

Streptococcal infections in pigs - with special emphasis on *S. suis*

Anders Miki Bojesen, DVM, PhD, Dipl ECPVS,
Professor

UNIVERSITY OF COPENHAGEN



Streptococci in pigs

S. dysgalactiae subsp. equisimilis

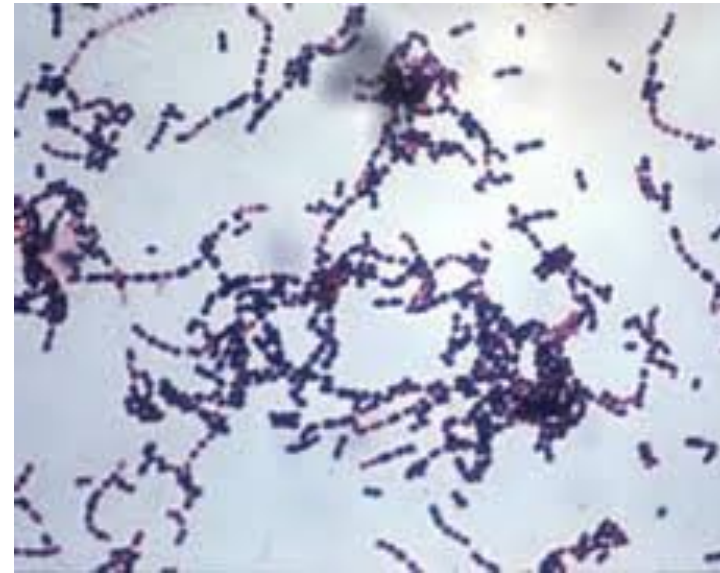
- beta-hemolytic streptococci
 - arthritis
 - endocarditis
 - meningitis
- } **young piglets**

S. porcinus

- beta-hemolytic streptococci
- submanibular lymphadenitis

S. suis

- alfa-hemolytic streptococci
- arthritis
- endocarditis
- meningitis
- bronchopneumonia
- septicemia



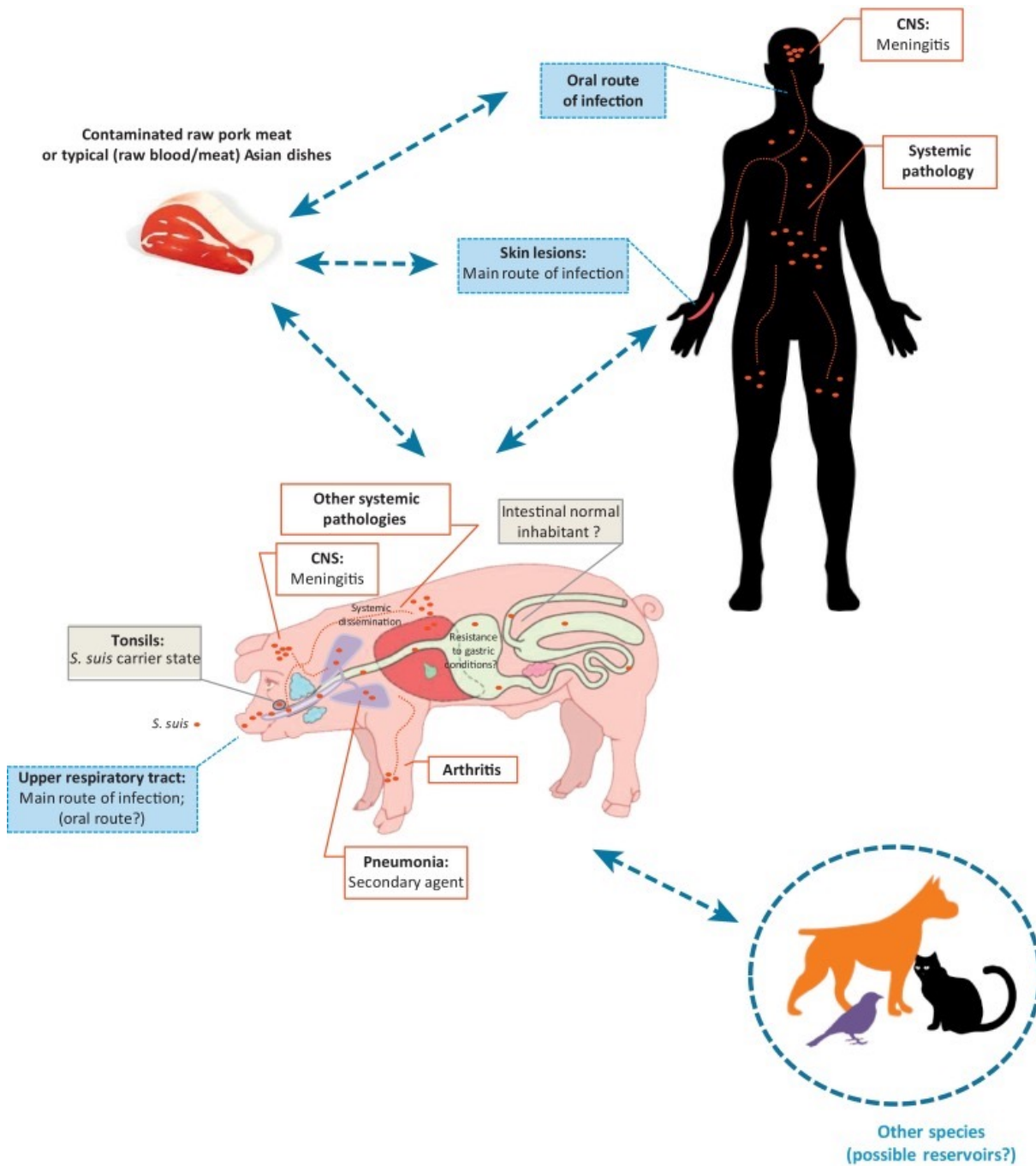
Streptococcus suis

- Gram-positive bacterium
- Common in healthy pigs (tonsils)
- Systemic disease/meningitis/arthritis
- Zoonotic

