Update on the global ASFV vaccine situation and guidance for African context

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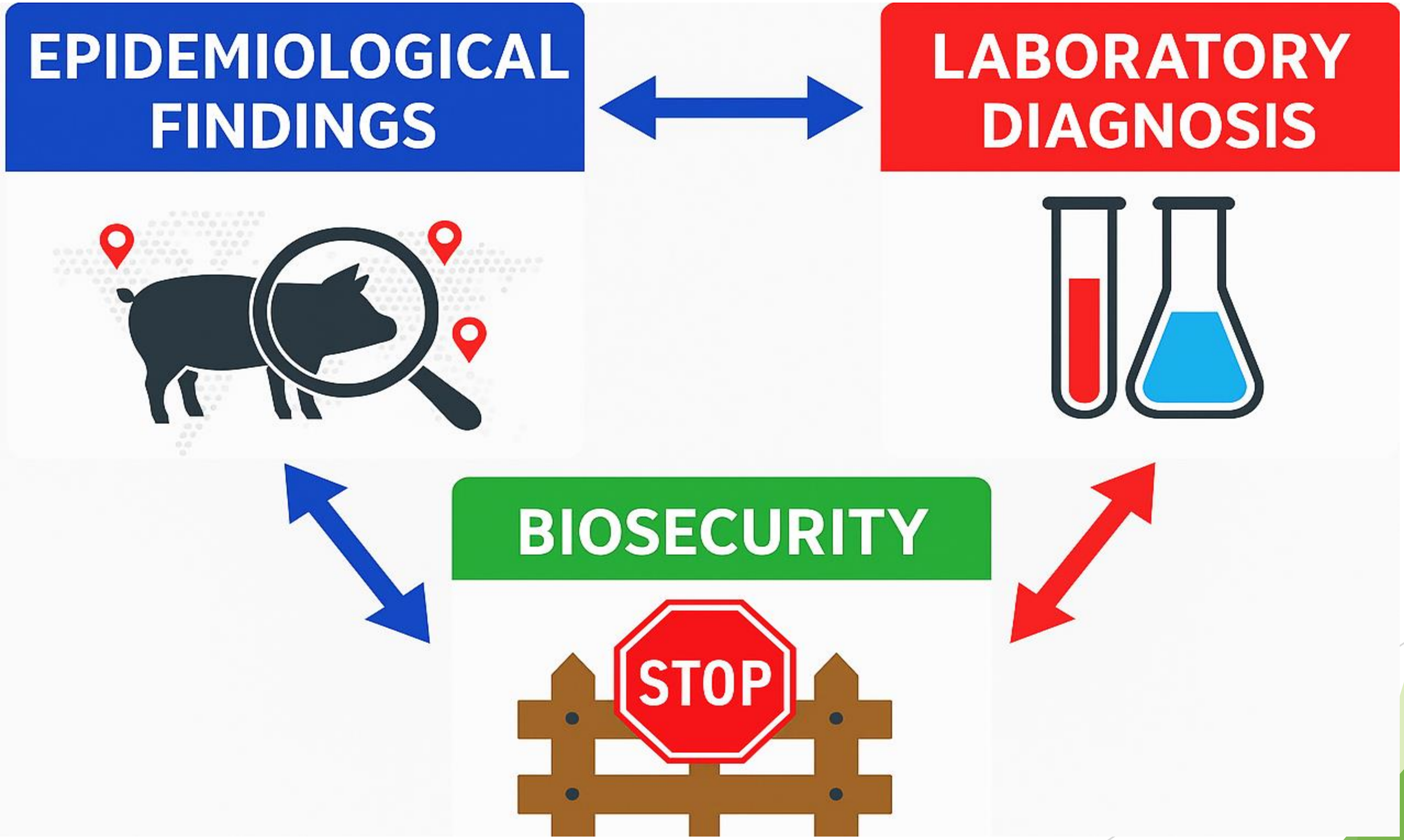
WOAH Reference Laboratory for ASF

Reference Centre World Organisation for Animal Health Founded as OIE

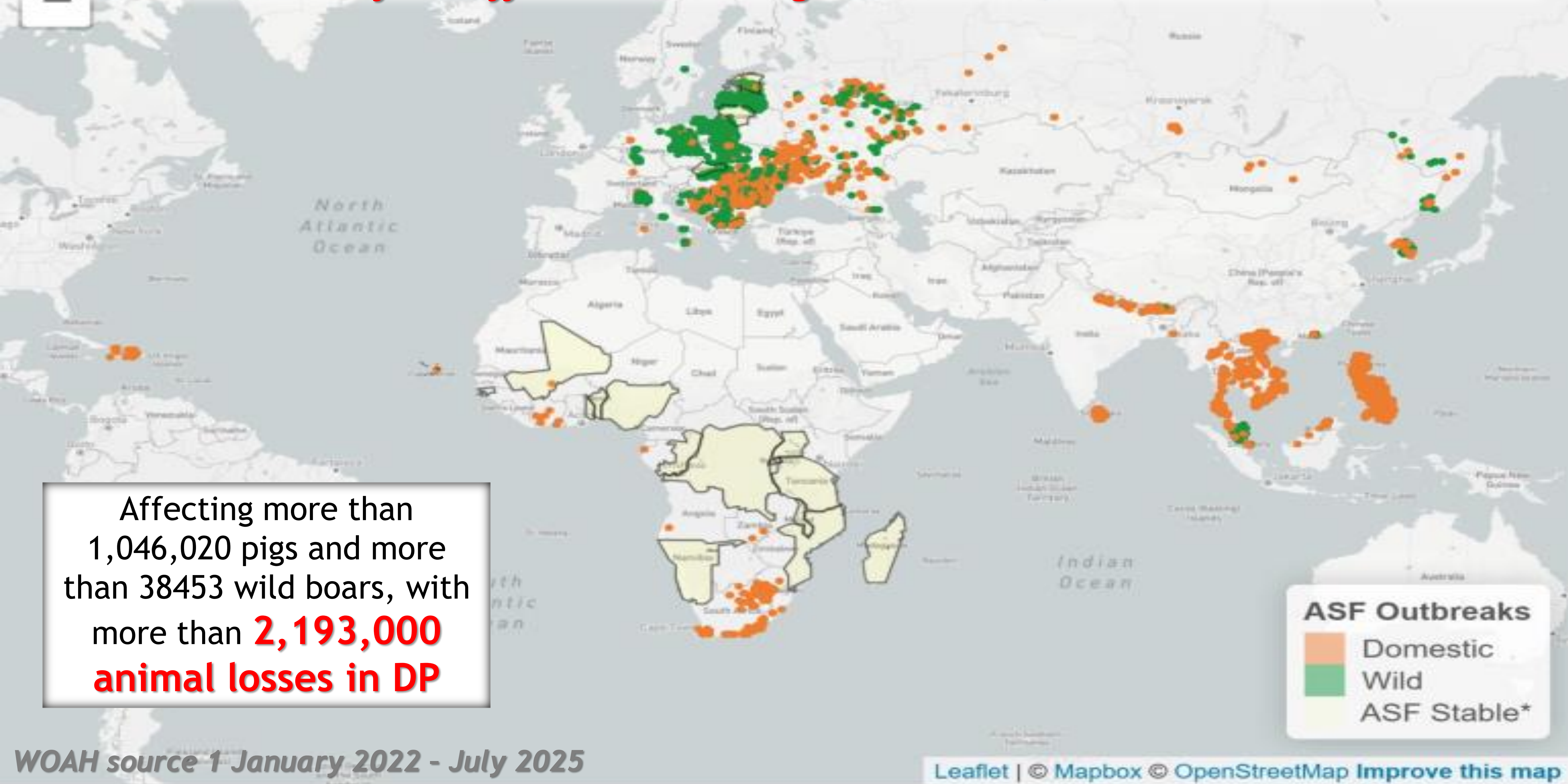
Fifth Meeting of the Standing Group of Experts (SGE) on African swine fever (ASF) of the GF-TADs for Africa.
Topic : ASF vaccines and vaccination. 14 October 2025, Lomé, Togo

