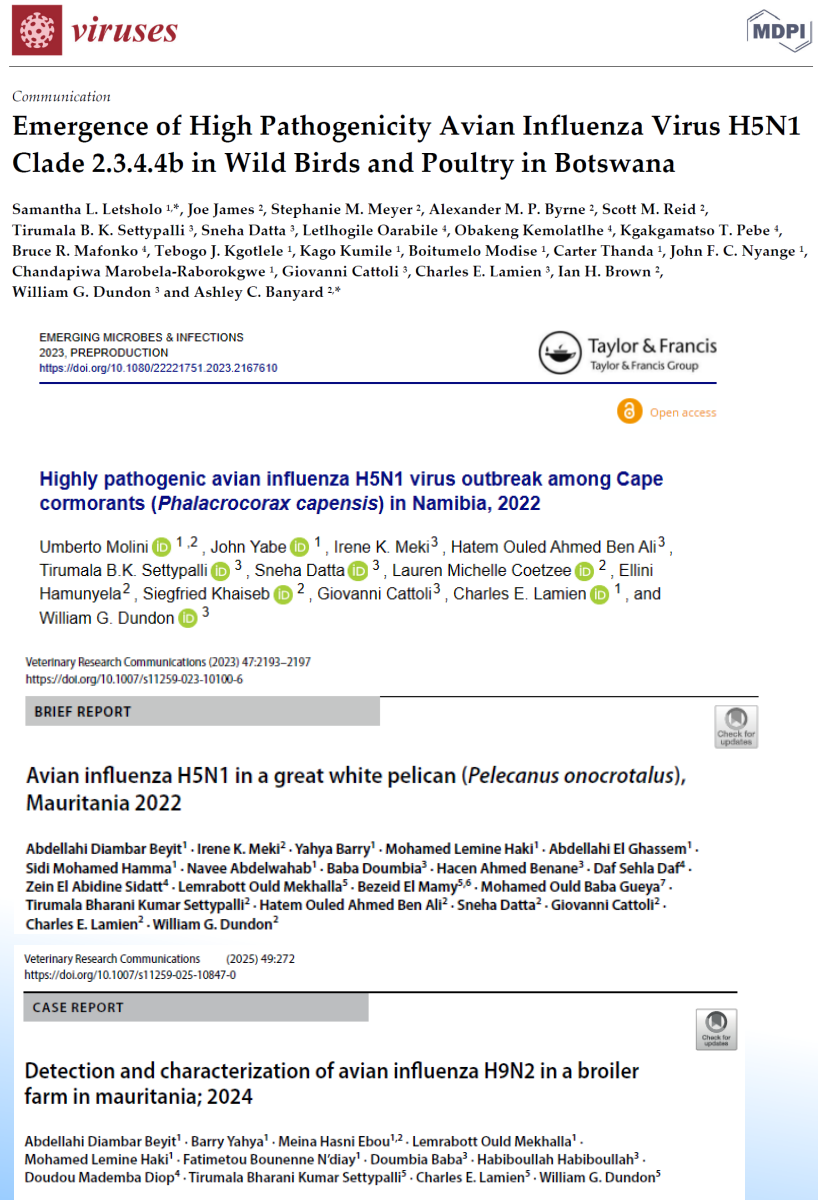


Thank You!

C.Lamien@iaea.org

Annex 4: Whole Genome Sequencing of Influenza and Rabies viruses

Avian influenza and Rabies



viruses

MDPI

Communication

Emergence of High Pathogenicity Avian Influenza Virus H5N1 Clade 2.3.4.4b in Wild Birds and Poultry in Botswana

Samantha L. Letsholo [1,*], Joe James [2], Stephanie M. Meyer [2], Alexander M. P. Byrne [2], Scott M. Reid [2], Tirumala B. K. Settypalli [3], Sneha Datta [3], Letlhogile Oarabile [4], Obakeng Kemolatlhe [4], Kgakgamatso T. Pebe [4], Bruce R. Mafonko [4], Tebogo J. Kgotlele [1], Kago Kumile [1], Boitumelo Modise [1], Carter Thanda [1], John F. C. Nyange [1], Chandapiwa Marobela-Raborokgwe [1], Giovanni Cattoli [3], Charles E. Lamien [3], Ian H. Brown [2], William G. Dundon [3] and Ashley C. Banyard [2,*]

EMERGING MICROBES & INFECTIONS
2023, PREPRODUCTION
https://doi.org/10.1080/22221751.2023.2167610

Taylor & Francis
Taylor & Francis Group

Open access

Highly pathogenic avian influenza H5N1 virus outbreak among Cape cormorants (*Phalacrocorax capensis*) in Namibia, 2022

