Different management systems in early life have impact on intestinal immune development in pigs

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Acknowledgements

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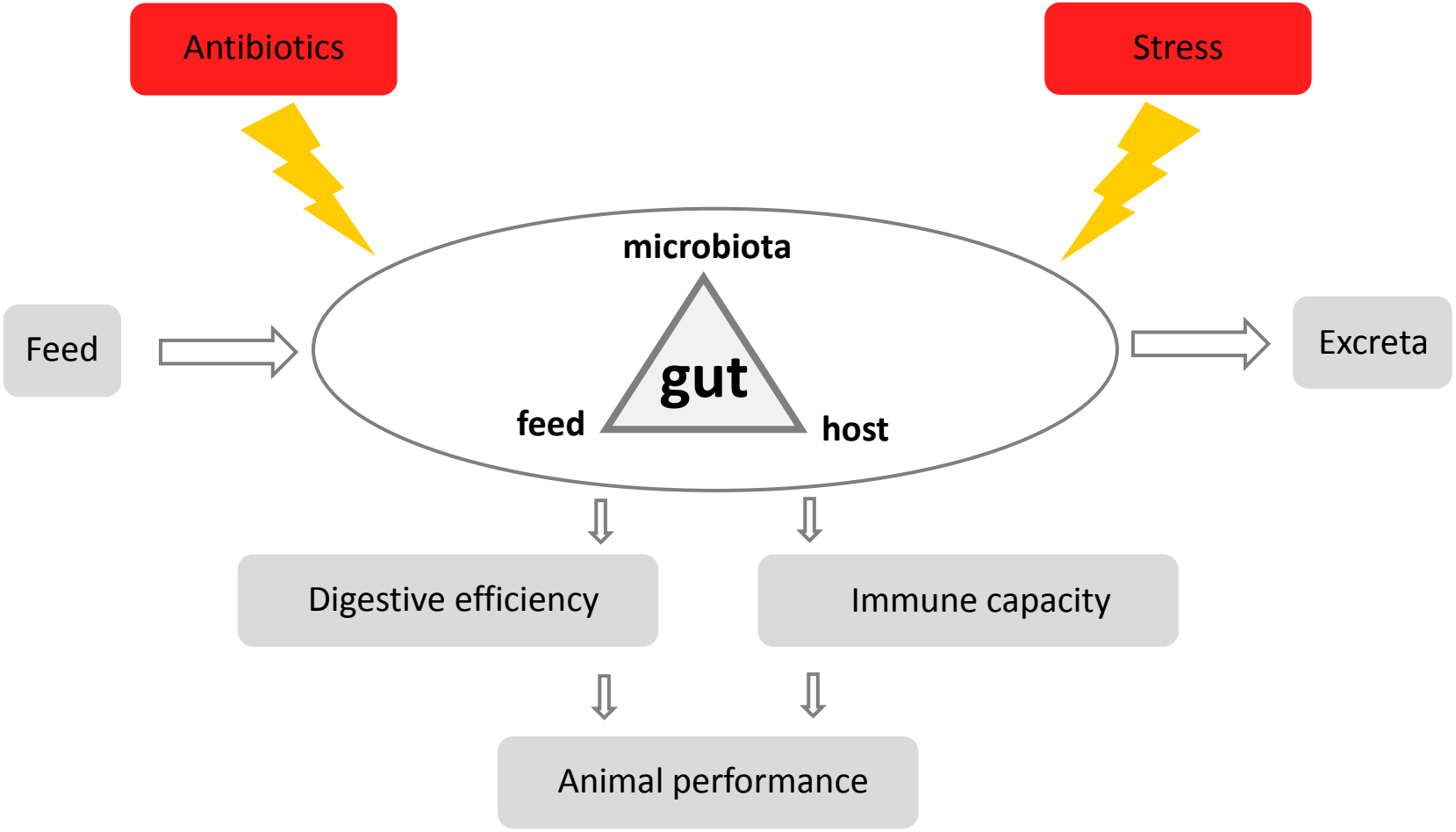
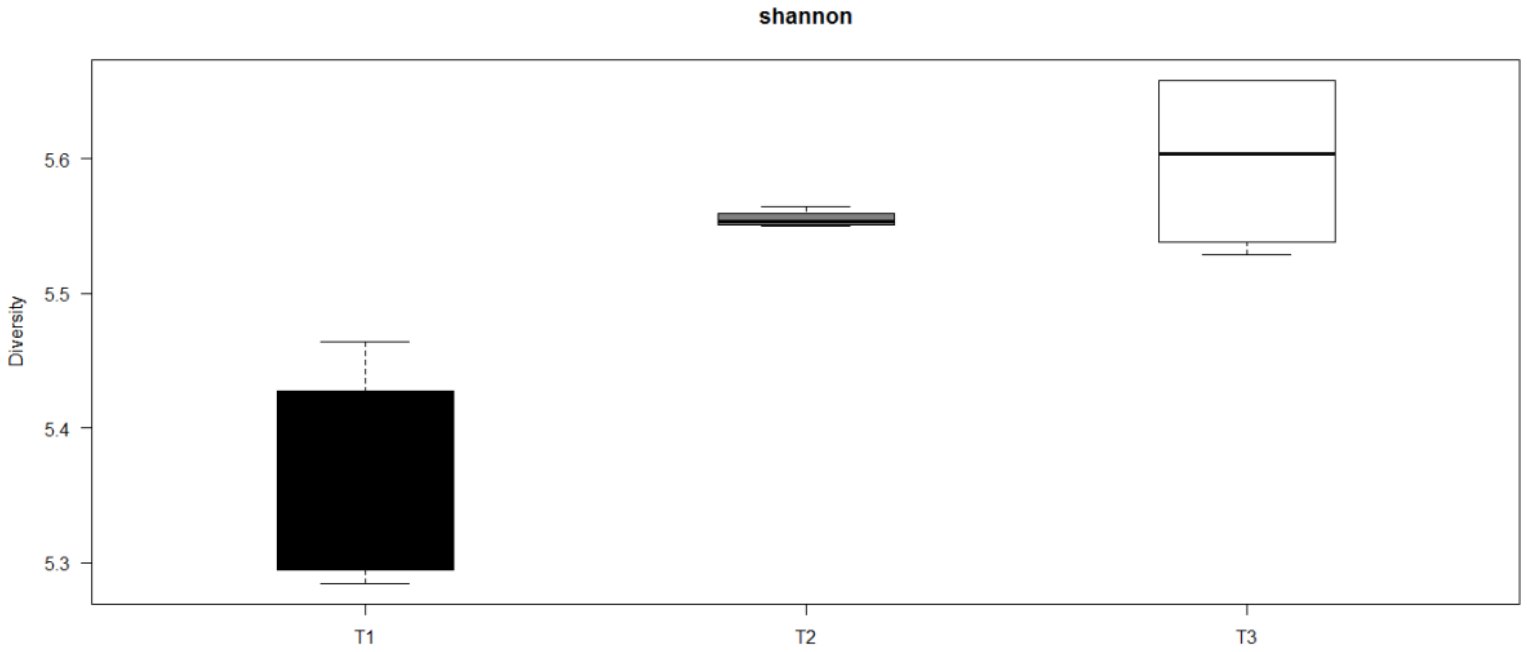
Interactions in the gut (co)determine animal performance



