

Comparison of adult intestinal stem cell derived organoids between different ages and sex in pigs

R.S.C. Rikkers, O. Madsen, S.K. Kar, L. Kruijt, A.A.C. de Wit, E. van der Valk,
L.M.G. Verschuren, S. Verstringe & E.D. Ellen



Acknowledgements



Animal Breeding & Genomics

Animal nutrition



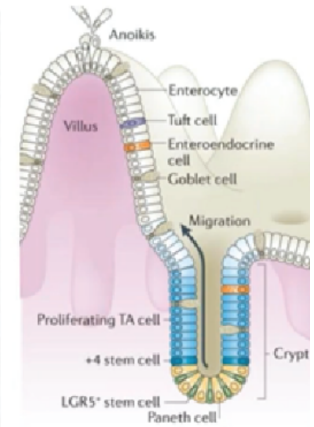
Organoids

Self-renewing and self-organizing 3D structures



Organoids

- Tissue collected from organ
- 3-D structure developed *in vitro*
- Contains major cell types of an organ
- Good representation of an organ



(Barker et al., 2014)

Why?

Can we use slaughter animals to collect samples?

Lack of information on organoids on difference in,

→ Developmental stages

→ Sexes

Objective

To investigate the **transcriptomic similarities** in cultured intestinal organoids from pigs between

1. Four different ages to determine a potential **age effect**
2. Boars and gilts to determine a potential **sex effect**

Material

- Ileal tissue collected at:

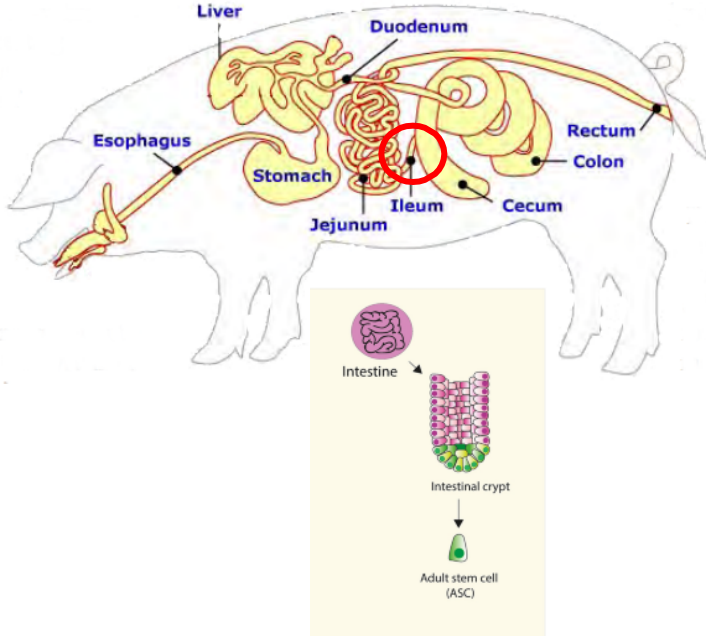
Age (week)	1	4	11	26
	10 ♂	10 ♂	10 ♂	10 ♂
	10 ♀	10 ♀	10 ♀	10 ♀

Material

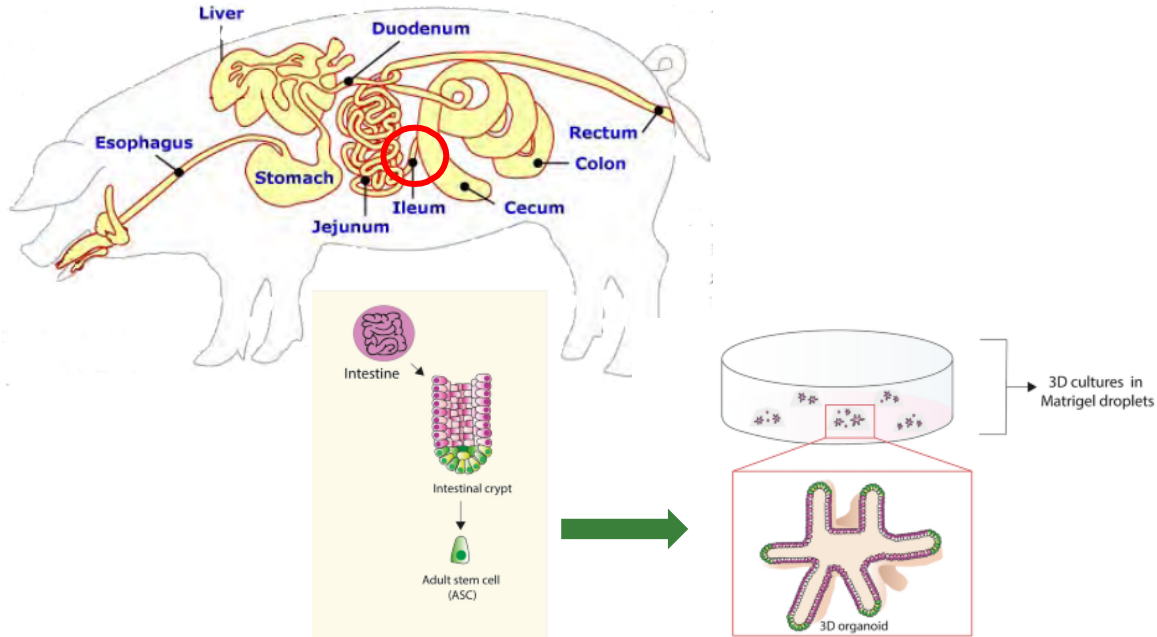
- Ileal tissue collected at:

