

The impacts of a spectrum of varied lifestyle factors on the porcine gut microbiota



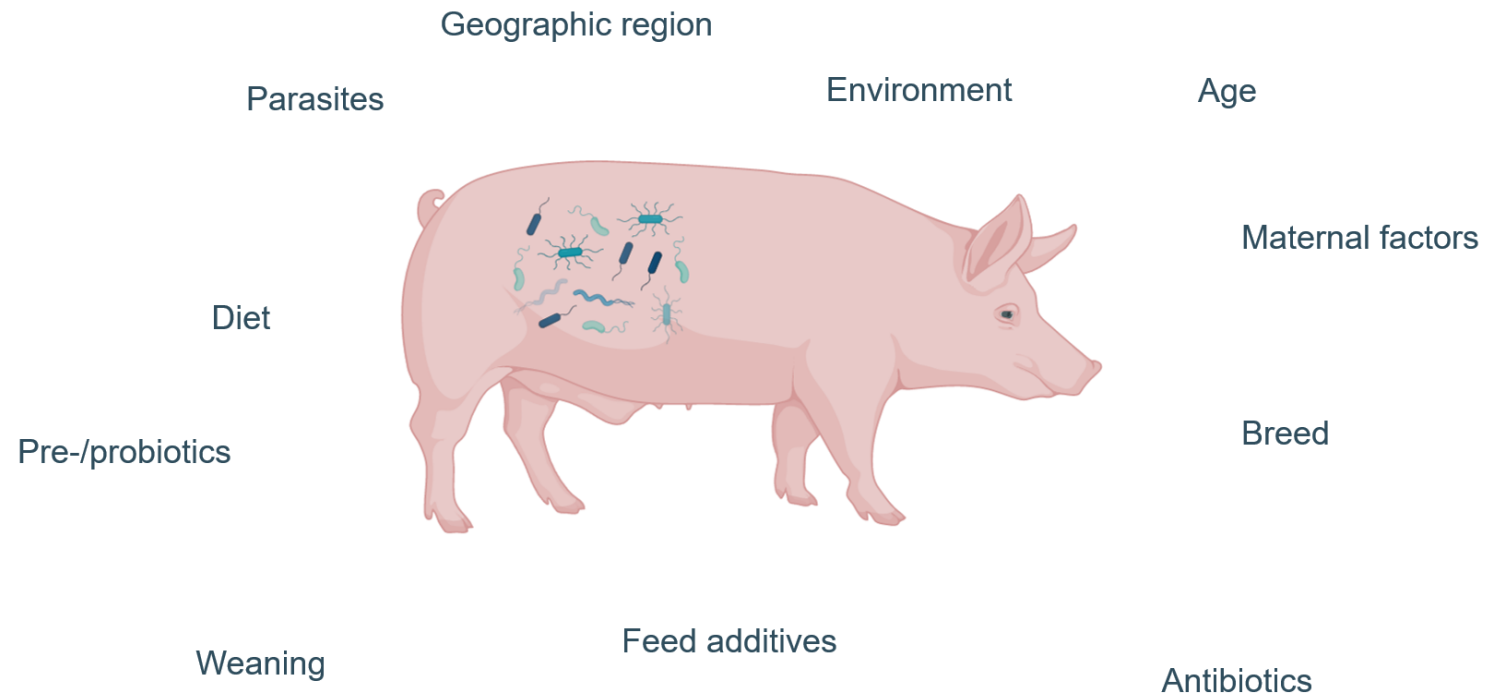
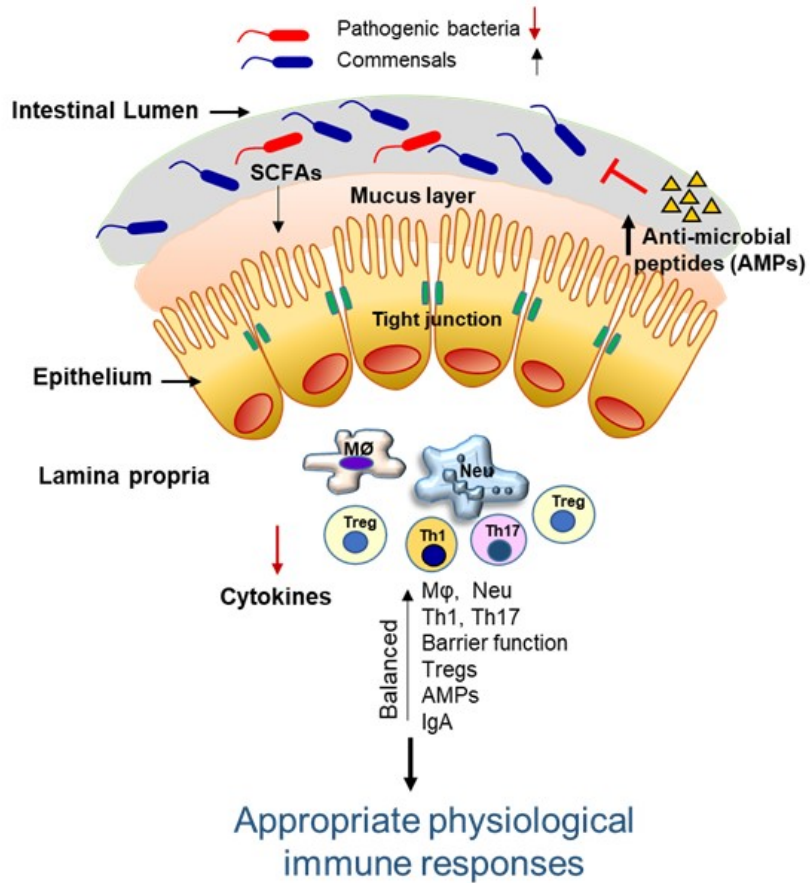
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EAAP 2023, Lyon



