Quality Control of PPR & FMD Vaccines

Dr Charles BODJO, Ag Director AU-PANVAC

AU-PANVAC's Mission & Mandates

MISSION: "To promote the use of **GOOD QUALITY VACCINES** and **DIAGNOSTIC REAGENTS** for the control, eradication and surveillance of animal diseases in Africa."

MANDATES

1. **INDEPENDENT QUALITY CONTROL** of vet. vaccines.
2. Development and Production of **DIAGNOSTICS**
3. **TRANSFER OF VACCINE PRODUCTION TECHNOLOGIES**
4. **STANDARDIZATION** of production and **HARMONIZATION** of the quality control techniques in Africa
5. **CAPACITY BUILDING** to veterinary laboratories.
6. **AUDITING AND CERTIFICATION of Vaccine Manufacturing Facilities** *in collaboration with National Regulatory Authorities in Africa.*

International Recognitions of AU-PANVAC

World Organisation for Animal Health
Founded as OIE

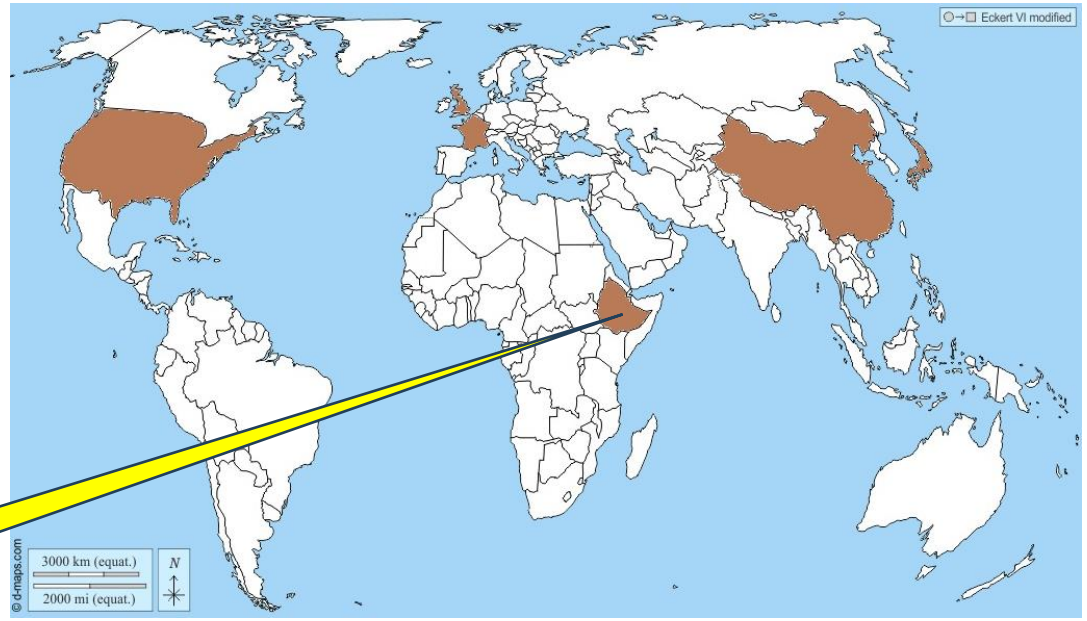
- **Collaborating Center For Quality Control of Veterinary Vaccine** (*WOAH Gen. Assembly Resolution 32, Paris, May 2013*)

Food and Agriculture Organization of the United Nations

- **Reference Centre for Technical Assistance in Quality Control of Veterinary Vaccine** *(11th May, FAO Rome, 2015)*

GF-TADs
GLOBAL FRAMEWORK FOR THE PROGRESSIVE CONTROL OF TRANSBOUNDARY ANIMAL DISEASES
Food and Agriculture Organization of the United Nations
World Organisation for Animal Health
Founded as OIE

- **Rinderpest Holding Facility (RHF) for Africa** *(among five other RHFs: US, UK, France, China & Japan)*