Age (week)	1	4	11	26
	10 ♂ 10 ♀	10 ♂ 10 ♀	10 ♂ 10 ♀	10 ♂ 9 ♀

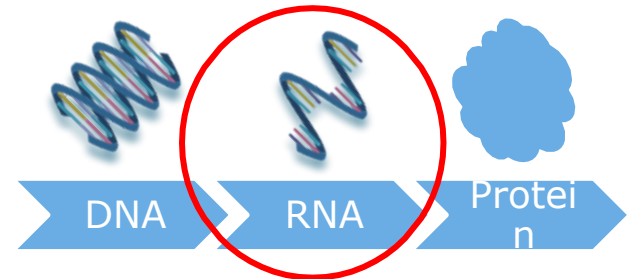
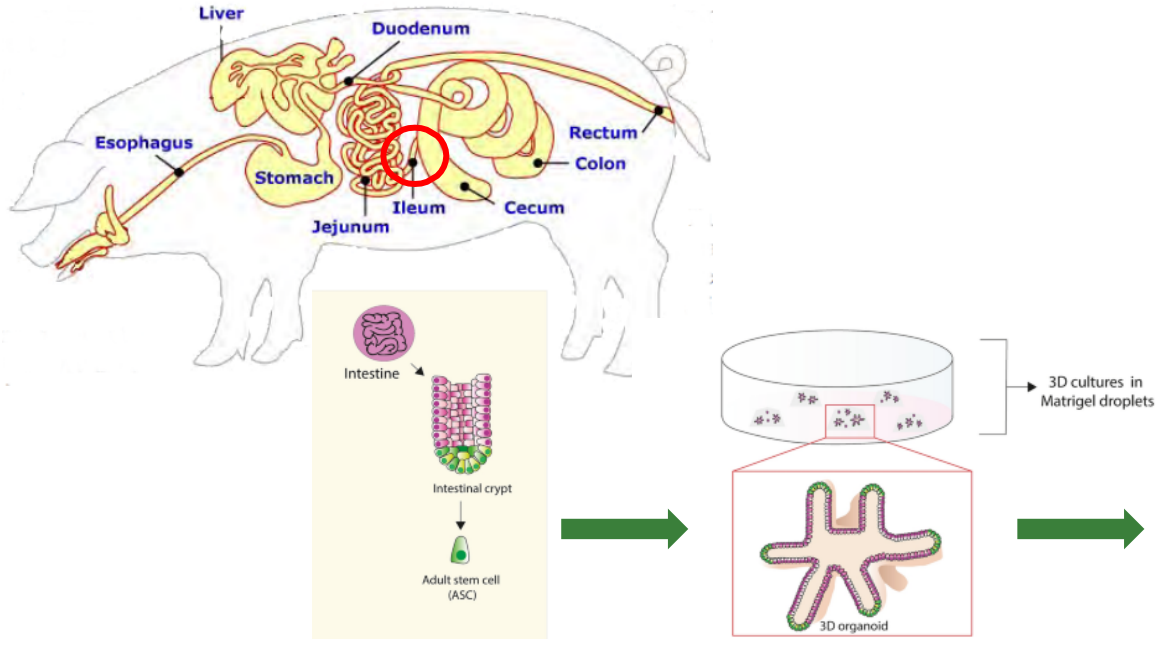
organoids