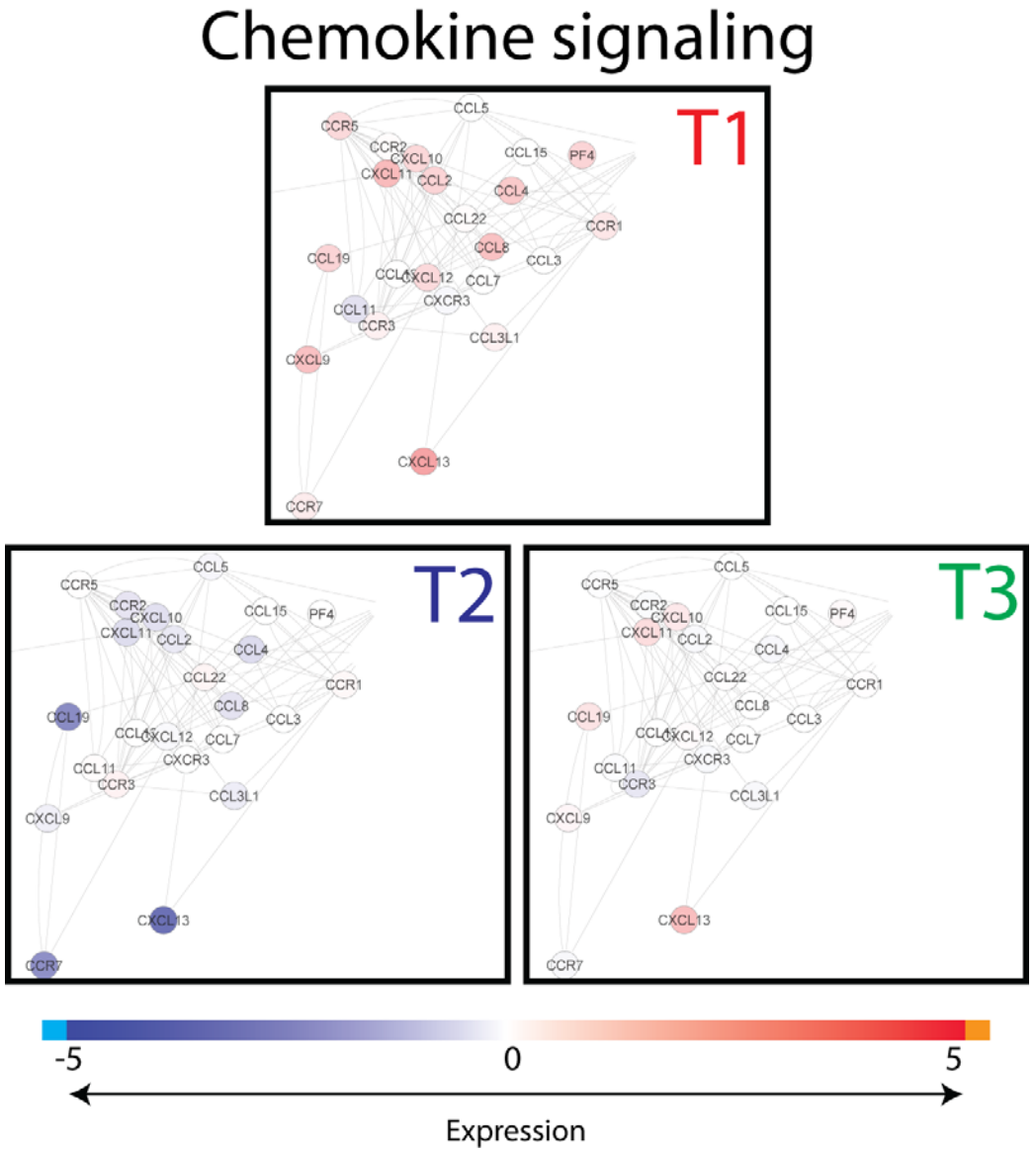
Conclusions previous study

- Administration of antibiotics (whether or not in combination with stressor) in early life (d4) has (**short-term**) effect on



Development of the (intestinal) immune system (day 8)

Reduced expression of immune related genes



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Objective present study

- Investigate the effect of antibiotics and stress factors at early age (day 4) on intestinal functioning and health in adult pigs (day 55 & 176)
    - Composition and diversity of microbiota
    - Biological processes of intestinal tissue