ASF control has historically relied on



Since January 2022 ASF has been reported as present in

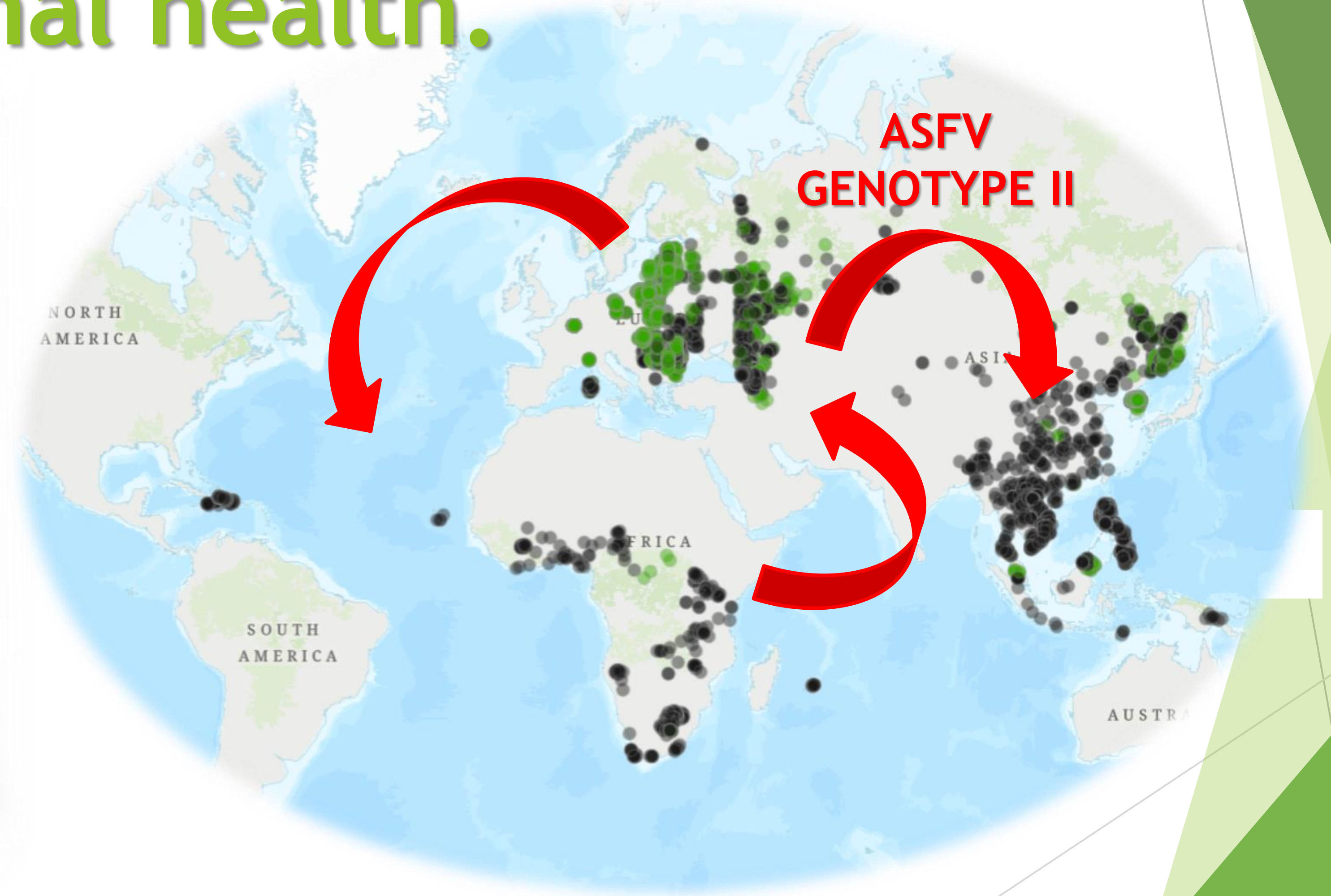
five different world regions in 68 countries



Affecting more than 1,046,020 pigs and more than 38453 wild boars, with more than **2,193,000 animal losses in DP**

WOAH source 1 January 2022 – July 2025

ASF, the pandemic of animal health.



What is going wrong?

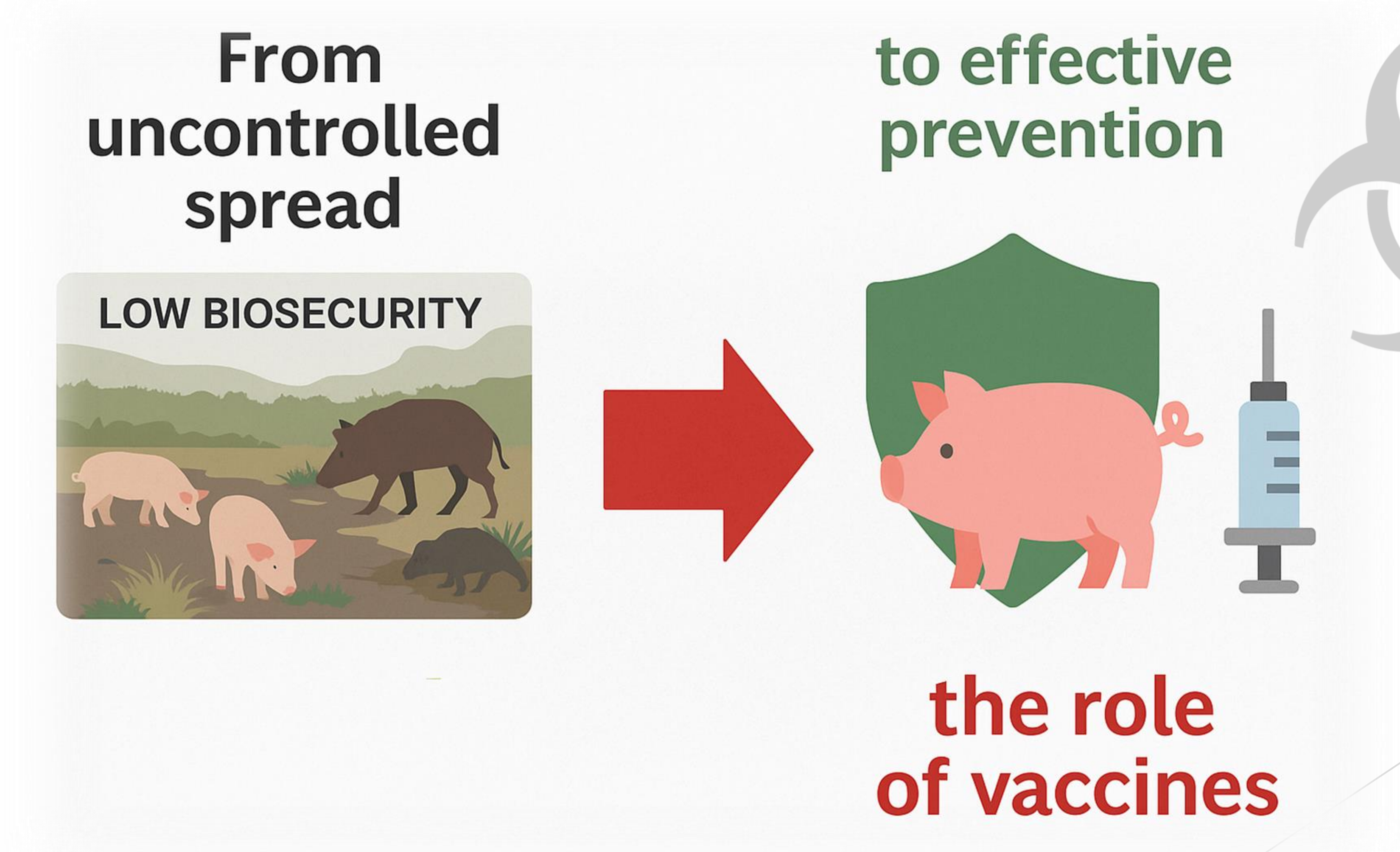
What is going wrong?

The virus and the disease have been underestimated

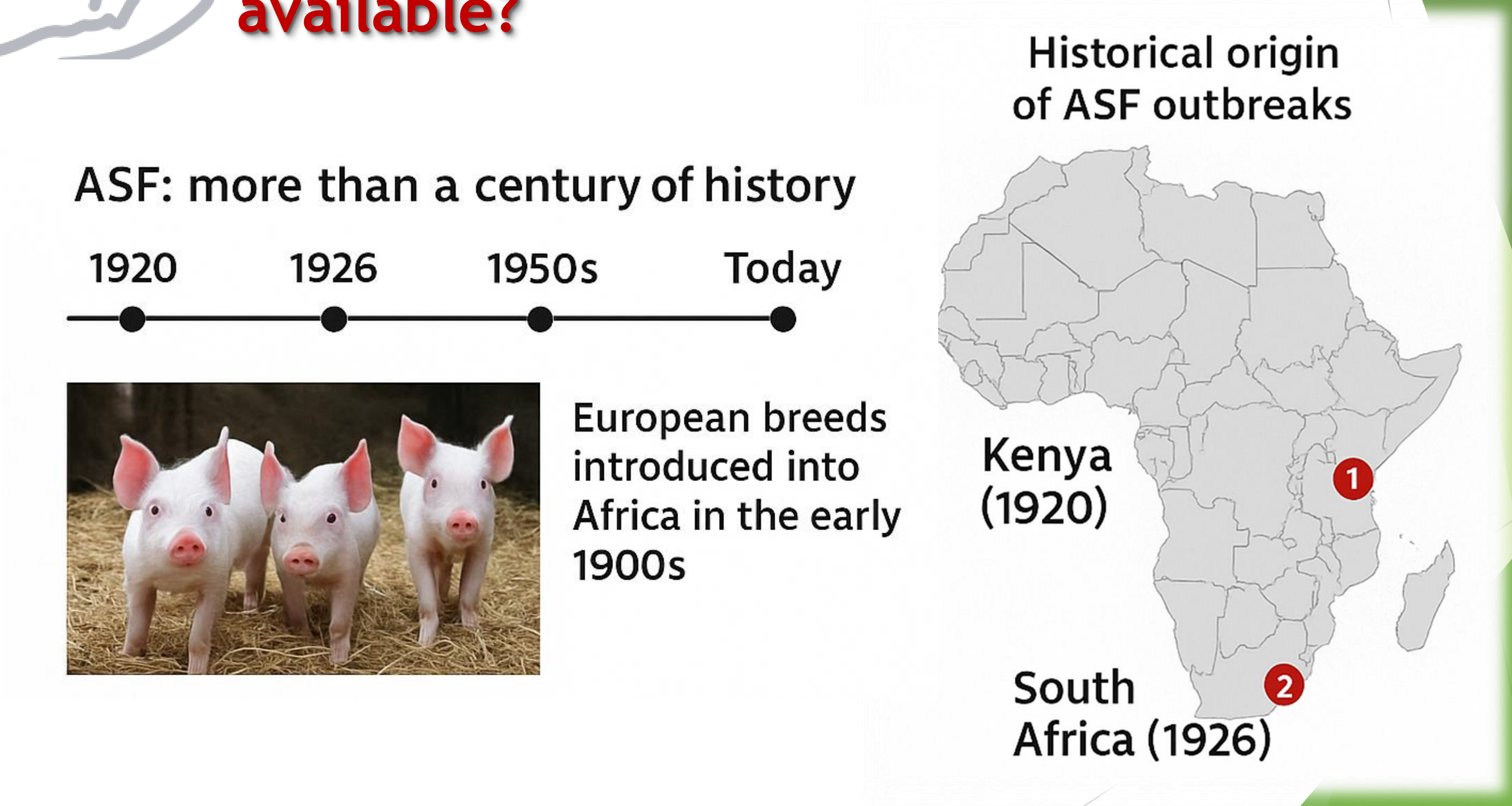
ASF is ASF — regardless of the circulating genotype.