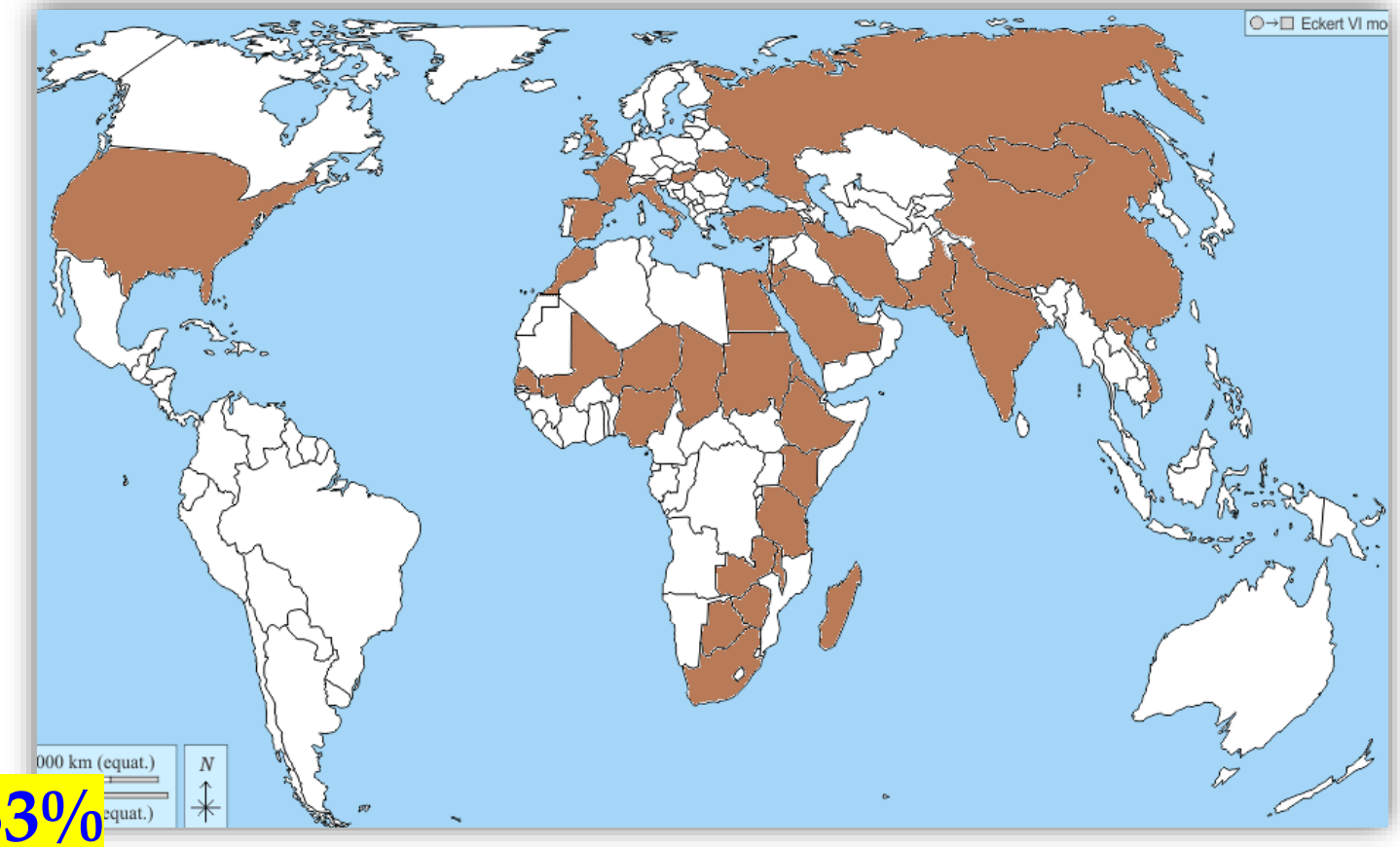
AU-PANVAC
ETHIOPIA.