Umberto Molini [1,2], John Yabe [1], Irene K. Meki [3], Hatem Ouled Ahmed Ben Ali [3], Tirumala B.K. Settypalli [3], Sneha Datta [3], Lauren Michelle Coetzee [2], Ellini Hamunyela [2], Siegfried Khaiseb [2], Giovanni Cattoli [3], Charles E. Lamien [1], and William G. Dundon [3]

Veterinary Research Communications (2023) 47:2193–2197
https://doi.org/10.1007/s11259-023-10100-6

BRIEF REPORT

Check for updates

Avian influenza H5N1 in a great white pelican (*Pelecanus onocrotalus*), Mauritania 2022

Abdellahi Diambar Beyit[1] · Irene K. Meki[2] · Yahya Barry[1] · Mohamed Lemine Haki[1] · Abdellahi El Ghassem[1] · Sidi Mohamed Hamma[1] · Navee Abdelwahab[1] · Baba Doumbia[3] · Hacen Ahmed Benane[3] · Daf Sehla Daf[4] · Zein El Abidine Sidatt[4] · Lemrabott Ould Mekhalla[5] · Bezeid El Mamy[5,6] · Mohamed Ould Baba Gueya[7] · Tirumala Bharani Kumar Settypalli[2] · Hatem Ouled Ahmed Ben Ali[2] · Sneha Datta[2] · Giovanni Cattoli[2] · Charles E. Lamien[2] · William G. Dundon[2]

Veterinary Research Communications (2025) 49:272
https://doi.org/10.1007/s11259-025-10847-0

CASE REPORT

Check for updates

Detection and characterization of avian influenza H9N2 in a broiler farm in mauritania; 2024

Abdellahi Diambar Beyit[1] · Barry Yahya[1] · Meina Hasni Ebou[1,2] · Lemrabott Ould Mekhalla[1] · Mohamed Lemine Haki[1] · Fatimetou Bounenne N'diay[1] · Doumbia Baba[3] · Habiboullah Habiboullah[3] · Doudou Mademba Diop[4] · Tirumala Bharani Kumar Settypalli[5] · Charles E. Lamien[5] · William G. Dundon[5]

400 to

600 samples

for diagnostic confirmation and molecular characterization

Emerging Microbes & Infections
2022, VOL. 11
https://doi.org/10.1080/22221751.2022.2043729

EMi

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LETTER

OPEN ACCESS

Check for updates

Highly pathogenic avian influenza (A/H5N1) virus outbreaks in Lesotho, May 2021

Mabusetsa R.J. Makalo [a], William G. Dundon [b], Tirumala B.K. Settypalli [b], Sneha Datta [b], Charles E. Lamien [b], Giovanni Cattoli [b], Moeketsi S. Phalatsi [c], Relebohile J. Lepheana [a], Mpaliseng Matlali [a], Relebohile G. Mahloane [a], Marosi Molomo [a] and Palesa C. Mphaka [a]

Emerging Microbes & Infections
2024, VOL. 13, 2321993 (5 pages)
https://doi.org/10.1080/22221751.2024.2321993

EMi

Taylor & Francis
Taylor & Francis Group

LETTER TO THE EDITOR

OPEN ACCESS

Check for updates

H7N6 highly pathogenic avian influenza in Mozambique, 2023

Iolanda Vieira Anahory Monjane[a], Hernâni Djedje[a], Esmeralda Tamele[a], Virgínia Nhabomba[a], Almiro Rogério Tivane[b], Zacarias Elias Massicame[c], Dercília Mudanisse Arone[c], Ambra Pastori[d], Alessio Bortolami [d], Isabella Monne [d], Timothy Woma[e], Charles E. Lamien [f] and William G. Dundon [f]

[a]Directorate of Animal Science, Central Veterinary Laboratory, Agrarian Research Institute of Mozambique, Maputo, Mozambique; [b]Mozambique One Health Secretariat, National Health Institute, Maputo, Mozambique; [c]Ministry of Agriculture and Rural Development, National Directorate of Livestock Development, Maputo, Mozambique; [d]Division of Comparative Biomedical Sciences (BSBIO), Istituto Zooprofilattico Sperimentale delle Venezie (IZSVe), Padova, Italy; [e]Emergency Centre for Transboundary Animal Diseases (ECTAD), Food and Agriculture Organization (FAO), Maputo, Mozambique; [f]Animal Production and Health Laboratory, IAEA Laboratories, Seibersdorf, Austria

frontiers | Frontiers in Veterinary Science

TYPE Case Report
PUBLISHED 18 June 2025
DOI 10.3389/fvets.2025.1524562

Check for updates

OPEN ACCESS

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University of Chile, Chile
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University of Veterinary and Animal Sciences, Pakistan

