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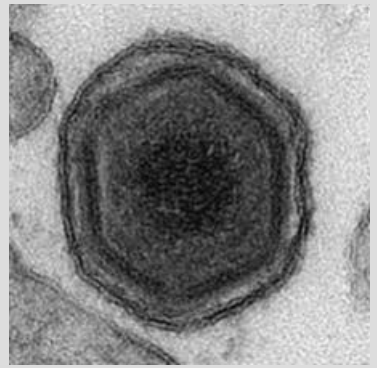
Challenges & risks related to a possible ASF vaccine



Brussels – September 27 2022

Our opponent

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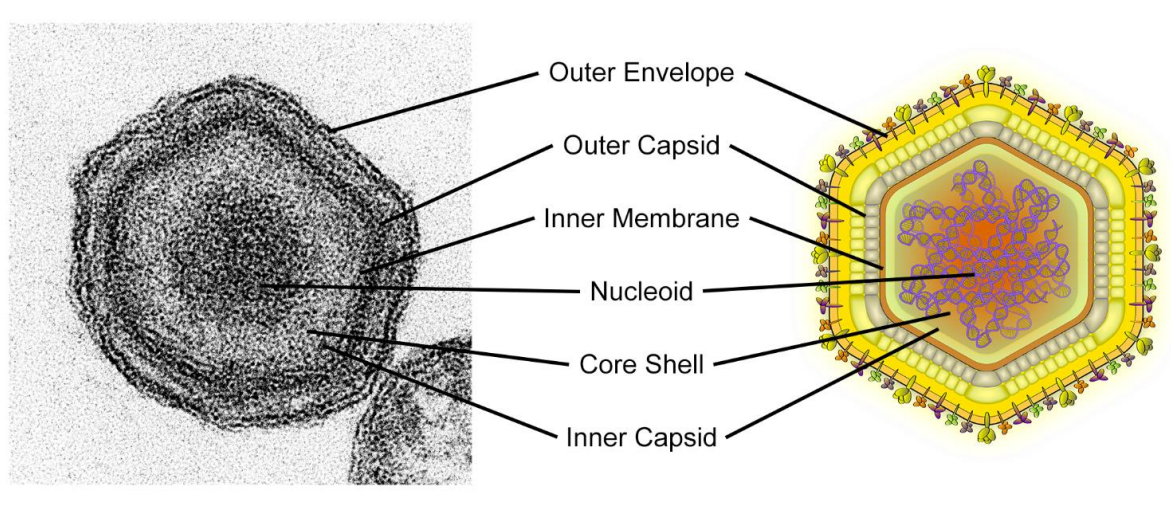

- large and complex DNA virus
- „master“ of immune modulation (manipulates host responses to its advantage)
- targets monocytic cells and grows best on them = adaptation to permanent cultures leads to genetic changes and loss of replication competency in the host
- almost no neutralization capacity of antibodies = antibody titers do not predict protection!
- T-cell responses are crucial !
- protective antigens are not known

General vaccine approaches (1)

