

Airborne Microbiota and Other Bioaerosols in Pig Farms

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Evaluation potential occupational exposure

→ dust and microorganisms in bioaerosol

Characterization

→ air microbiota

→ pig nasal microbiota

→ farmer nasal microbiota

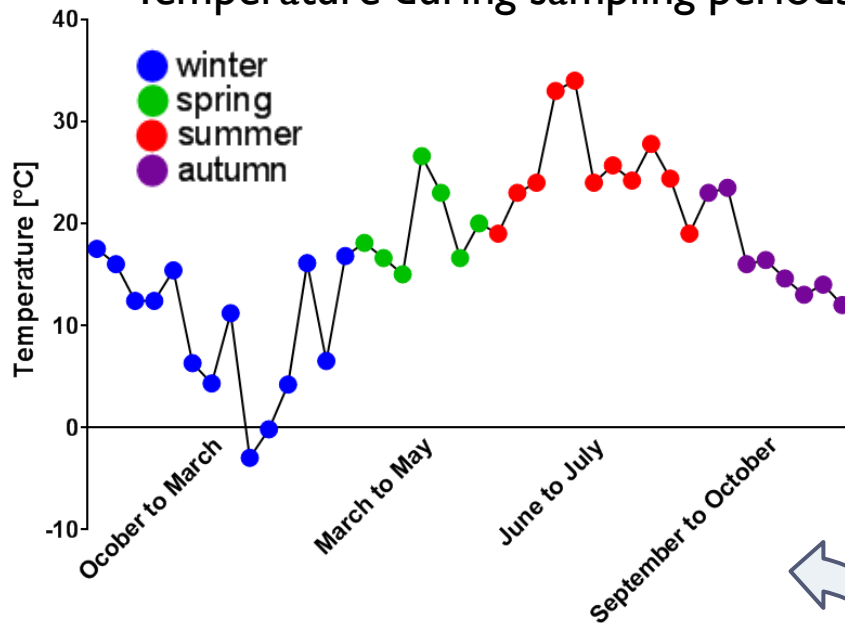
→ Impact of occupation on whole microbiome,
not just single species.

Sampling

31 pig farms



Temperature during sampling periods



four seasons



Sampling



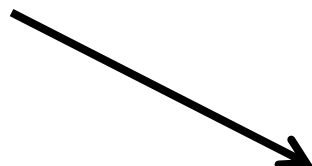
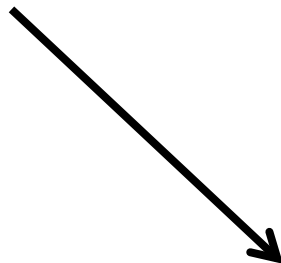
nasal microbiota
MRSA



ESBL producers



allergens
 β -glucan
endotoxin



Nanoparticles
Inhalable fraction
Thoracic fraction
Alveolic fraction



MRSA
MSSA
fungi count

Dust particles

mass [$\mu\text{g}/\text{m}^3$]

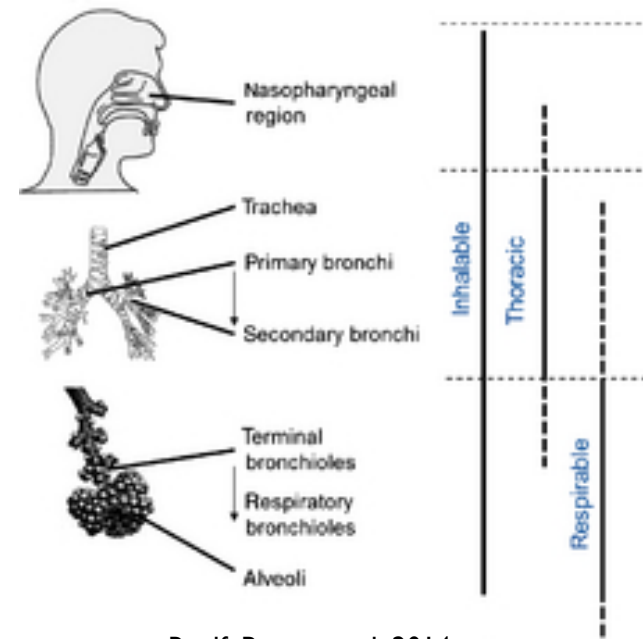
$p=0.058$

$p=0.028$

$p=0.006$

mass [$\mu\text{g}/\text{m}^3$]