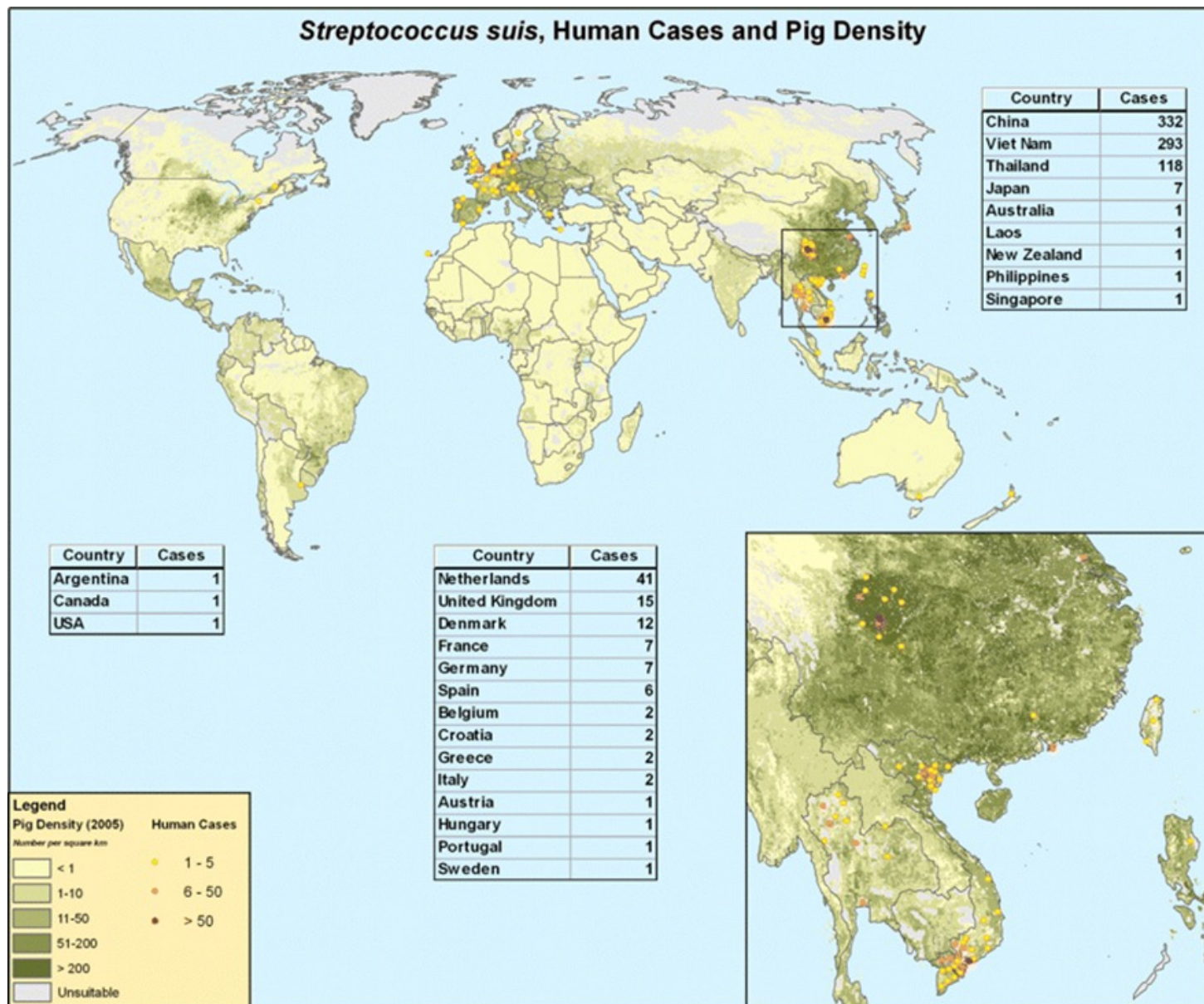


Unterweger et al. Pathogens 2018, 7(2), 34;
<https://doi.org/10.3390/pathogens7020034>





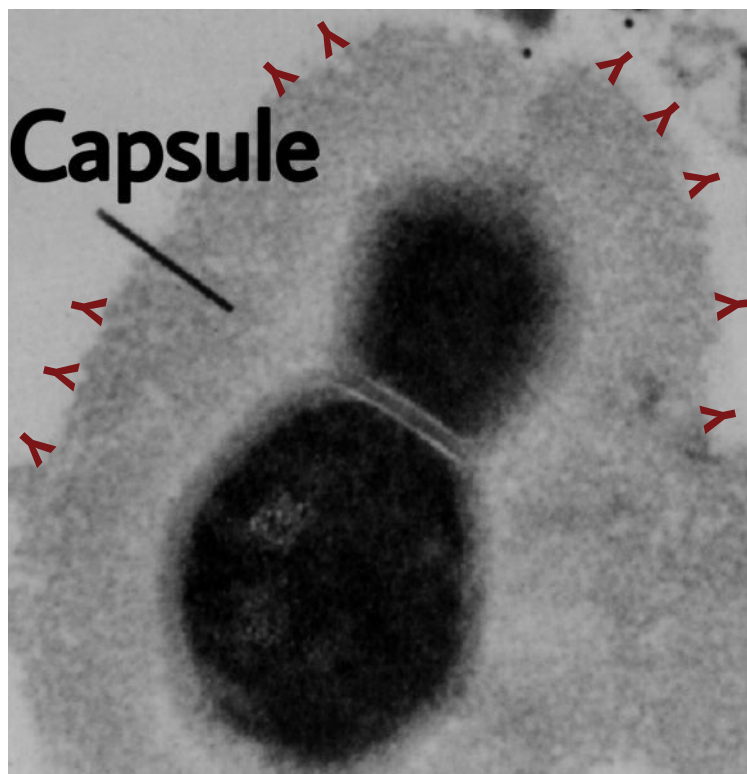
Pigs and human *S. suis* infections



Heiman et al. Clinical Infectious Diseases
Vol. 48, No. 5 (Mar. 1, 2009), pp. 617-625