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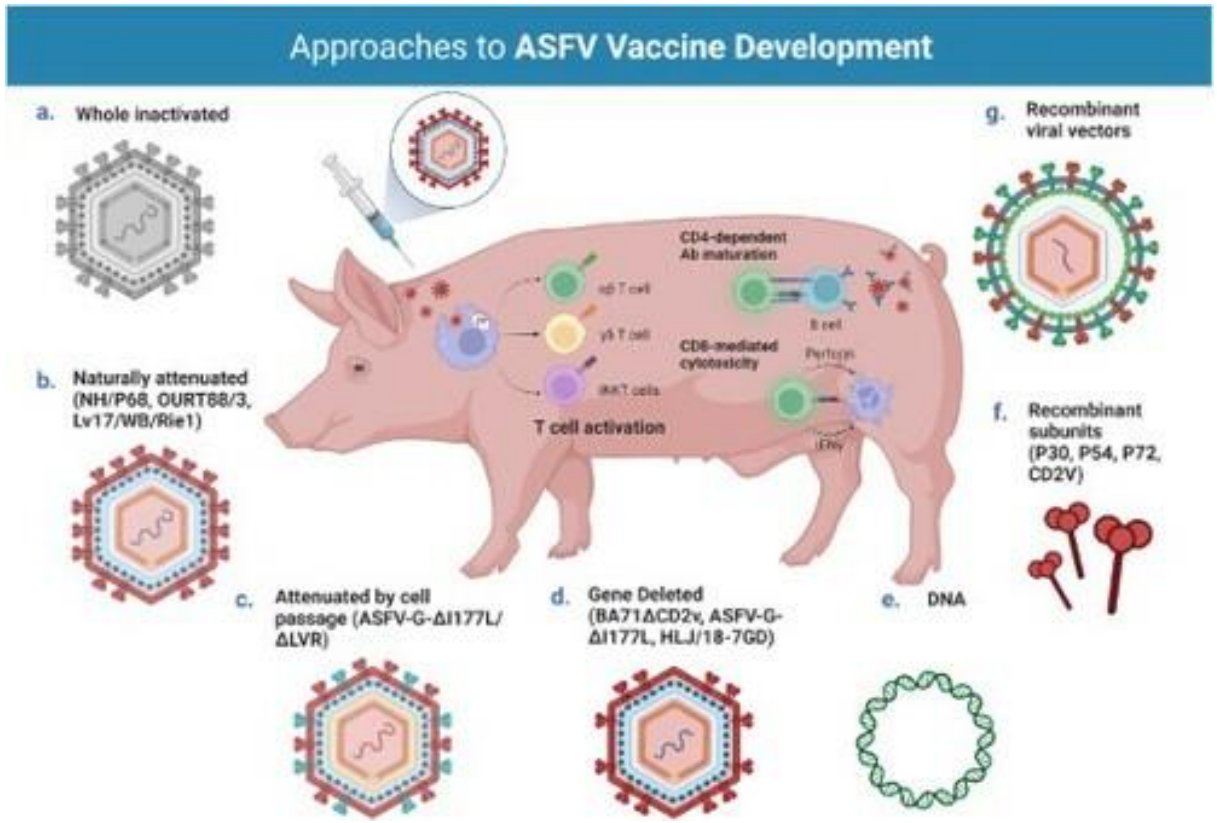

- **Inactivated vaccines**
  - good safety profile
  - did never induce true protective immunity
- **Naturally attenuated strains and live vaccines obtained through passaging**
  - induction humoral and cellular responses
  - oral application possible
  - potential to cause post-vaccination reactions including chronic/persistent infections
  - variable results with different candidates
- **Vectored vaccines, subunits, DNA vaccines**
  - easy to scale-up, good safety profile
  - depending on the system both humoral and cellular responses, high DIVA potential
  - so far only partial protection (if any)
- **Gene deleted live vaccines**
  - deletions targeting „virulence“ genes
  - cellular and humoral responses, DIVA potential
  - All advantages and disadvantages of live vaccines

In a nutshell: only live attenuated vaccines have shown real potential and would be required for oral vaccination of wild boar!

Urbano and Ferreira 2022, doi: 10.1080/22221751.2022.2108342

General vaccine approaches (2)

JVI

African Swine Fever Virus Georgia Isolate Harboring Deletions of MGF360 and MGF505 Genes Is Attenuated in Swine and Confers Protection against Challenge with Virulent Parental Virus

Vivian O'Donnell,[a,b] Lauren G. Holinka,[a] Douglas P. Gladue,[a,b] Brenton Sanford,[a] Peter W. Krug,[a] Xiqiang Lu,[c] Jonathan Arzt,[a] Bo Reese,[b] Consuelo Carrillo,[a] Guillermo R. Risatti,[b] Manuel V. Borca[a]