- winter
- spring
- summer
- autumn



Raulf, Buters et al. 2014

Dust particles - Nanoparticles

$p=0.058$

Number

Number



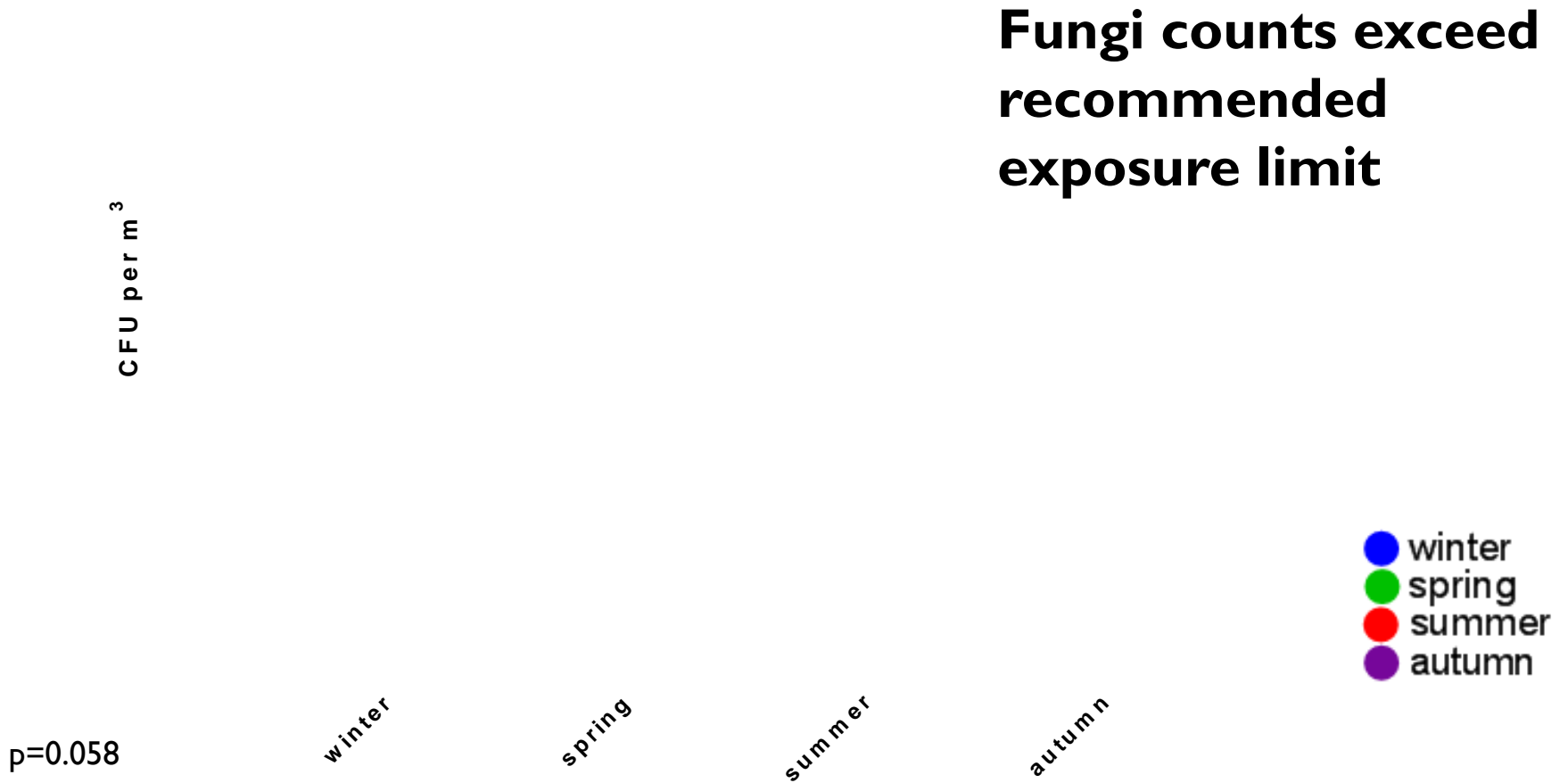
Number

Number

No increase
compared to control
for majority of farms

Main particle burden:
bigger particle