African Union
Pan African Veterinary Vaccine Centre
AU-PANVAC

Vaccine Quality Control Activities

❑ African Manufacturers (22): 67%

- Egypt (**VSRVI, MEVAC**) & Morocco (**MCI & BIOPHARMA**),
- Senegal (**ISRA**), Mali (**LCV**), Niger (**LABOCEL**) & Nigeria (**NVRI**)
- Cameroun (**LANAVET**), Chad (**IRED**)
- Ethiopia (**NVI**) & Kenya (**KEVEVAPI, INNOVA**), Tanzania (**TVI, HESTER Africa**)
- Botswana (**BVI**), South Africa (**OBP, MSD**), Madagascar (**IMVAVET**), Malawi (**CTTBD**), Zambia (**CVRI**), Zimbabwe (**CVL**)



❑ Manufacturers out of Africa (23): 33%

France, Spain, UK, Hungary (Boehringer, CEVA, ZOETIS, HIPRA, Vaxxinova), Kazakhstan (BIOTRON), Pakistan, Russia (ARRIAH), Turkey (DOLVET, VETAL), Jordan (JOVAC), Iran (VIRA Vaccine, RAZIVSRI), India (Brilliant Biopharma, Biomed Indian Immunologicals, Ventri), Ukraine (Biotestlab), USA (Zoetis, CEVA), Vietnam (AVAC), China (SINOPHARM ANIMAL HEATH CORPORATION, SHAN DONG LVDU, TECON BIOLOGY JOINT STOCK COMPANY), Saudi Arabia (IBRIZ)

Vaccine Quality Control Activities…

- More than **50 types of Vet. Vaccines (for all animal species)** tested
- ≈ **300-400 batches** received annually

≈ 2 Billion doses of vaccines to protect all animal species

- Required 4 Weeks Test/Batch
- Publication of batches passed QC tests on the AU-PANVAC website:

WWW.AUPANVAC.ORG

African Union
Pan African Veterinary Vaccine Centre
AU-PANVAC

Current PPR vaccines

- **PPRV Nigeria 75/1 Strain** (*Diallo et al. 1989; Diallo 2004*): Lineage II, **Most widely used in the world (ONLY currently used in AFRICA)**
- **PPRV Sungri/96** (*Singh et al. 2009; Saravanan et al. 2010*): Lineage IV, **used only in India**
- **Duration of immunity**: **immunity for at least 3 years**.
- **Vaccine produced in freeze-dried form,**
  - Heat sensitive.
  - Need to **maintain cold chain** to guarantee vaccine efficacy for field use.

Peste des Petits Ruminants Vaccine (Nigerian Strain 75/1) Confers Protection for at Least 3 Years in Sheep and Goats

Aamer Bin Zahur[1], Hamid Irshad[1*], Aman Ullah[1], Muhammad Afzal[2], Asma Latif[1], Riasat Wasee Ullah[1], Umer Farooq[1], Muhammad Humayoon Samo[2], Muhammad Jahangir[1], Giancarlo Ferrari[3], Manzoor Hussain[2], M. Munir Ahmad[4]

[1]Animal Health Research Laboratories, Animal Sciences Institute, National Agricultural Research Centre, Islamabad, Pakistan
[2]FAO-UN Pakistan (GCP/PAK/127/USA) NARC, Park Road, Islamabad, Pakistan
[3]AGAH, FAO (Hq), Rome, Italy
[4]Divisional Diagnostic Laboratory, Livestock and Dairy Development Department, Multan, Pakistan
Email: *hamidirshad@hotmail.com