- **Tendency towards endemicity** in affected regions.
- **Complex epidemiological situation** with co-circulating viruses (even within the same genotype).
- **Evolution of ASF viruses towards less virulent strains regardless of genotypes**, causing mild or unspecific signs and making disease recognition difficult (carriers).
- **Early detection** is failing and the **disease often stays one step ahead.**

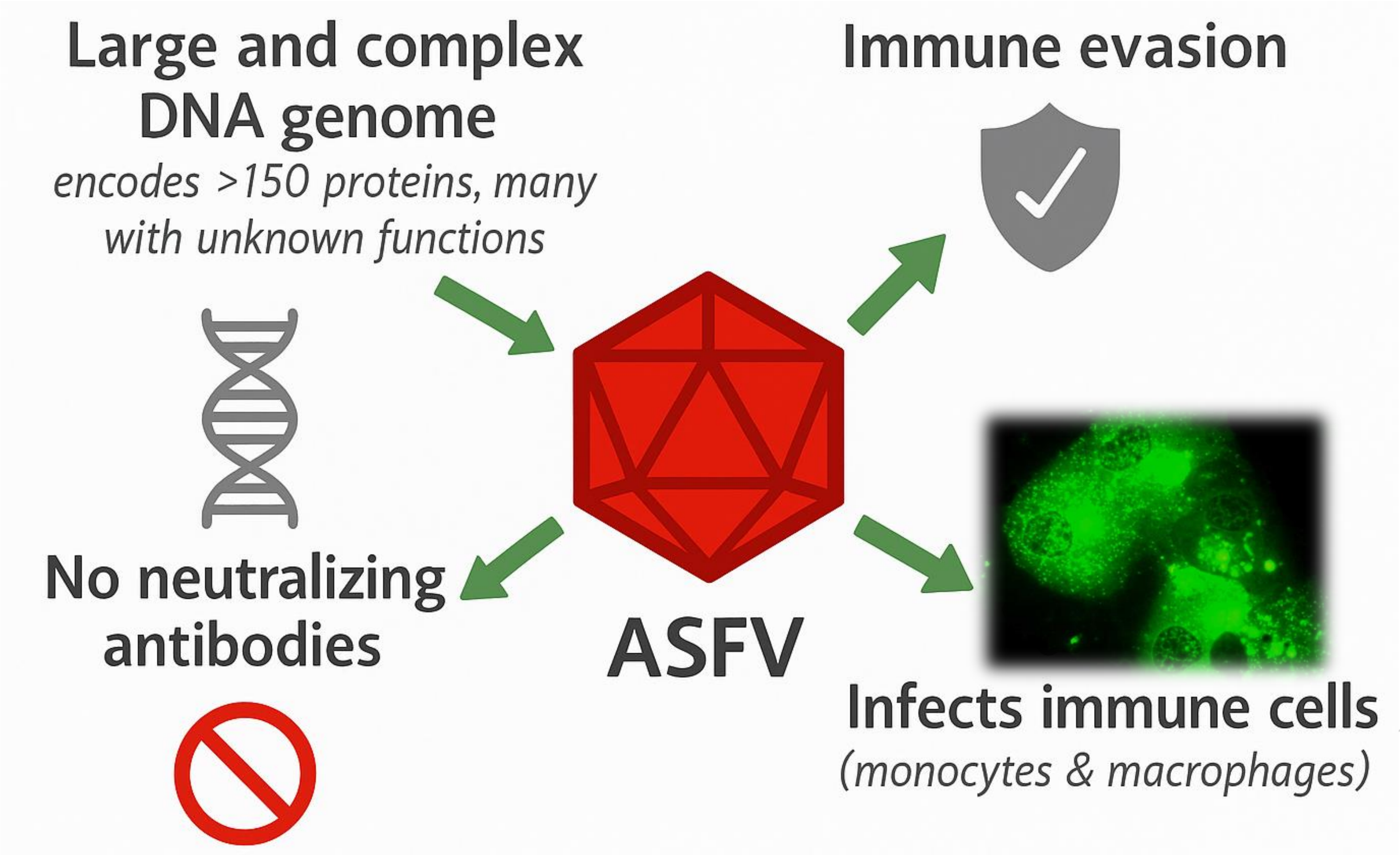
ASF control requires urgent vaccine solutions



The ASF vaccine challenge:
Why has there been no vaccine available?



Key challenges for ASF vaccine development



The ASF vaccine development.

Early vaccine development against ASF began in the 1960s

- **Vaccine candidate:** Live attenuated field virus passaged in bone marrow cells
- **Protection:** ~90% against related viruses
- **Side effects: YES.** Pneumonia, arthritis, joint swelling, necrotic foci, fever

Tested in the field in the 1960s in Portugal and Spain.
DISCARDED for side effects

The ASF vaccine development.

Since 1960s several strategies

- **Inactivated vaccines**
- Subunit vaccines
- DNA based vaccines
- Live attenuated vaccines

Vaccination With a Gamma Irradiation-Inactivated African Swine Fever Virus Is Safe But Does Not Protect Against a Challenge

Jutta Pikalo[1], Luca Porfiri[2], Valerij Akimkin[3], Hanna Roszyk[1], Katrin Pannhorst[4],

vaccines MDPI

Article

High Doses of Inactivated African Swine Fever Virus Are Safe, but Do Not Confer Protection against a Virulent Challenge

Estefanía Cadenas-Fernández [1,2,*], Jose M. Sánchez-Vizcaíno [1,2], Erwin van den Born [3], Aleksandra Kosowska [1,2], Emma van Kilsdonk [3], Paloma Fernández-Pacheco [4], Carmina Gallardo [4], Marisa Arias [4] and Jose A. Barasona [1,2,*]

Do not provide adequate protection against a virulent challenge, largely because **they fail to stimulate the necessary immune responses (not effective vaccination)**

The ASF vaccine development.

Since 1960s several strategies

Inactivated vaccines

- ❖**Subunit vaccines**
- ❖**DNA based vaccines**

Live attenuated vaccines

Review

Subunit Vaccine Approaches for African Swine Fever Virus

Natasha N. Gaudreault * and Juergen A. Richt *

Department of Diagnostic Medicine & Pathobiology, College of Veterinary Medicine, Kansas State University, K224 Mosier Hall, 1800 Denison Ave, Manhattan, KS 66506, USA

* Correspondence: nng5757@vet.k-state.edu (N.N.G); jricht@vet.k-state.edu or jricht@ksu.edu (J.A.R.); Tel.: +1-785-532-2793 (J.A.R.)

Genes/Proteins Delivered	Type of Vaccine	Challenge
p54/E183L, p30/CP204L	Baculovirus expressed proteins	Partial protection
P54/E183L, p30/CP204L, p72/B646L	Baculovirus expressed proteins	No protection
CD2v/pEP402R	Baculovirus expressed proteins	Partial protection
p54/E183L, p30/CP204L	DNA vaccination	No protection
Ubiquitin-CD2v/pEP402R-p54/E183L-p30/CP204L	DNA vaccination	Partial protection
DNA expression library	DNA vaccination	Partial protection

Offer long-term potential for ASF control, but **current candidates are not yet providing complete protection**, and **further research is needed** to identify effective antigens and optimize delivery methods.

The ASF vaccine development.