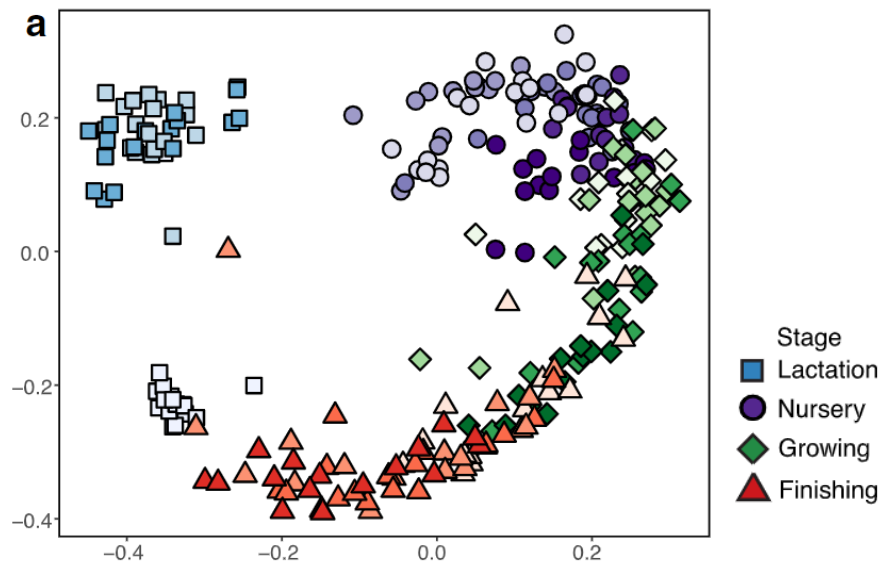
The Role of the Porcine Microbiota in Health



Campbell *et al.* *Biomedicines* 2023

Lifestyle and the Microbiota

Life stage and β -diversity



Contribution of lifestyle factors to the microbiota

Lifestyle Factor	Contribution to Microbiota Variation
Diet	35%
Age	11%
Individual pig variation	7%
Gender	<1%

Wang *et al.* *Microbiome* 2019

The Microbiota Across Varied Lifestyles



Environment type



Weaning

Diet



Organic/standard



Straw/slatted floor



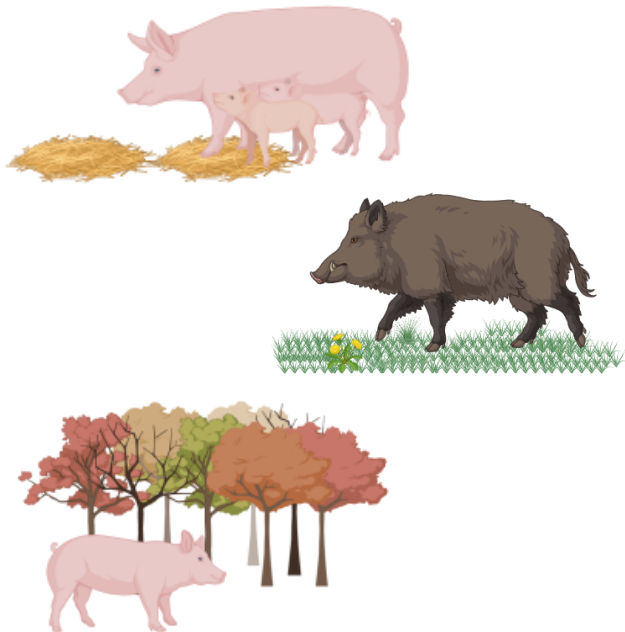
Goals

- Determine how much variation is observed in the microbiota across a spectrum of lifestyles
- Analyse which lifestyle factors are driving these differences