Treatments

Treatment	Antibiotic*	Stressor
T1	No	No
T2	Yes	No
T3	Yes	Yes

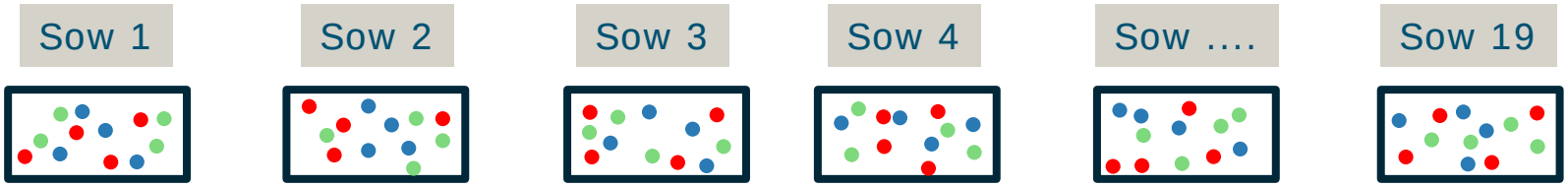
* Tulathromycine

Treatment: At day 4 after birth

Antibiotics: Regularly used in intense farming systems to prevent respiratory diseases

Stressor: Common in intense farming systems are weighing, numbering, and tail docking

Experimental design



Day 4
(intervention)

