African Swine Fever: A Growing Threat for India's Pig Sector

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ABSTRACT

African Swine Fever (ASF), a highly lethal viral disease affecting domestic pigs and wild boars, has emerged as a major global and national concern. On the world stage, recent breakthroughs such as a reverse-genetics system for ASF virus (ASFV) developed in 2025 are revitalizing vaccine research. In India, ASF was first detected in 2020 in northeastern states, and has since spread to additional regions including Goa and Kerala. Molecular studies confirm that Indian ASFV strains predominantly belong to genotype II, with unique genetic mutations. Aggressive outbreaks have caused significant economic losses. However, Indian scientists are responding: rapid antigen-detection kits developed in Assam (2025), PCR-based molecular surveillance in Karnataka (2024-25), and epidemiological assessments in the northeast are improving detection and control. Still, challenges remain like no licensed vaccine, weak biosecurity in small-scale farms, and potential wildlife reservoirs in wild boar. Addressing ASF in India will require a coordinated strategy combining diagnostics, biosecurity, surveillance, and research support to protect food security and rural livelihoods.

INTRODUCTION

African Swine Fever (ASF) is more than just a pig disease - it's a high-stakes global threat. It is caused by a large ds DNA virus, African Swine Fever Virus (ASFV), family *Asfarviridae*, and it can kill up to 100% of infected pigs in some outbreaks. While it poses no direct health risk to humans, its impact on global food security, economies, and rural livelihoods is profound.

A Worldwide Crisis

ASF has spread across continents - from Africa, where it was first identified, to Europe, Asia, and parts of the Americas. Its persistence is driven by several factors:

- **Hardy Virus**: ASFV survives for long periods in pork products, farm equipment, and even in the environment, making eradication difficult.
- **Wild Boar Reservoirs**: In many regions, wild boars act as a reservoir, sustaining transmission and making control complex.
- **Trade and Movement**: Global trade of pigs and pig products helps the virus hop borders, while local movements spread it within countries.

In recent research, scientists have made some breakthrough advances. For example, a reverse genetics system for ASFV was developed (2025) that allows researchers to generate modified versions of the virus in the lab, greatly accelerating vaccine research (Fuchs *et al*. 2025). This synthetic biology toolkit, promises to fast-track our understanding of the virus's behavior and speed up the creation of safe and effective vaccines.

Another global challenge has been modelling how ASF spreads. Mechanistic models (e.g., via arXiv, 2020) have helped researchers understand transmission dynamics, predict outbreak trajectories, and evaluate control strategies - though many models still under-represent the role of wild boar spillover (Hayes *et al.* 2021).

ASF in India

India's pig population is estimated at around 9 million, with nearly half in the northeastern states where they are most susceptible (Patil *et al*. 2020). ASF first appeared in India in early 2020, in the states of Assam and Arunachal Pradesh, causing alarm among farmers and authorities (Rajukumar *et al*. 2021). Since then, the virus has continued its march: from Northeast India to the south, and recently even to the west coast.

A landmark study published in *Frontiers in Cellular and Infection Microbiology* in 2025 reports the first acute ASF outbreak on India's west coast (Goa) (Narnaware *et al*. 2025). The authors described high pig mortality, classic hemorrhagic lesions, and confirmed the virus genotype through molecular sequencing, underlining that ASF can strike even in regions previously considered low-risk.

In Mizoram (Northeast India), sudden pig deaths prompted molecular investigations. Researchers detected parts of the ASFV genome (p72, p54, and B602L genes) using PCR, and confirmed that the strains there belong to genotype II, closely related to Eurasian ASFV lineages (Rajkhowa *et al.* 2022). Another epidemiological study in Kerala (South India) in 2023, traced the source of infections to swill feeding, implicating contaminated food waste as a driver of outbreaks (Hiremath *et al*. 2024).

The genetic characterization of Indian ASFV is also revealing. A 2021–2022 study sequenced outbreaks from the first Indian cases and found some unusual mutations in genes such as MGF (multigene family)

proteins, suggesting that ASFV in India may be evolving in unique ways (Senthilkumar *et al*. 2022).

Recent Advances in India

Responding to the crisis, Indian researchers are innovating:

- **Diagnostics**: A rapid antigen-detection kit has been developed by Assam Agricultural University (2025). This kit can detect ASFV from just a drop of pig blood, and gives results in minutes - a huge improvement over lab-based PCR tests (Barman *et al*. 2025).
- **Molecular Epidemiology**: A 2024–2025 study in the *Indian Journal of Veterinary Sciences & Biotechnology* examined ASF seroprevalence in Karnataka, revealing antibody presence in healthy pigs and characterizing viral isolates (Nagaraju *et al*. 2024).
- **Awareness & Control**: Extension scientists have evaluated the economic and social impact of ASF in Northeast India (2025), offering mitigation strategies tailored to small pig farmers who rely heavily on backyard rearing.
- **Review Insights**: A comprehensive review article published in the *Indian Journal of Animal Research* synthesizes what is known about ASF's epidemiology, pathogenesis, diagnosis, and control - serving as a guide for researchers, veterinarians, and policymakers (Ranganatha *et al*. 2024).

Challenges Still Ahead

- **No Licensed Vaccine in India**: Despite research, there is no commercial ASF vaccine available for Indian pig farmers.
- **Biosecurity Gaps**: Many small-scale and backyard farms lack strong biosecurity; practices like swill feeding and poor carcass disposal continue (Bora, 2024).
- **Wild Boar Threat**: Mortality among free-ranging wild boars has been documented, such as in national parks in southern India, indicating possible viral spillover from domestic pigs (Sai Balaji *et al*. 2024)
- **Economic Burden**: ASF outbreaks lead to mass culling, trade restrictions, and huge financial losses for rural pig farmers.
- **Surveillance Needs**: To detect and control ASF early, India needs broader surveillance, especially in wildlife, and better lab capacity across states.

Why It Matters to Everyone

- **Food Security**: Pork is a key source of protein in many regions; ASF can disrupt local supplies and raise prices.
- **Rural Livelihoods**: Pig farming is a vital income source for smallholder farmers, especially in northeast India, when ASF strikes, it can devastate families.
- **Policy & Infrastructure**: ASF's spread tests India's veterinary services, lab capacity, and disaster-response systems.
- **Global Health Nexus**: While ASF doesn't infect humans, its control requires a One-Health approach - linking wildlife, domestic animals, and human communities.

CONCLUSION

To effectively control African swine fever, India must scale up the use of rapid testing tools, such as the Assam-developed antigen kit, across all pig-rearing states to ensure early detection of outbreaks. Strengthening biosecurity training for small farmers is equally important, particularly in areas such as safe feeding practices and proper carcass disposal. Enhanced surveillance, including

monitoring wild boar populations and other high-risk zones, will help identify and contain potential sources of infection. At the same time, continued investment in vaccine research, especially by using advanced global tools like reverse-genetics platforms - is essential for long-term prevention. Finally, farmers need strong financial and institutional support, including fair compensation, insurance coverage, and educational programs, to help them recover from losses and adopt safer farming practices.

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