Study Design

Cohort



$n > 300$

Range of lifestyles

Sampling



Faecal samples
Lifestyle metadata

Analysis

PacBio 16S V1-V9 rRNA
sequencing

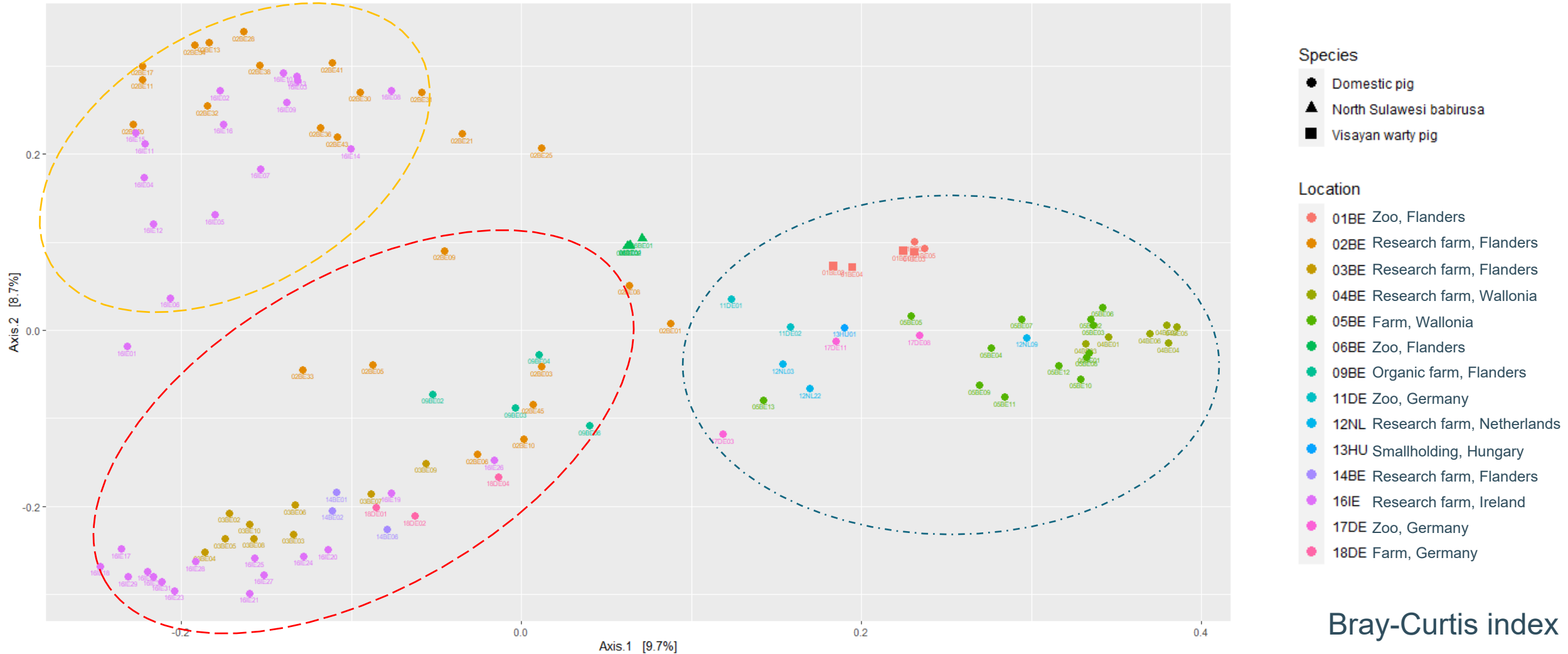
QIIME 2 and DADA2

Taxonomy

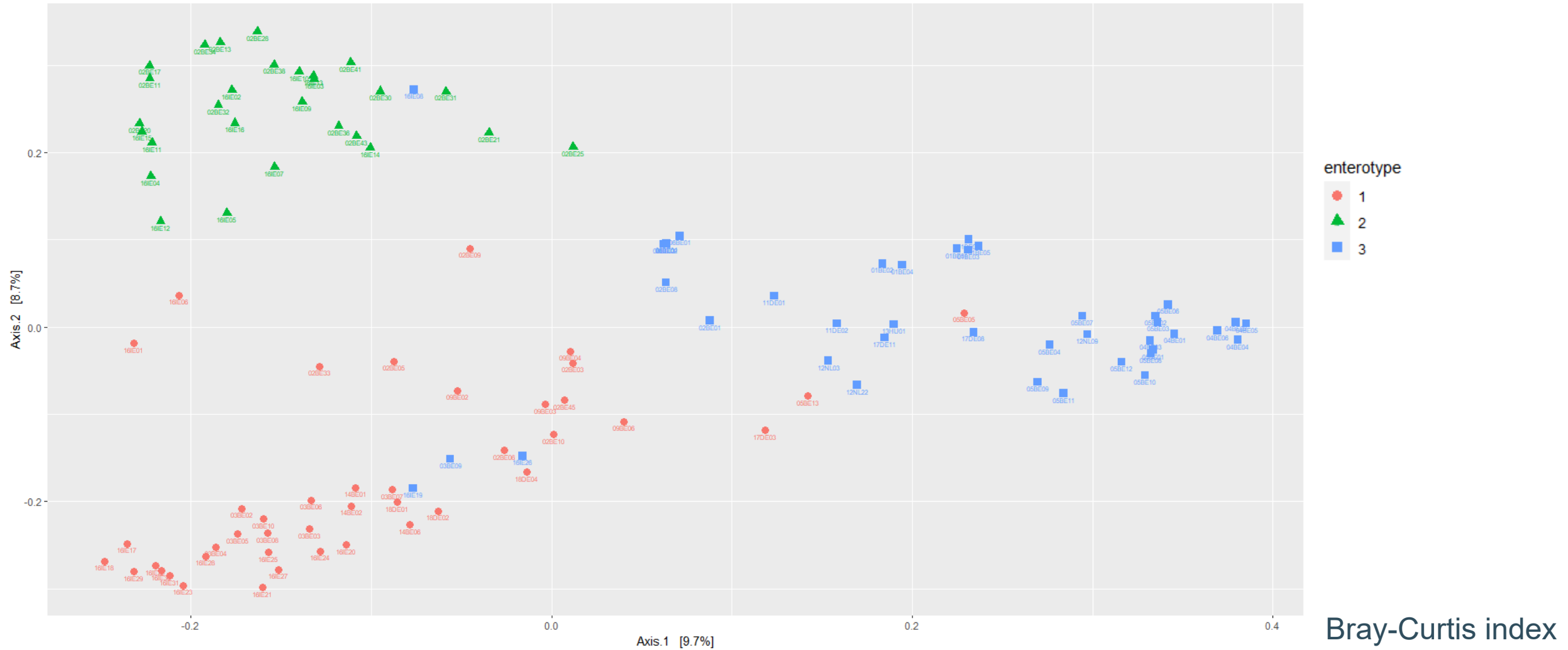
Diversity and enterotypes



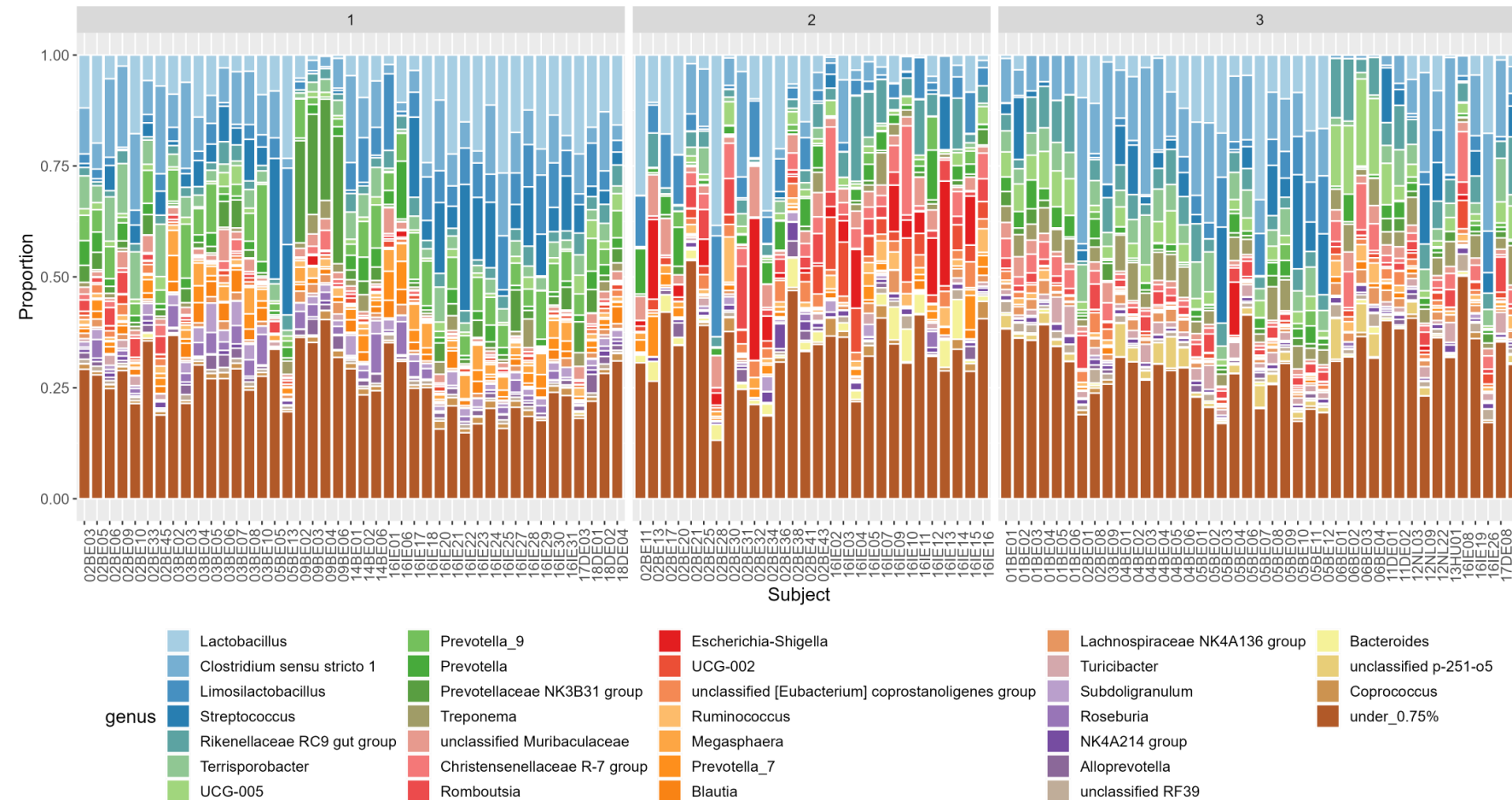
PCoA of β -Diversity