Agricultural Research Service[a] and APHIS,[c] USDA, Plum Island Animal Disease Center, Greenport, New York, USA; DHS, Plum Island Animal Disease Center, Greenport, New York, USA[b]; Department of Pathobiology and Veterinary Science, CAHNR,[b] and Center for Genome Innovation,[d] University of Connecticut, Storrs, Connecticut, USA

A seven-gene-deleted African swine fever virus is safe and effective as a live attenuated vaccine in pigs

Weiye Chen[1†], Dongming Zhao[1†], Xijun He[2†], Renqiang Liu[1†], Zilong Wang[1†], Xianfeng Zhang[2], Fang Li[1], Dan Shan[1], Hefeng Chen[1], Jiwen Zhang[1], Lulu Wang[1], Zhiyuan Wen[1], Xijun Wang[1], Yuntao Guan[2], Jinxiong Liu[1] & Zhigao Bu[1,2*]

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

Manuel V. Borca,[a*] Elizabeth Ramirez-Medina,[a,b] Ediane Silva,[a,b] Elizabeth Vuono,[a,b] Ayushi Rai,[a,b] Sarah Pruitt,[a,b] Lauren G. Holinka,[a] Lauro Velazquez-Salinas,[a,b] James Zhu,[a] Douglas P. Gladue[a]

vaccines

MDPI

Article

A Pool of Eight Virally Vectored African Swine Fever Antigens Protect Pigs against Fatal Disease

Lynnette C. Goatley [1], Ana Luisa Reis [1], Raquel Portugal [1], Hannah Goldswain [1], Gareth L. Shimmon [1], Zoe Hargreaves [1], Chak-Sum Ho [2], María Montoya [1,†], Pedro J. Sánchez-Cordón [1,‡], Geraldine Taylor [1], Linda K. Dixon [1] and Christopher L. Netherton [1,*]

Emerging Microbes & Infections
2020, VOL. 9
https://doi.org/10.1080/22221751.2020.1772675

EMi Taylor & Francis

OPEN ACCESS Check for updates

A porcine macrophage cell line that supports high levels of replication of OURT88/3, an attenuated strain of African swine fever virus

Raquel Portugal[a], Lynnette C. Goatley[a], Robert Husmann[b], Federico A. Zuckermann[b,c] and Linda K. Dixon[a]

[a]The Pirbright Institute, Surrey, UK; [b]Department of Pathobiology, University of Illinois at Urbana-Champaign, Urbana, IL, USA; [c]Aptimmune Biologics, Inc., St Louis, MO, USA

ABSTRACT
The main target cells for African swine fever virus (ASFV) replication in pigs are of monocyte macrophage lineage and express markers typical of the intermediate to late stages of differentiation. The lack of a porcine cell line, which accurately represents these target cells, limits research on virus host interactions and the development of live-attenuated vaccine strains. We show here that the continuously growing, growth factor dependent ZMAC-4 porcine macrophage cell line is susceptible to infection with eight different field isolates of ASFV. Replication in ZMAC-4 cells occurred with similar kinetics and to similar high titres as in primary porcine bone marrow cells. In addition we showed that twelve passages of an attenuated strain of ASFV, OURT88/3, in ZMAC-4 cells did not reduce the ability of this virus to induce protection against challenge with virulent virus. Thus, the ZMAC-4 cells provide an alternative to primary cells for ASFV replication.

ARTICLE HISTORY Received 27 December 2019; Revised 15 May 2020; Accepted 15 May 2020

KEYWORDS African swine fever virus; macrophage cell line; ZMAC; vaccine; virus replication