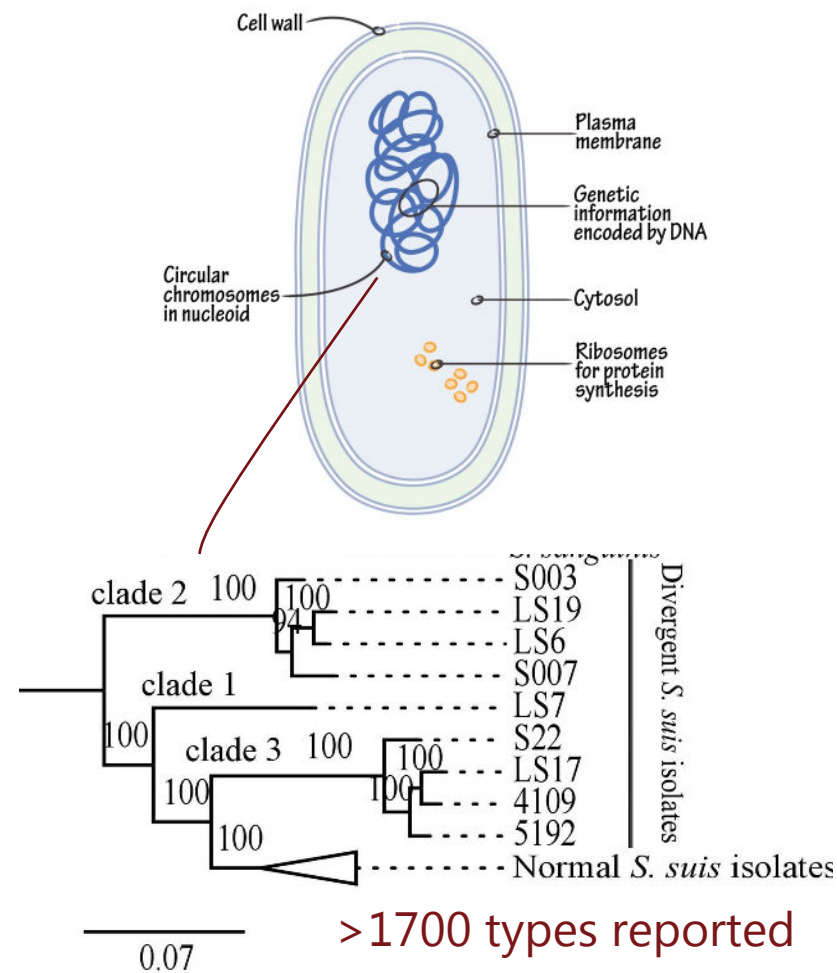
Ways to distinguish *S. suis* types

Sero-typing (capsular polysaccharides)