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Theophilus Odoom
theodoom@yahoo.com

Case Report: Molecular characterization of rabies virus transmitted from a dog to a bull in a livestock market in Ghana

Theophilus Odoom[1,2*], Richard Kwamena Abbiw[3], Joseph Kofi Abuh[4], Emmanuel Allegye-Cudjoe[4], Sherry Ama Mawuko Johnson[2*], William Tasiame[5], Daniel Arthur[1], Benita Anderson[4], Tirumala B. K. Settypalli[6], Charles E. Lamien[6] and William G. Dundon[6]

Countries supported recently

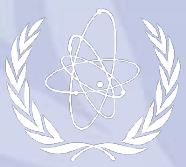
Avian Influenza & Other Avian Viruses

Botswana, Burkina Faso, Cameroon, Ethiopia, Ivory Coast, Kenya, Kuwait, Mauritania, Mozambique, Namibia, Nepal

Rabies Virus

Bangladesh, Cameroon, Ghana, Kenya, Lesotho, Nepal

THANK YOU



IAEA

Joint FAO/IAEA Centre

Nuclear Techniques in Food and Agriculture

Joint FAO/IAEA Centre
Nuclear Techniques in Food and Agriculture

Annex 5: Building capacity on PPR and small ruminant respiratory diseases in Africa – the VETLAB Network

Joint FAO/IAEA Centre
Nuclear Techniques in Food and Agriculture

Building capacity on PPR and small ruminant respiratory diseases in Africa – the VETLAB Network

Charles Euloge LAMIEN (c.lamien@iaea.org or CharlesEuloge.Lamien@fao.org)

Joint FAO-IAEA Centre

International Atomic Energy Agency, Vienna, Austria

APHL

The Animal Production and Health Laboratory (APHL) is a WOAH Collaborating Centre for ELISA and Molecular Techniques in Animal Disease Diagnosis

- We maintain good collaboration with several WOAH and FAO collaborating centres and Reference laboratories
- Trainers for all VETLAB training courses on disease diagnosis are mostly from WOAH and FAO collaborating centres and WOAH reference laboratories
- We support laboratories in implementing validated protocols to facilitate disease reporting to WOAH

APHL ACTIVITIES IN ANIMAL DISEASES CONTROL

Research and Innovation (nuclear, nuclear-related, and molecular techniques)

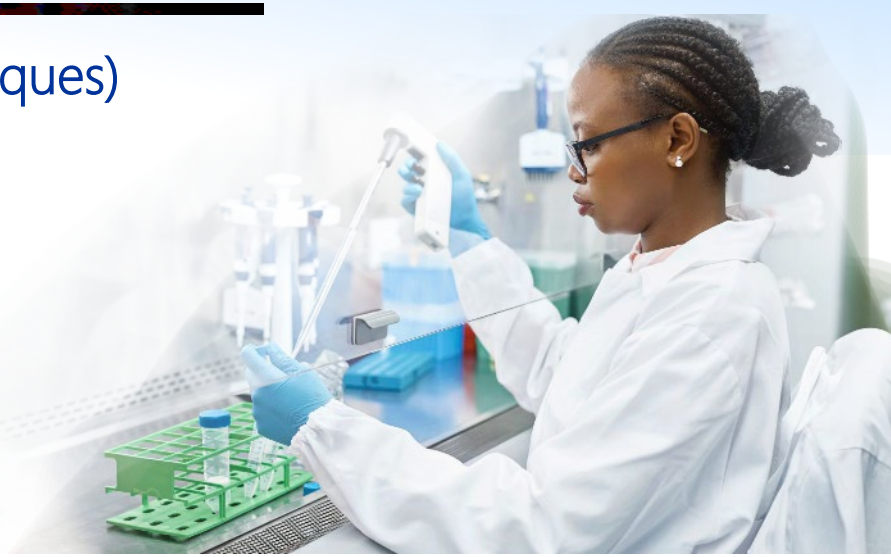
- Molecular and serological assays;
- Sequencing and next-generation sequencing
- Molecular epidemiological studies

Capacity building and technology transfer

- VETLAB Network
- TCPs
- CRPs
- On-site training
- Fellowship training
- Group trainings

Networking, data sharing and services

- The VETLAB Network
- Service (ring trials, shipment, calibration)