Since 1960s several strategies

Inactivated vaccines

Subunit vaccines

DNA based vaccines

Live attenuated vaccines

EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR HEALTH AND FOOD SAFETY

Food chain stakeholder and international relations
Unit D4 Food safety programme, emergency funding

Brussels, 31 January 2017

SANTE-2017-10272

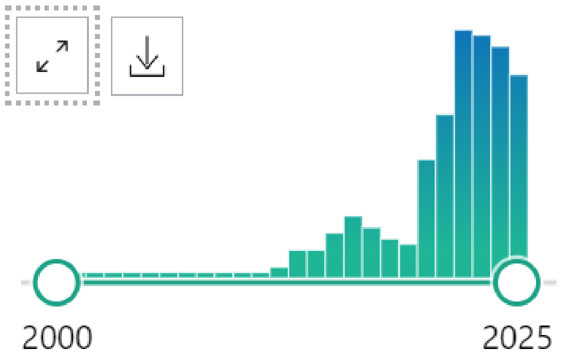
WORKING DOCUMENT

Blueprint and Roadmap on the possible development of a vaccine for African Swine Fever prepared by the African Swine Fever EU reference laboratory[1] on Commission request

Live attenuated vaccines (LAVs) are the most effective type of ASF vaccine. These vaccines work by reducing the virulence of the ASFV through **genetic modification from a virulent or attenuated strain**, to create a safe yet immunogenic virus that protects against infection

Since ASFV entered Asia in 2018, global efforts to develop LAVs increased rapidly.

RESULTS BY YEAR



~98% of LAV candidates derived from genotype II strains (pandemic lineage).

Two main approaches→ gene deletions from:

- **Virulent parental strains** (Georgia 2007/1, HLJ/18, Arm07, etc)
- **Naturally attenuated strains** (Lv17/WB/Rie1)

Development of a Highly Effective African Swine Fever Virus Vaccine by Deletion of the I177L Gene Results in Sterile Immunity against the Current Epidemic Eurasia Strain

Article

Taking a Promising Vaccine Candidate Further: Efficacy of ASFV-G-ΔMGF after Intramuscular Vaccination of Domestic Pigs and Oral Vaccination of Wild Boar

Article

Double Deletion of EP402R and EP153R in the Attenuated Lv17/WB/Rie1 African Swine Fever Virus (ASFV) Enhances Safety, Provides DIVA Compatibility, and Confers Complete Protection Against a Genotype II Virulent Strain

Goal: achieve an **optimal balance between safety and protection**, and develop stable **DIVA prototypes.**

First commercial ASF LAVs in Vietnam derived from the virulent genotype II Georgia strain

July 24, 2023 — official commercialization milestone of ASF vaccines in Asia.

NAVETCO

Trade name: **NAVET-ASFVAC**

- ASFV-G-ΔI177L Strain
- Cell line: PBMC
- Virus titer ≥ $10^{2.6}HAD_{50}$/dose
- Animals: Pig 8 weeks of age

AVAC

Trade name: **AVAC ASF Live**

- ASFV-G-ΔMGF Strain
- Cell line: DMAC
- Virus titer ≥ $10^{3.5}HAD_{50}$/dose
- Animals: Pig 4 weeks of age

- **NAVET-ASFVAC**: field use in >140 farms across 22 provinces ≈ **95% protection rate.**
- **AVAC ASF Live**: used in >500 farms, including CP Group holdings; ≈ **93.4% protection rate.**

First commercial ASF LAVs in Vietnam derived from the virulent genotype II Georgia strain

February 28, 2025 — third LAV (DABACO) officially licensed for commercial circulation on February 28, 2025,

NAVETCO

Trade name: **NAVET-ASFVAC**

- ASFV-G-ΔI177L Strain
- Cell line: PBMC
- Virus titer ≥ $10^{2,6}HAD_{50}$/dose
- Animals: Pig 8 weeks of age

AVAC

Trade name: **AVAC ASF Live**

- ASFV-G-ΔMGF Strain
- Cell line: DMAC
- Virus titer ≥ $10^{3,5}HAD_{50}$/dose
- Animals: Pig 4 weeks of age

DABACO

Trade name: **DACOVAC ASF2**

- ASFV-G-ΔI177L/ΔLVR Strain
- Cell line: PIPEC
- Virus titer ≥ $10^{3,0}HAD_{50}$/dose
- Animals: Pig 4 weeks of age

First commercial ASF LAVs in Vietnam derived from the virulent genotype II Georgia strain

September 2025 — Vietnam exported AVAC to the Philippines, officially approved by MARD.

HOME » LIVESTOCK PRODUCTION, ANIMAL HEALTH

Vietnam exports 340,000 doses of African swine fever vaccine to the Philippines

18:18 08/09/2025

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On the afternoon of September 8, in Hung Yen, AVAC Vietnam Joint Stock Company held a ceremony to export a batch of 340,000 doses of AVAC African swine fever (ASF) vaccine (AVAC AFS LIVE) to the Philippines.

In the context of the world not having an ASF vaccine, Vietnam is the first country to succeed and allow the free circulation of this vaccine from July 2023. With such a new and important vaccine, quality is something the world is always concerned about and evaluates, and licenses cautiously.

From the ASF field-vaccination experience. Field-reported advantages

- ❖**Documented protection in the field**: reports summarise **~95% protective immune response for NAVET-ASFVAC** and ~**93.4% for AVAC ASF LIVE**; large-scale deployments (hundreds of farms) under official supervision.
- ❖**Large-scale vaccination datasets (Vietnam):** monitoring of ~600k doses per product showed high seroconversion after 1–2 doses (avg. ~**95.5% Ab-positive** in NAVET cohorts).

From the ASF field-vaccination experience. Field-reported advantages

❖ Peer-reviewed evidence of efficacy/safety and long term immunity.

Evaluation of the Safety Profile of the ASFV Vaccine Candidate ASFV-G-ΔI177L

Xuan Hanh Tran [1,*], Le Thi Thu Phuong [1], Nguyen Quang Huy [1], Do Thanh Thuy [1], Nguyen Van Dung [1], Pham Hào Quang [1], Quách Võ Ngôn [1], Ayushi Rai [2], Cyril G. Gay [3], Douglas Paul Gladue [2,*] and Manuel Victor Borca [2,*]

1 National Veterinary Joint Stock Company (NAVETCO), Ho Chi Minh City 70000, Vietnam; lephuong.navetco@gmail.com (L.T.T.P.); nguyenquanghuy166@gmail.com (N.Q.H.); dothuy81@gmail.com (D.T.T.); dungngvnavetco@gmail.com (N.V.D.); phamhaoquang@gmail.com (P.H.Q.); qngonnavetco@gmail.com (Q.V.N.)

2 Plum Island Animal Disease Center, Agricultural Research Service, U.S. Department of Agriculture, Greenport, NY 11944, USA; ayushi.rai@usda.gov

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Abstract: African swine fever (ASF) is the cause of a recent pandemic that is posing a threat to much of the world swine production. The etiological agent, ASF virus (ASFV), infects domestic and wild swine, producing a variety of clinical presentations depending on the virus strain and the genetic background of the pigs infected. No commercial vaccine is currently available, although recombinant live attenuated vaccine candidates have been shown to be efficacious. In addition to determining efficacy, it is paramount to evaluate the safety profile of a live attenuated vaccine. The presence of residual virulence and the possibility of reversion to virulence are two of the concerns that must be evaluated in the development of live attenuated vaccines. Here we evaluate the safety profile of an efficacious live attenuated vaccine candidate, ASFV-G-ΔI177L. Results from safety studies showed that ASFV-G-ΔI177L remains genetically stable and phenotypically attenuated during a five-passage reversion to virulence study in domestic swine. In addition, large-scale experiments to detect virus shedding and transmission confirmed that even under varying conditions, ASFV-G-ΔI177L is a safe live attenuated vaccine.

Safety and Efficacy Profiles of the Live Attenuated Vaccine AVAC ASF LIVE for Preventing African Swine Fever in Pigs

Nguyen Van Diep [1], Nguyen Thi Ngoc [1], Nguyen Van Duc [1], Vu Xuan Dang [1], Tran Ngoc Tiep [1], Chu Thi Quy [1], Bui Thi Tham [1], and Pham Ngoc Doanh [2]

[1] *Center for Research and Development of Veterinary Vaccines, AVAC Viet Nam Joint Stock Company, Hung Yen, Vietnam*
[2] *Institute of Biology, Vietnam Academy of Science and Technology, Hanoi, Vietnam*

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Received 10 January 2025; Accepted 22 May 2025

Academic Editor: Nan-hua Chen

African swine fever (ASF) is one of the most devastating diseases affecting the global pig industry. Therefore, the development of safe and effective vaccines is crucial in combating the virus. The AVAC ASF LIVE vaccine, produced from an attenuated genotype II ASF virus (ASFV) strain with the deletion of six MGF genes and cultured in a Diep's macrophage (DMAC) cell line, has been officially licensed for use and commercialization in Vietnam. This study evaluated the safety and efficacy of the AVAC ASF LIVE vaccine. In the safety experiment, pigs received a dose equivalent to 100 times the protective dose. In the efficacy experiment, control pigs and one-dose vaccinated pigs were challenged with a highly virulent p72 genotype II ASFV on day 28 post-vaccination. The duration of protective immunity was assessed by challenging pigs at various time points, from 2 weeks up to 6 months post-vaccination. Results showed that pigs given the 100-fold protective dose remained healthy with no abnormal signs. Significantly, 60% of vaccinated pigs survived the challenge 14 days after vaccination, and the survival rates reached 100% when challenged at 28, 90, 120, and 150 days post-vaccination (dpv). The vaccine effectively induced robust immunity, leading to a reduction in viral shedding and the persistence of viral DNA in vaccinated animals. In conclusion, the AVAC ASF LIVE vaccine has demonstrated safety and high efficacy in protecting pigs from genotype II ASFV infection.