T1 **T2** **T3**

Day 55

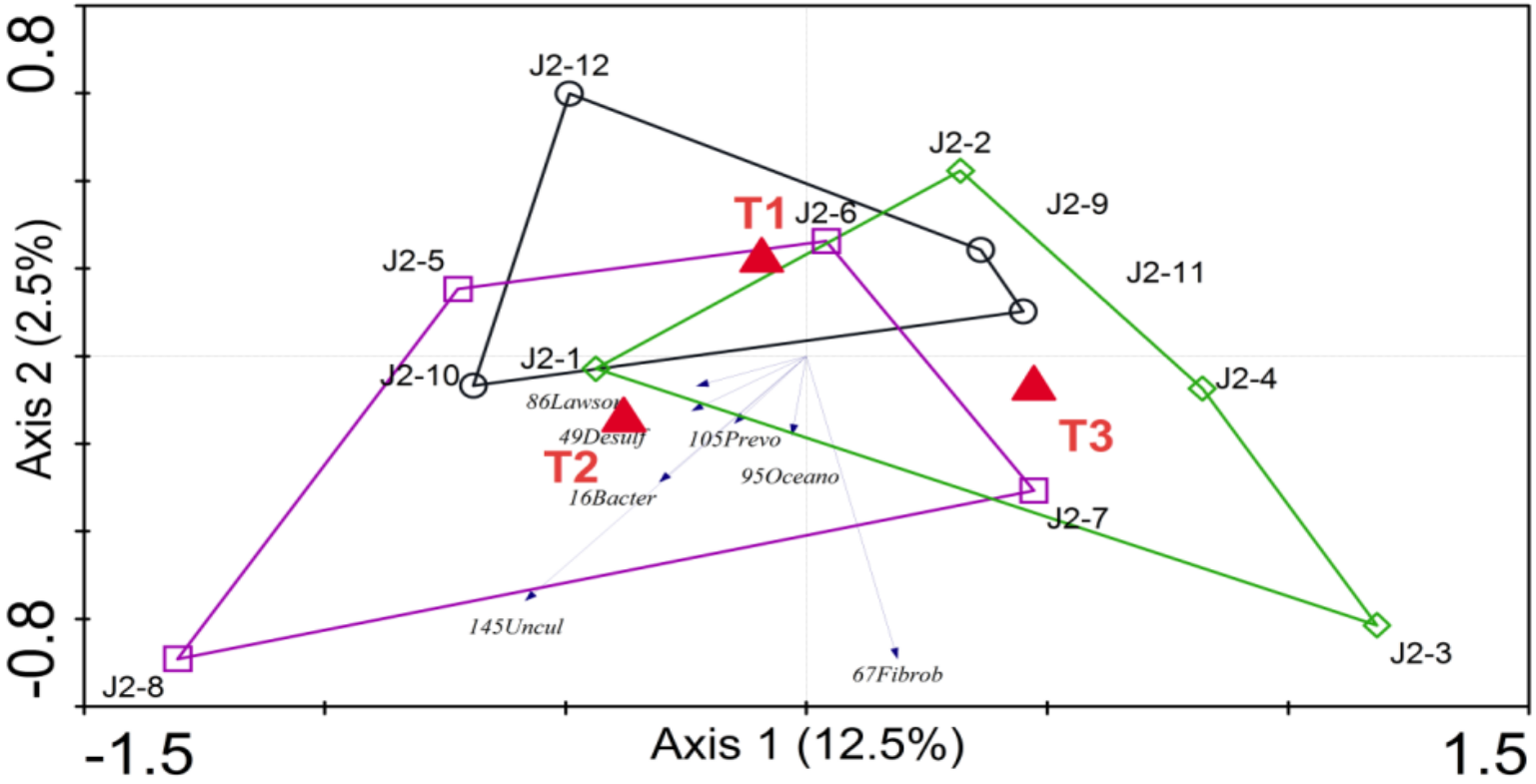
Day 176

Transcriptomics and Microbiota data

