



Technical Report Workshop on Emergency Vaccination against Foot-and-Mouth Disease

Rio de Janeiro, Brazil - 24-25 March 2026



TECHNICAL REPORT

Workshop on Emergency Vaccination against Foot-and-Mouth Disease

PANAFTOSA/VPH – PAHO/WHO
Rio de Janeiro, Brazil | 24-25 March 2026

INTRODUCTION

Within the framework of the Workshop on Emergency Vaccination against Foot-and-Mouth Disease, held in Rio de Janeiro from March 24 to 25, 2026, a group of international specialists was convened to analyze, from a comprehensive perspective, the main technical, epidemiological, and operational components associated with the use of emergency vaccination as a control tool in the face of potential outbreaks of foot-and-mouth disease in the region.

The workshop was financially supported by the Regional Bank of Antigens for Foot-and-Mouth Disease (BANVACO) and coordinated by the Pan American Center for Foot-and-Mouth Disease and Veterinary Public Health (PANAFTOSA), of the Pan American Health Organization (PAHO).

The event was structured in plenary sessions and three specialized working groups, which addressed the main axes of emergency vaccination in a complementary manner:

- **Group 1 – Laboratory:** Focused on aspects related to the quality, potency, evaluation, and monitoring of vaccines and antigens for use in emergency situations.
- **Group 2 – Modeling and Risk Analysis:** Oriented towards risk characterization, selection of priority strains for BANVACO, and estimation of antigen and vaccine needs based on the vaccination strategies considered.
- **Group 3 – Operational:** Focused on the implementation of emergency vaccination in the field, including logistical, operational, traceability, and post-vaccination surveillance aspects.

The integrated approach of these three components allowed for the construction of an articulated vision that links the scientific basis, analytical support, and practical feasibility essential elements for decision-making and application in emergency situations.

The results of the workshop aim to contribute to strengthening the actions foreseen in the 2026-2030 Action Plan of the Hemispheric Program for the Eradication of Foot-and-Mouth Disease (PHEFA), as well as to provide relevant technical inputs for regional discussion within the framework of the Pre-COSALFA 52 Seminar and for the consolidation of regional preparedness and response mechanisms, such as BANVACO.

The workshop agenda and the list of participants are presented in Annexes 1 and 2, respectively.

GROUP 1 – LABORATORY

The analysis developed by Group 1 focused on the technical elements that determine the effectiveness of emergency vaccination, the quality and potency of vaccines, as well as the mechanisms to evaluate their performance in outbreak scenarios.

Regarding the quality and potency of vaccines, it was recognized that, although there are differences in antigenic performance between serotypes—generally observing better performance of serotypes O and A compared to SAT—this behaviour is strongly influenced by the production processes of each manufacturer. Therefore, it was emphasized that the minimum required potency must be consistently guaranteed, regardless of the product's origin, as an indispensable condition for its use in emergency situations.

The importance of quality controls aimed at ensuring the purity, identity, and safety of vaccines through internationally recognized methodologies, such as those established in the Code of Federal Regulations (CFR) and the European Pharmacopoeia, was also highlighted. In this context, the need to strengthen independent verification capacities was identified, incorporating complementary tools such as metagenomics and promoting the participation of OIE reference laboratories for foot-and-mouth disease.

Regarding antigen stability, the critical role of monitoring the 146S component as an indicator of structural integrity and immunogenicity was underlined. Consequently, periodic evaluations, at least annually, were recommended to ensure the quality and stability of stored material over time.

Finally, the evaluation of vaccine efficacy through vaccine matching tests was addressed, highlighting its relevance for estimating the level of protection against circulating strains. However, it was warned that indicators such as the R1 index, although useful tools for comparison, should not be used as the sole criterion for evaluating or comparing different batches or manufacturers of vaccines, as their interpretation requires considering various biological, methodological, and production factors. In this context, the results of neutralizing antibody detection tests (VN) should also be jointly analyzed.

In summary, Group 1 recommends the systematic review of a comprehensive set of tests including: sterility, safety, purity and detection of contaminants, antigen identity, vaccine potency (≥ 6 PD₅₀), in vitro immunological evaluation (viral neutralization assays), efficacy evaluation, antigenic and genetic characterization, antigenic stability (quantification of 146S particles), emulsion stability, and vaccine matching tests. This multidimensional approach, complemented by independent and periodic evaluations, is essential to ensure the quality, safety, stability, and immunogenicity of antigens and vaccines, as well as to ensure an effective response to health emergencies.