Received July 2014

Abstract

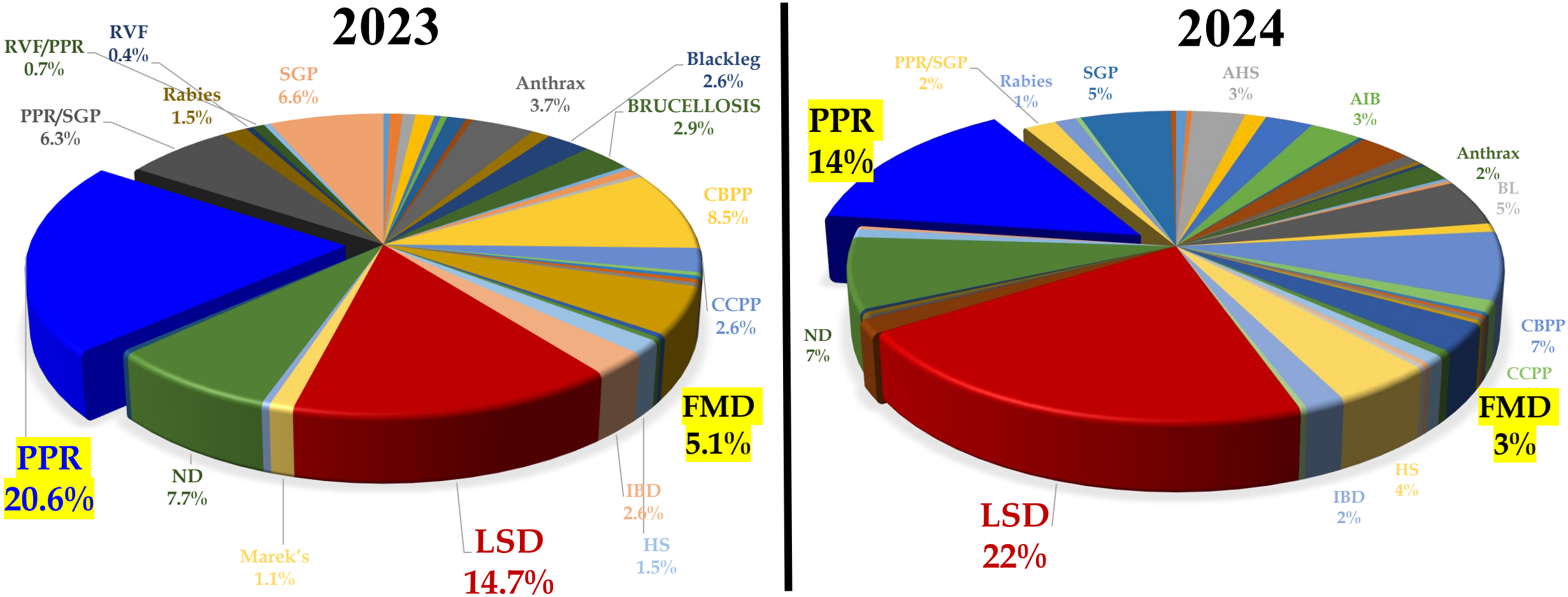
The present study reports the duration of immunity and protective efficacy of Peste des Petits Ruminants (PPR) vaccine (Nigerian strain 75/1) in sheep and goats. A total of 105 sheep and goats were divided into three groups A, B and C. Group A received normal recommended dose (1.0 ml) of PPR vaccine, group B received half dose (0.5 ml) of PPR vaccine and group C was kept as unvaccinated control group in contact with vaccinated animals. The post vaccination dynamics of antibodies against PPR virus was studied. It was found that significant antibody titres persisted for 3 years post vaccination in sheep and goats vaccinated with either full dose or half dose of PPR vaccine. The challenge protection studies were carried out in experimental animals at 24 and 36 month post vaccination. The vaccinates withstood challenge and were found completely resistant clinically and virologically to virulent PPR virus for 24 and 36 months post vaccination. The unvaccinated control animals developed typical clinical signs of PPR and the challenged virus was detected in ocular, nasal and oral secretions of these animals. This study demonstrated that a single immunization with PPR vaccine conferred solid protection in sheep and goats for 3 years.