Vaccine candidate ASFV-G-ΔMGF

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pathogens

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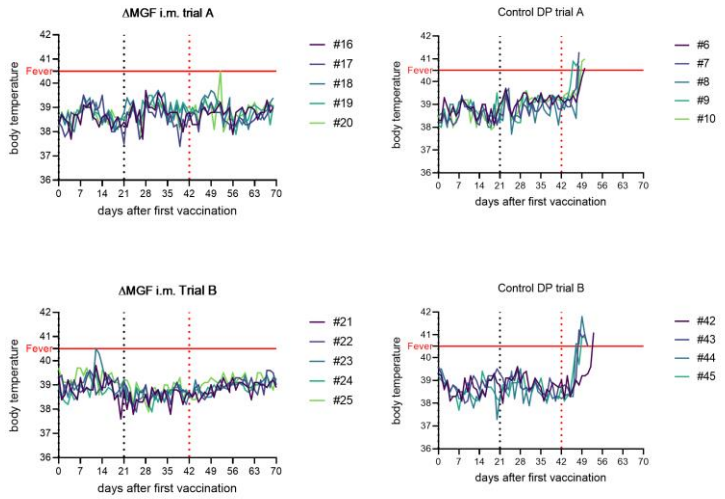
Article

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

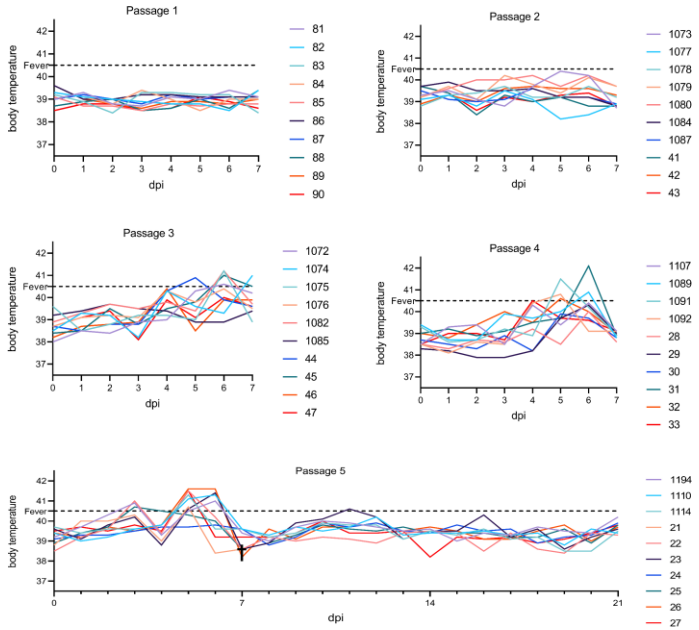
Paul Deutschmann [1], Tessa Carrau [1], Julia Sehl-Ewert [2], Jan Hendrik Forth [1], Elisenda Viaplana [3], Jose Carlos Mancera [4], Alicia Urniza [3], Martin Beer [1] and Sandra Blome [1,*]

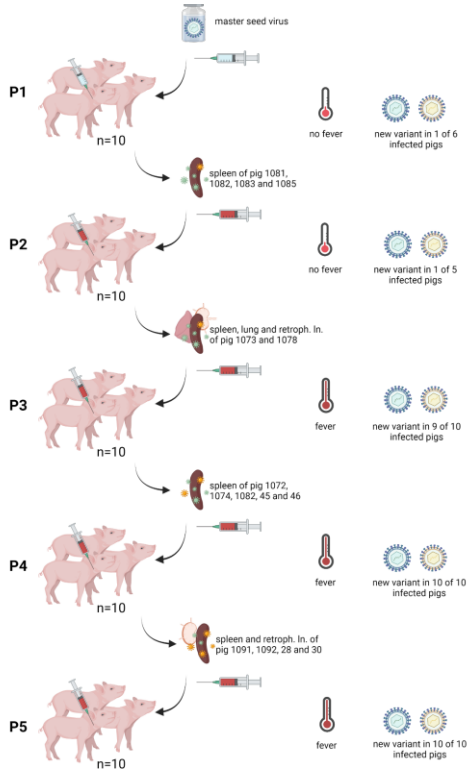


Safety and genetic stability of African swine fever virus vaccine candidate "ASFV-G-ΔMGF" in an in vivo "reversion to virulence" study