(inhalable fraction)

Fungal burden



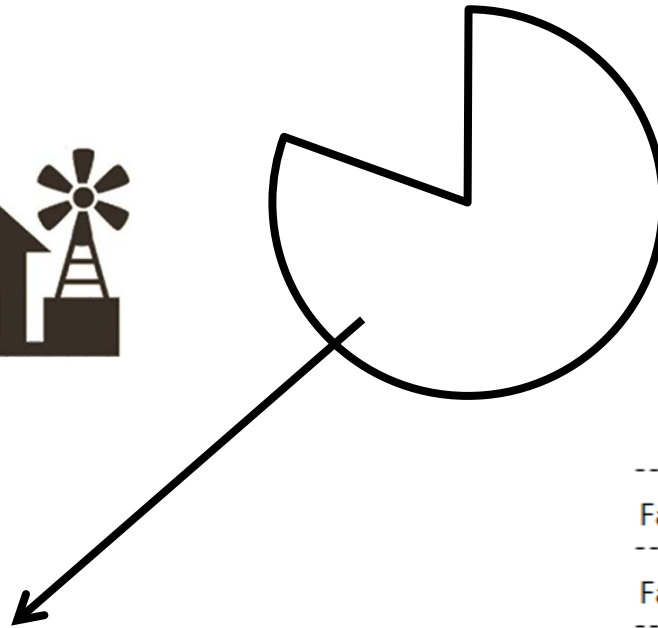
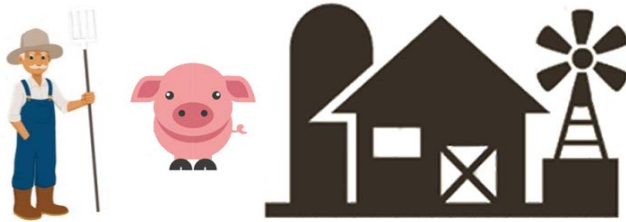
Endotoxins

Endotoxin concentration



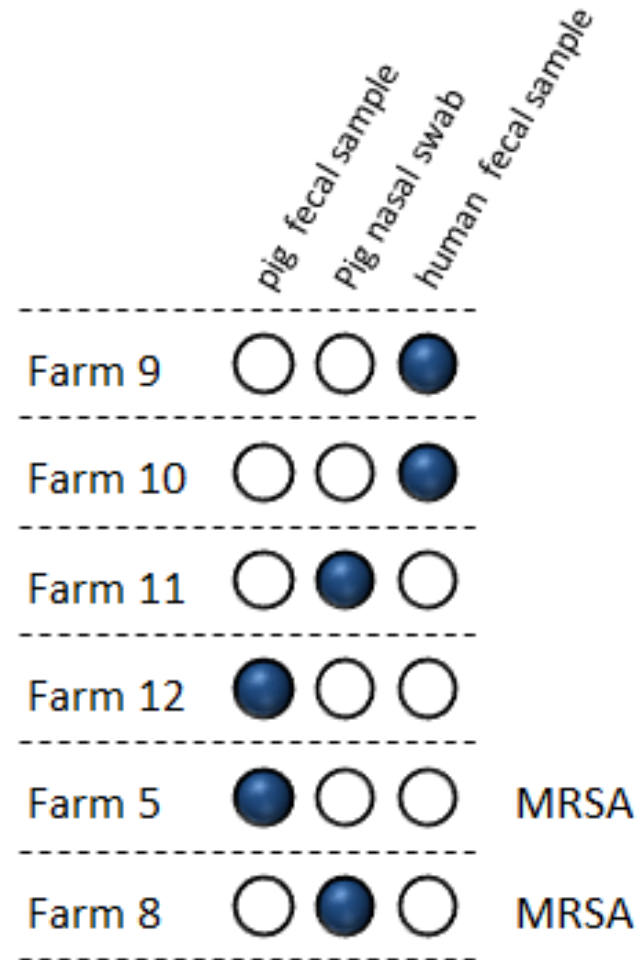
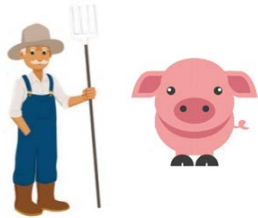
**Endotoxin levels
exceed
recommended
exposure limits**