PCoA of β -Diversity: Enterotypes



Taxonomic Differences by Enterotype



Significant genera by enterotype

Enterotype 1:
Prevotella (group 9),
Faecalibacterium, *Roseburia*

Enterotype 2:
Fusobacterium, *Bacteroides*,
Alistipes

Enterotype 3:
Treponema, *Cellulosilyticum*,
Turicibacter

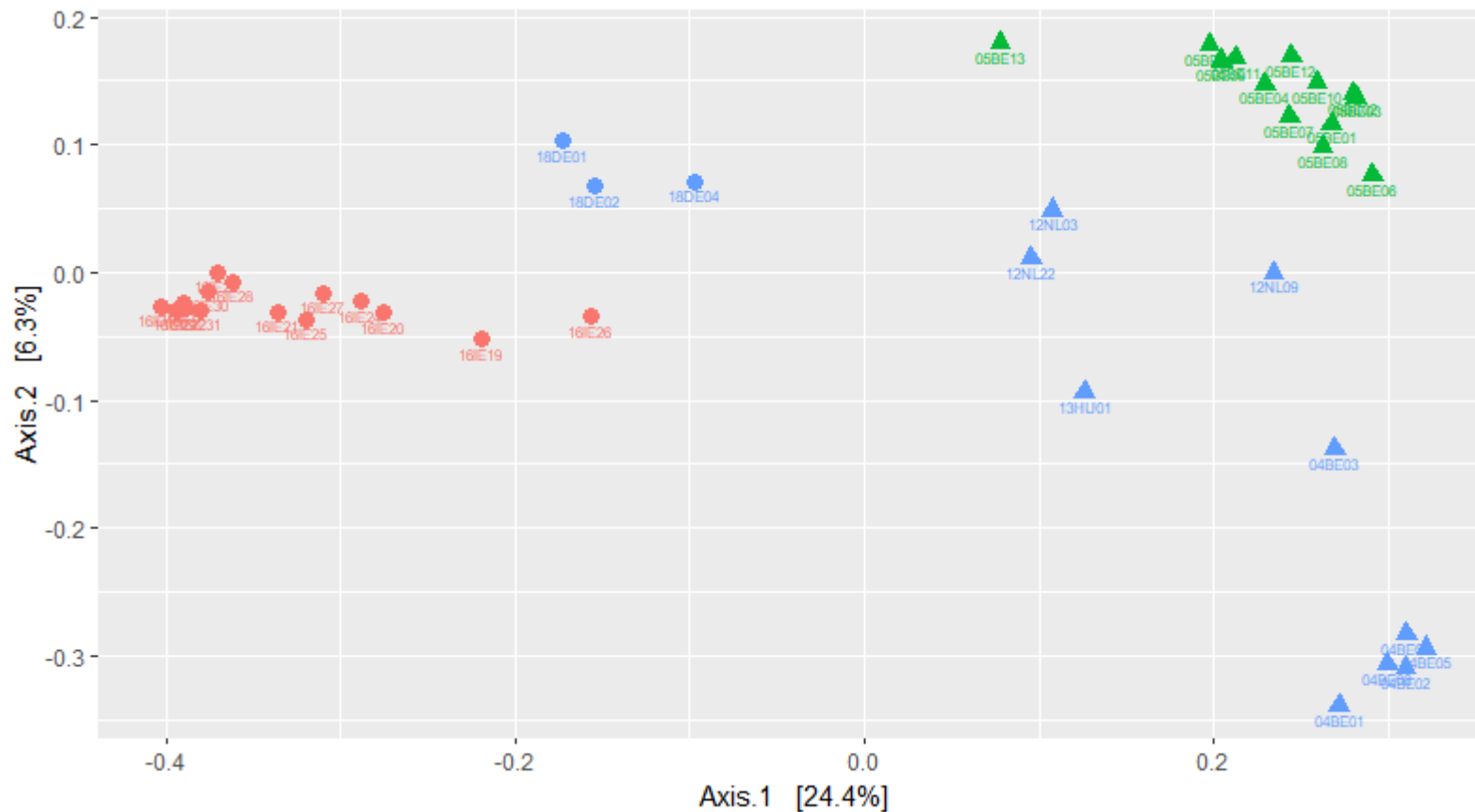
($p < 0.001$)

Contribution of Lifestyle Factors to the Microbiota

Factor	Effect size (ω^2)
Location	28.4%
Life stage	18.2%
Bedding material	13.1%
Establishment type	12.0%
Slatted floor	7.3%
Milk in diet	5.9%
Species	5.1%
Inside vs. outside	5.1%
Husbandry intensity	5.0%
Soil presence	4.1%
Diet: purely commercial vs. other	3.5%

P-values <0.01 for all factors (PERMANOVA)