Keywords

PPR Vaccine, Small Ruminants

African Union Pan African Veterinary Vaccine Centre AU-PANVAC

Proportion of PPR Vaccines



PPR vaccine was the major vaccine tested throughout the years, however this seems to be declined in favor of LSD vaccines

AU-PANVAC

PPR Vaccines Quality Control Pass Rate

Year	Batches received	Pass Rate (%)
2020	61	96.7
2021	78	98.7
2022	88	84.1
2023	43	80
2024	70	93.3

Testing of PPR Thermotolerant Vaccine

- In December 2017, FAO and WOAH PPR-Secretariat, with the support of the Global Alliance for Livestock Veterinary Medicines (GALVmed), organised a workshop on PPR thermotolerant vaccines at the FAO Headquarters in Rome:

- Define criteria for evaluation of PPR Thermotolerant vaccine

- Proposal to use an average temperature of **40°C** to evaluate thermotolerant PPR vaccines

Standard for PPR Thermotolerant Vaccine

❑ Define Criteria/Standards for Testing PPR Thermotolerant Vaccine

(1) **Titer ≥ 2.5 log10** (TCID50/ml) after incubation **40°C/Day-5**

(2) **Titer Loss** after post exposure should be **≤ 1 log10**

❑ For comparison with other viral vaccines:

- *Rindertest Thermostable vaccine:* **Titer ≥ 2.5 log10** (TCID50/ml) after incubation **45°C/14 Days** & **Titer loss ≤ 1.6 Log10**

- *Measles-Mumps vaccine:* **Titer ≥ 3 log10** (TCID50/ml) after incubation **37°C/7Days** & **Titer loss ≤ 1 Log10**

Standard for PPR Thermotolerant Vaccine

viruses

MDPI

Article

Peste des Petits Ruminants Vaccine: Criteria for Assessing Its Thermotolerance

Charles S. Bodjo [1,*], Hassen Belay Gelaw [1], Zione D. Luhanga [1], Yebechaye Degefa Tessema [1], Jean-De-Dieu Baziki [1], Cisse R. Moustapha Boukary [1], Gelagay Ayelet Melesse [1], Ethel Chitsungo [1], Nick Nwankpa [1,2], Simon Kihu [2], Felix Njeumi [3], Satya Parida [3] and Adama Diallo [4]

1 African Union-Pan African Veterinary Vaccine Centre (AU-PANVAC), Debre Zeit P.O. Box 1746, Ethiopia; hasseng@africanunion.org (H.B.G.); zioneluhanga0@gmail.com (Z.D.L.)
2 World Organisation for Animal Health (WOAH), Sub-Regional Representation for Eastern Africa, Nairobi P.O. Box 19687, Kenya; s.kihu@woah.org
3 Food and Agriculture Organization of the United Nations (FAO), Viale delle Terme di Caracalla, 00153 Rome, Italy; felix.njeumi@fao.org (F.N.); satya.parida@fao.org (S.P.)
4 Independent Researcher, Hahngasse 24-26/02 07, 1090 Vienna, Austria; a.diallob@outlook.com
* Correspondence: bodjoc@africanunion.org

Published: 22 August 2025

https://doi.org/10.3390/v17091151

Criteria for Testing Thermotolerant PPR Vaccine Submitted to the WOAH Biological Commission

- Presentation on the criteria and the Standard Operating Procedure (SOP) for testing thermotolerant PPR vaccines was made on Sept. 2025 to WOAH Biological Commission.

- The WOAH Biological Commission agreed to:

  - Incorporate the criteria for assessing thermotolerant of PPR vaccines in the Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, Chapter 3.8.8 (Section C.2.2.4 or C.2.3.3 on batch release).

  - Detailed step-by-step SOP for testing thermotolerant PPR vaccines should be prepared and maintained through available platforms such as the WOAH PPR Reference Laboratory Network website."

Development of PPR Diagnostics

PPR-bELISA (*Archives of Virology, 2018)*

Archives of Virology
https://doi.org/10.1007/s00705-018-3782-1

ORIGINAL ARTICLE

Development and validation of an epitope-blocking ELISA using an anti-haemagglutinin monoclonal antibody for specific detection of antibodies in sheep and goat sera directed against peste des petits ruminants virus

Sanne Charles Bodjo[1] · Jean-de-Dieu Baziki[1] · Nick Nwankpa[1] · Ethel Chitsungo[1] · Yao Mathurin Koffi[2] · Emmanuel Couacy-Hymann[2] · Mariame Diop[3] · Daniel Gizaw[4] · Idris Badri Adam Tajelser[5] · Mamadou Lelenta[6] · Adama Diallo[7] · Karim Tounkara[8]