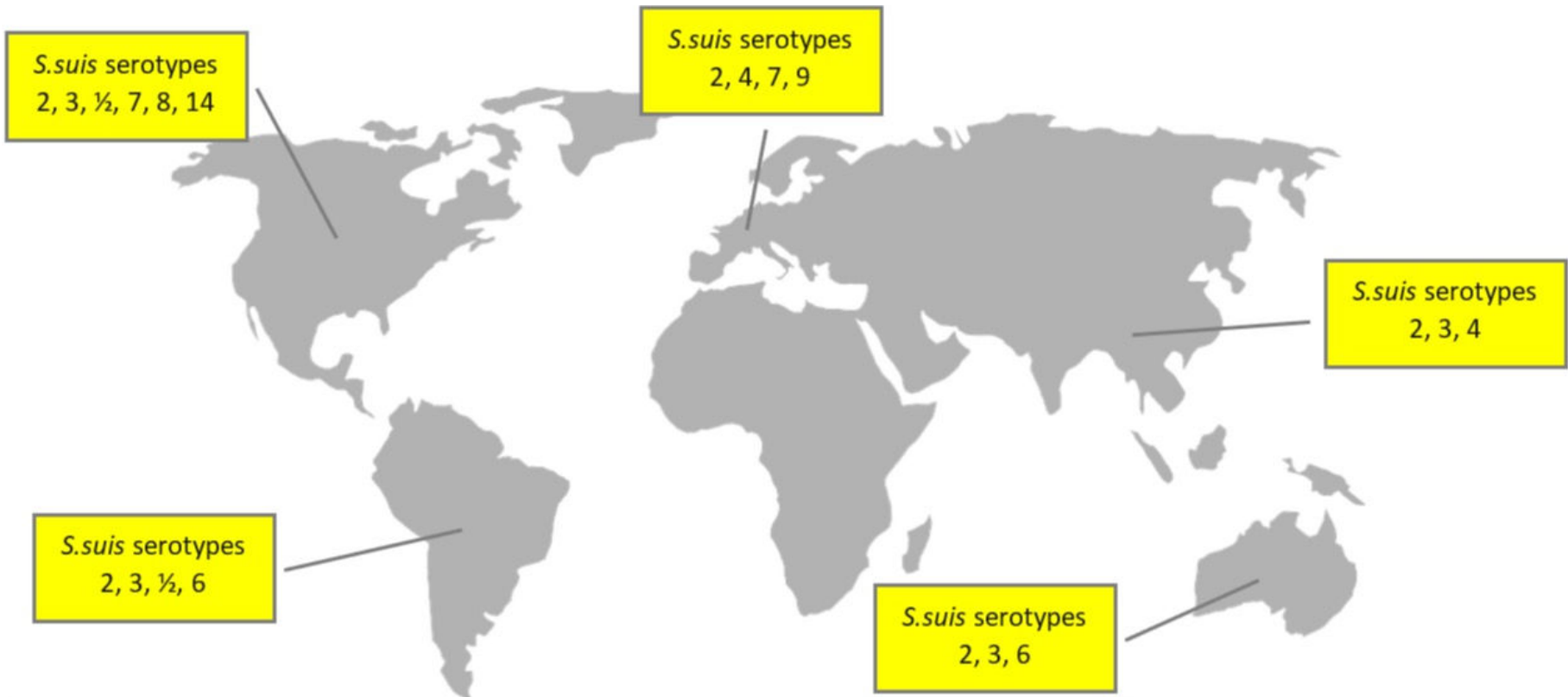


29 serotypes described

Sequence typing

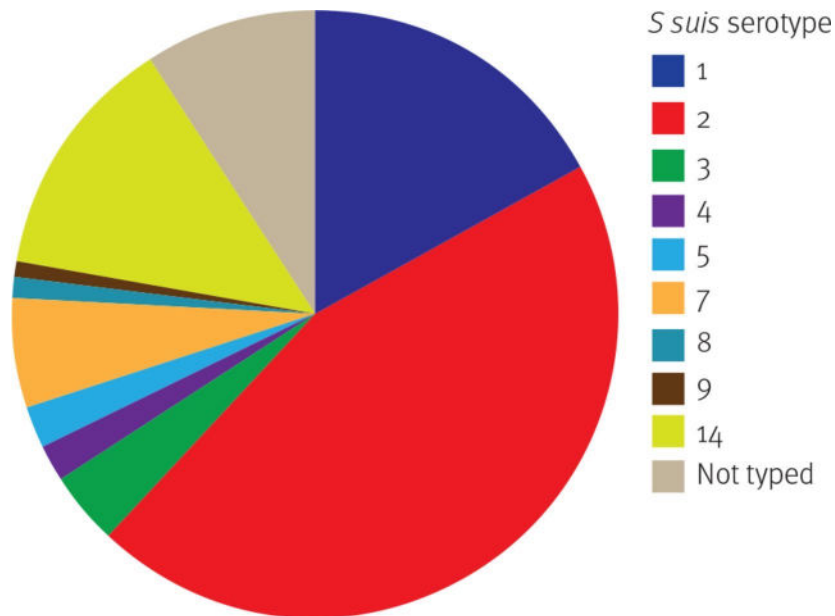


Serotypes and clinical disease



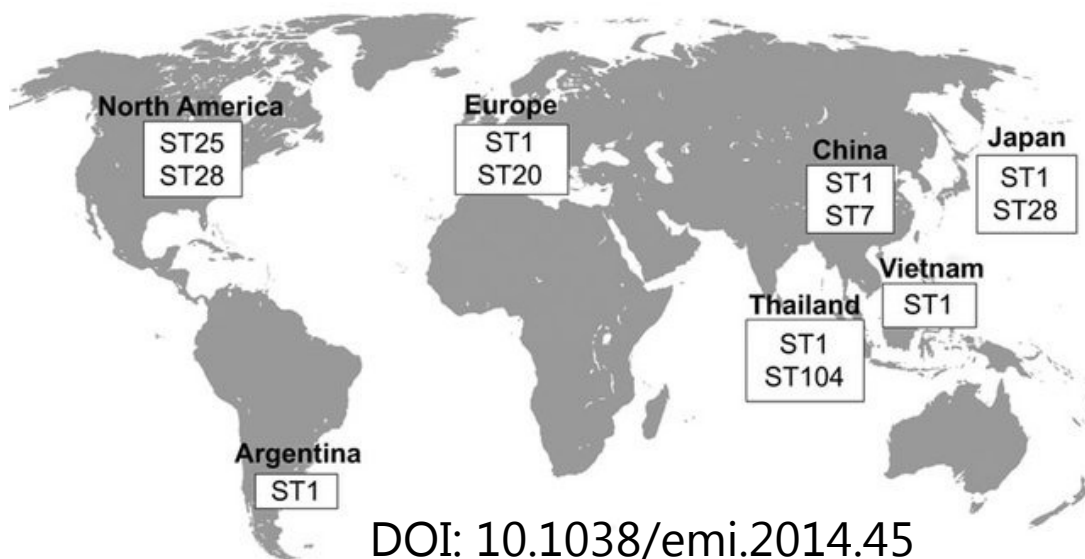
Goyette-Desjardins et al. (2014), Zimmermann et al. (2019), and Gebhart (2019)

Which types cause clinical problems?