Impact of litter material vs. slatted floor



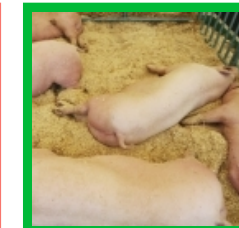
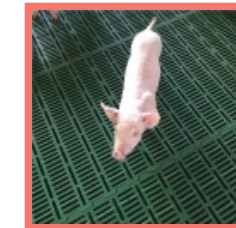
Subset: only inside animals (finishing-mature)

Bedding material

- None
- Sawdust
- Straw

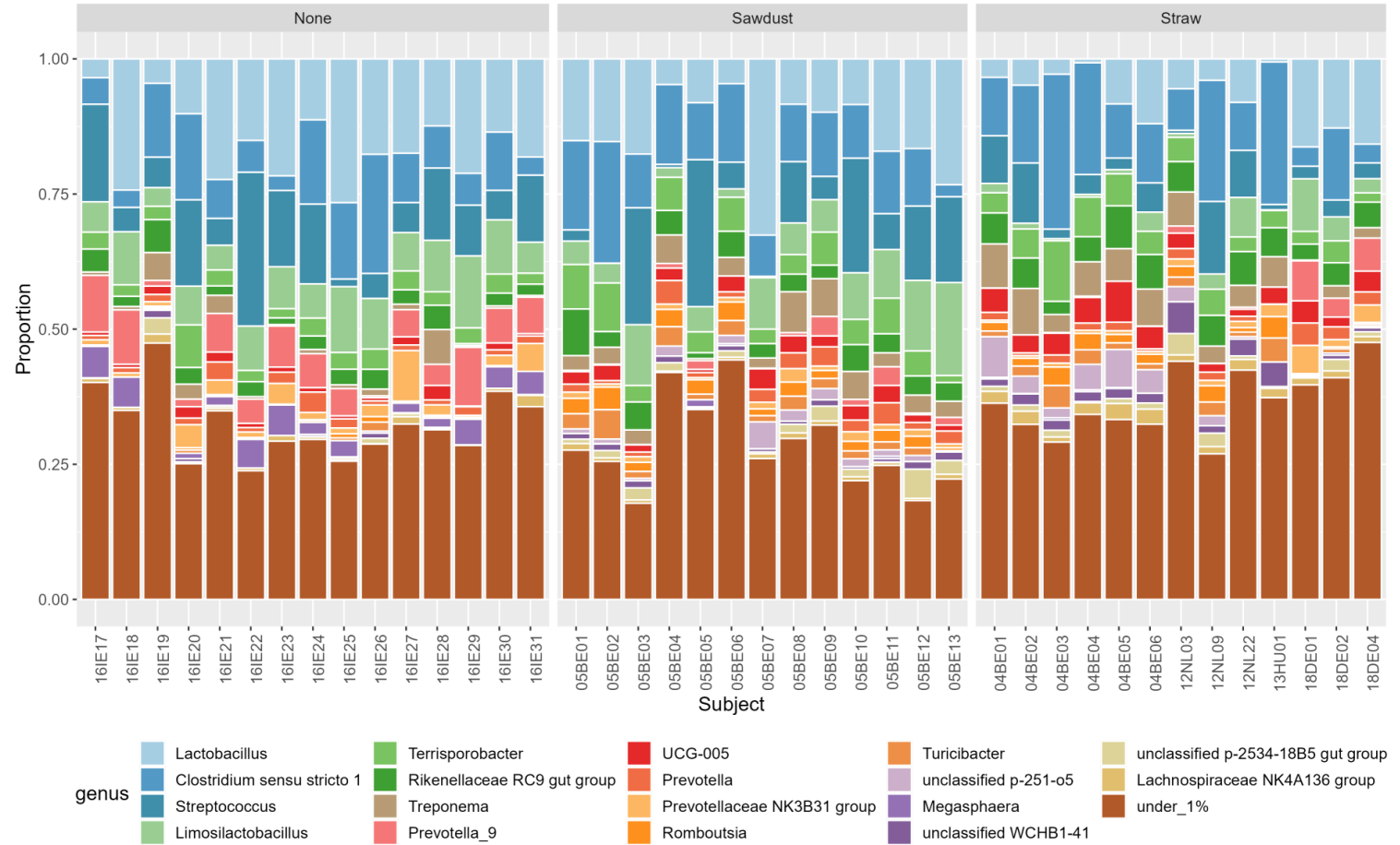
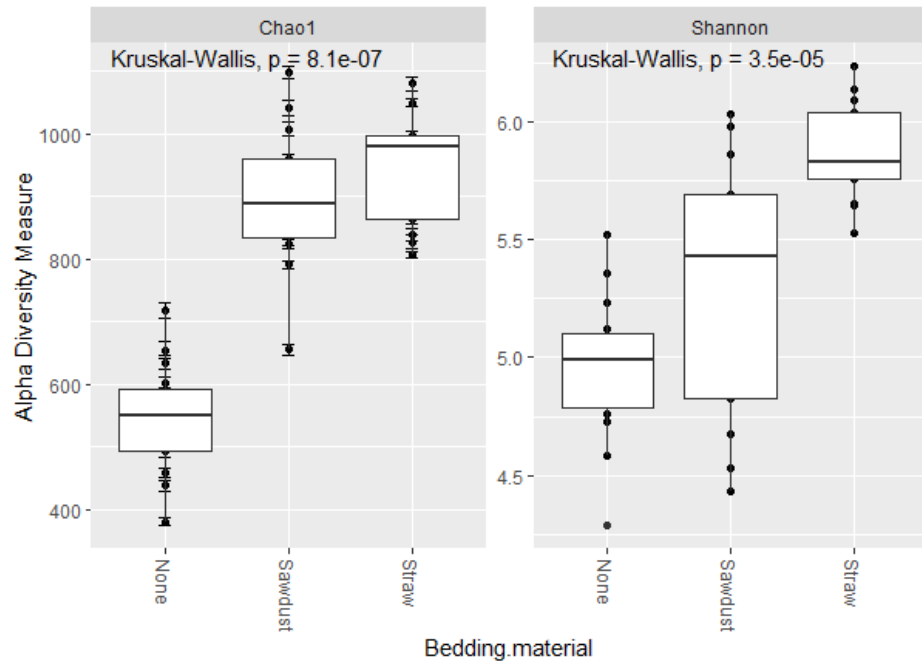
Life_stage