Capacity building: The VETLAB Network

Information, Knowledge and Experience Exchange

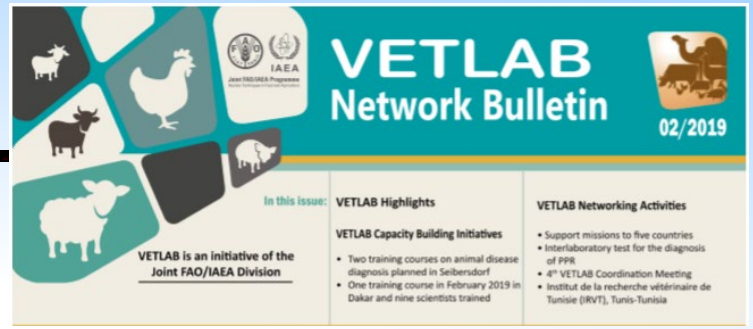
Third joint coordination meeting for Africa and Asia (August 2018)

Fourth joint coordination meeting for Africa and Asia (August 2019)

Fifth joint coordination meeting for Africa and Asia (November 2021), Virtual meeting

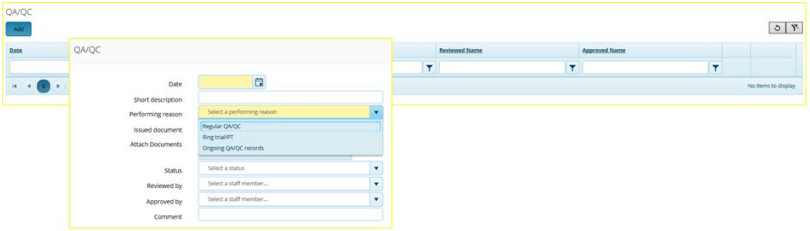
Fourth joint coordination meeting for Africa and Asia (August 2022)

7th joint coordination meeting for Africa and Asia (August 2023)



Countries' contribution to the VETLAB Bulletin

Indonesia, Mongolia



iVetNet – Information platform of APH

Support the implementation of ISO 17025

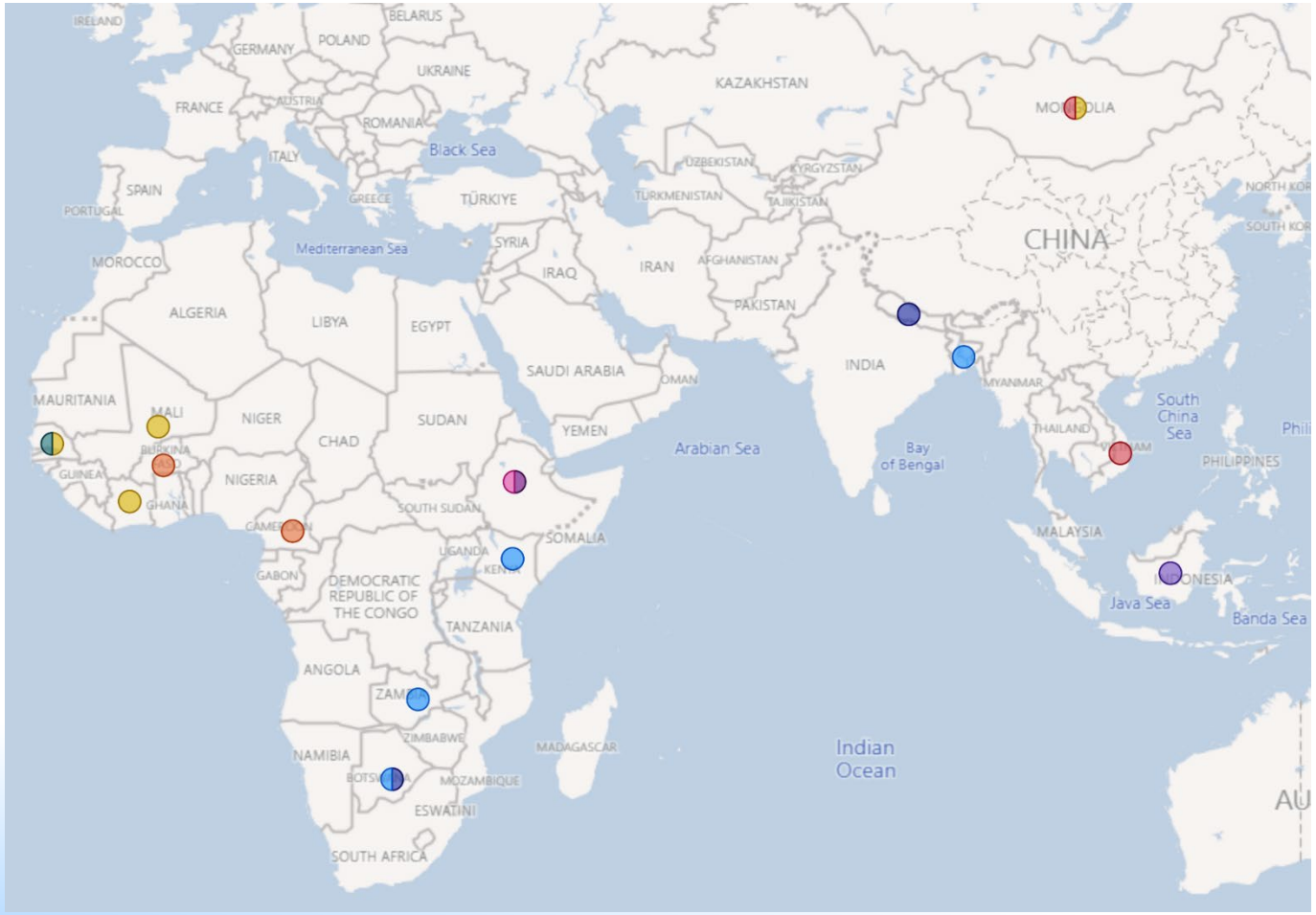
Increasing Awareness during VETLAB Director's Meetings