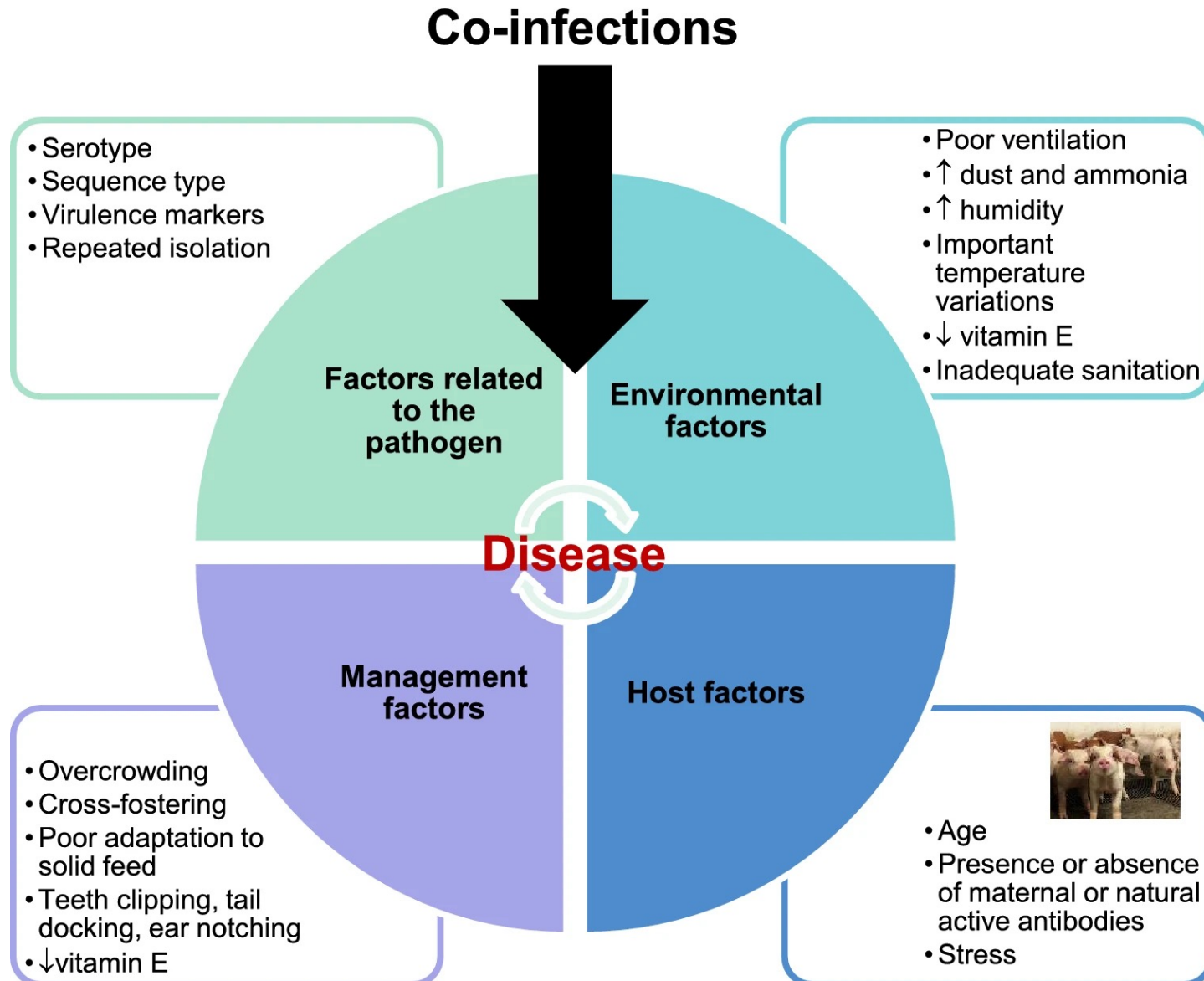
<http://dx.doi.org/10.1136/vr.k4181>

Serotype 2 – Sequence Type 1



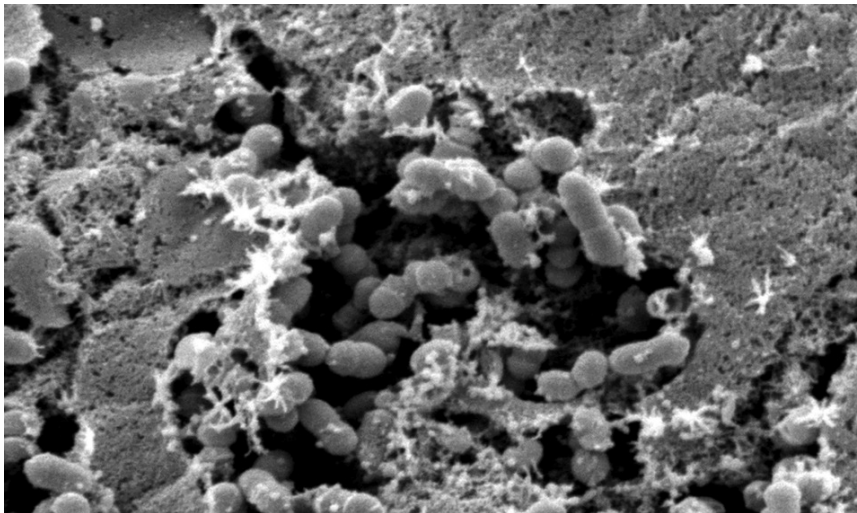
DOI: 10.1038/emi.2014.45

Factors of importance for *S. suis* infections

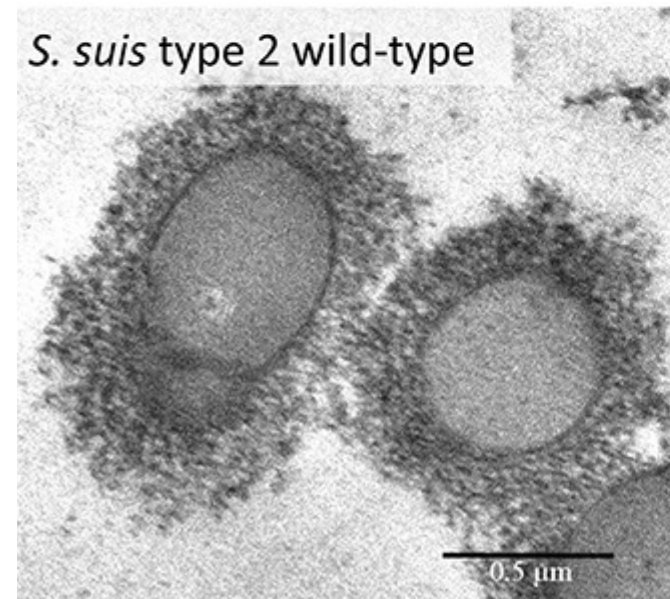


Why and how do systemic infections occur?

- Several “essential” virulence factors have been proposed
- Concurrent viral infection (e.g. PRRSV – SIV)
- Methods to test pathogenicity remain controversial
- No current vaccines provide broad protection



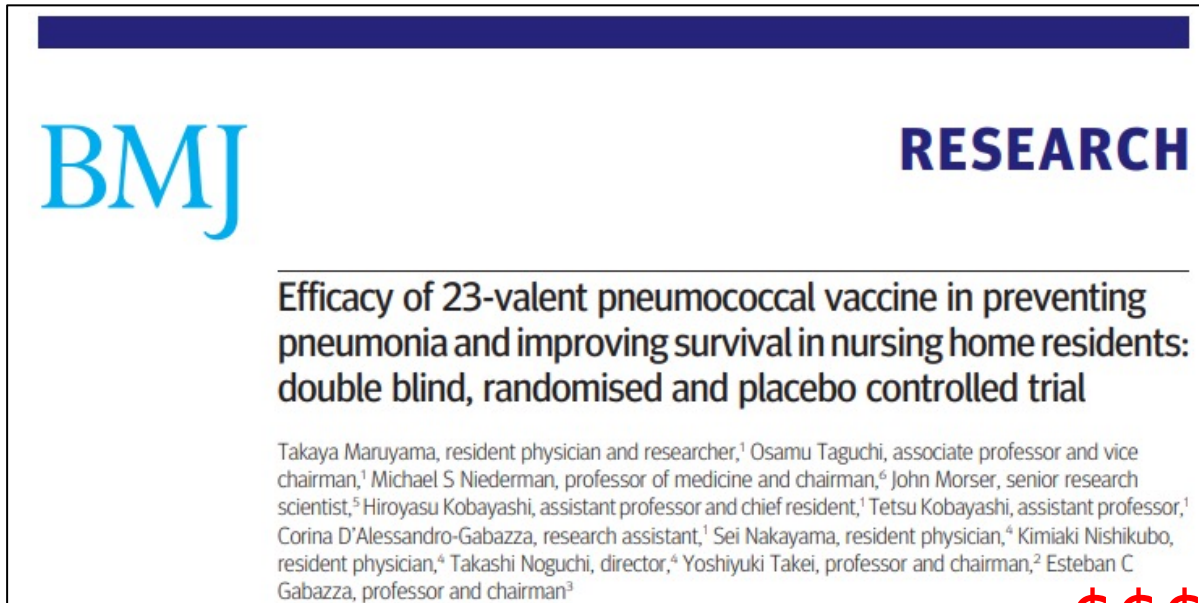
[//journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.0030187](https://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.0030187)



<https://www.frontiersin.org/articles/10.3389/fmicb.2018.00545/full>

Means of prevention by vaccination

- Human streptococcal pneumoniae



The image shows the cover of a research article from the British Medical Journal (BMJ). The title is "Efficacy of 23-valent pneumococcal vaccine in preventing pneumonia and improving survival in nursing home residents: double blind, randomised and placebo controlled trial". The authors listed are Takaya Maruyama, Osamu Taguchi, Michael S Niederman, John Morser, Hiroyasu Kobayashi, Tetsu Kobayashi, Corina D'Alessandro-Gabazza, Sei Nakayama, Kimiaki Nishikubo, Takashi Noguchi, Yoshiyuki Takei, and Esteban C Gabazza.