organoids



organoids



RNAsequencing analysis

Results

■ Basic alignment results

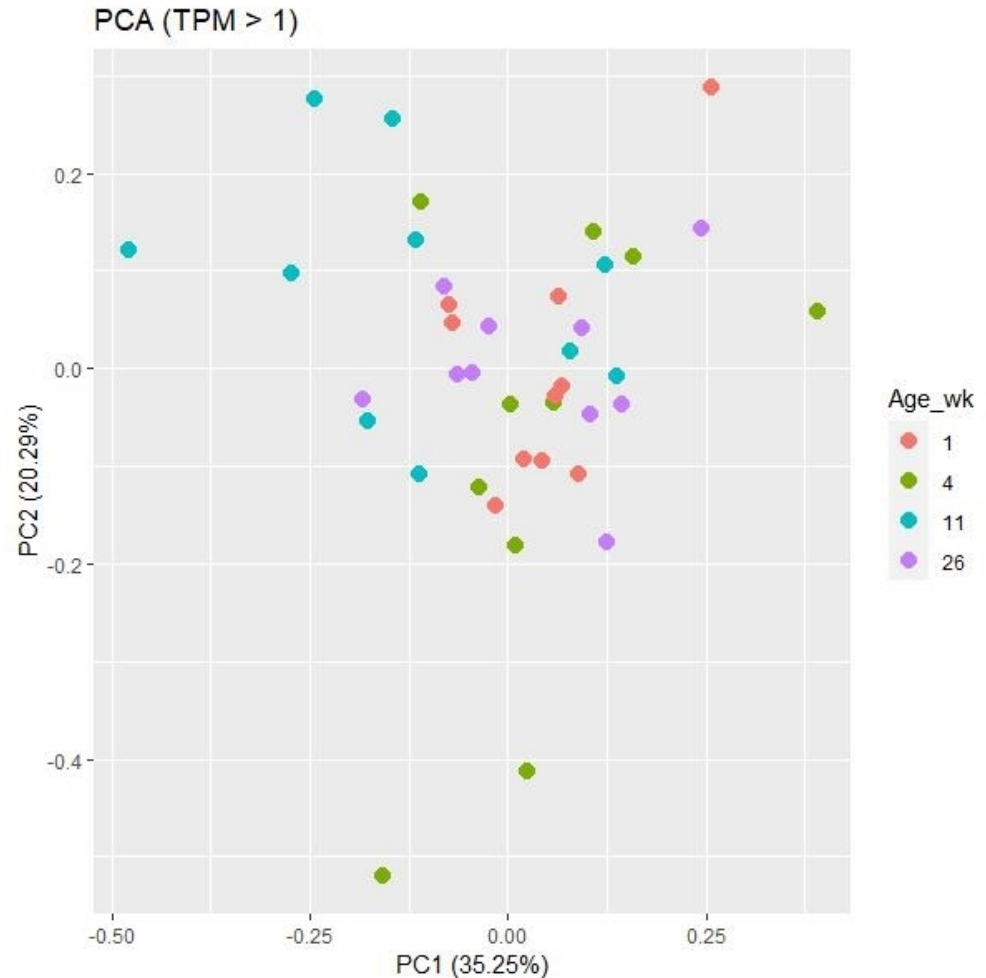
- Number of input reads 37.5 ± 4.6 Million
- Uniquely mapped reads 35.2 ± 4.5 Million
- Uniquely mapped reads 93.8 ± 1.4 %

■ Basic expression results

- Total number of genes reference genome 31 908
- Number of expressed genes (TPM > 0) 16 355
- Number of expressed genes (TPM > 1) 11 539