- March 2015 (1st directors meeting): Information sharing about the ongoing APHL activities on PPR, and other respiratory diseases of ruminants. Support offered to VETLAB partners for disease diagnosis and outbreak investigations (Africa) and laboratory preparedness (Asia).
- August 2016: a session dedicated to the syndromic surveillance of PPR and respiratory diseases of ruminants.
- August 2017 sessions dedicated to the syndromic surveillance, and bioinformatics tools for respiratory diseases.
- August 2018: a session on collaborative research with VETLAB partners included, differential diagnosis, and molecular epidemiology of PPR and capripox.

Increasing Awareness during VETLAB Director's Meetings

- August 2019: Session on PPR global eradication program for VETLAB partner laboratories preparedness
- November 2021. A session dedicated APHL R&D and initiatives to support animal and zoonotic diseases surveillance and control covered PPR.
- August 2022. a session dedicated to VETLAB partners' achievements and challenges in Transboundary animal diseases diagnosis and surveillance: focus on PPR and other TADs.
- August 2023. Presentation and discussion of Annual PPR PT results

Capacity Building



PPR-related Field Support Missions

- 6 in Asia between 2015 and 2020
- 12 in Africa between 2011 and 2018
- Direct detection and differential diagnosis tools were transferred

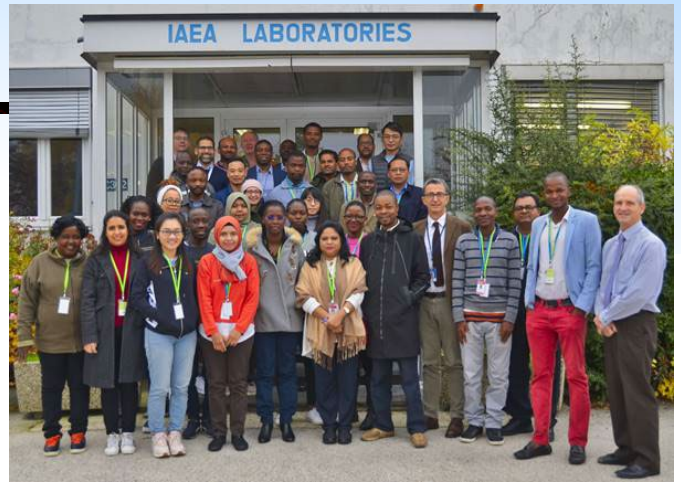
Botswana 2016

Senegal 2019

Capacity Building

17 courses between 2013 and 2023 for Africa

Title	Year	Venue	Targeted audience
workshop on the prevention and control of PPR in the Southern African Development Community (SADC) region	2013	Tanzania	Africa
Practical Approaches for Introducing New Assays for Routine Use in Veterinary Diagnostics Laboratories	2014	Austria	Africa and Asia
Transboundary Animal Diseases Diagnosis: Sequencing and Bioinformatics Analysis of Animal Pathogen Genomes	2015	Austria	Africa and Asia
Transboundary Animal Diseases Diagnosis: Respiratory disease of small ruminants (PPR, CCPP, Pasteurella and Capripox)	2016	Austria	Africa and Asia
Transboundary Animal Diseases Diagnoses: Early Detection and Characterization	2017	Ethiopia	Africa
Transboundary Animal Diseases Diagnoses: Early Detection and Characterization	2017	Austria	Africa and Asia
Sequencing and Bioinformatics Analysis of Animal Pathogen Genomes"	2018	Austria	Africa and Asia