- Finishing
- ▲ Mature



Impact of litter material vs. slatted floor

α-Diversity

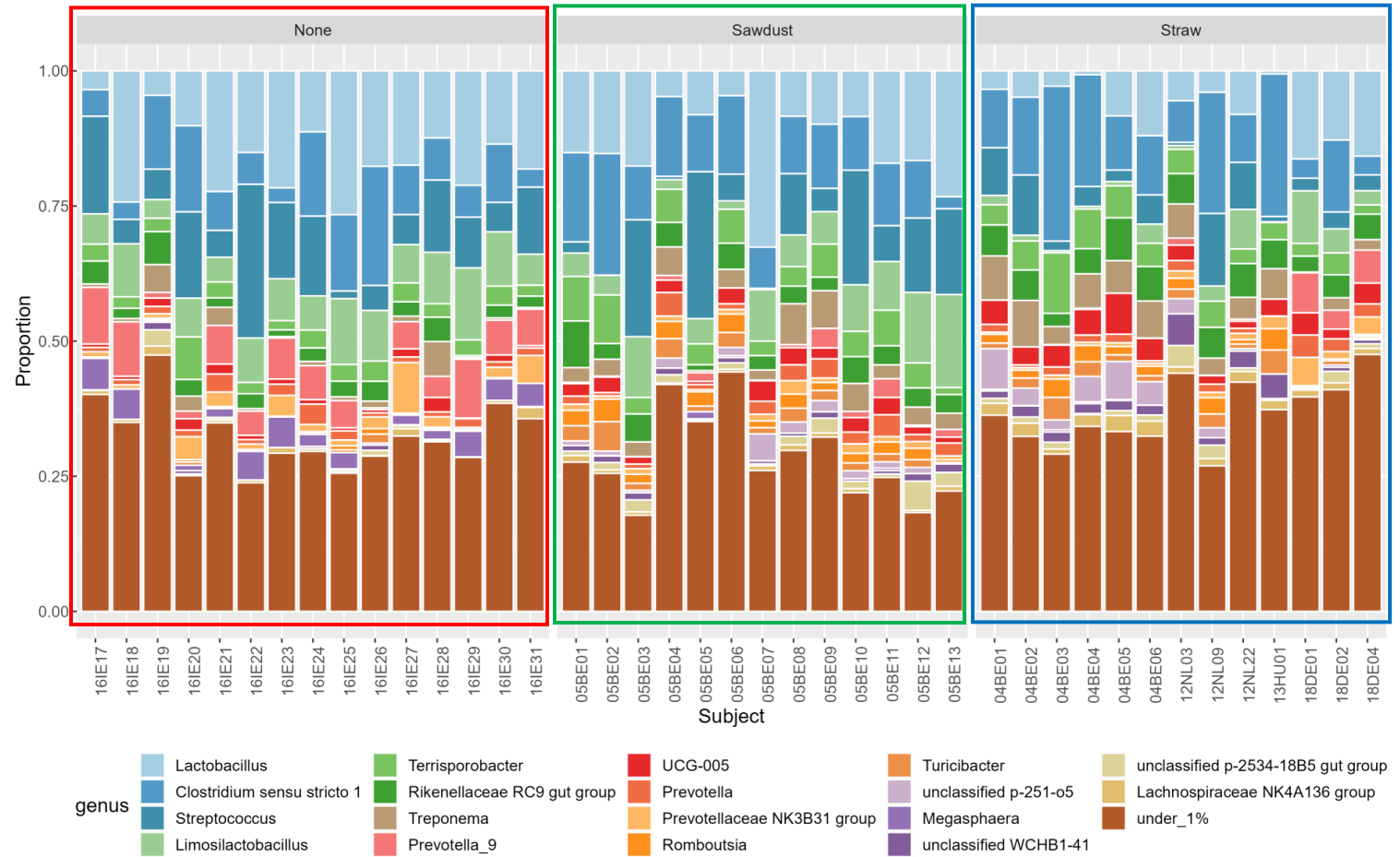


Impact of litter material vs. slatted floor

Plain slatted floor:
Megasphaera, *Prevotella* 7,
Catenibacterium, *Subdoligranulum*