Article

African Swine Fever Vaccine Candidate ASFV-G-ΔI177L/ΔLVR Protects Against Homologous Virulent Challenge and Exhibits Long-Term Maintenance of Antibodies

Sun A Choi [1,†], Yeonji Kim [2,3,†], Su Jin Lee [1], Seong Cheol Moon [1], Keun Seung Ahn [1], Xinghua Zheng [1], Do Soon Kim [1], Se Young Lee [1], Seung Pyo Shin [1], Dongseob Tark [4], Wonjun Kim [2], Yongwoo Shin [2], Weonhwa Jheong [2,*] and Jung Hyang Sur [1,*]

Abstract: African swine fever virus (ASFV) has substantially spread worldwide, resulting in significant economic losses in the swine industry. Despite extensive research, no ASF vaccine has surpassed the effectiveness of live attenuated vaccines. For instance, the live attenuated vaccine ASFV-G-ΔI177L/ΔLVR has demonstrated good efficacy and safety, along with prolonged persistence of ASF antibodies after vaccination. Therefore, we aimed to evaluate its potential for protection against highly virulent homologous ASF viruses based on changes in the farm environment. To this end, we challenged domestic pigs with a virulent field strain of ASFV following intramuscular immunization with ASFV-G-ΔI177L/ΔLVR. We further assessed its genomic stability and long-term antibody persistence in immunized domestic pigs. All vaccinated pigs exhibited high antibody positivity, with higher levels of antibodies observed at the time of challenge. These high ASF vaccine antibodies were maintained for approximately 2 months after vaccination. In addition, no organ or tissue damage was observed in the vaccinated animals. Our findings demonstrate the applicability of this vaccine candidate in the prevention of ASFV infection in the swine industry.

From the ASF field-vaccination experience. Constraints and risks from field experience and recent studies

- **Limited vaccine uptake / low coverage** → Despite commercialization, farmer adoption remains low due to cost, logistics, and confidence issues.

Vietnam facing worsening African swine fever outbreaks

By **Reuters**

August 5, 2025 6:53 AM GMT+2 · Updated Augus

Though Vietnam was the first country reportedly to have developed an African swine fever vaccine that has been in commercial use since 2023, officials said the vaccination rate was low due to concerns about costs and efficiency.

"Vaccination is just a supporting tool that can not replace basic prevention measures"

From the ASF field-vaccination experience. Constraints and risks from field experience and recent studies

- **Use restricted to porkers (not breeders)→** AVAC and NAVETCO vaccines authorized only for fattening pigs; not for sows or boars.

npj | vaccines Article
Published in partnership with the Sealy Institute for Vaccine Sciences
https://doi.org/10.1038/s41541-025-01099-9

African swine fever virus vaccine strain Asfv-G-ΔI177l reverts to virulence and negatively affects reproductive performance

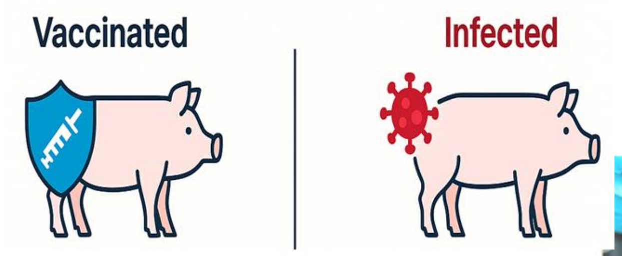
Erwin van den Born[1], Ferenc Olasz[2,3], István Mészáros[2], Eszter Gölti[2,3], Barbara Oláh[2], Jui Joshi[1], Emma van Kilsdonk[1], Ruud Segers[1] & Zoltán Zádori[2,3]

ASF vaccine for sows and boars urgently needed

(VAN) This is the wish of local governments and pig farmers to establish comprehensive herd immunity, enhance the effectiveness of African Swine Fever (ASF) control, and reduce economic losses.

From the ASF field-vaccination experience. Constraints and risks from field experience and recent studies

- **Lack of DIVA serological marker→** non accompanied DIVA test; **No validated serological DIVA assay – essential for vaccination monitoring**



Report of the *ad hoc* Group meeting on ASF vaccines: field evaluation and post-vaccination monitoring

Original: English (EN)

22–24 July 2025
Paris

7.3. Importance of serology

While recognising the practical value of serology in surveillance, the Group agreed that the guidelines should clearly articulate its limitations within ASF vaccination programmes. Neutralising antibodies are not consistently detectable, and no reliable correlation has been established between antibody presence and protective immunity. As such, serology is not suitable for evaluating vaccine efficacy or for monitoring individual animals' post-vaccination. Nonetheless, baseline serological data may still be useful for estimating population-level exposure or tracking the circulation of field strains or vaccine strains in unvaccinated areas. Despite its limitations, the Group agreed that serology contributes meaningfully to broader surveillance efforts, particularly when used alongside other diagnostic methods such as PCR.

In the absence of a reliable DIVA strategy, Members might consider using tools such as ELISA, where feasible, to monitor trends at the group level. Importantly, any interpretation of seroconversion should be aligned with the specific objectives of the vaccination strategy.

From the ASF field-vaccination experience. Constraints and risks from field experience and recent studies

- **Reversion to virulence / stability concerns→** Risk after serial passages or uncontrolled field use; strict monitoring required.

ARTICLE OPEN

Check for updates

Assessment of African swine fever vaccine candidate ASFV-G-ΔMGF in a reversion to virulence study

Paul Deutschmann[1], Jan-Hendrik Forth[1], Julia Sehl-Ewert[1], Tessa Carrau[1], Elisenda Viaplana[2], Jose Carlos Mancera[3], Alicia Urniza
Martin Beer[1] and Sandra Blome[1]✉

African swine fever (ASF) has gained panzootic dimensions and commercial vaccines are still unavailable. Recently, a series of liv attenuated vaccines has raised hope for an efficacious and safe vaccine, among them "ASFV-G-ΔMGF". We tested the latter in an vivo reversion to virulence study in accordance with *International Cooperation on Harmonisation of Technical Requirements for Registration of Veterinary Medicinal Products* guidelines. Upon forced animal passaging, a virus variant emerged that was associate with transient fever and an increased replication and shedding. However, all animals were healthy upon completion of the stud and reversion to significant virulence was not observed. The genomic changes did not affect the recombination site but involve deletions and reorganizations in the terminal regions of the genome. Thus, our study underscores that in-depth safety characterization is needed for live ASF vaccines. For this particular candidate, additional studies should target long-term effects an transmission characteristics before thorough benefit-risk analysis can be carried out.

npj Vaccines (2023)8:78 ; https://doi.org/10.1038/s41541-023-00669-z

npj | vaccines Article

Published in partnership with the Sealy Institute for Vaccine Sciences

https://doi.org/10.1038/s41541-025-01099-9

African swine fever virus vaccine strain Asfv-G-ΔI177l reverts to virulence and negatively affects reproductive performance

Check for updates

Erwin van den Born[1], Ferenc Olasz[2,3], István Mészáros[2], Eszter Göltl[2,3], Barbara Oláh[2], Jui Joshi[1], Emma van Kilsdonk[1], Ruud Segers[1] & Zoltán Zádori[2,3]✉

From the ASF field-vaccination experience. Constraints and risks from field experience and recent studies

- **Emergence of vaccine-like variants in the field** → Field reports from Vietnam and China reveal ASFV recombinant or vaccine-like variants causing **reproductive failures**

An African swine fever vaccine-like variant with multiple gene deletions caused reproductive failure in a Vietnamese breeding herd

Thanh Che Nguyen[1,2,4,11], Nga To Thi Bui[3,11], Lua Thi Nguyen[3], Tram Ngoc Thi Ngo[4], Cuong Van Nguyen[4], Luan Minh Nguyen[4], Janin Nouhin[5], Erik Karlsson[5], Pawin Padungtod[6], Nakarin Pamornchainavakul[7], Sawang Kesdangsakonwut[2,8,9], Roongroje Thanawongnuwech[2,10]✉ & Duy Tien Do[4]✉

African swine fever (ASF), an economically damaging disease in domestic pigs, has emerged in Vietnam since 2019. Vietnam is the only country granted licenses for developing and commercializing modified live-attenuated vaccines (LAVs) against the highly pathogenic ASF virus (ASFV). The nationwide implementation of LAVs in Vietnam for prophylaxis has likely influenced the viral genetic pool among the swine population. This study highlighted the incursion of a novel ASF vaccine-like variant into a non-vaccinated breeding herd. Retrospective epidemiology suggested a high replacement rate and improper biosecurity measures might introduce the disease into the herd. Affected gilts displayed non-to-mild symptoms, whereas gestational sows experienced reproductive disorders. Remarkably, severe ulcerative dermatitis in udders was observed in lactating sows 1–2 weeks postpartum. The ASF outbreak was significantly associated with reduced reproductive performance compared to the pre-outbreak period ($P < 0.001$). Genetic analysis revealed several virulence-associated gene deletions and a marker gene presence in the left variable region, consistent with the ASFV-G-ΔMGF vaccine strain. Molecular detection and immunohistochemistry indicated viral antigens distributed in macrophage-like cells of the reproductive organs and affected udders. Microscopic findings implied massive necrotizing vasculitis with fibrinoid degeneration compatible with immune complex-induced lesions. In conclusion, naïve sows are highly susceptible to the novel ASF vaccine-like variant than gilts, underscoring improved biosecurity requirements when introducing replacement gilts and monitoring ASF vaccine-like variants.