Received: 29 June 2017 / Accepted: 7 February 2018

Assay Performances:

Specificity: 99%

Sensitivity: 93.74%

Evaluation ELISAs Cross reactivity against CDV Antibodies

Sera from Dogs (*immunized with CDV vaccine*) tested with ID Screen® PPR Competition (IDVET) and PPR-bELISA (PANVAC):

	ID Screen® PPR Competition (IDvet)	**PPR-bELISA** (PANVAC)
% Positive	**12/63**	**0/63**
% Doutfull	**7/63**	**0/63**
Negative	**44/63**	**63/63**

Goats Immunized with CDV Vaccine

Sera from Goats immunized with CDV vaccine tested with PPR-cELISA (IDVET) and PPR-bELISA (PANVAC)

❑ Day 0

SAMPLE TYPE	ID Screen cELISA (% PI)	PANVAC bELISA (% PI)
DO-691	72.47 (Neg)	-0.37 (Neg)
DO-692	57.73 (Neg)	6.41 (Neg)
DO-685	60.15 (Neg)	-7.44 (Neg)
DO-686	51.40 (Neg)	-11.24 (Neg)
DO-696	71.18 (Neg)	0.90 (Neg)

❑ Day 31

SAMPLE TYPE	ID Screen cELISA (% PI)	PANVAC bELISA (% PI)
D31-691	67.38 (Neg)	-7.05 (Neg)
D31-692	68.27 (Neg)	-5.34 (Neg)
D31-685	38.59 (Pos)	-0.02 (Neg)
D31-686	25.58 (Pos)	9.19 (Neg)
D31-696	68.27 (Neg)	6.32 (Neg)

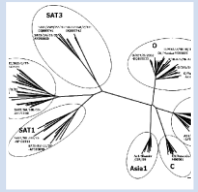
False positives results can occur with ID Screen® PPR Competition (IDvet)

African Union Pan African Veterinary Vaccine Centre AU-PANVAC

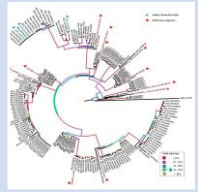
Quality Control of FMD Vaccines & Challenges

FMD is an important constraint to livestock with impact on global trade.

Vaccination is a critical component of FMD control



7 serotypes of FMDV (O, A, C, SAT1, SAT2, SAT3, and Asia1) and multiple subtypes are currently recognized