BMJ **RESEARCH**

Efficacy of 23-valent pneumococcal vaccine in preventing pneumonia and improving survival in nursing home residents: double blind, randomised and placebo controlled trial

Takaya Maruyama, resident physician and researcher,¹ Osamu Taguchi, associate professor and vice chairman,¹ Michael S Niederman, professor of medicine and chairman,⁶ John Morser, senior research scientist,⁵ Hiroyasu Kobayashi, assistant professor and chief resident,¹ Tetsu Kobayashi, assistant professor,¹ Corina D'Alessandro-Gabazza, research assistant,¹ Sei Nakayama, resident physician,⁴ Kimiaki Nishikubo, resident physician,⁴ Takashi Noguchi, director,⁴ Yoshiyuki Takei, professor and chairman,² Esteban C Gabazza, professor and chairman³

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- No commercial vaccine against *S. suis*

Autogenous vaccines

Farm-specific vaccines

Step 1



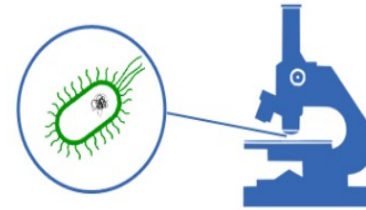
Viral and bacterial pathogens weaken the animal



Step 3

Production of a herd-specific vaccine

Step 2



Identification of the pathogen from tissue or sampling of the infected animal



Step 4

Treatment with herd-specific vaccine



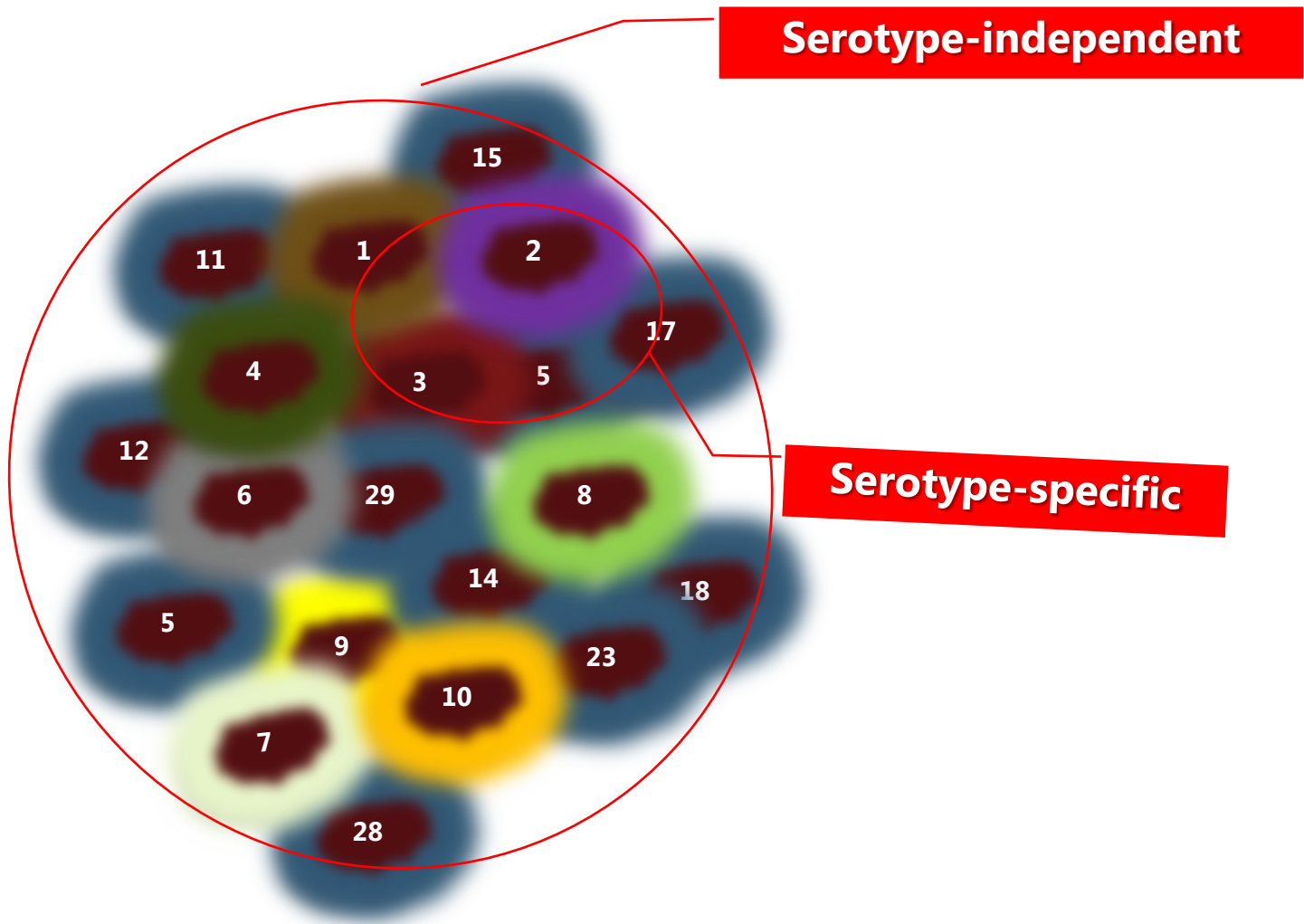
Step 6

Vaccine reduces morbidity from field infection