Additionally, it was recommended that BANVACO request detailed information from manufacturers on the studies conducted with the strains included in their products and carry out a critical analysis of the available information to identify knowledge gaps and additional evaluation needs. It was also suggested to include in the procurement terms for antigens and vaccines the obligation for manufacturers to preserve and make available to the client the reagents, reference materials, and/or samples necessary for subsequent verification and characterization tests.

GROUP 2 – MODELING AND RISK ANALYSIS

The work of Group 2 was aimed at structuring an analytical framework to support decision-making in contexts of uncertainty, integrating risk characterization with epidemiological modeling tools. This group aimed to discuss the fundamental elements to establish the methodology for strain selection for BANVACO, the methodology for estimating the number of doses, and the criteria for modeling the most appropriate scenarios for implementing emergency vaccination. This approach was organized around three complementary dimensions: risk at origin, risk of introduction, and virus dissemination.

Regarding risk at origin, the usefulness of tools such as PRAGMATIST for strain prioritization and virological risk contextualization was analyzed. While its value as a support instrument was recognized, limitations associated with the indicators used were identified, particularly regarding comparability between vaccines, suggesting the need to incorporate additional parameters for a more comprehensive evaluation.

Regarding the risk of introduction, methodologies aimed at estimating the probability of virus entry were discussed, considering both formal and informal flows. Thus, studies conducted through the QUANTRA platform, developed by the University of California-UCLA and initially applied in Ecuador and tested in workshops in South and Central America, were presented. In this area, significant challenges were identified, especially in quantifying unregistered movements and incorporating the role of fomites as transmission vectors. In the face of these limitations, it was proposed to complement the models with the structured use of expert judgment and sensitivity analysis, as well as to strengthen information collection systems at critical entry points.

Regarding dissemination modeling, it was highlighted that the usefulness of models depends on their ability to reflect the real conditions of the productive and response systems of the countries. The need to avoid both information overload and excessive simplification was underlined, prioritizing scenarios that are technically sound and operationally applicable. It was also emphasized that models should consider the real intervention capacities, including human resources, response times, and transmission dynamics.

Transversally, the Group identified significant gaps in the availability and quality of data, particularly regarding informal movements and local epidemiological parameters, introducing uncertainty into the analyses. In this context, the need to move towards the development of adapted regional tools, such as risk analysis frameworks and mathematical modeling, was raised, allowing the integration of available information and the generation of comparable scenarios between countries.

As a conclusion, the Group highlighted that the integration of the three analyzed dimensions constitutes a logical and adequate framework for supporting strategic decisions, recommending the development of a regional modeling tool that articulates these components and facilitates their application in the countries.

GROUP 3 – OPERATIONAL IMPLEMENTATION OF VACCINATION

The analysis of Group 3 focused on the practical aspects of implementing emergency vaccination in real conditions, if the decision to vaccinate has already been made. In this sense, the approach was aimed at identifying the critical factors that determine the effectiveness of field execution.

One of the main consensuses reached was the need to clearly differentiate between the availability of vaccines and the decision to use them. In this context, the importance of the early activation of mechanisms such as BANVACO was highlighted, with the aim of ensuring the timely availability of vaccines in the country—initially in minimum quantities estimated at approximately 100,000 doses—even before the formal decision to apply them, thus reducing response times.

It was also identified that prior planning is one of the most determining factors for the success of the strategy. A significant gap was evidenced between the theoretical capacities, often considered in epidemiological models, and the real capacities of countries to carry out vaccination campaigns in emergency situations. Therefore, the need to conduct periodic simulations and define realistic operational parameters that allow for a more accurate estimation of the required resources and execution times was emphasized. Regarding operational capacity, the possibility of integrating the private sector, particularly accredited veterinarians, as a complement and subordinate to Official Veterinary Services, was analyzed. However, this strategy requires the prior development of training programs, as well as the implementation of standardized protocols that ensure the quality, biosafety of interventions, and individual identification of vaccinated animals, allowing for their proper traceability.

