

## ACRONYM: ExcludeMRSA

**Title:** Preventing transmission of MRSA from livestock to humans through competitive exclusion

**Keywords:** MRSA, microbiome, transmission, metagenomics, *Staphylococcus aureus*, competitive exclusion, pigs

### Consortium composition:

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### Abstract:

Pig farms act as reservoir of Livestock-Associated Methicillin-resistant *Staphylococcus aureus* (LA-MRSA).

Through occupational exposure to farm dust and contact with pigs, farm workers are at risk for acquiring LA-MRSA. Although health care institutions can cope with the current situation, it is a burden for patients, health care staff, and finances. In addition, the recent observed adaptation of LA-MRSA originating from pigs to humans in Denmark further highlights the need to reduce LA-MRSA colonization in pigs and subsequent transmission to humans. In a pilot study of the nasal microbiome we observed that piglets become LA-MRSA positive after a few days of birth. The presence of several other bacterial species, including coagulase-negative staphylococci was negatively associated with the presence of LA-MRSA.

More evidence is needed regarding which bacterial species and/or strains compete with LA-MRSA. The project aims to establish the effect of colonization resistance (bacterial competition) on the transmission of LA-MRSA from pigs to humans by i) identifying bacterial species that compete with LA-MRSA (*S. aureus* in general) in a systematic way using state of the art bioinformatics and metagenomics methods at strain level, ii) studying the efficacy of applying a nasal microflora for piglets which will be produced under GMP conditions by the industrial partner in the project and tested under field conditions at conventional farms, and iii) to estimate the risk reduction as a result from limiting MRSA transmission to humans by reducing shedding and consequently a more limited environmental contamination. Communication with farmers, veterinarians, public health workers and other stakeholders, with

the help of our supporting organizations, will prepare the stakeholders for the outcome of the project, bringing it close to immediate use in practice. ExcludeMRSA will deliver a reduction of MRSA colonization or will lead to complete prevention of MRSA colonization by pre-colonization of piglets with microflora. The efficacy will be assessed in two countries by using proven environmental risk models for human exposure and evaluating changes in the exposure risk association. Because of the earlier performed successful pilot studies, the experience of the partners and the inclusion of an industrial partner experienced in production of live strains, this project is feasible in three years' time.