Blome S, Deutschmann P, Forth J, Sehl-Ewert J, Carrau T, Viaplana E, Mancera J, Urniza A, Beer M

Preprint from **Research Square**, 17 Aug 2022
DOI: 10.21203/rs.3.rs-1922286/v1 PPR: PPR532883
Preprint





Vaccine candidate ASFV-G-ΔI177L

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VACCINES AND ANTIVIRAL AGENTS

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

Manuel V. Borca,[a] Elizabeth Ramirez-Medina,[a,b] Ediane Silva,[a,c] Elizabeth Vuono,[a,d] Ayushi Rai,[a,e] Sarah Pruitt,[a,e] Lauren G. Holinka,[a] Lauro Velazquez-Salinas,[a,c] James Zhu,[a] Douglas P. Gladue[a]

Made-in-Vietnam vaccine against African swine fever effective

Monday, 06:44, 18/01/2021

VOV.VN - A vaccine developed by a Vietnamese company to combat the African swine fever (ASF) has proved effective following clinical trials and is expected to be commercially marketed in the second quarter of 2021.

Leaders of the Ministry of Agriculture and Rural Development visit a production line of the ASF vaccine. (Photo: Hong Thuy).

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Vietnam suspends use of African swine fever vaccine

By Ann Reus | August 25, 2022

vchal | Bigstock.com

'Dozens' of pigs died after being inoculated, Reuters reports

Vietnam has temporarily suspended the use of its African swine fever (ASF) vaccine after pigs that received the shot died, according to a Reuters report.

viruses

MDPI

Article

ASFV-G-ΔI177L as an Effective Oral Nasal Vaccine against the Eurasia Strain of Africa Swine Fever

Manuel V. Borca [1,*], Elizabeth Ramirez-Medina [1], Ediane Silva [1,2], Elizabeth Vuono [1,3], Ayushi Rai [1,4], Sarah Pruitt [1], Nallely Espinoza [1], Lauro Velazquez-Salinas [1,2], Cyril G. Gay [5] and Douglas P. Gladue [1,*]

A cell culture-adapted vaccine virus against the current pandemic African swine fever virus strain

M. V. Borca[a*], A. Rai[a,b], E. Ramirez-Medina[a,c], E. Silva[a,d], L. Velazquez-Salinas[a,d], E. Vuono[a,e], S. Pruitt[a], N. Espinoza[a], and D. P. Gladue[a]*

Special supervision of the African swine fever vaccine

(VAN) Acting Director of the Department of Animal Health Nguyen Van Long suggested provinces and cities using the African swine fever vaccine and Navetco Company to correct the monitoring of vaccine use.

Future perspectives

- Only live attenuated deletion mutants have shown real potential
- Vaccination must be embedded in an ASF control and prevention strategy
- Animal welfare efforts go in the direction of free-range husbandry and use of natural enrichment, here vaccine may play a greater role
- Vaccines will not replace the need for biosecurity, behavior changes, improved management, diagnostic approaches and culling measures
- Safety characteristics and minimum standards must be developed
- Major candidates should be studied at different institutions
- We need field trials under controlled European conditions (outsourcing is not an option)
- GMO issues have to be discussed → BSL3ag/BSL4 / release into the field
- **BENEFIT-RISK-ANALYSIS**
- How much perfection do we really need?

Controlled zones for field trials?