- 4 pools of 4 animals per treatment

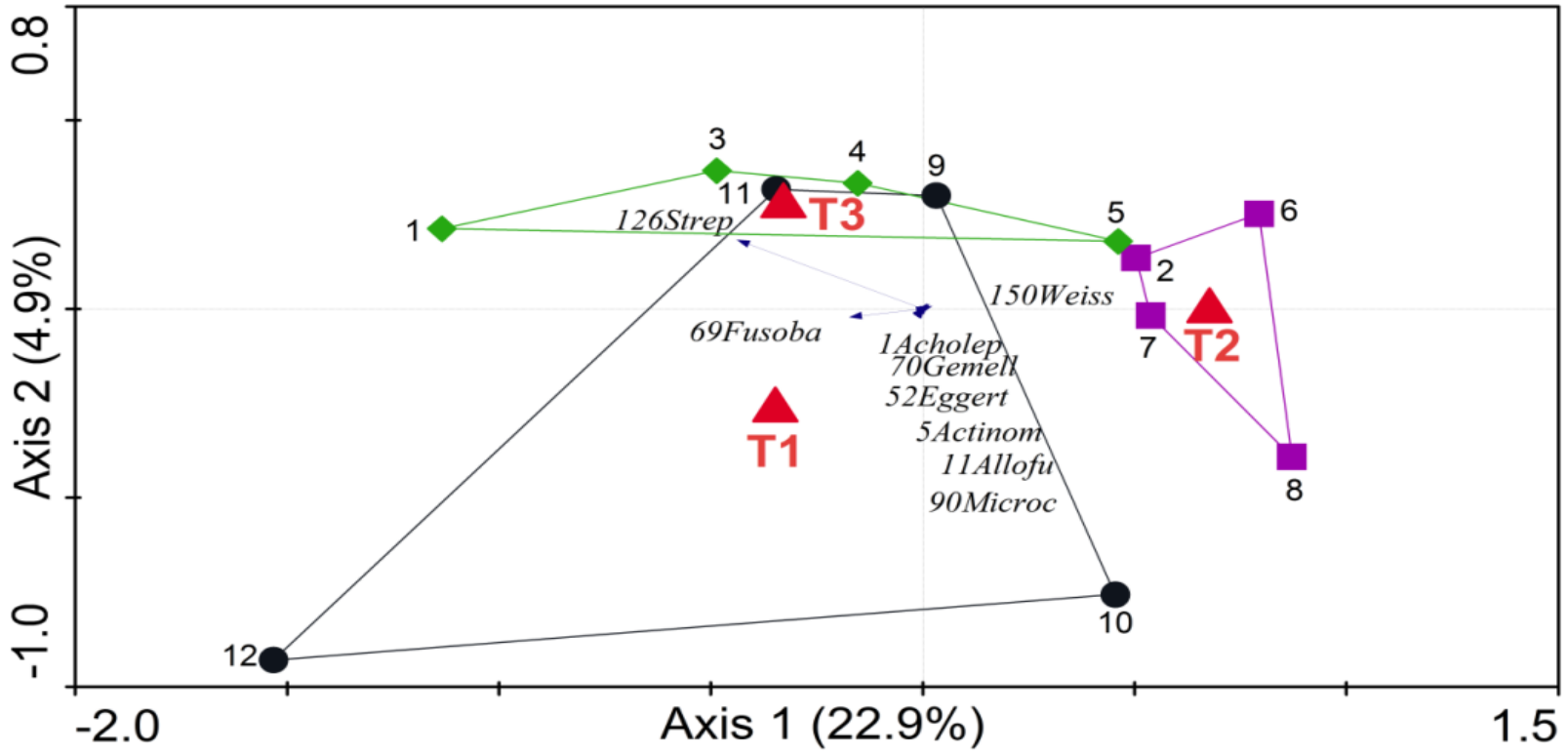
Microbiota composition (RDA triplots)