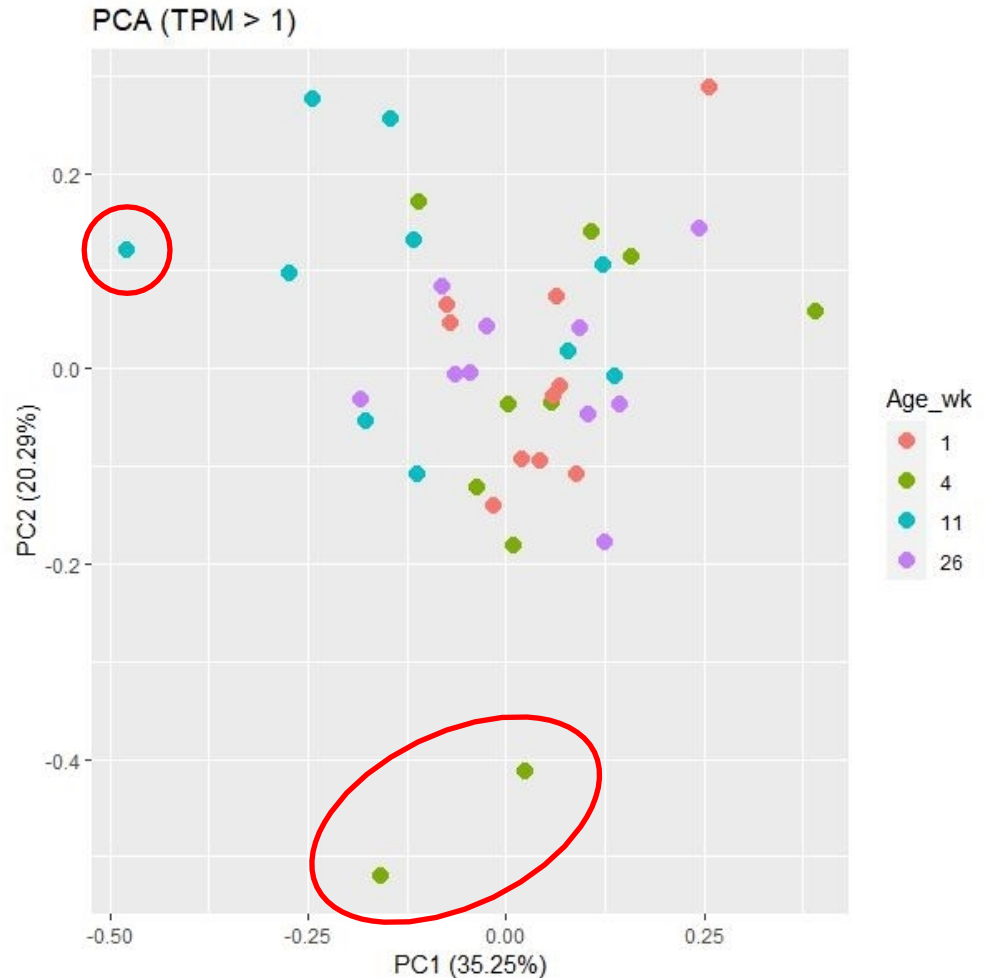
Effect age

- PCA analyses grouped by age (TPM > 1)
- No effect of age



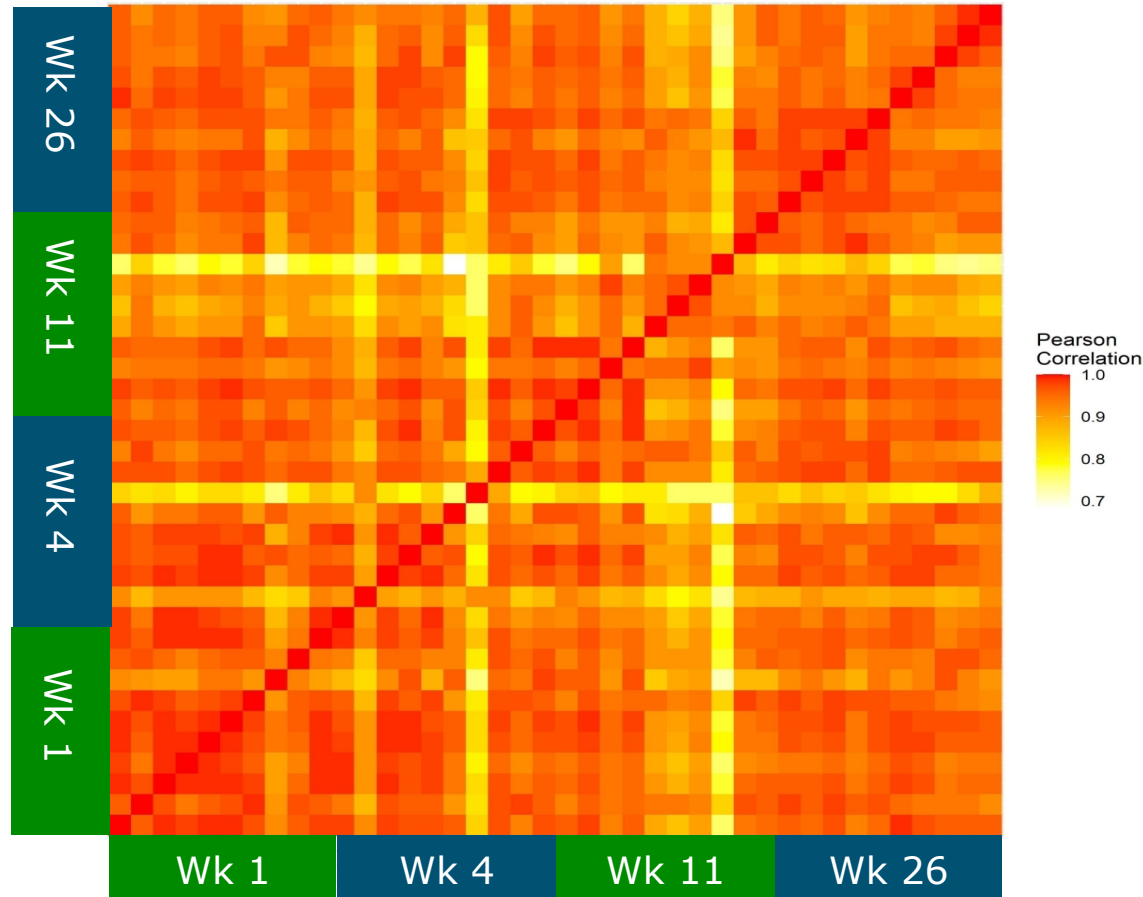
Effect age

- PCA analyses grouped by age (TPM > 1)
- No effect of age
- 3 'outliers', however no problems in quality control



Correlation matrix (TPM > 1)

- Within age group
 - 1: 0.97 ± 0.03
 - 4: 0.93 ± 0.06
 - 11: 0.92 ± 0.06
 - 26: 0.96 ± 0.03
- **All** **0.93 ± 0.05**