From the ASF field-vaccination experience. Constraints and risks from field experience and recent studies

- **Emergence of vaccine-like variants in the field** → Field reports from Vietnam and China reveal ASFV recombinant or vaccine-like variants causing **reproductive failures** and **reduced protection.**

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Article | Open access | Published: 29 May 2023

Highly lethal genotype I and II recombinant African swine fever viruses detected in pigs

Dongming Zhao, Encheng Sun, Lianyu Huang, Leilei Ding, Yuanmao Zhu, Jiwen Zhang, Dongdong Shen, Xianfeng Zhang, Zhenjiang Zhang, Tao Ren, Wan Wang, Fang Li, Xijun He & Zhigao Bu

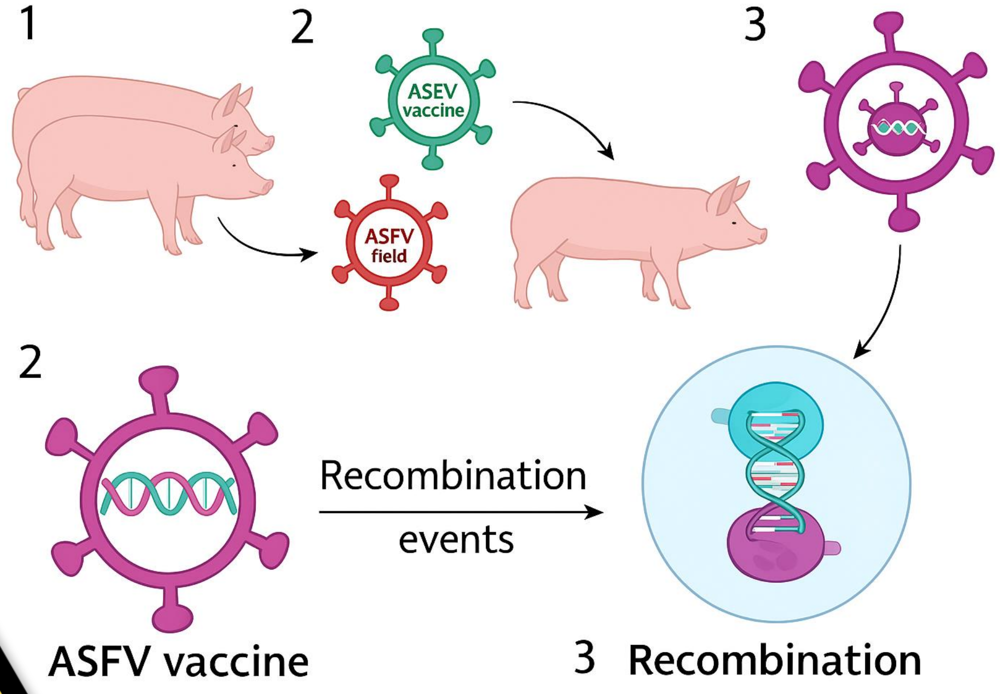
Open Access Article

Genotype II Live-Attenuated ASFV Vaccine Strains Unable to Completely Protect Pigs against the Emerging Recombinant ASFV Genotype I/II Strain in Vietnam

by Nguyen Van Diep [1], Nguyen Van Duc [1], Nguyen Thi Ngoc [1], Vu Xuan Dang [1], Tran Ngoc Tiep [1], Viet Dung Nguyen [2], Thi Tam Than [3], Dustin Maydaniuk [4], Kalhari Goonewardene [4], Aruna Ambagala [4,*] and Van Phan Le [3,5,*]

From the ASF field-vaccination experience. Constraints and risks from field experience and recent studies

Recombination events in the field: unpredictable and uncontrollable.



From the ASF field-vaccination experience. Constraints and risks from field experience and recent studies

- **Limited cross-protection→** ΔI177L vaccines protect well against homologous challenge but **fail against other ASFV variants.**

Open Access | Article

Evaluation of Cross-Protection of African Swine Fever Vaccine ASFV-G-ΔI177L Between ASFV Biotypes

by Manuel V. Borca [1,2,*], Elizabeth Ramirez-Medina [1,2], Christine Mutisya [3], Rose Ojuok [3], Josiah Odaba [3], Mark Dihbol [1,4], Anna Lacasta [3,*] and Douglas P. Gladue [1,2,*,†]

- **Strong protection –** Pigs vaccinated and exposed to the same strain.
- **Partial protection** –80% survived when challenged with a **genetically different strain isolated in Ghana (I)**.
- **No protection –** against **genetically distinct strains from Malawi (VII), Kenya (IX), South Africa (XX) and Uganda (X).**

From the ASF field-vaccination experience. Constraints and risks from field experience and recent studies

- **Limited cross-protection→** widely demonstrated in ASFV live-attenuated prototype vaccines and naturally attenuated field viruses, where protection is strong against homologous strains but **limited or absent against genetically distinct variants.**

Gene-modified genotype II live attenuated African swine fever virus induces cross-protection against genotype I but not against genotype IX

Anusyah Rathakrishnan[a], Johanneke D. Hemmink[b], Vlad Petrovan[a], Ana Luisa Reis[a] and Linda K. Dixon[a]

[a]The Pirbright Institute, Woking, United Kingdom; [b]International Livestock Research Institute, Nairobi, Kenya

Live Attenuated African Swine Fever Viruses as Ideal Tools to Dissect the Mechanisms Involved in Cross-Protection

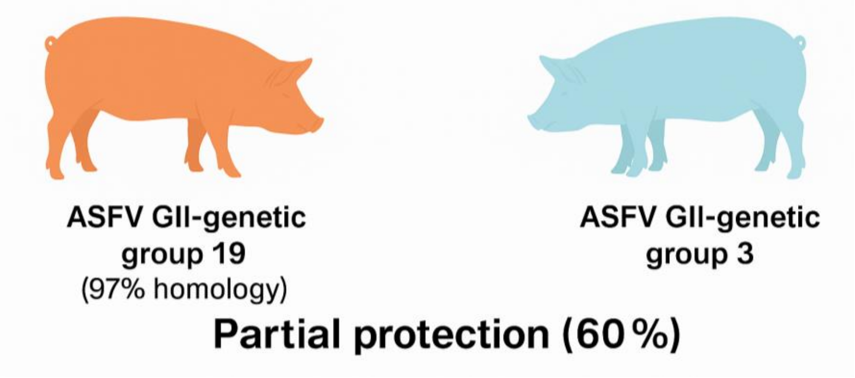
by Elisabeth Lopez[1], Juanita van Heerden[2], Laia Bosch-Camós[1], Francesc Accensi[1,3], Maria Jesus Navas[1], Paula López-Monteagudo[1], Jordi Argilaguet[1], Carmina Gallardo[4], Sonia Pina-Pedrero[1], Maria Luisa Salas[5], Jeremy Salt[6] and Fernando Rodriguez[1,*]

Challenging boundaries: is cross-protection evaluation necessary for African swine fever vaccine development? A case of oral vaccination in wild boar

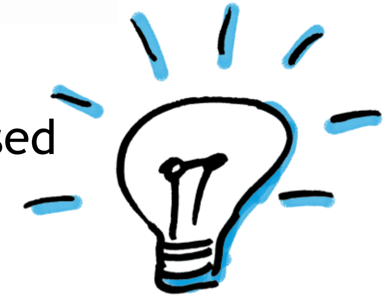
Estefanía Cadenas-Fernández[1,2†], Sandra Barroso-Arévalo[1,2*†], Aleksandra Kosowska[1,2], Marta Díaz-Frutos[1,2], Carmina Gallardo[3], Antonio Rodríguez-Bertos[1,4], Jaime Bosch[1,2], Jose M. Sánchez-Vizcaíno[1,2] and Jose A. Barasona[1,2]

From the ASF field-vaccination experience. Constraints and risks from field experience and recent studies

- **Limited cross-protection→** even against **same genotype but distinct genetic group**



Reminder→ ASFV genotypes/biotypes (based on p72) **do not predict protection or virulence**.



Experimental evaluation of cross-protection induced by naturally attenuated ASFV genotype II strains

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Introduction: African swine fever virus (ASFV) genotype II continues to evolve, leading to the emergence of non-hemadsorbing (non-HAD) variants with distinct CD2v mutations and a wide clinical spectrum ranging from acute to subclinical infections. While molecular genotyping is essential for outbreak tracing, it is not predictive of virulence or clinical outcome. Some non-HAD genotype II strains are naturally attenuated, with low or absent viremia, strong antibody responses, and reduced transmission, allowing them to go undetected and contribute to viral persistence. However, their ability to confer cross-protection remains poorly defined.