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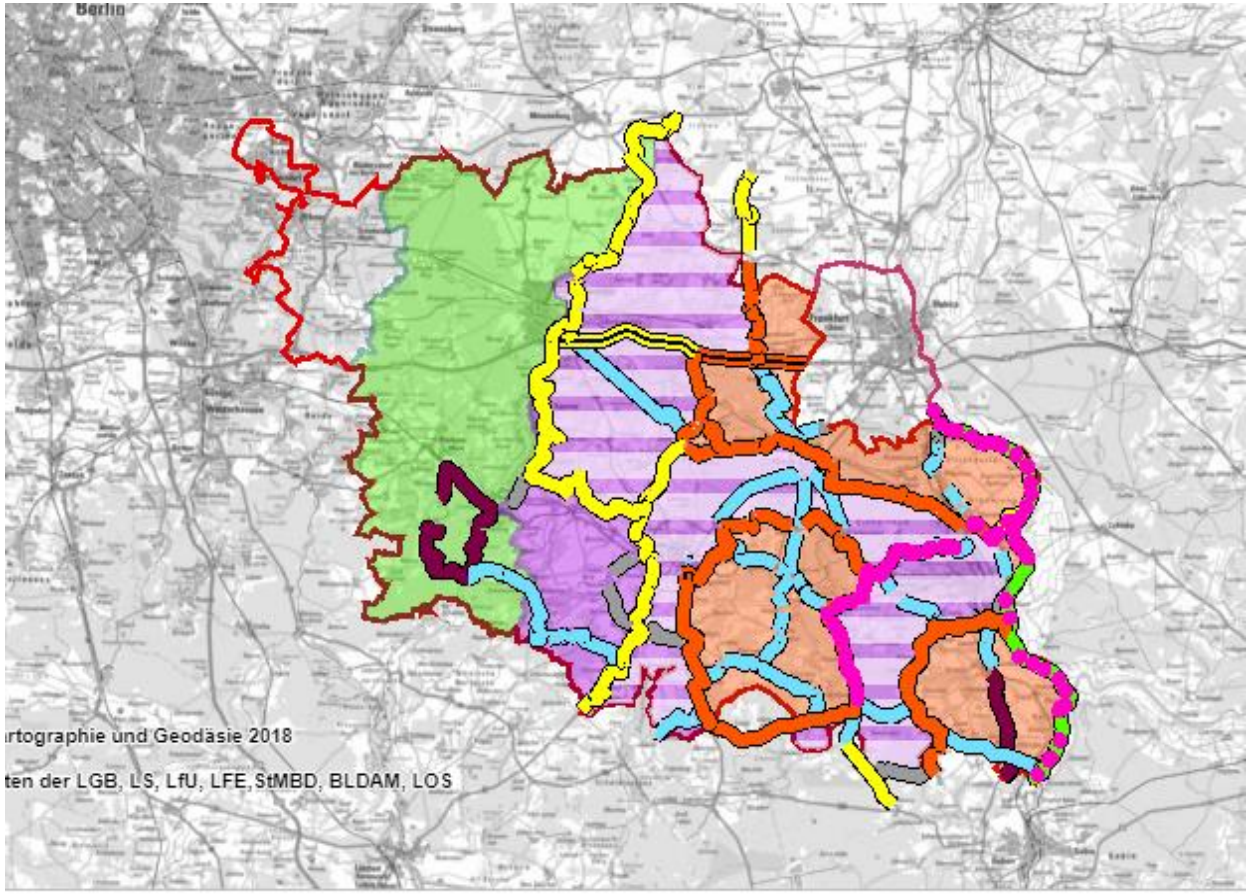

White zones and double-fenced areas may provide the basis for field trials

Looking beyond the horizon

FAO, IUCN SSC and OIE warn of African swine fever impact on wildlife conservation

Mon, 23 Aug 2021

The increasing rate of infection of African swine fever (ASF) among domestic and wild pigs in the Asia-Pacific region has prompted the Food and Agriculture Organization of the United Nations (FAO), the International Union for Conservation of Nature's Species Survival Commission (IUCN SSC), and the World Organisation for Animal Health (OIE) to issue a joint call for countries in the region to develop stronger policies and implement strategies to mitigate the impacts of ASF on wildlife, livestock health, and rural livelihoods.

Oral vaccination may protect endangered species from extinction … in the wild and well-controlled in zoological institutions

Thanks for your attention!

Global African Swine Fever Research Alliance

Questions? → sandra.blome@fli.de