Day 55



Microbiota composition (RDA triplots)

Day 176



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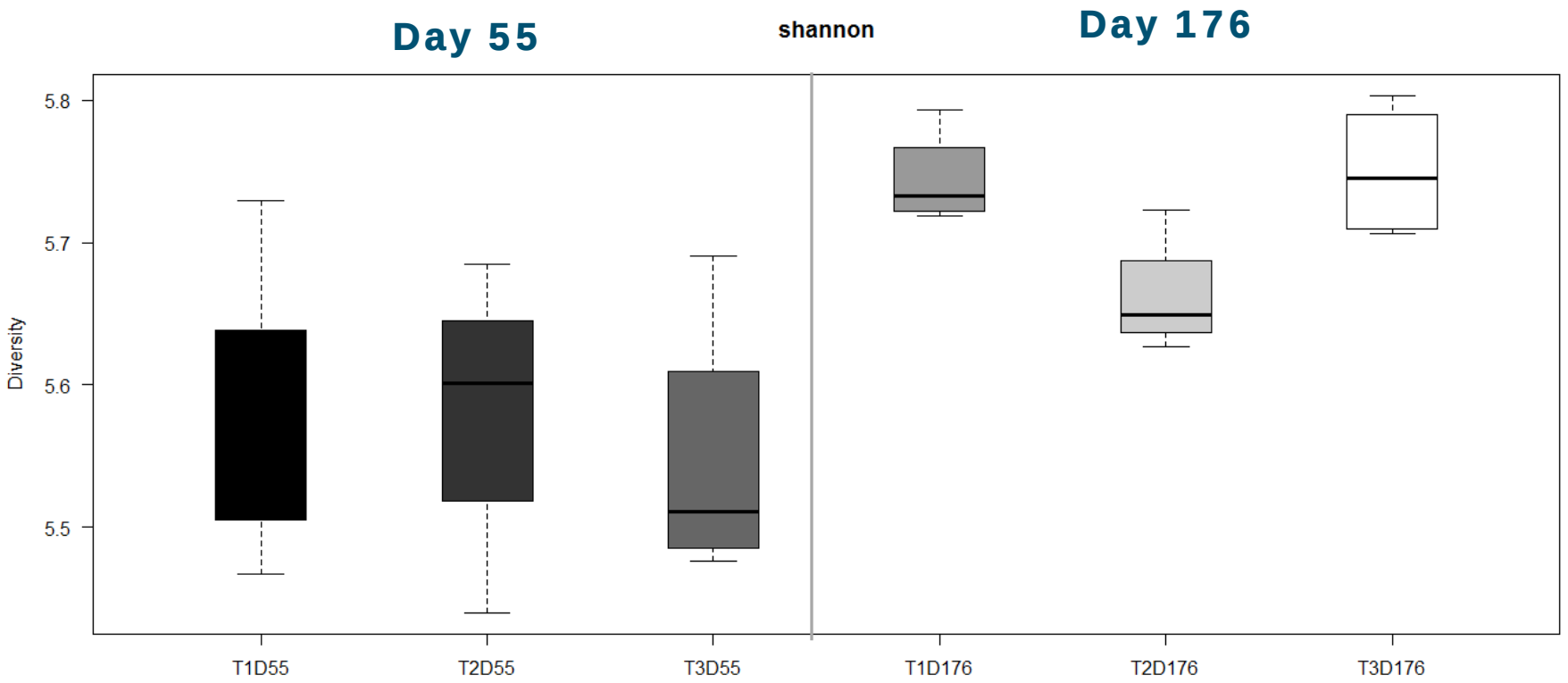
Diversity microbiota