Austria 2018

Austria 2019

Capacity Building

17 courses between 2013 and 2023 for Africa

Title	Year	Venue	Targeted audience
Early Detection and Differentiation of Animal and Zoonotic Diseases" Support by OFID funding through TC	2018	Austria	Asia
Detection of Multiple Pathogens for the Differential diagnosis and Syndromic Surveillance (PPR, Capripox and ASF)	2019	Austria	Africa and Asia
Validation, Implementation, Monitoring and Quality Control for Molecular Assays	2019	Austria	Africa and Asia
Virtual Training Course on Sequencing and Bioinformatics	2021	Online	Africa and Asia
Early Diagnosis and Pathogen Characterization with a focus on Next-generation sequencing technology	2022	Austria	Africa and Asia
Detection and Differential Diagnosis of PPR in Small Ruminants and Other Non-Conventional Hosts	2022	Austria	Africa and Asia
Training Course on Detection and Differential Diagnosis of PPR and other Small Ruminants respiratory diseases	2023	Tunisia	Africa
PPR Laboratory Diagnosis Workshop (FAO PPR secretariat)	2023	Jordan	Asia and Egypt
Detection and Differential Diagnosis of PPR and other Small Ruminants Respiratory Diseases	2023	Tunisia	Africa
Detection and differential diagnosis of PPR in Small Ruminants (FAO PPR secretariat)	2023	Tanzania	Tanzania

Austria 2022

Tunisia 2023

Capacity Building

Fellowship and long-term training

Several fellows trained for 1 to 3 months on molecular diagnosis and sequencing

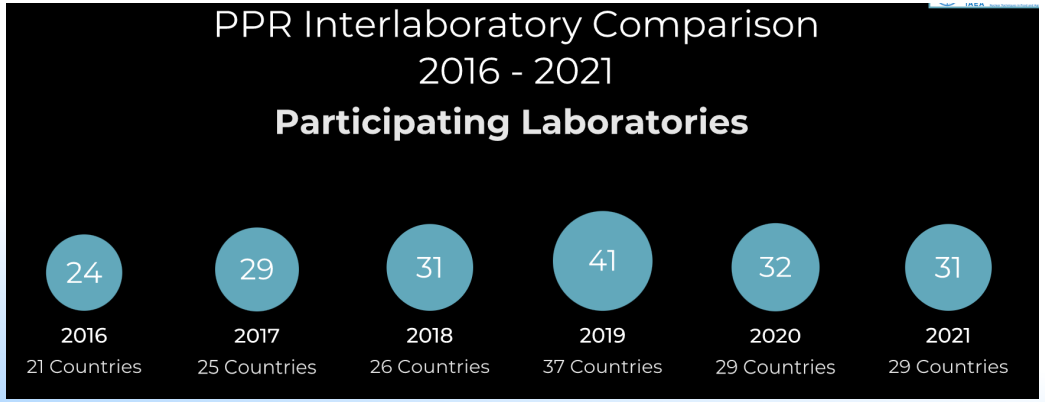
- Botswana
- Lesotho
- Zambia
- Ethiopia
- Burundi
- Morocco
- Senegal
- Tunisia

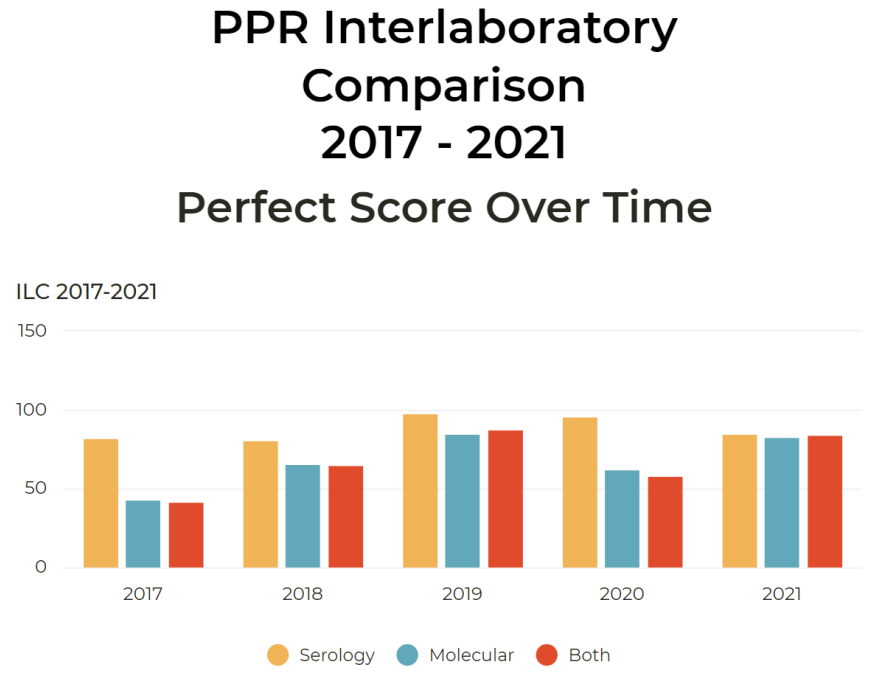
Harmonizing approach to PPR and small respiratory diseases laboratory diagnoses