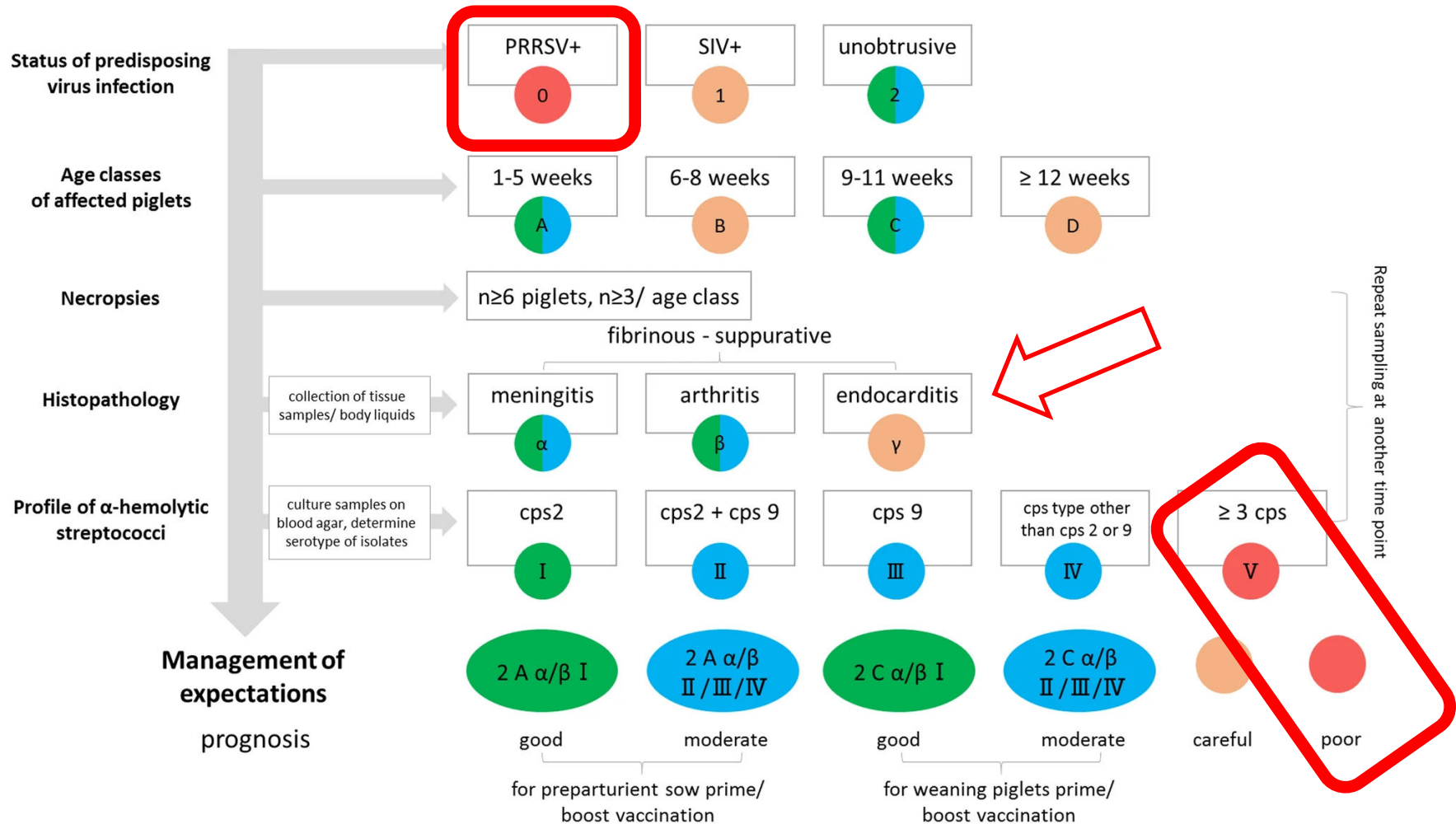
Step 5

After treatment the animal form antibodies against the pathogen

Vaccination coverage



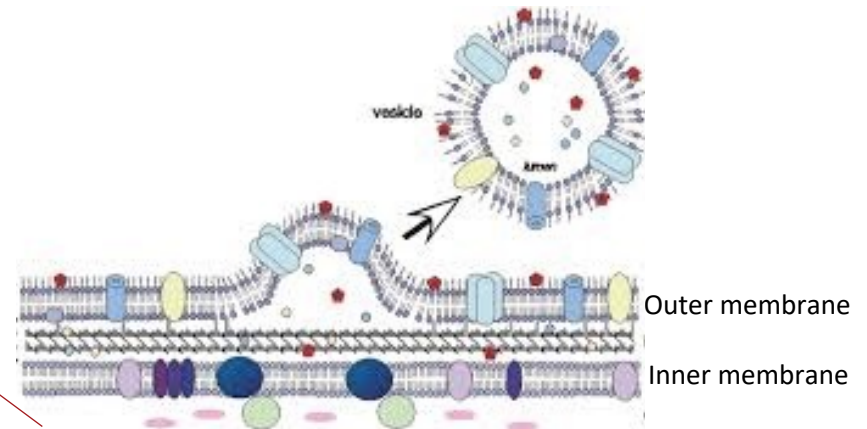
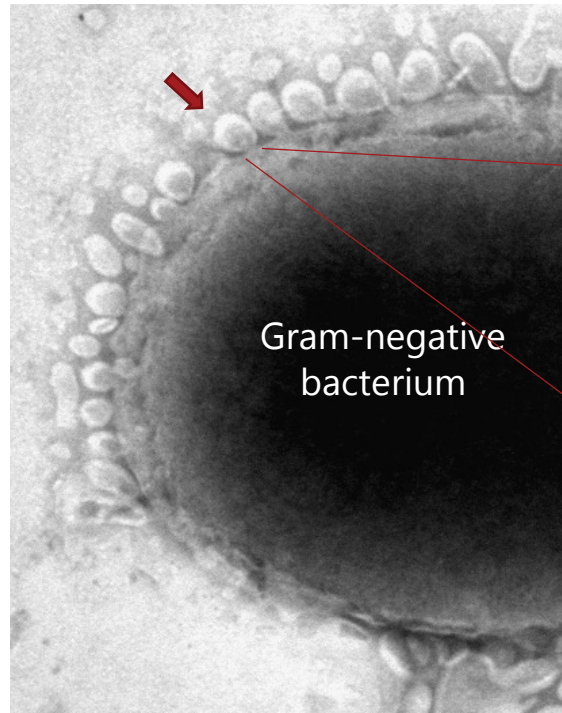
Expectations to autogenous vaccine prophylaxis





Important points at autogenous vaccine use

- PRRS (and SIV) limits positive effect
 - Endocarditis limits value of antibiotic treatment (biofilm)
 - Presence of ≥ 3 capsular types leads to poor prognosis
-
- Know the epidemiological "landscape" of *S. suis*
 - Vaccination of weaners of at least 3 to 4 weeks of age
 - Vaccination of sows based on situation in the farm

Bacterial membrane vesicles are ideal vaccines





Article

Hydrostatic Filtration Enables Large-Scale Production of Outer Membrane Vesicles That Effectively Protect Chickens against *Gallibacterium anatis*

Fabio Antenucci, Homa Arak, Jianyang Gao, Toloe Allahgadry, Ida Thofner and Anders Miki Bojesen *


Department of Veterinary and Animal Sciences, University of Copenhagen, DK-1870 Frederiksberg C, Denmark; fante@sund.ku.dk (F.A.); homaarak@gmail.com (H.A.); 648291851a@gmail.com (J.C.); toloe@sund.ku.dk (T.A.); icnt@sund.ku.dk (I.T.)
* Correspondence: miki@sund.ku.dk