The study: This study evaluated the cross-protection conferred by the attenuated non-HAD strain Lv19/WB/Rie29/Tukuma14 (genotype II, group 3). Five pigs were infected and, at 28 days post-infection, challenged with either genotype I strain E70 or the virulent genotype II strain 22489_4_2312/RC/2023 (group 19, Italy 2022). Whole genome identity between immunizing and challenge strains was 97% (group 19) and 95% (E70). Clinical signs, survival, viremia, and infectious virus detection were assessed.

Results: No protection was observed against genotype I: all pigs developed acute ASF and were euthanized at 10 dpi, with lesions indistinguishable from non-immunized controls. In contrast, partial protection (60%) was observed after challenge with the genotype II strain: 3 out of 5 pigs survived, showing delayed disease progression and reduced clinical scores. However, infectious virus was detected in blood for approximately 20 days in most pigs, confirming extended virus circulation despite survival.

Conclusion: These results demonstrate that cross-protection is limited and group-specific, and high genomic similarity alone does not ensure protective immunity. Naturally attenuated strains can persist silently, shedding infectious virus and potentially maintaining ASFV circulation. Control strategies must adapt to detect subclinical infections, and vaccine development should consider intra-genotype diversity and the risks posed by partial immunity under field conditions.

From ASF field-vaccination experience: key lessons learned

Field-reported advantages

- **Demonstrated protection (~93–95%) and high seroconversion rates** in large-scale deployments.
- Peer-reviewed evidence confirming **efficacy, safety, and long-term immunity.**

Constraints and risks from field experience

- **Restricted use** → approved only for fattening pigs, not for breeders.
- **No validated DIVA test** for antibody detection.
- **Reversion to virulence** risks.
- **Emergence of recombinant** or vaccine-like variants.
- **Limited cross-protection**

Rethinking vaccination strategies

Field experience highlights both the potential and the risks of LAVs. Clear guidance is needed to design safe and effective ASF vaccination strategies, depending on the **scenario** and **objectives** to be achieved with vaccination.

How should vaccination strategies be defined in the African context?

Rethinking vaccination strategies. Guidance for the African context.

❶ **Current ASF vaccines** are *live-attenuated (modified-live) viruses*, **not inactivated or killed.**

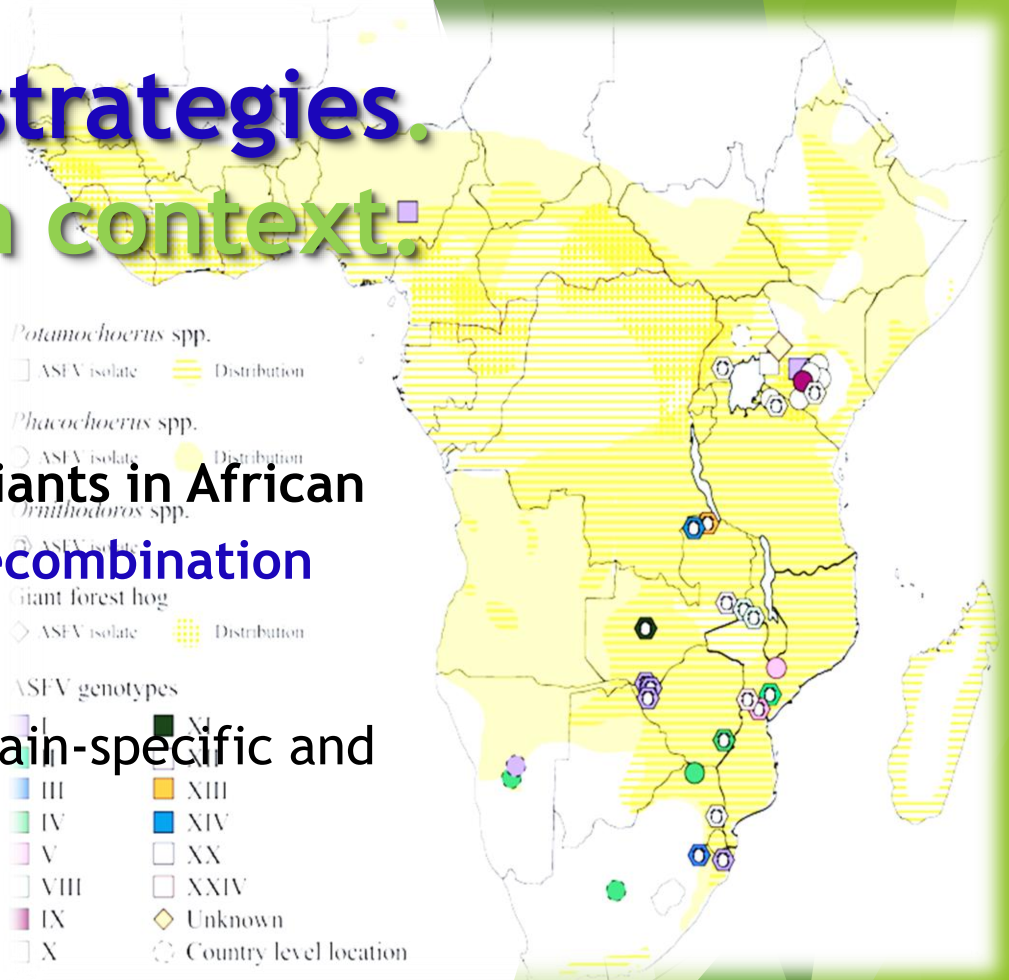
❷ As a result, **virus shedding from vaccinated pigs** can occur, and **adverse reactions** are possible.

❸Without a **validated DIVA test**, distinguishing vaccinated from infected pigs is difficult.

❹In Africa, where **ASF is endemic, diagnostics limited, and multiple diseases overlap**, defining an **ASF case after vaccination will be particularly challenging.**

→ Requires strict veterinary supervision, **clear case definitions**, and **laboratory confirmation by PCR or sequencing** to avoid confusion between infection and vaccination reactions.

Rethinking vaccination strategies.
Guidance for the African context.



❺ The coexistence of **multiple ASFV genotypes and variants in African** regions increases the risk of reversion to virulence or recombination between vaccine and field strains.

❻ Cross-protection is limited; vaccines are generally strain-specific and may fail against genetically distinct variants.

→ **Understanding local ASFV genotypes** circulating in specific regions is crucial for effective vaccination, which should be based on **strain-specific vaccines**.
→ Use **PCR-based surveillance and sequencing** to guide vaccine choice.
→ After vaccination, **apply risk-based monitoring to verify safety and stability.**

Rethinking vaccination strategies.
Guidance for the African context.

Pig health

Read this article in: Language

China cracks down on illegal ASF vaccines

Illegal ASF vaccines, new strains, and artificial gene deletion strains... Here's what China is doing to combat it.

9 March 2021

China's Ministry of Agriculture and Rural Affairs announced that it is further cracking down on illegal activities surrounding fake African swine fever (ASF) vaccines, implementing normalized ASF prevention and control measures, and making every effort to maintain the recovery of pig production.

To date, no country has approved the use of ASF vaccines. The ASF vaccines being used in production in China are not approved and are *fake vaccines*, which pose great safety risks. All local animal husbandry and veterinary departments are

Emerging uncontroled virulent variants

African Swine Fever Mutation Spreads in China, Sparking New Control Fears

By Du Caicai, Sun Xiaoxue and Lin Ting

Gift this article

Rethinking vaccination strategies. Guidance for the African context.

❻ Verification of vaccine effectiveness is **challenging in Africa** due to the **endemic situation**, where **pre-existing antibodies** are not necessarily related to vaccination.
❼ Requires controlled vaccination areas and **strict Veterinary Authority supervision.**
❽ Low farm biosecurity increases the risk of virus circulation and hampers data reliability.

→ Ideally, vaccination campaigns should rely on DIVA-compatible vaccines, accompanied by validated molecular and serological DIVA tests to enable effective monitoring and traceability.

Rethinking vaccination strategies.
Guidance for the African context.

➡️ DIVA-compatible vaccines accompanied by validated molecular and serological DIVA tests

Open Access | Article

A Novel Prototype African Swine Fever Virus DIVA (Differentiation Between Infected and Vaccinated Animals) Serological Assay Based on the Detection of Antibodies Against the pEP153R, eGFP, and p72 Proteins

by Gabriela González-García [1], Carmina Gallardo [2], Mercedes Montón [1], Sandra Barroso-Arévalo [3], Nadia Casado [2], José Ángel Barasona [3], José Manuel Sánchez-Vizcaíno [3], Ángel Venteo [1], Patricia Sastre [1] and Paloma Rueda [1,*]

GOLD STANDARD DIAGNOSTICS

Rethinking vaccination strategies.
Guidance for the African context.

➡️ DIVA-compatible vaccines accompanied by validated molecular and serological DIVA tests.