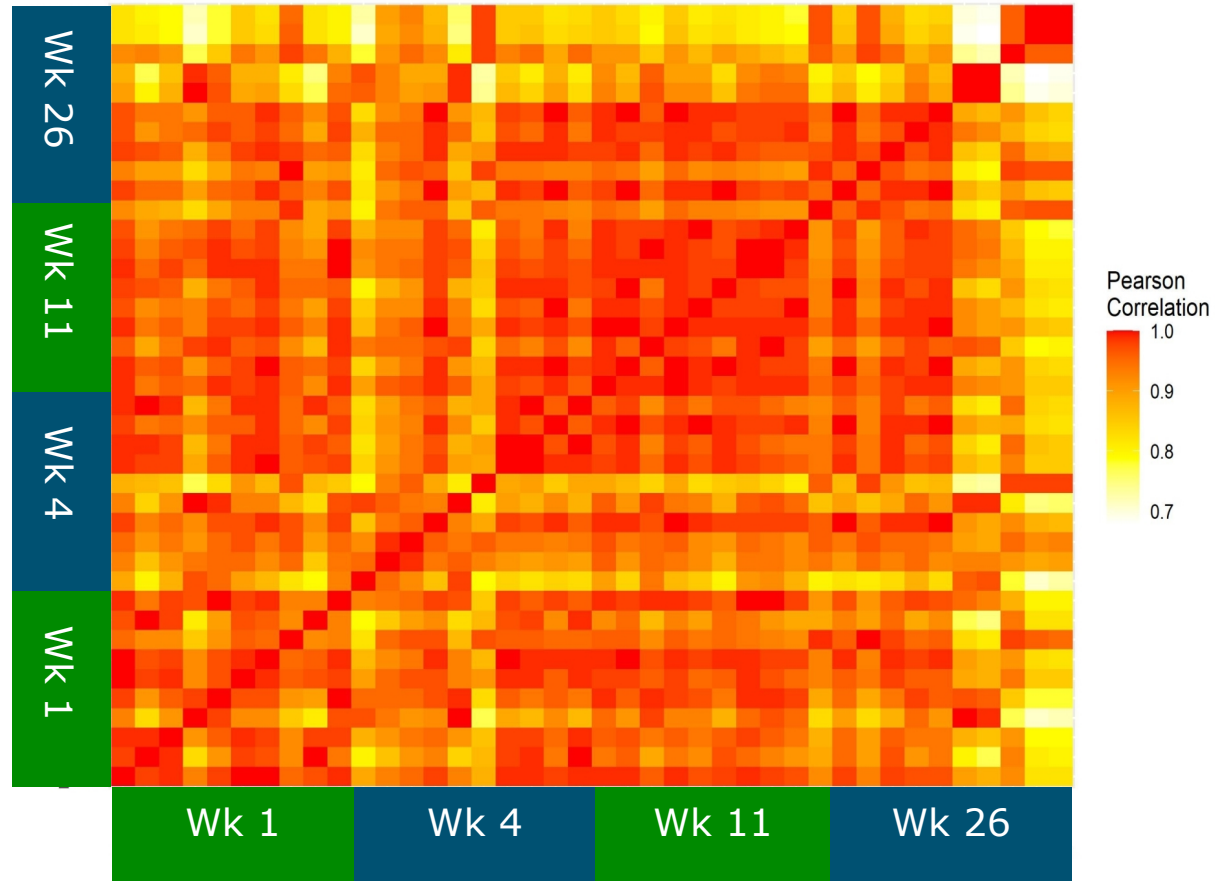


Specific genes (46 of 53 ileum expressed)

- Within age group

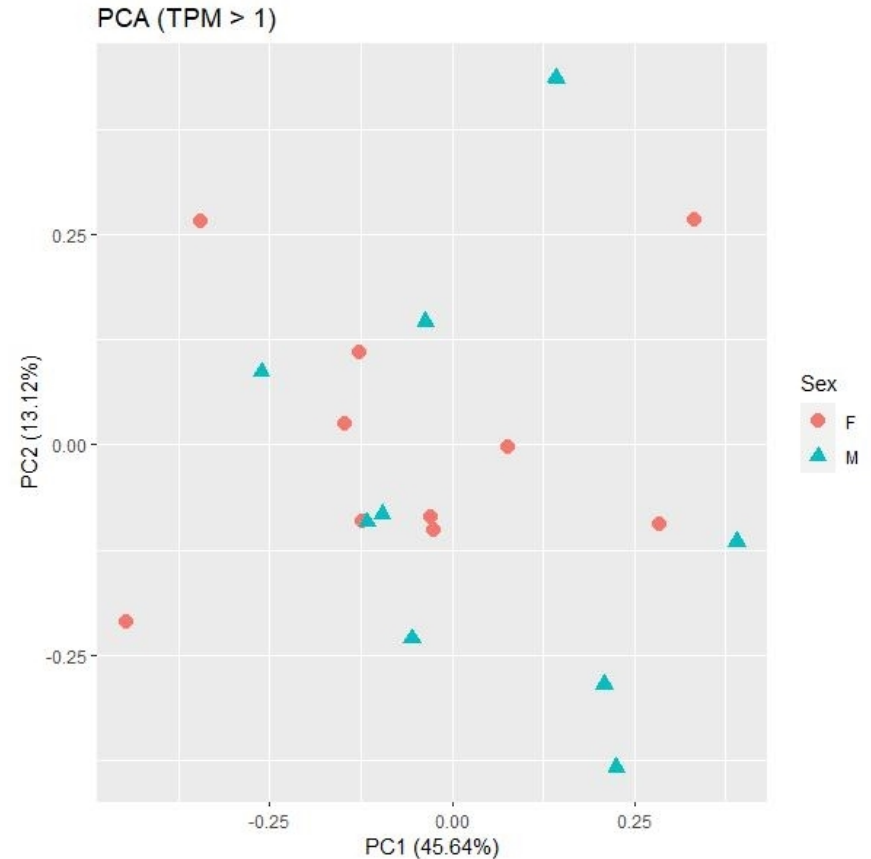
- 1: 0.96 ± 0.04
- 4: 0.93 ± 0.06
- 11: 0.98 ± 0.03
- 26: 0.90 ± 0.09