Staphylococcus aureus and MRSA



	<i>pig nasal swab</i>	<i>air sample</i>	<i>human nasal swab</i>	
Farm 1	●	●	●	spa type t899
Farm 2	●	●	●	spa type t011
Farm 3	●	●	●	spa type t1594
Farm 4	○	●	●	spa type t034
Farm 5	○	●	●	spa type t034
Farm 6	●	●	○	spa type t034
Farm 7	●	○	○	spa type t1594
Farm 8	●	○	○	spa type t1594

ESBL-producing *E. coli*



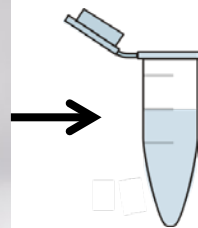
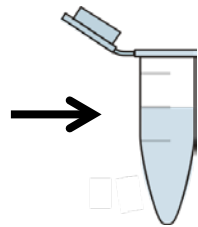
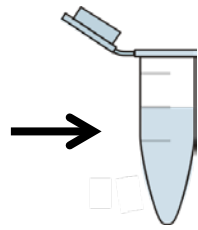
In two farms, we found both MRSA and ESBL-producing *E. coli*

Diversity of microbiota - Methods

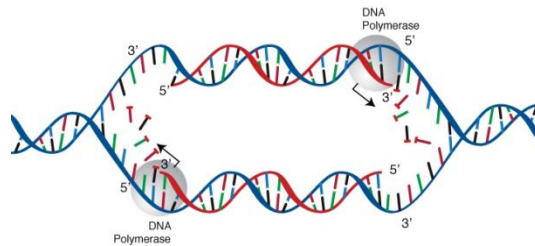
Sampling



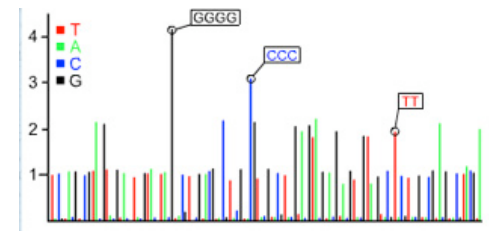
DNA
extraction



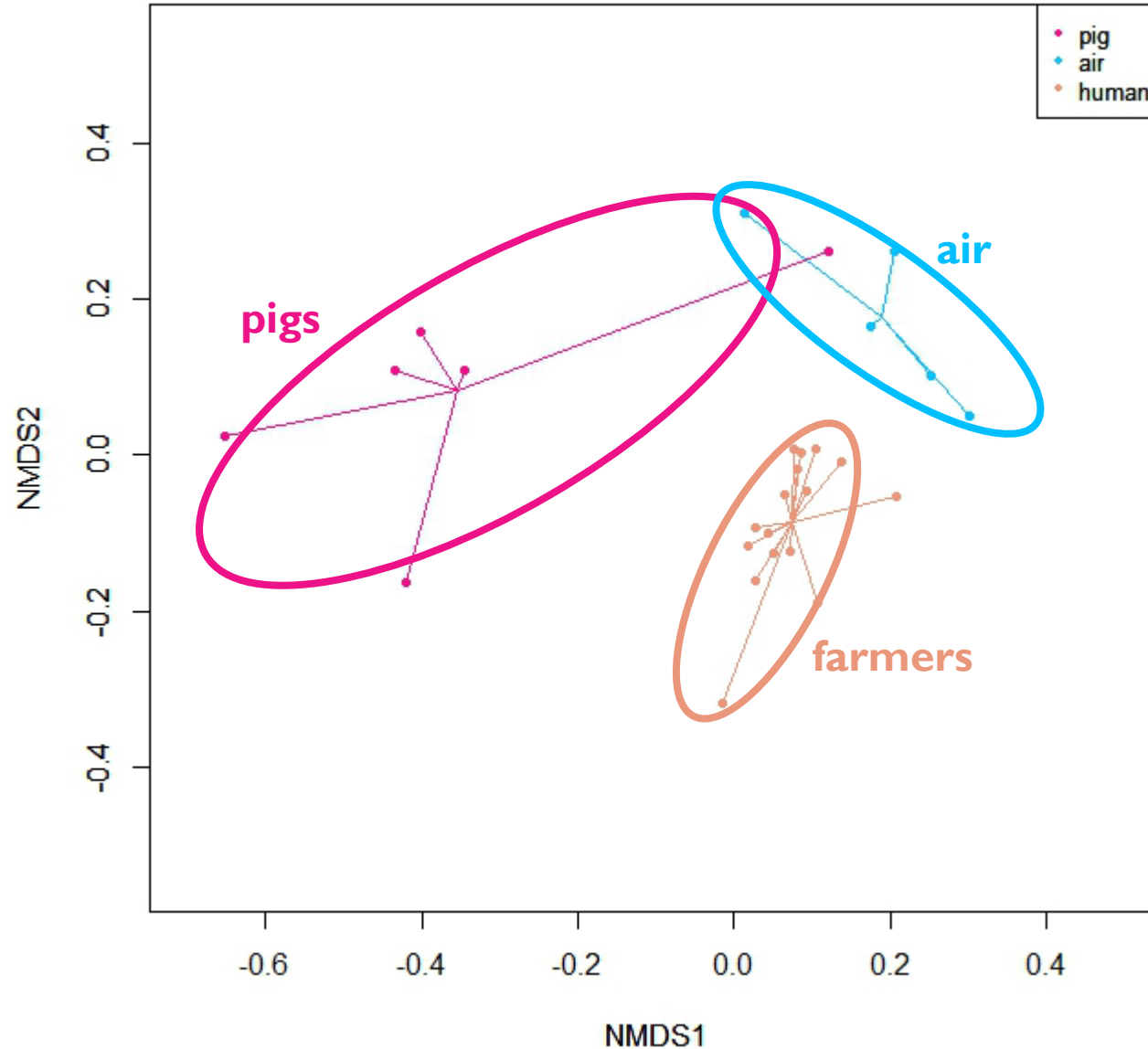
Amplification of 16S
variable region V4



High-throughput
sequencing and
bioinformatical
analysis



Diversity of microbiota



Comparison of three different microbial communities:

- air microbiota
- pig nasal microbiota
- farmer nasal microbiota

The respective communities differ from each other.

Conclusions

High concentrations of big dust particles.



Low nanoparticle counts.



Fungi counts and endotoxin levels exceed Swiss exposure limits.



ESBL-E (22%) and MRSA (25%) found in Swiss pig farms.

Farmer's nasal microbiota clearly distinguishable from pig's nasal microbiota or air microbiota.

Conclusions

Working in pig farms might pose a risk for workers and use of personal protection measures, especially for the respiratory tract, should be investigated.

Further research will show the effect on the nasal microbiota of working in close contact with pigs.

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References

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Masclaux, F. G., et al. (2013). "Concentration of Airborne Staphylococcus aureus (MRSA and MSSA), Total Bacteria, and Endotoxins in Pig Farms." Annals of Occupational Hygiene **57**(5): 550-557.

Farm pictures designed by FreePik