Regarding the operational strategy in the field, it was concluded that the methodology to be applied must be previously defined based on modeling studies and considering the specific epidemiological context of the emergency, including factors such as the affected region, vaccination objectives, the serotype involved, susceptible species present, and the characteristics of the productive systems. However, in general, the group considered that a vaccination strategy from the periphery to the focus ("from outside to inside") should be prioritized, starting in an initial radius of 3 km around the occurrence. It was also recommended to prioritize the vaccination of the bovine species and assign vaccination teams the responsibility for both the application of the vaccine and the individual identification of the intervened animals.

A critical aspect considered was the traceability of vaccinated animals, recognizing that the absence of robust registration systems can compromise both the evaluation of vaccination effectiveness and subsequent processes for the recovery of sanitary status. In this sense, the use of information systems, preferably digital, was recommended, allowing real-time monitoring of activities and the generation of verifiable health evidence. Additionally, the importance of post-vaccination surveillance as a fundamental component of the strategy was highlighted, allowing the evaluation of the intervention's effectiveness, detection of possible operational or immunological failures, and support for subsequent health decisions. From a logistical point of view, the cold chain was identified as one of the main critical points. Therefore, the need to have previously established protocols validated through drills was pointed out, ensuring the integrity of vaccines from their entry into the country and initial storage to their distribution, transport, and field application.

Finally, from a regulatory and legal perspective, one of the main potential limitations identified was the rapid authorization for the import and use of emergency vaccines. Consequently, it was recommended that countries develop in advance the necessary procedures and protocols for emergency situations, ensuring that all competent institutions know and previously validate the authorization mechanisms. This would expedite both the entry of vaccines into the country and their immediate use, through pre-established regulatory instruments, such as emergency registrations, conditional authorizations, or other equivalent mechanisms.

FINAL CONSIDERATIONS

The integrated analysis of the results of the three working groups made it possible to consolidate a common vision on the role of emergency vaccination as an additional strategic tool for responding to foot-and-mouth disease outbreaks in the Americas. Transversally, it was shown that its effectiveness does not depend on a single component, but on the proper articulation between the scientific basis (laboratory), analytical support (epidemiology and modeling), and field implementation capacity (operational management).

In this sense, the contributions of the groups converge in that emergency vaccination should be understood as a previously developed capacity, based on prior preparation, evidence-based decision-making, and efficient operational execution. The availability of vaccines, although an essential element—especially through mechanisms such as BANVACO—is not sufficient by itself to guarantee an effective response if it is not accompanied by enabling conditions in the technical, regulatory, and operational fields.

From this integrated vision, opportunities are identified to improve the possible use of emergency vaccination in the region. In the Laboratory field, limitations persist in access to independent information for vaccine evaluation. From the epidemiological perspective, the need to develop or improve methodologies for the region for the selection of priority strains and the definition of the number of doses is evident. In the operational field, there are opportunities for progress in legal, logistical, and operational issues prior to the effective implementation of vaccination.

Based on these opportunities, the following integrated strategic recommendations are established, aimed at strengthening the regional capacity for preparedness and response:

1. Strengthen regional capacities for independent evaluation and verification of the quality of vaccines and antigens, promoting the participation of international reference laboratories and the incorporation of complementary methodologies.
2. Establish systematic programs for monitoring the antigenic stability of antigen banks, including periodic evaluation of 146S particles and other relevant indicators of structural integrity and immunogenicity, to ensure the quality and potential efficacy of materials stored over time.
3. Incorporate technical requirements in the procurement processes for antigens and vaccines that oblige manufacturers to provide complete information on the antigenic, genetic, and immunological characterization of their strains, as well as to preserve and make available reagents, reference materials, and samples necessary for independent verification, vaccine matching, and performance evaluation tests.
4. Strengthen risk analysis and strain selection mechanisms, ensuring dynamic, periodic, and evidence-based processes, with the participation of independent technical bodies and articulation with epidemiological modeling tools.
5. Develop and adapt regional modeling tools that integrate risk analysis at origin, introduction, and dissemination, and that allow the generation of comparable and operationally applicable scenarios in the countries.
6. Consolidate flexible and pre-approved regulatory frameworks that allow the import, release, and immediate use of vaccines in emergency situations, in line with international standards and based on risk assessment.