- **All** **0.93 ± 0.06**



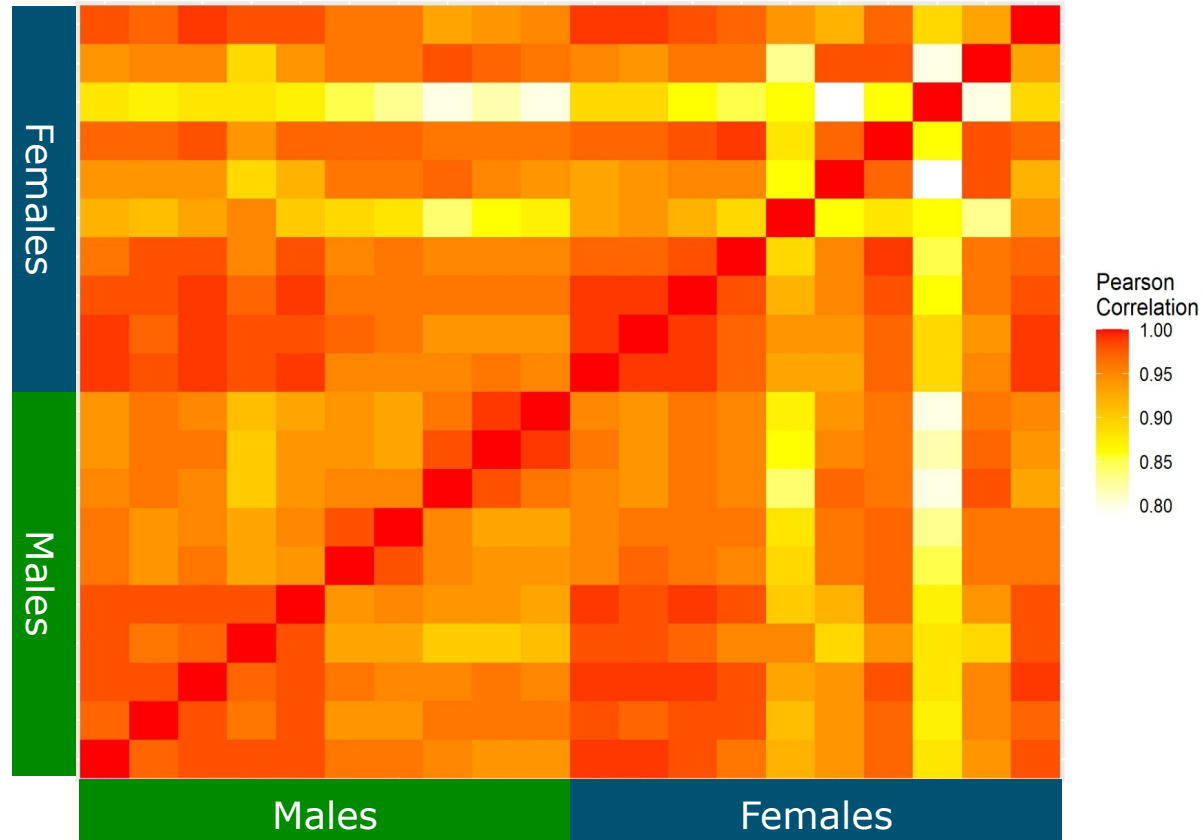
Effect sex

- PCA analyses grouped by sex (TPM > 1)



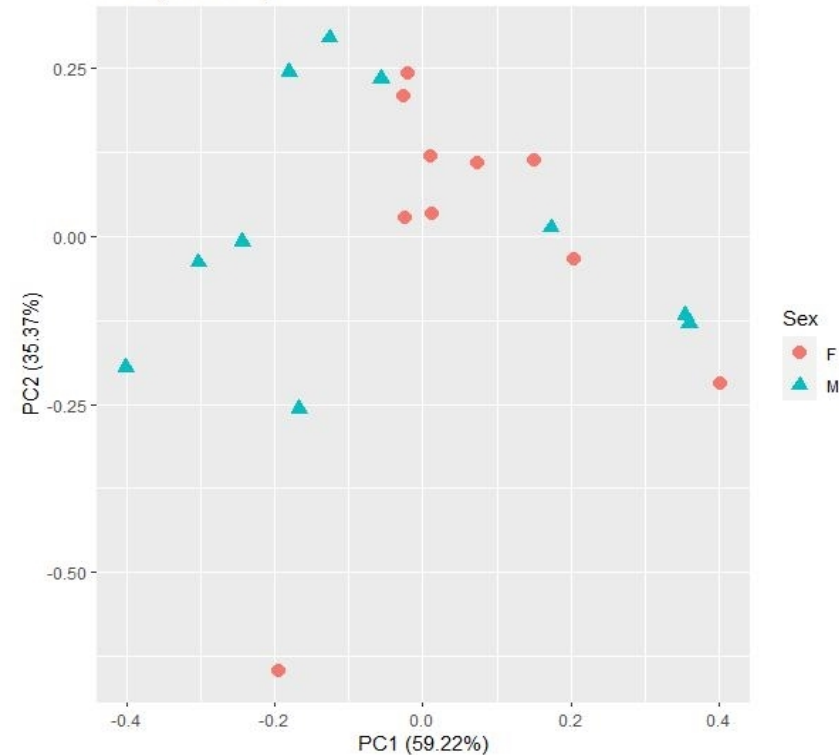
Correlation matrix (TPM > 1)