Open Access Article

Deletion of the EP402R Gene from the Genome of African Swine Fever Vaccine Strain ASFV-G-ΔI177L Provides the Potential Capability of Differentiating between Infected and Vaccinated Animals

by Manuel V. Borca [1,2,*], Elizabeth Ramirez-Medina [1,2], Nallely Espinoza [1,2], Ayushi Rai [1,3], Edward Spinard [1,2], Lauro Velazquez-Salinas [1,2], Alyssa Valladares [1,3], Ediane Silva [2], Leeanna Burton [2], Amanda Meyers [1,3], Jason Clark [2], Ping Wu [4], Cyril G. Gay [5] and Douglas P. Gladue [1,2,*]

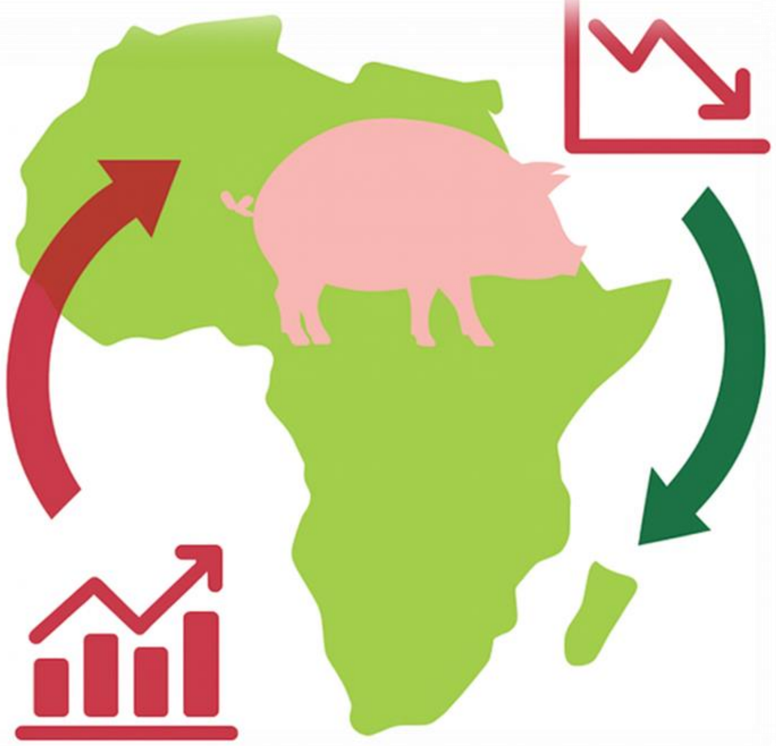
Non-HAD ASFV strains lacking CD2v may escape detection by CD2v-based ELISAs.

Rethinking vaccination strategies.
Guidance for the African context.

- In Africa, vaccination should aim to **reduce disease impact**, not eradication.
- **Effectiveness** can be measured through simple, practical **indicators,** such as:
  - reduction in **mortality** and **clinical outbreaks**,
  - faster **farm recovery** and **production stability**,
  - reduced **virus detection** in tissues or contacts.

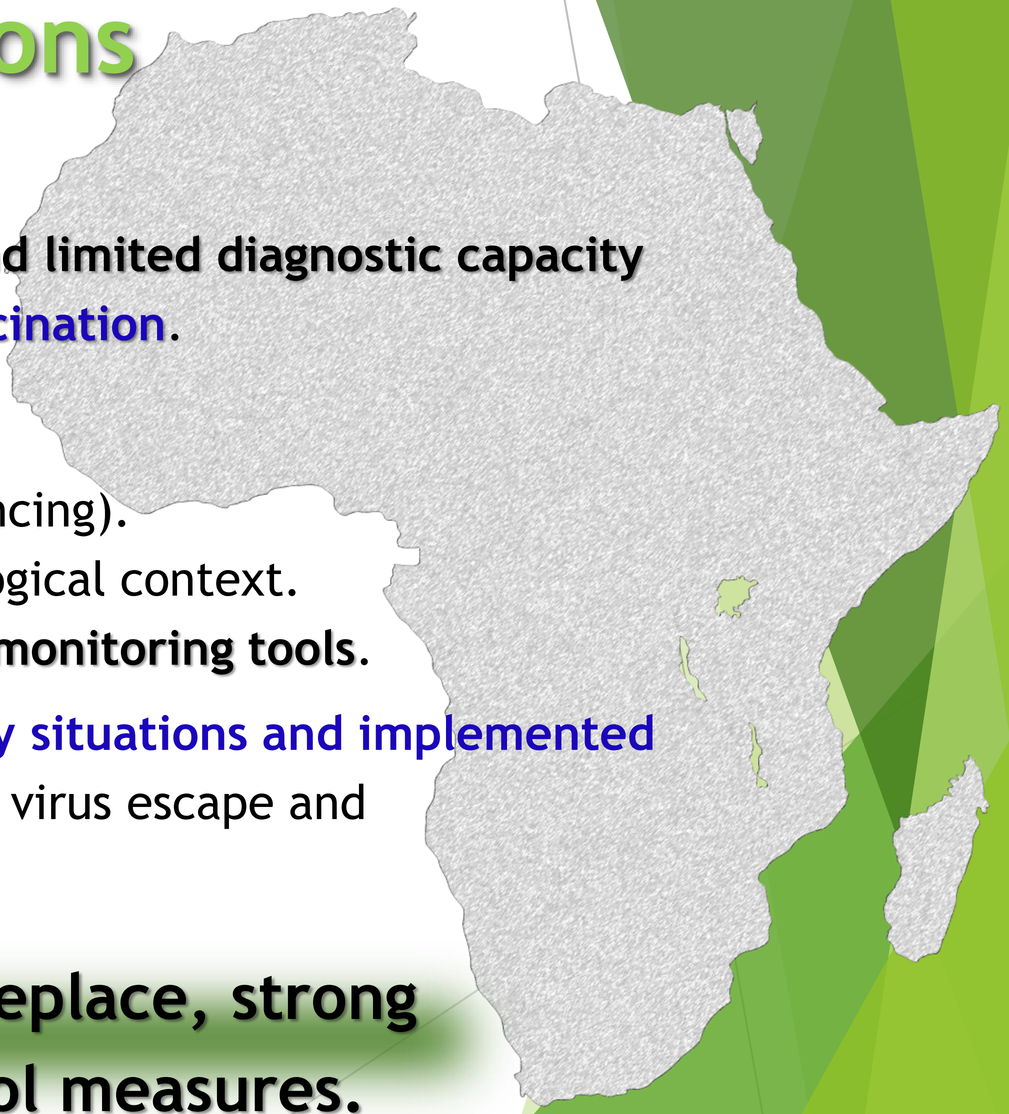
Veterinary Authorities must oversee evaluations to ensure credible and traceable data.

Evaluating vaccine impact



Guidance for the African context.

Summary and conclusions



- In Africa, **low biosecurity, diverse ASFV genotypes, and limited diagnostic capacity** represent **major challenges for safe and effective vaccination**.

- **Effective vaccination** should be guided by:
  - ✓ Knowledge **of local circulating strains** (PCR/sequencing).
  - ✓ **Strain-specific vaccines** adapted to the epidemiological context.
  - ✓ Strict veterinary supervision and **DIVA-compatible monitoring tools**.

- Vaccination should only be considered under **emergency situations and implemented in well-controlled, confined farms** to minimize risks of virus escape and recombination events.

Vaccination must complement, not replace, strong biosecurity and classical ASF control measures.

Future perspectives - Key messages for ASF vaccination

Any future use of the vaccine candidate should be based on a **thorough risk benefit assessment** considering **all safety and efficacy features** as well as the **potential vaccination scenario.**

Future perspectives - Key messages for ASF vaccination

- **Safety and genetic stability** remain the **main challenges for current LAV candidates**.
- **Vaccination should target local circulating genotypes**, applied **under controlled and supervised conditions.**
- **Improved ASFV classification** is urgently needed to **better match vaccines to regional virus types** — since **current p72 genotyping is not linked to virulence or protection.**
- **Low biosecurity** and **uncontrolled field use** increase the risk of **virus escape and recombination events**.
- **DIVA-compatible and next-generation vaccines** are essential for **traceability, safety and long-term protection.**

ASF: WOAH VACCINE STANDARD

Minimum standards for safe and effective ASF vaccines

- ✅ Must **reduce disease severity**, limit virus **transmission**, and **protect animals**.
- ✅ Should **decrease production losses** caused by ASF.
- ✅ Must be **proven safe before use** — no severe or lasting clinical signs.
- ✅ Should **not harm the environment** or contain wild ASF virus or other harmful agents.
- ✅ Must **match the circulating ASF genotype** to ensure effectiveness and avoid recombination or emergence of new strains.


World Organisation for Animal Health

Home » Articles » **African swine fever: WOAH vaccine standard adopted**

Article

African swine fever: WOAH vaccine standard adopted

ASF: WOAH VACCINE STANDARD

Minimum standards for safe and effective ASF vaccines

Multi-layered ASF control

↓

Successful disease management involves a **combination of biosecurity practices**, **import measures and animal movement control** to which **vaccines are a complementary action**.


World Organisation for Animal Health

Home » Articles » **African swine fever: WOAH vaccine standard adopted**

Article

African swine fever: WOAH vaccine standard adopted

THANK YOU VERY MUCH FOR YOUR ATTENTION

GF-TADs Africa

GLOBAL FRAMEWORK FOR THE PROGRESSIVE CONTROL OF TRANSBOUNDARY ANIMAL DISEASES

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World Organisation for Animal Health
Founded as OIE

African Union