Environmentally enriched housing reduces disease severity in pigs after co-infection, with stronger effects when applied from birth than from weaning

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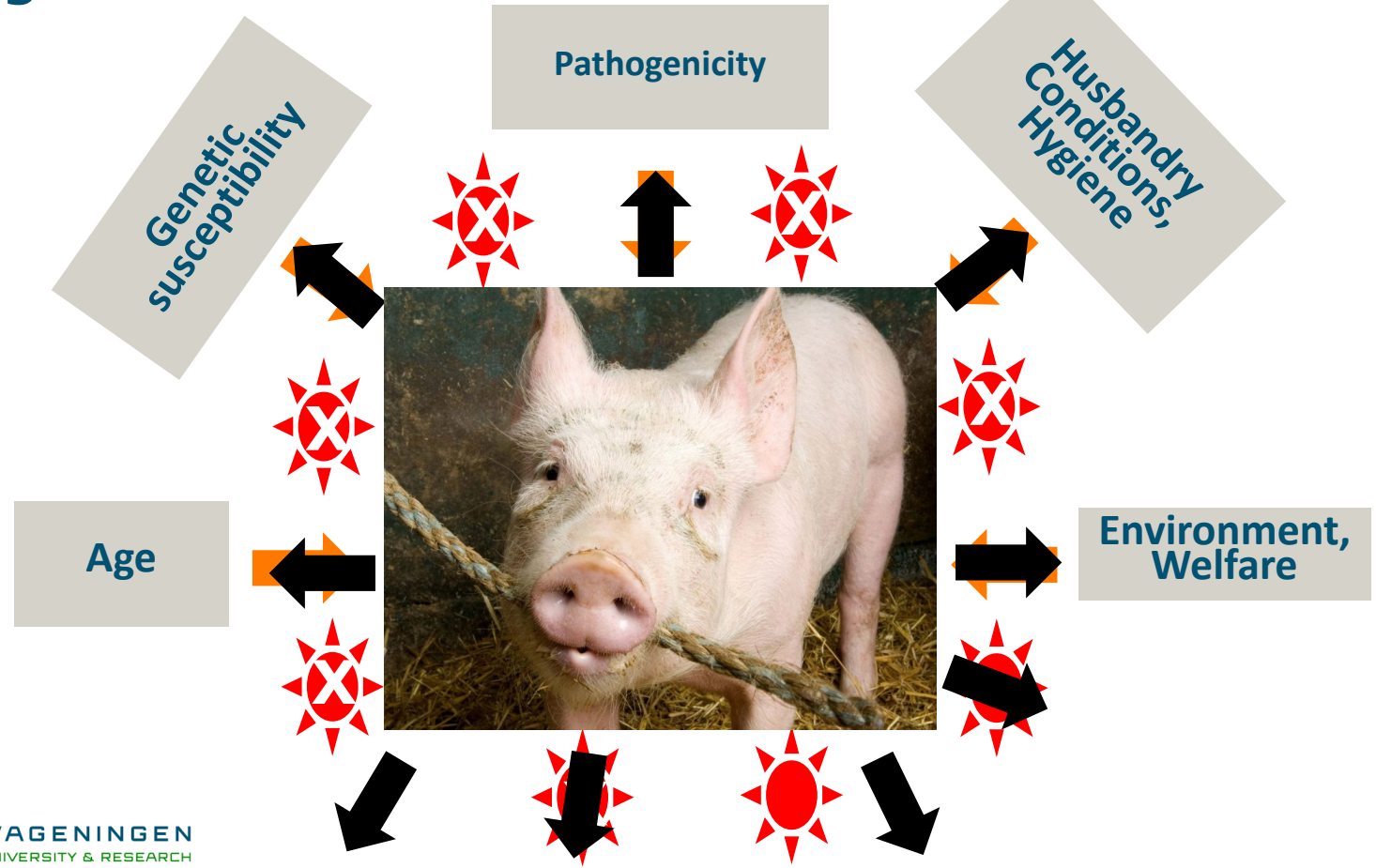
Background



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Background

- Social and environmental enrichment reduced disease susceptibility to co-infection in barren vs enriched housed pigs (Van Dixhoorn et al., 2016)
- When should enrichment be applied?
    - From birth onwards?
    - Later in life?
- Similar results in experimental vs semi-commercial setting?