7. Strengthen countries' operational preparedness through the updating of contingency plans, periodic simulations, definition of real capacities, and validation of logistical protocols, including the cold chain.
8. Expand response capacity by integrating the private sector, promoting prior training programs and the establishment of standardized protocols under the supervision of official veterinary services.
9. Implement robust traceability and information management systems, preferably digital, that allow real-time monitoring of vaccination and the generation of evidence for intervention evaluation and recovery of sanitary status.
10. Optimize the strategic use of BANVACO, promoting its early activation based on preliminary risk analysis and strengthening its technical components, including strain selection, antigen monitoring, and articulation with countries.

In conclusion, emergency vaccination should be conceived as part of an integrated preparedness and response system, whose success will depend on the countries' ability to anticipate scenarios, make informed decisions, and coordinate the necessary actions. In this context, the continuous strengthening of national and regional capacities will be decisive to ensure the sustainability of the sanitary status achieved in the Americas.

ANNEX 1



PANAFTOSA
Pan American Center for Foot-and-Mouth
Disease and Veterinary Public Health



BANVACO
Regional Antigen Bank for Foot-and-Mouth Disease

Workshop: Emergency Vaccination against Foot-and-Mouth Disease

Rio de Janeiro, Brazil

March 24–25, 2026

AGENDA

TUESDAY March 24, 2026	
08:00 – 08:15	Opening session Director of PANAFTOSA/VPHPAHO/WHO
08:15 – 08:30	Methodology and expectations of the Workshop <i>Dr. Guilherme Marques, PANAFTOSA/VPHPAHO/WHO</i>
08:30 – 09:00	Optimization of antigen banks based on risk <i>Dr. Dónal Sammin, European Commission for the Control of FMD</i>
09:00 – 10:00	North America's experience with national and regional emergency vaccine banks: evaluation and monitoring of vaccines prior to use <i>Dr. Jennifer Stesle, Animal and Plant Health Inspection Service / United States Department of Agriculture (APHIS/USDA)</i>
10:00 – 10:30	Emergency vaccination against FMD: technical criteria, decision support tools, and implementation logistics <i>Dr. Dónal Sammin, European Commission for the Control of FMD</i>
10:30 – 11:00	Coffee break
11:00 – 11:30	Characteristics of emergency vaccines against FMD <i>Dr. Anna Ludi, The Pirbright Institute</i>
11:30 – 12:00	Considerations after vaccination: recovery of FMD-free status without vaccination <i>Dr. Min-Kyung Park, World Organisation for Animal Health (WOAH)</i>
12:00 – 13:30	Lunch break
13:30 – 15:30	Working groups: - Laboratory - Epidemiology and Modeling - Field Operation Group discussions
15:30 – 16:00	Coffee break
16:00 – 17:45	Continuation of group discussions
17:45 – 18:00	Summary/closure of Day 1
19:00 – 21:00	Cocktail

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ANNEX 2



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WEDNESDAY March 25, 2026	
08:00 – 10:00	Working groups: • Laboratory • Epidemiology and Modeling • Field Operation Group discussions
10:00 – 10:30	Coffee break
10:30 – 12:00	Continuation of group discussions and preparation of recommendations for the plenary session
12:00 – 13:30	Lunch break
13:30 – 14:30	Presentation in plenary of Group 1 results and recommendations for the technical report
14:30 – 15:30	Presentation in plenary of Group 2 results and recommendations for the technical report
15:30 – 16:00	Coffee break
16:00 – 17:00	Presentation in plenary of Group 3 results and recommendations for the technical report
17:00 – 17:30	Final comments and closing of Day 2

ANNEX II



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Regional Antigen Bank for Foot-and-Mouth Disease