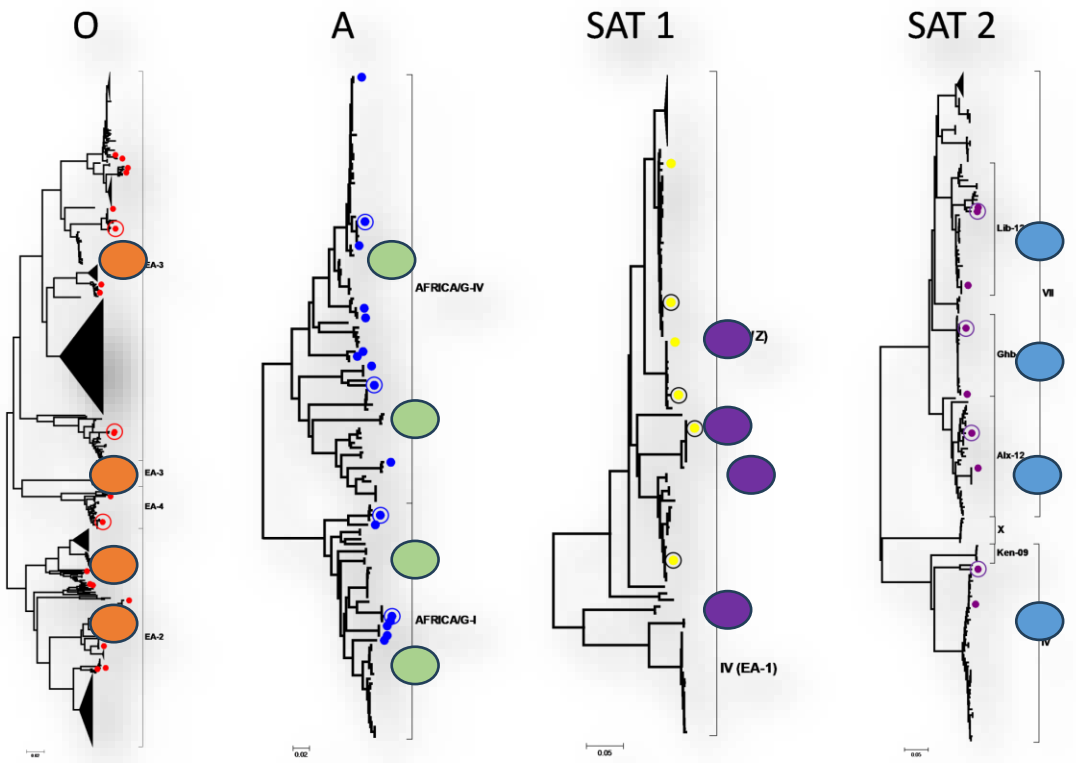


Constant evolving of antigenic diversity of FMD virus require that vaccine strains **BE MATCHED** with field strains.

Development of FMDV Reference Panel for Vaccine Quality Control

African Union Pan African Veterinary Vaccine Centre AU-PANVAC

Reference Panels for Quality Control of FMD



Selection of a panel of **16 FMD Viruses** (**O**, **A**, **SAT1** & **SAT2**) among O = 709; A = 138; SAT 1 = 143; SAT 2 = 190 from the repository WRLFMD covering the genetic diversity circulating in **Eastern African Region (10 countries)** and used for VNT

African Union — Pan African Veterinary Vaccine Centre — AU-PANVAC

East African Region FMD Virus Panel

16 VIRUSES SELECTED

Serotype A	Serotype O	Serotype SAT 1	Serotype SAT 2
SUD/9/2018	ETH/4/2015	TAN/22/2013	ETH/16/2015
ETH/2/2018	ETH/9/2019	KEN/10/2013	KEN/19/2017
UGA/28/2019	ETH/30/2016	TAN/27/2012	EGY/1/2018
ETH/19/2019	KEN/4/2018	TAN/22/2014	ETH/11/2018

Immunogenicity Trials on the Reference Panel

- Sera from vaccinated animals with 13 batches of commercial FMD vaccines supplying of quadrivalent FMD vaccine O, A, SAT 1, and SAT 2.
- Coloured boxes show sera from vaccinated animal with FMD vaccines that induced ≥1.5 log10 antibody responses in ≥ 60% of cattle
- Grey colour indicates positive responses at day 0 results were not provided to confirm the validity of the trial).

Results showed variability in vaccine potency and some batches failed to provide adequate cross-protection

Vaccine Batch	Trial Location[a]	Serotypes Included	Time between manufacture and use (months)	No. of Cattle Vaccinated (and of unvaccinated controls where present)	Score[c]			
					O	A	SAT 1	SAT 2
1	TPI (F)	O, A, SAT 1, SAT 2	5	5				
2	TPI (F)	O, A, SAT 1, SAT 2	8	10				
2b	TPI (F)	O, A, SAT 1, SAT 2	8	5				
3	AU-P (E)	O, A, SAT 1, SAT 2	6	10(2)[b]				
3b	AU-P (E)	O, A, SAT 1, SAT 2	6					
4	AU-P (E)	O, A, SAT 1, SAT 2	6	10(2)[b]				
4b	AU-P (E)	O, A, SAT 1, SAT 2	6					
5	AU-P (E)	O, A, SAT 1, SAT 2	10	10(2)[b]				
5b	AU-P (E)	O, A, SAT 1, SAT 2	10					
6	Other (F)	O, A, SAT 1, SAT 2	ND[d]	5				
7	Other (F)	O, A, SAT 1, SAT 2	ND	5				
8	Other (F)	O, A, SAT 1, SAT 2	ND	5				
9	Producer (E)	O, A, SAT 1, SAT 2	13	5[b]				
9b	Producer (E)	O, A, SAT 1, SAT 2	13					
10	Producer (E)	O, A, SAT 1, SAT 2	2	6				
11	TPI (F)	O, A, SAT 2	17	5				
12	Other (F)	O, A, SAT 2	6	5[b]				
12b	Other (F)	O, A, SAT 2	6					
13	TPI (F)	SAT 1, SAT 2	2	10				
13b	TPI (F)	SAT 1, SAT 2	2	5				