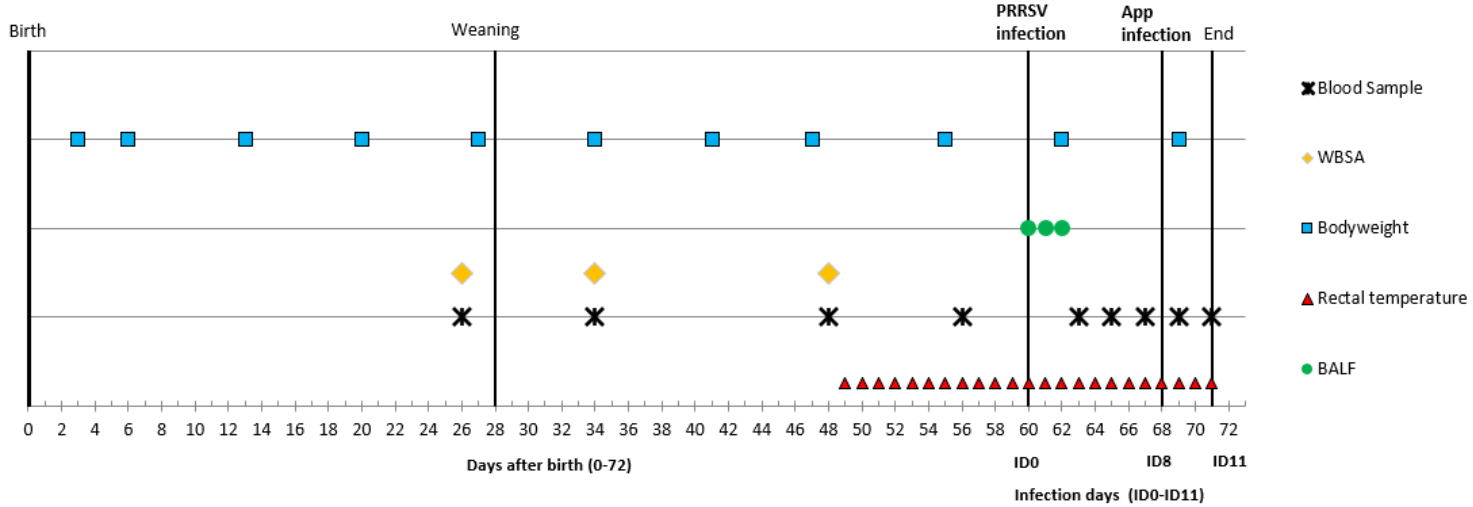
Study objective

- Investigate whether the life stage at which enrichment is provided plays a role in immune development and function and disease susceptibility of young pigs

- Co-infection model of porcine reproductive and respiratory virus (PRRSV) and *A. pleuropneumoniae* (App)

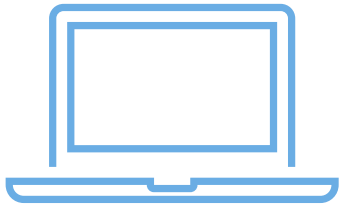
Experimental design

Treatment	Housing before weaning	Housing after weaning	Infection	Number of pigs	Number of pens
CCH	Conventional	Conventional	PRRSV+App	10	1
CEH	Conventional	Enriched	PRRSV+App	10	1
EEH	Enriched	Enriched	PRRSV+App	10	1
Control	Conventional/Enriched	Conventional/Enriched	No infection	12	1
BALF	Conventional/Enriched	Conventional/Enriched	No infection	18	



Statistical analysis

- *Before infection:* WBC counts, whole blood stimulation assay, growth, BALF
- *After infection:* viral RNA, WBC counts, growth, temperature, lung histology, pathology and bacteriology.
    - Mixed models with pig as repeated effect
    - Fixed effect → housing (CCH, CEH, EEH) + day + interaction
    - Random effect → sow



Effects of different enrichment on pig health around weaning

- Six days after weaning, EEH pigs had:
  - higher **whole blood cell counts**,
  - higher **IL1ß** and **TNFα** concentrations after LPS treatment
- than CCH and CEH pigs

Enrichment from birth onwards resulted in a faster innate immune response after weaning, likely due to a differently developed immune system.