WORKSHOP ON EMERGENCY VACCINATION AGAINST FOOT-AND-MOUTH DISEASE

PANAFTOSA/VPH-PAHO/WHO | Rio de Janeiro | March 24 and 25, 2026

List of Attendance

Name	Country	Institution	Position
1. <i>Ángela Zambrano</i>	Colombia	VECOL	Senior Director of Quality Assurance
2. <i>Anna Ludi</i>	United Kingdom	The Pirbright Institute	Deputy Head of the WRLFMD
3. <i>Carolina Lecce</i>	Argentina	CDV	Quality Assurance and Biosecurity Manager
4. <i>Conrad Estrada</i>	U.S.A.	APHIS/USDA	Deputy Director of International Services (APHIS-IS-ODA)
5. <i>Daniel Magalhães</i>	PAHO/WHO	PANAFTOSA	Veterinary Epidemiology Specialist
6. <i>Diego Viali</i>	PAHO/WHO	PANAFTOSA	Foot-and-Mouth Disease Coordinator
7. <i>Dónal Summin</i>	Italy	EuFMD	Executive Secretary
8. <i>Dulma Segovia</i>	Paraguay	SENACSA	Director of Vesicular Diseases, DIGELAB
9. <i>Edviges Maristela Pituco</i>	PAHO/WHO	PANAFTOSA	Consultant
10. <i>Euclides De La Torre</i>	PAHO/WHO	PANAFTOSA	LPRO/LREF Coordinator
11. <i>Fabio Enrique González Ochoa</i>	Colombia	VECOL	Senior Director of Quality Assurance
12. <i>Fabrizio Bortolanza</i>	Brazil	Biogénesis Bagó	Site Manager BBCL & Government and Regulatory Affairs Brazil
13. <i>Fernando Ferreira (virtual)</i>	Brazil	USP	Full Professor
14. <i>Fernando Horacio Barroumeres</i>	Argentina	Biogénesis Bagó	Director of Industrial Technology
15. <i>Francisco D'alessio</i>	Argentina	OMSA	Regional Representative

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Name	Country	Institution	Position
16. <i>Geraldo Marcos de Moraes</i>	Brazil	MAPA	Coordinator-General for Animal Health Planning - CGPSA
17. <i>Guilherme Marques</i>	PAHO/WHO	PANAFTOSA	BANVACO Manager
18. <i>Gustavo Machado</i>	U.S.A.	NCSU	Assistant Professor, Department of Population Health and Pathobiology
19. <i>Hernán Oliver Daza Gutiérrez</i>	Bolivia	SENASAG	National Responsible for Veterinary Epidemiology
20. <i>Hernando Duque (virtual)</i>	U.S.A.	BANVACO	Ex-Manager of the North American Foot-and-Mouth Disease Vaccine Bank
21. <i>Iram de Rezende</i>	Brazil	TECPAR	Director of Industrial Health
22. <i>Jennifer Steele (virtual)</i>	U.S.A.	APHIS/USDA	Vaccine Banks Manager, Foreign Animal Disease Diagnostic Laboratory / Veterinary Services Diagnostics & Biologics / National Bio- and Agro-Defense Facility
23. <i>Jayden McCall (virtual)</i>	U.S.A.	APHIS/USDA	Veterinary Medical Officer / Veterinary Services Diagnostics & Biologics / National Bio- and Agro-Defense Facility
24. <i>José Luis Gonzales Rojas (virtual)</i>	Netherlands	WUR	Researcher, Epidemiologist
25. <i>Lucia Ayala Rodríguez</i>	Colombia	VECOL	President
26. <i>Marcos Elielson Pinheiro de Sá</i>	Brazil	MAPA	Coordinator-General for Specialized Operations (CGOPE/DTEC)
27. <i>Manuel Sánchez</i>	PAHO/WHO	PANAFTOSA	Epidemiology Coordinator
28. <i>Marcos Vinicius de Santana Leandro Junior</i>	Brazil	MAPA	Federal Agricultural Auditor / Laboratory Demand Management Coordination - CDL
29. <i>Maria Victoria Iriarte Barbosa</i>	Uruguay	MGAP	Technical Advisor
30. <i>Mayra Alexandra Torres Vaca</i>	Ecuador	AGROCALIDAD	Director of Zoosanitary Surveillance
31. <i>Min-Kyung PARK</i>	France	WOAH	Head of Status Department
32. <i>Nicolas Denormandie</i>	France	Boehringer Ingelheim	Technical Director, Foot-and-Mouth Disease
33. <i>Pacellynson Rodrigues</i>	Argentina	CDV	Production Manager P2
34. <i>Pauline Cunha</i>	Brazil	MAPA	Agricultural Auditor - Division of Registration of Biological Products
35. <i>Victor Dario Maldonado Caceres</i>	Paraguay	SENACSA	General Director of Health, Identity and Traceability (DIGESIT)

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