African Union — Pan African Veterinary Vaccine Centre — AU-PANVAC

Publications on East African FMD Virus Panel

Publication 1 : 2021

Rev. Sci. Tech. Off. Int. Epiz., **40** (1)

A.B. Ludi, V. Mioulet, L. Bakkali Kassimi, D.J. Lefebvre, K. De Clercq, E. Chitsungo, N. Nwankpa, W. Vosloo, D.J. Paton & D.P. King

https://doi.org/10.20506/rst.40.1.3221

Publication 2: 2025

npj | vaccines

Article

Published in partnership with the Sealy Institute for Vaccine Sciences

https://doi.org/10.1038/s41541-025-01128-7

An antigen panel to assess the regional relevance of foot and mouth disease vaccines

Check for updates

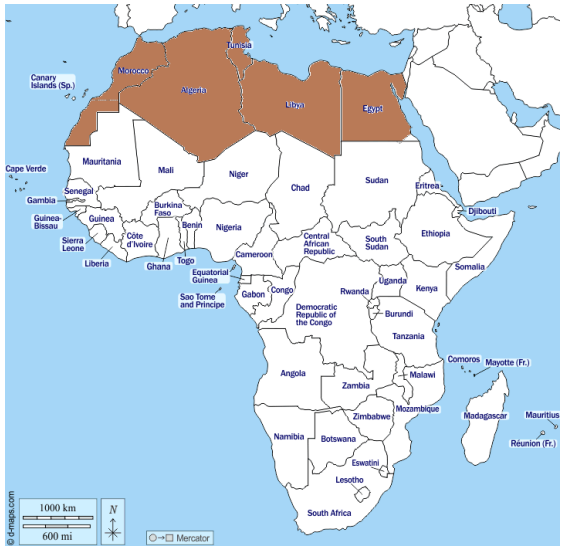
David J. Paton[1] ✉, Ginette Wilsden[1], Clare FJ Browning[1], Efrem A. Foglia[2], Antonello Di Nardo[1], Nick J. Knowles[1], Jemma Wadsworth[1], Simon Gubbins[1], Ethel Chitsungo[3], Cisse Rahamatou Moustapha Boukary[3], Gelagay Ayelet[3], Charles S. Bodjo[3], Nick Nwankpa[3], Emiliana Brocchi[2], Santina Grazioli[2], Anna Ludi[1] & Donald P. King[1]

https://doi.org/10.1038/s41541-025-01128-7

African Union — Pan African Veterinary Vaccine Centre — AU-PANVAC

Future Direction

- Developing similar approach of FMD virus panel for:



Northern

Western

Central

Southern

- Exploration of guinea pigs as an alternative model for vaccine testing.

AU-PANVAC New Facility Complex

- Fully supported by **US - DTRA**

- Enhance Biosafety and Biosecurity measures
- Expand Laboratory operation Training & capacity

- Groundbreaking Ceremony held on **21st Feb. 2024** & presided by H.E Excellency Moussa Faki Mahamat, Chairperson of AUC

African Union — Pan African Veterinary Vaccine Centre — AU-PANVAC

Construction AU-PANVAC New Lab. Complex

- **Commencement of Construction work March 2026**

Construction site visite by His Excellency Moses Vilakati, Commissioner for Agriculture, Rural Development, Blue economy, and Sustainable Environment (ARBE)

- **Construction completion expected in 2028**

AU-PANVAC !

ADDING VALUE TO ANIMAL HEALTH AND HUMAN LIVES!!

WWW.AUPANVAC.ORG