Distribution of laboratory SOPs from international reference laboratories or from the Animal Production and Health Laboratory (CJN, FAO/IAEA)

- DNA extraction
- PCR-based screening and confirmatory tests
- purification of PCR products for sequencing
- virus gene sequencing protocols

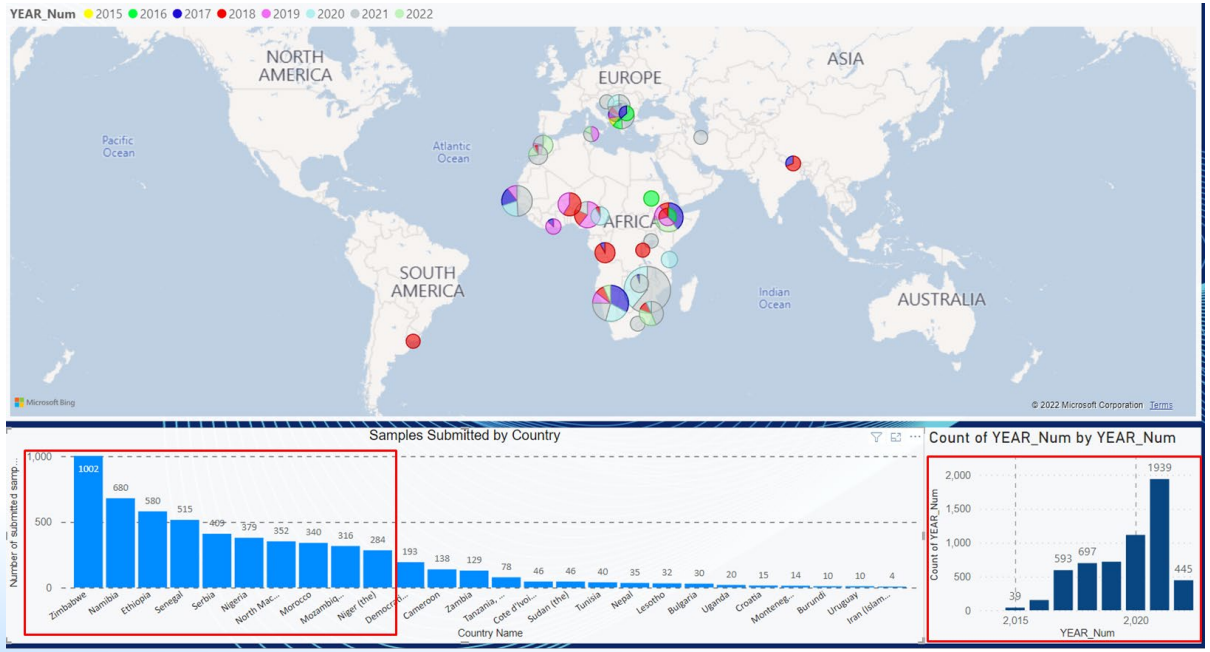
- Distribution of positive controls to up request
- Inter-laboratory comparison for PPR (Serology and Molecular)





Support to the molecular characterization of PPRV and other respiratory diseases of small ruminants