- Within sex:
 - Males 0.96 ± 0.03
 - Females 0.96 ± 0.04
- All **0.95 ± 0.03**



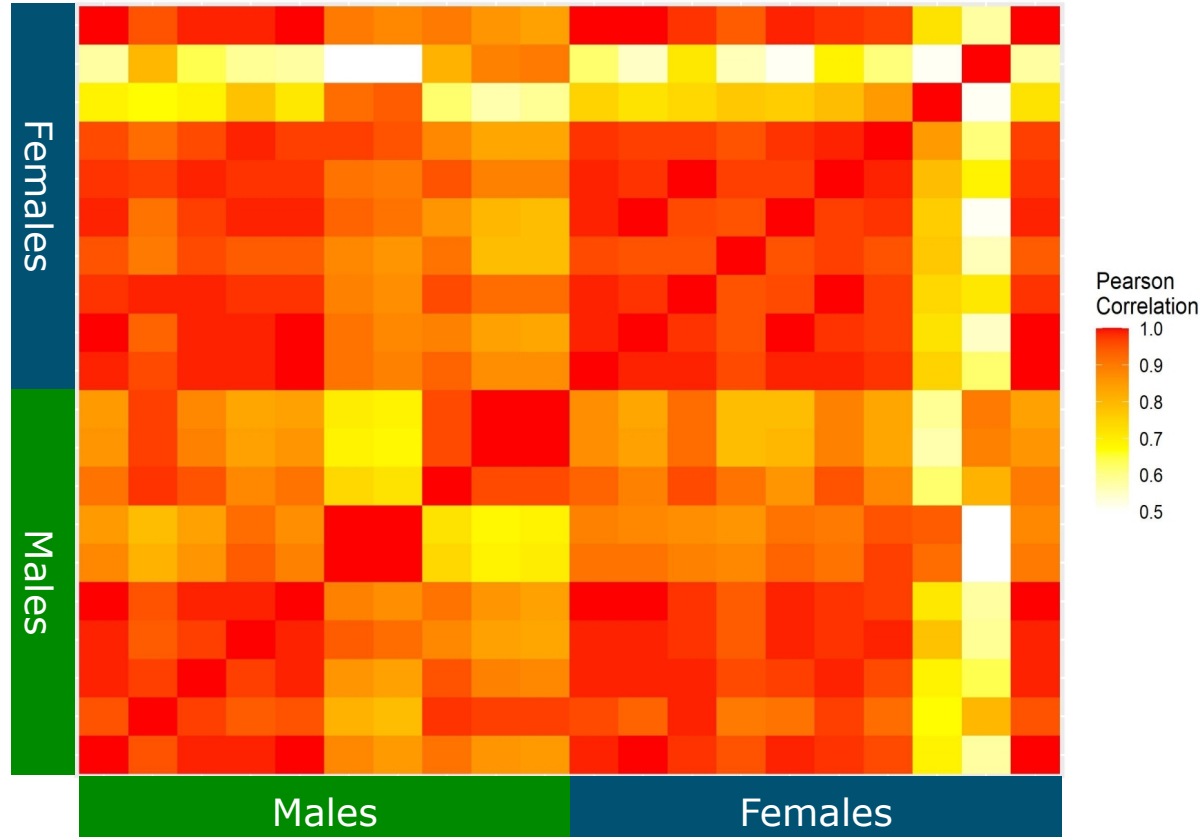
Specific genes (46 of 53 ileum expressed)

PCA (TPM > 1)



Specific genes (46 of 53 ileum expressed)

- Within sex:
 - Males 0.90 ± 0.09
 - Females 0.91 ± 0.15
- **All** **0.90 ± 0.12**



Summary

- No effect of age
- Sex effect depends on type of genes

Implication

→ Based on gene expression patterns, intestinal organoids derived from tissue samples collected at slaughter age resonates younger pigs

Questions?

Thank you for your attention!