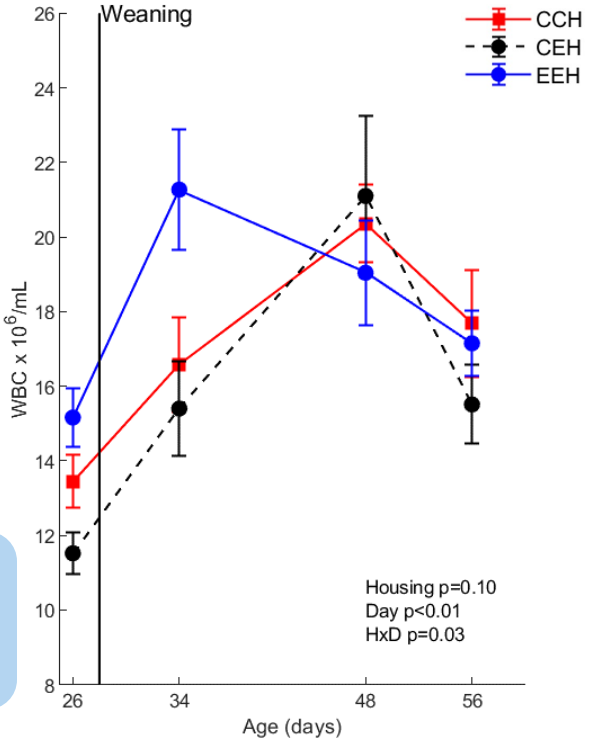
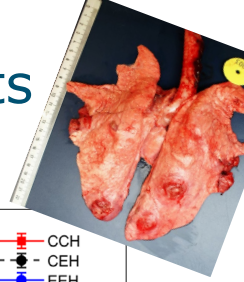
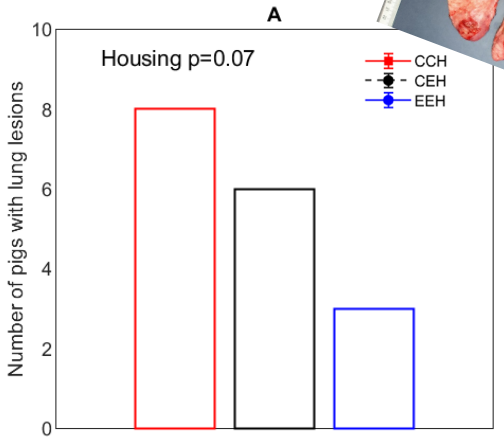


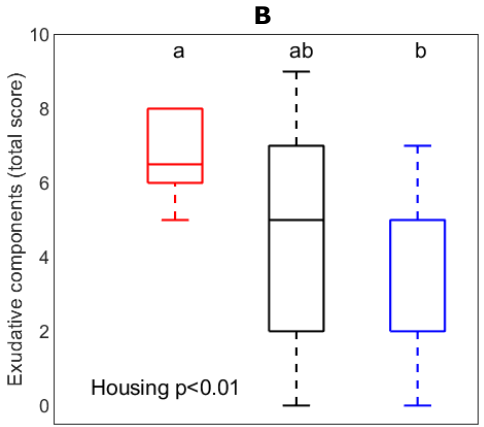
Fig 1. Whole blood cell count (WBC) around weaning in pigs with different housing treatments

Response to co-infection after different housing treatments



- Less exudative lung components of inflammation for EEH pigs than CCH pigs
- Number of pigs with lung lesions tended to be lower in EEH pigs than CCH pigs
- CEH pigs in between





Enriched housing reduced disease susceptibility to PRRSV-APP co-infection, likely due to a faster and more adequate immune response

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Take home message

- Enriched housing before weaning resulted in a faster innate immune response after weaning.
- Enriched housing reduced disease susceptibility to PRRSV-APP co-infection.
- A switch to enriched housing after weaning had an intermediate beneficial effect on disease susceptibility, life-long enrichment was most effective.

Thank you!

Questions?

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