Received: 2 January 2020; Accepted: 21 January 2020; Published: 23 January 2020

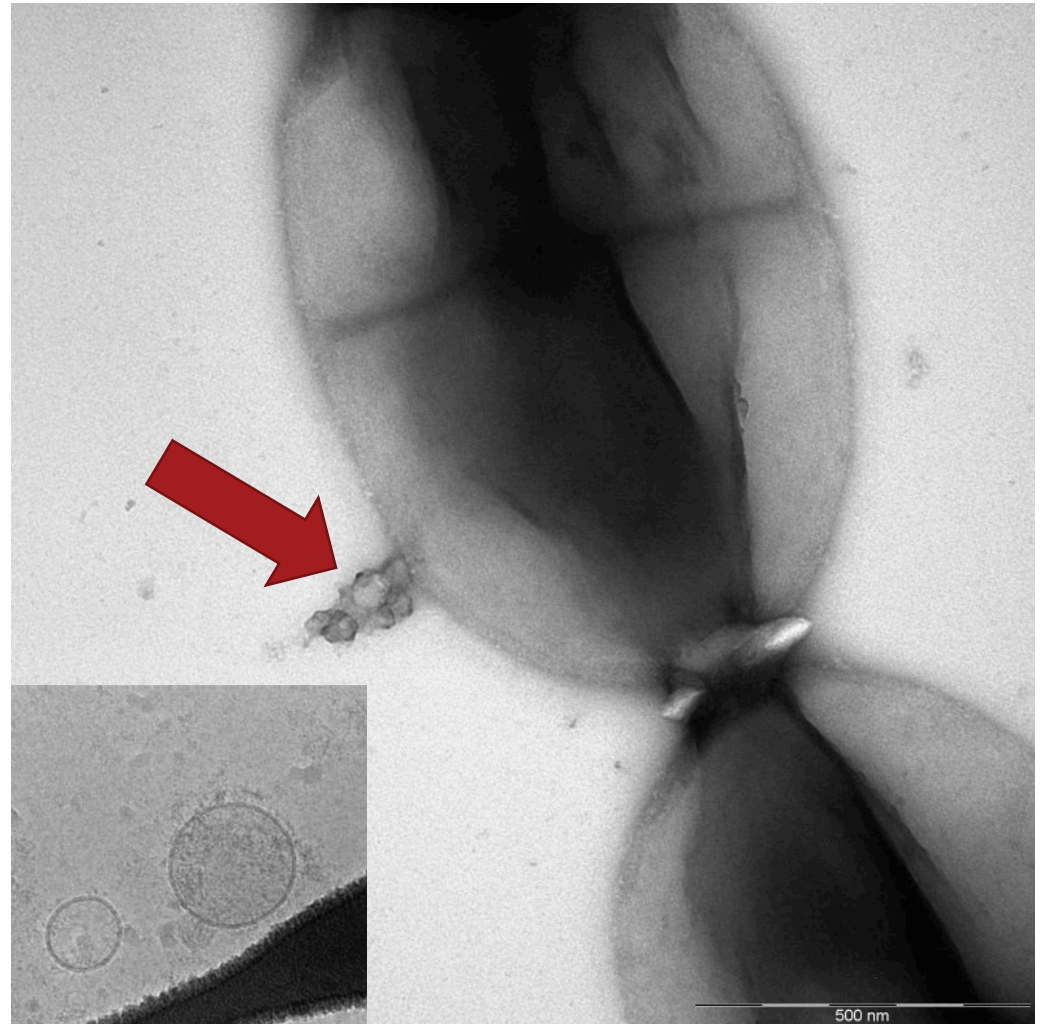
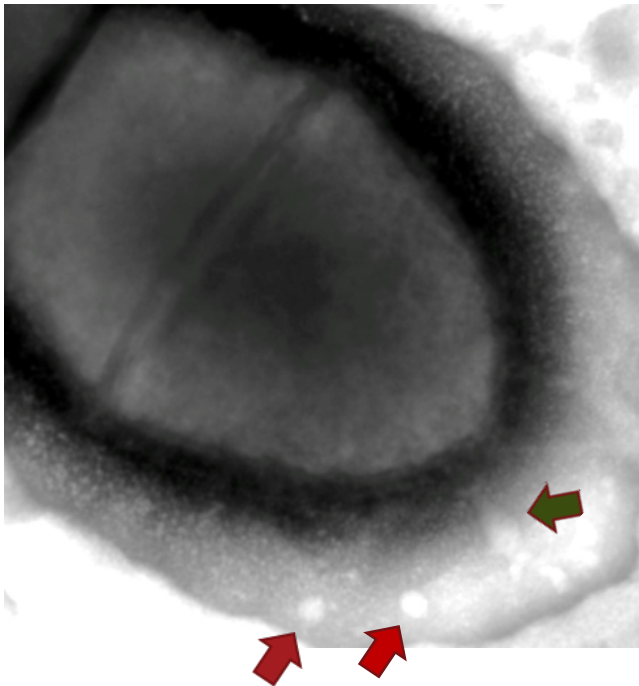
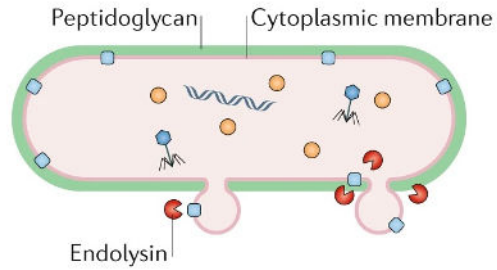
RESEARCH ARTICLE
September/October 2022 Volume 10 Issue 5 e01819-22
<https://doi.org/10.1128/spectrum.01819-22>

Outer Membrane Vesicles of *Actinobacillus pleuropneumoniae* Exert Immunomodulatory Effects on Porcine Alveolar Macrophages

Zhuang Zhu^a, Fabio Antenucci^a, Hanne Cecilie Winther-Larsen^b, Kerstin Skovgaard^c, Anders Miki Bojesen ^a

S. suis Membrane Vesicles

Gram-positive bacteria



Take home

S. suis is endemic in most pig herds

Common cause of antimicrobial prescription

Resource demanding management in problem herds

- the epidemiological landscape is typically incompletely understood
- targeted prevention rely on herd-specific characteristics
 - PRRS status
 - Presence of ≥ 3 *S. suis* capsular types

Broadly protective vaccine needed