



Strong together against infections
Science • Society • Industry

Vaccine development with an emphasis on the cooperation of industry and science

VacoME - Development of vaccines against respiratory and systemic infections in humans and pigs

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VacoME –

Development of vaccines against respiratory and systemic infections in humans and pigs

- Vaccine research and development
- VacoME as an example of an interdisciplinary One Health approach
 - Objectives
 - Disciplines and working groups involved
 - Results
 - Achievements due to the interdisciplinary One Health approach
- Outlook



Vaccine research and development



VacoME – an interdisciplinary One Health approach

Objectives

In a trans-sectoral approach, antigens should be identified which provide broad cross serotype protection against *S. suis*

- Identification of host compartment-specific antigens in *S. suis* (nasopharynx, lung, blood, CSF)
 - *In vivo* and *ex vivo* proteomics
 - RNAseq analyses
- Recombinant production and purification of potentially immunogenic AG candidates
- Immunoproteome analyses by convalescent sera from pigs
- Immunization with multi-component vaccine prototypes and testing of the protective effect in challenge experiments in pigs
- Identification of *ex vivo* correlates for protective immunity

VacoME – an interdisciplinary One Health approach

Disciplines and working groups involved

UNIVERSITÄT GREIFSWALD
Wissen lockt. Seit 1456



UNIVERSITÄT LEIPZIG

Vet.med. Fakultät **VMF**
Bacteriology and Mycology

UNIVERSITÄT LEIPZIG

Vet.med. Fakultät **VMF**
Immunology

 **HELMHOLTZ**
ZENTRUM FÜR
INFEKTIONSFORSCHUNG



VacoME – an interdisciplinary One Health approach

Results

The objective of cross serotype protection against *S. suis* was not achieved, but,

- the immunoproteomics application was established and validated;
- a spectral database for *S. suis* was created;
- a large number of *S. suis* proteins have been identified which are differentially expressed *in vivo* (>100) in a compartment-specific manner;
- 52 antigen candidates were identified by immunoproteomics (significant difference between sera from convalescent and susceptible pigs);
- a multicomponent vaccine was produced from 6 antigens;
- this vaccine resulted in high antibody titres but no protection in the challenge test;
- the *S. suis*-induced oxidative burst in blood granulocytes was established as a new *in vitro* correlate of protection.

VacoME – an interdisciplinary One Health approach

Achievements due to the interdisciplinary One Health approach

- Immunoproteomics based identification of putative cross-protective antigens
- *S. suis*-induced oxidative burst in blood granulocytes as an *in vitro* correlate of protection



Immunoproteomics-based approach to identify putative cross-protective antigens

Database of well-defined pig sera

Animal studies covering wide range of *S.suis* serotypes



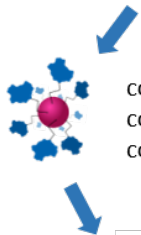
- Sera pre infection
- Sera post infection (convalescence)
- Sera of susceptible piglets (experimentally confirmed)
- Hyperimmune sera



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His-tagged purified antigens