Similar diversity at day 55, however high variation
T2 differs at day 176 compared to T1 and T3

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Functional Analysis – Day 55 (DAVID)

jejunum

top5	T2 vs. T1			
	down		up	
	term	score	term	score
1	protease inhibitor	1.481	TNF/cytokine activity	1.503
2	Serine/threonine protein kinase	1.362	adaptive immune response	1.266
3	cell cycle	1.277	organelle lumen	1.187
4	regulation of (epithelial) cell proliferation	1.011	cell activation (lymphocytes)	1.143
5				

ileum

top5	T3 vs. T1			
	Down		up	
	term	score	term	score
1	sex differentiation (male)	1.724	tight junction/cell adhesion	2.255
2	extracellular region	1.445	vesicle (cytoplasmic)	1.83
3	metabolic process (sugar)	1.276	Pleckstrin homology	1.631
4			(positive) regulation of protein kinase activity	1.571
5			regulation of cell migration /motility (leukocytes) / response to external stimulus	1.404

Functional Analysis – Day 176 (GSEA)

jejunum

T3vsT1		T2vsT1	
T1	T3	T1	T2
Neuro. receptor	x	TRANSPORT ACTIVITY	RNA PROCESSING / spliceosome
		Neuro. receptor	

ileum

T3vsT1	T3vsT1	T2vsT1	T2vsT1
T1	T3	T1	T2
metabole	metabole	metabolism	ECM
	TRANSCRIPTION (INITIATION, DNA/RNA, and TFs)	ribosome	
	BCR SIGNALING PATHWAY	degradation (proteasome)	
	leukemia / cancer	membrane (endo/mitochonrion/ER)	
	RNA	cell cycle	
		ribosome/translation	
		APOPTOSIS	
		virus (response)	
		SIGNALING_BY_WNT	
		CYTOKINE_PRODUCTION	
		DIABETES_PATHWAYS	

Discussion

Investigate the effect of antibiotics and stress factors at early age (day 4) on intestinal functioning and health in adult pigs (day 55 & 176)

- Composition and diversity of microbiota

All animals develop ‘adult-like’ microbiota in time

Similar composition at day 55 as well as similar diversity

Only (significant) difference at day 176 (T2 vs. T1/T3)

Discussion

Investigate the effect of antibiotics and stress factors at early age (day 4) on intestinal functioning and health in adult pigs (day 55 & 176)

- Biological processes of intestinal tissue

Day 55 - T2/T3 animals have higher expression of immune and/or barrier related genes

Day 176 – less significant genes between treatments
→ GSEA analysis, no clear picture of certain enriched clusters of genes/processes

Thanks for your attention

Questions

Remarks

Additions

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