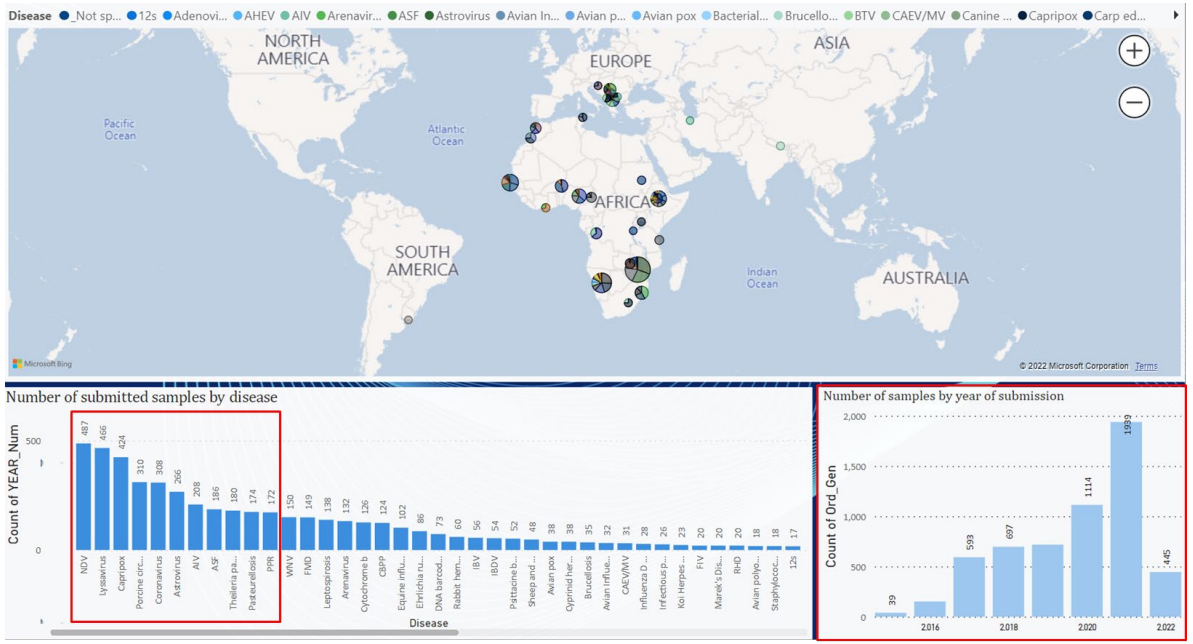
SANGER SEQUENCING SERVICE OF APH - NUMBER OF SAMPLE SUBMISSIONS BY COUNTRY



The top 10 submitting countries

Submissions by year

SANGER SEQUENCING SERVICE OF APH - NUMBER OF SAMPLE SUBMISSIONS BY DISEASE

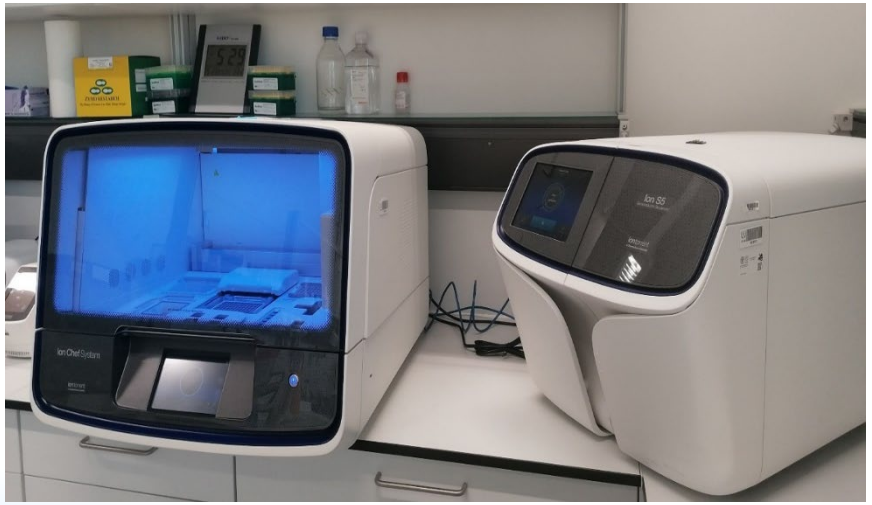


The top 10 diseases of ineterest

Submissions by year

Support to the molecular characterization of PPRV and other respiratory diseases of small ruminants

Targeted and whole genome sequencing



Ion S5

Minion Nanopore

PacBio (Sequel II instrument)

Support to the molecular characterization of PPRV and other respiratory diseases of small ruminants

Support Molecular Characterization of PPRV (2020-2023)

- Burkina (Targeted sequencing and WGS)
- Cameroon (Targeted sequencing and WGS)
- Ghana (Targeted sequencing and WGS)
- Guinea (Targeted sequencing and WGS)
- Ivory Coast (Targeted sequencing and WGS)
- Mauritania (Targeted sequencing and WGS)
- Nigeria (Targeted sequencing and WGS)
- Tunisia (Targeted sequencing and WGS)

Lessons learned

Laboratories are undoubtedly able to diagnose PPR

- At present, many labs managed to detect and report PPR themselves
- Laboratories usually contact APHL (and FAO/WOAH reference laboratories) mainly for confirmation and further characterization
- For newly affected countries, quick support with SOPs and the availability of appropriate control is critical
- A few labs may need additional help with reagents to implement the tests

Further effort needed for differential diagnosis and Serology:

- In some cases, samples with suspected lesions were negative for PPRV
- Serology for wildlife still need some validation
- No DIVA serological method is available

FAO/IAEA Agriculture and Biotechnology Laboratory

Joint FAO/IAEA Centre
Nuclear Techniques in Food and Agriculture

Animal Production and Health
Sub-programme

Thank You