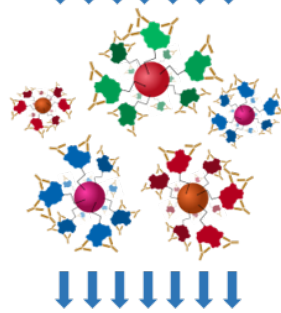


coupling to MagPlex® beads,
control with anti-His₅ R-PE
conjugated antibody



read-out with Flexmap 3D®
& data analysis in

7-step dilution
series of each
serum sample



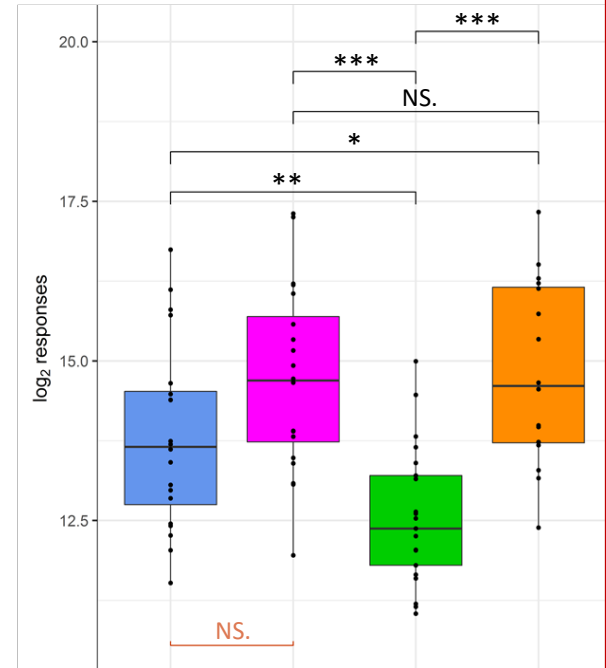
Meyer *et al.*,
J Proteomics 2020

incubation with bead mix,
binding of serum antibodies
to presented antigens



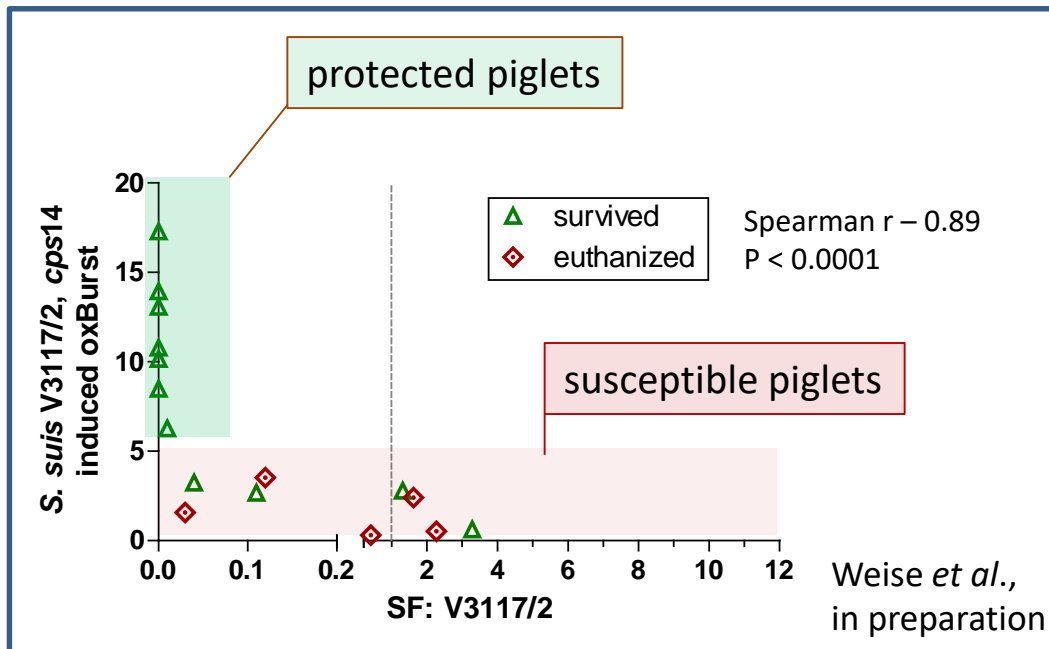
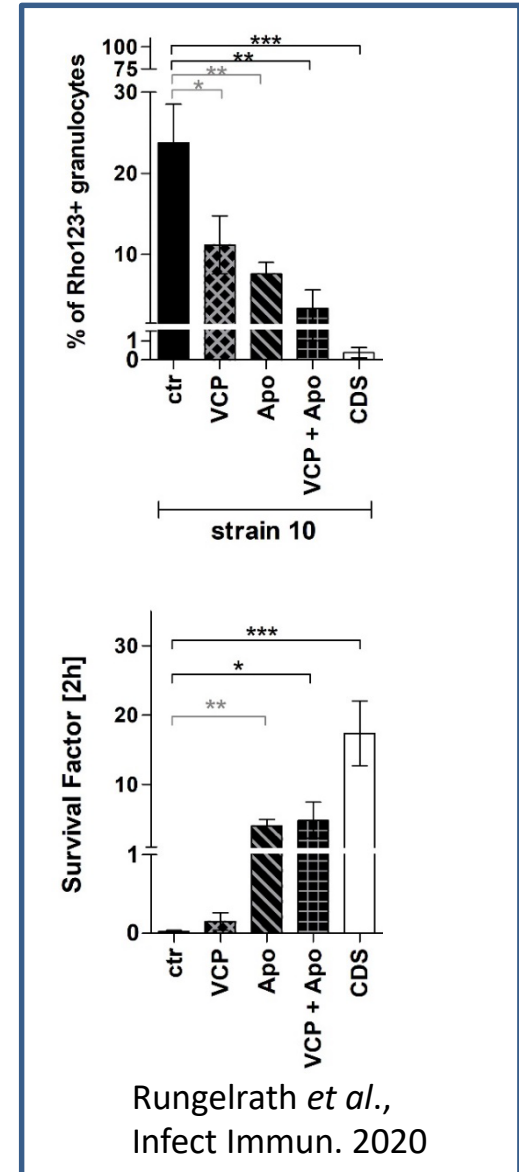
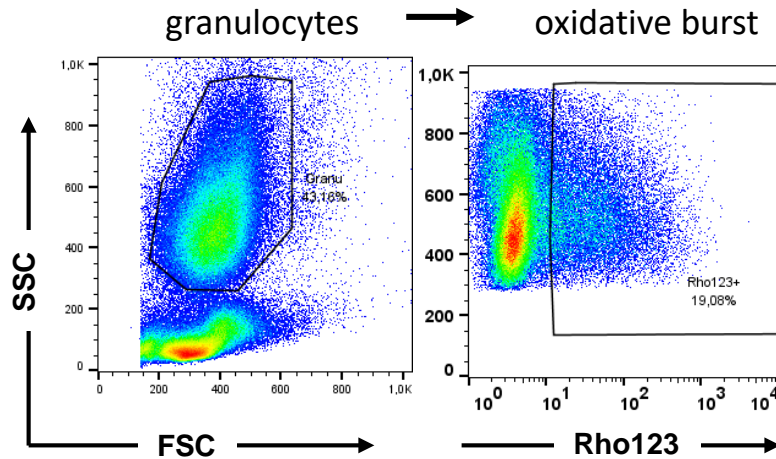
detection of bound
serum IgG by addition of
PE-conjugated antibody

SSU1950



identification of
vaccine candidates:
- significant difference between sera of
convalescence and susceptibility

New *in vitro* correlate of protection: *S. suis*-induced oxidative burst in blood granulocytes



Outlook

PathoWIKI 2020-2021: Development of pathogen-specific databases (WIKI) for *S. suis* and *S. pneumoniae* as a basis for the analysis and application of OMICS data for vaccine development



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