Sawdust:
Rhodococcus, *Enterococcus*

Straw:
Sphaerochaeta



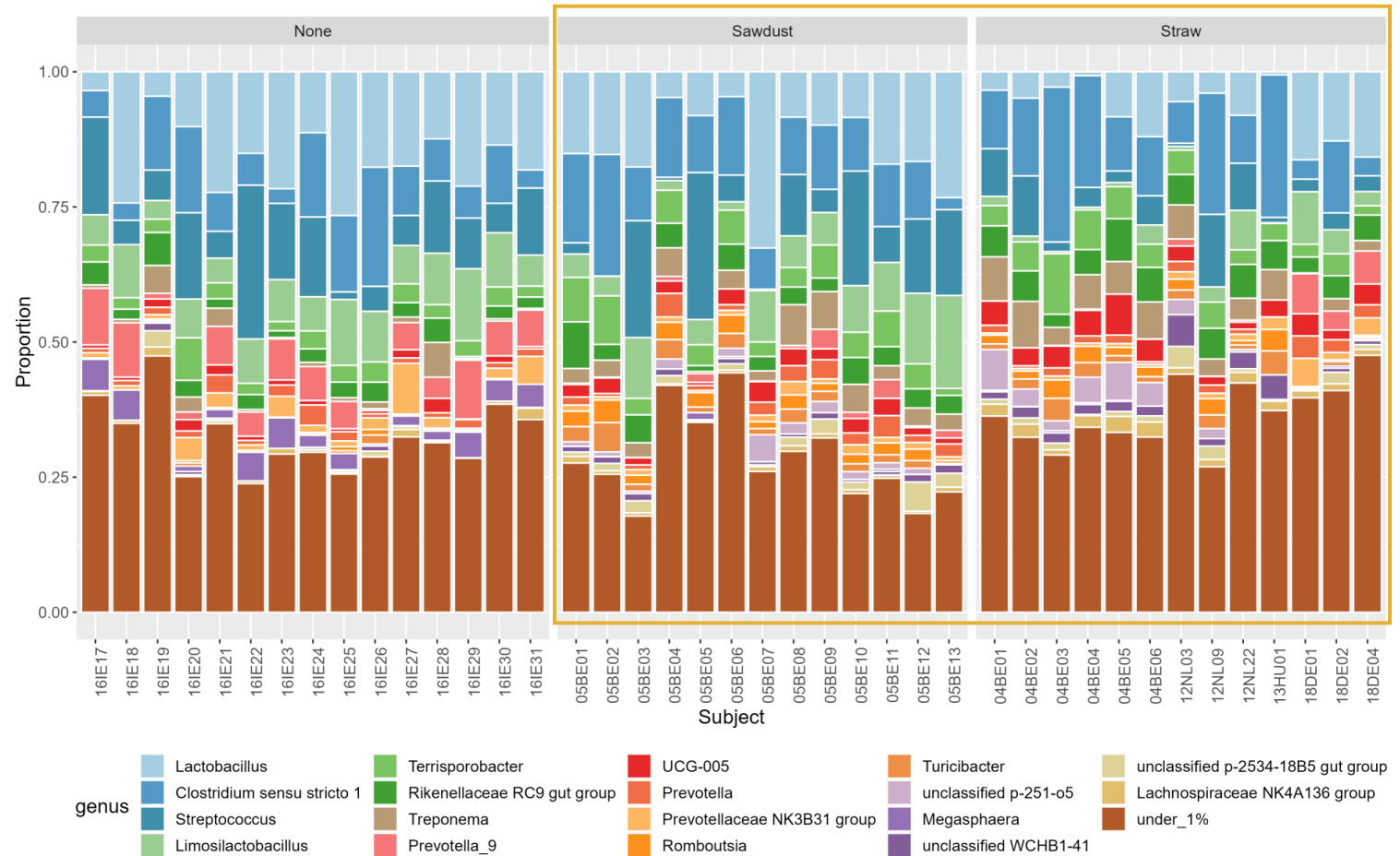
Impact of litter material vs. slatted floor

Plain slatted floor:
Megasphaera, *Prevotella* 7,
Catenibacterium, *Subdoligranulum*

Sawdust:
Rhodococcus, *Enterococcus*

Straw:
Sphaerochaeta

Sawdust and straw:
Romboutsia, *Bifidobacterium*,
Turicibacter, *Oscillibacter*,
Lachnospiraceae UCG-007,
Lachnoclostridium, *Cellulosilyticum*



Conclusions and Future Scope

- Despite varied lifestyles, microbiotas can still be categorised according to life stage
- The presence of straw and sawdust are associated with increased microbial richness
- Future work to elucidate further lifestyle impacts

Thank you for your attention!

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Acknowledgements:

