# EFFICIENT & ECOLOGICALLY-FRIENDLY PIG AND POULTRY PRODUCTION.

ECOFCE

## A WHOLE-SYSTEMS APPROACH TO OPTIMISING FEED EFFICIENCY AND REDUCING THE ECOLOGICAL FOOTPRINT OF MONOGASTRICS.

## BASIC DATA

**Funding:**
EU-FP7
(€ 6 million)

**Start date:**
1 February 2013

**Duration:**
48 months
(2013 to 2017)

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No. 311794.

# Optimising feed efficiency and reducing the ecological footprint of monogastrics (ECO-FCE)

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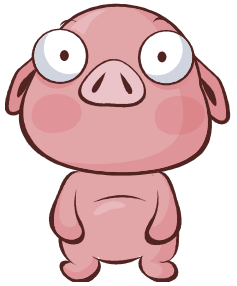
# ECO-FCE overview

- Feb 2013 – Feb 2017
- 17 partners
- Overall objectives
  - improve food security by optimising feed efficiency (FE) in pigs without negatively impacting on animal welfare or meat quality
  - reduce the ecological footprint of pig production
- Teagasc objective
  - to examine gut structure, function and microbiota in pigs divergent for FE

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# Expected benefits

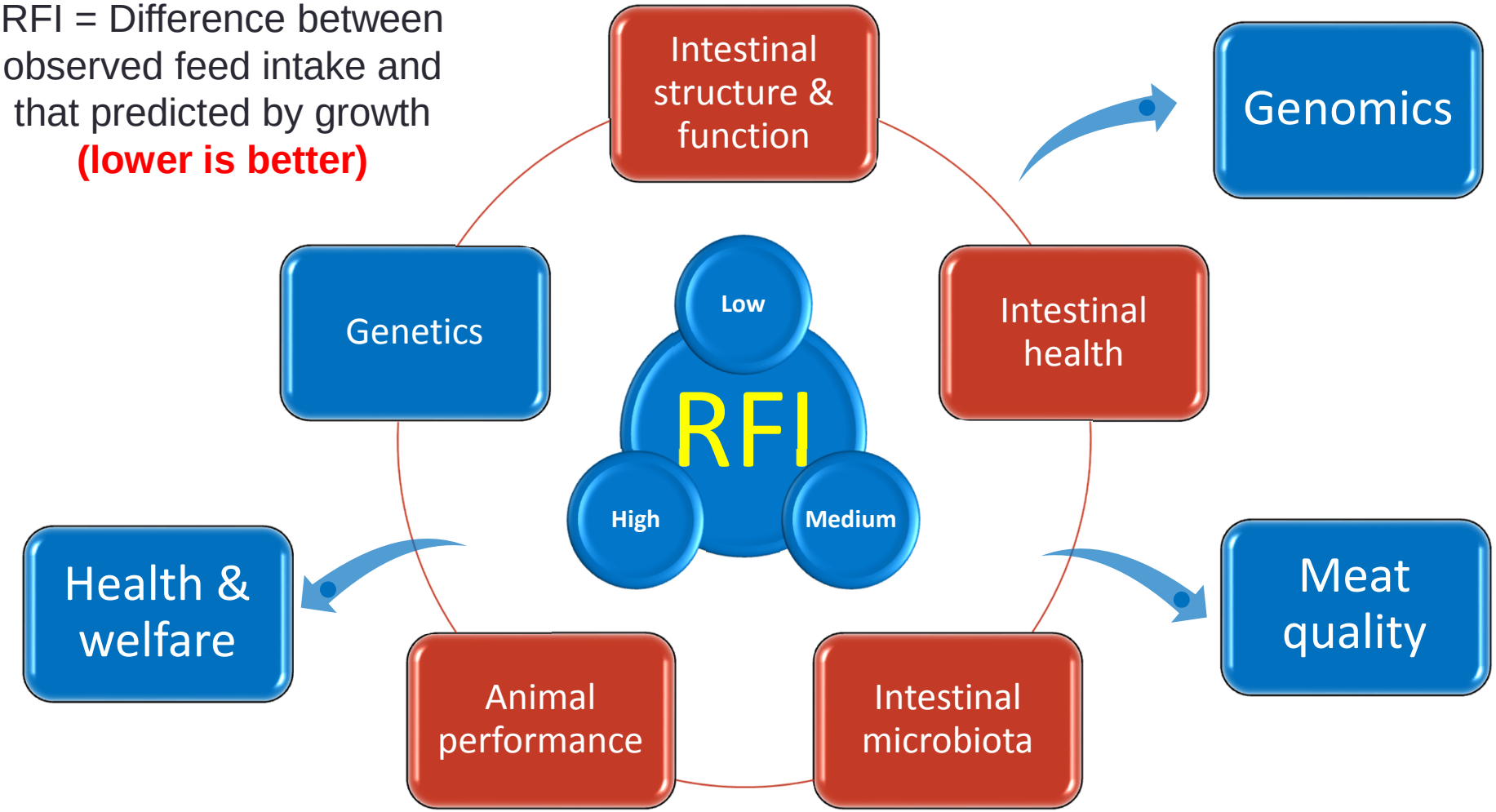
- Improved FE (microbiota, feed additives & genetics)
  - ↓ feeding costs
  - ↓ emissions
  - improve meat quality
  - improve animal welfare


- Improved intestinal microbial profile
  - ↓ costs associated with sick animals (growth check, medication, housing, labour, etc.)
  - better digestion and nutrient uptake

- Implementation of an Internet ECO-FCE hub
  - factors affecting feed efficiency
  - ecological calculators

# ECO-FCE overview

RFI = Difference between observed feed intake and that predicted by growth **(lower is better)**

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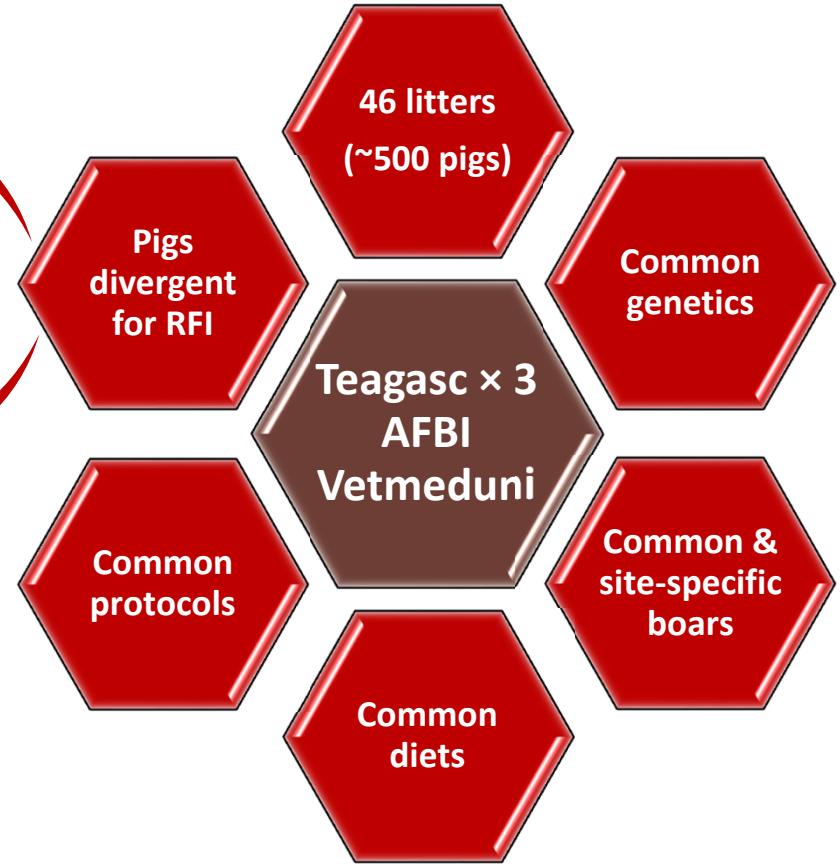
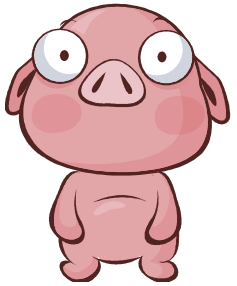
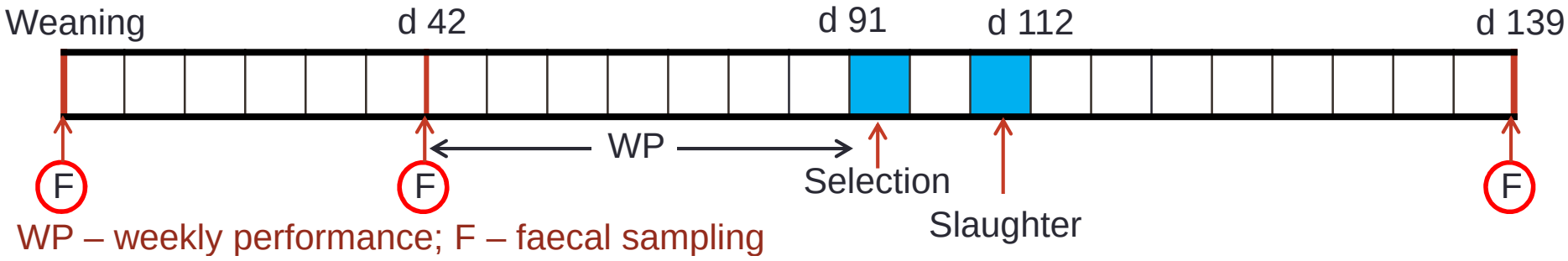
# Pig studies

Selection within litter & gender

More accurate FE indicator






WP – weekly performance; F – faecal sampling

# Results

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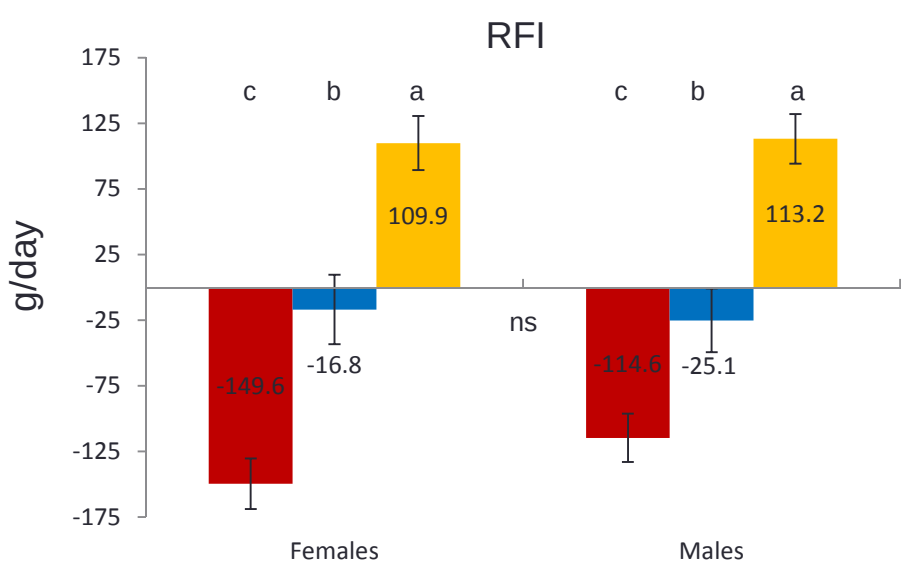
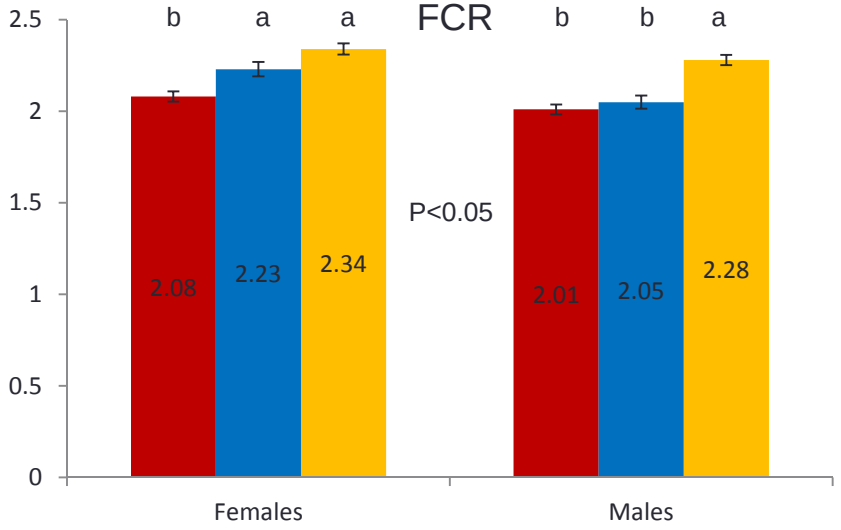
# Growth performance




Feed efficiency

Good Medium Poor

$^{a,b,c}P \leq 0.05$; ns – $P > 0.05$;

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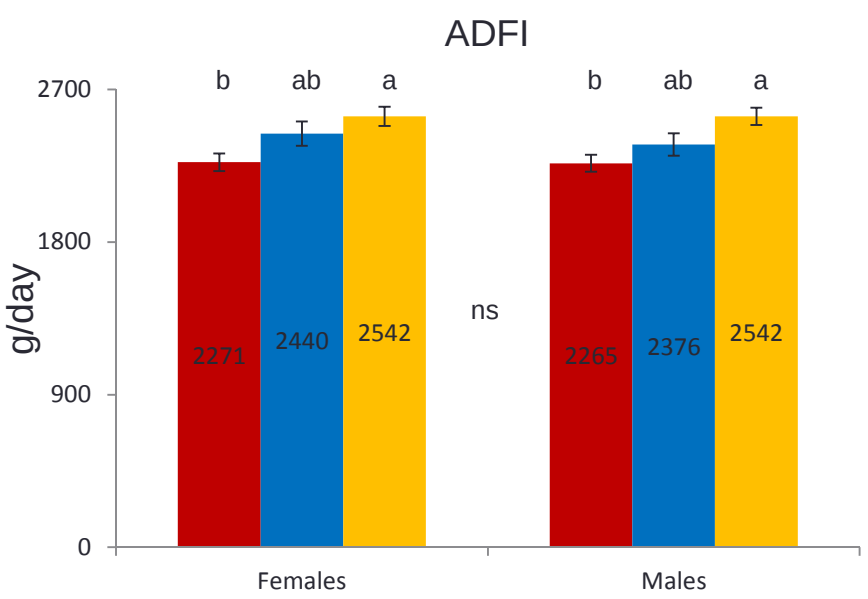
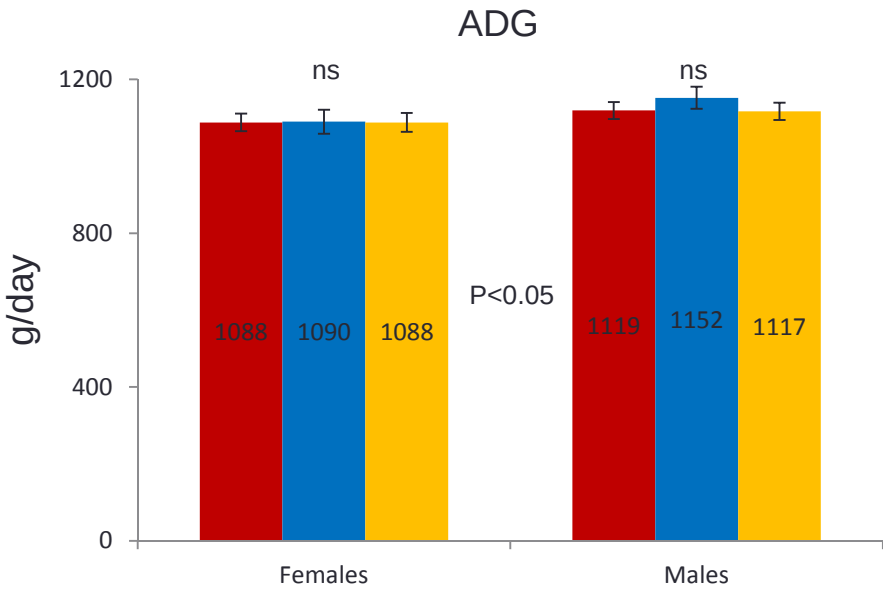
# Growth performance

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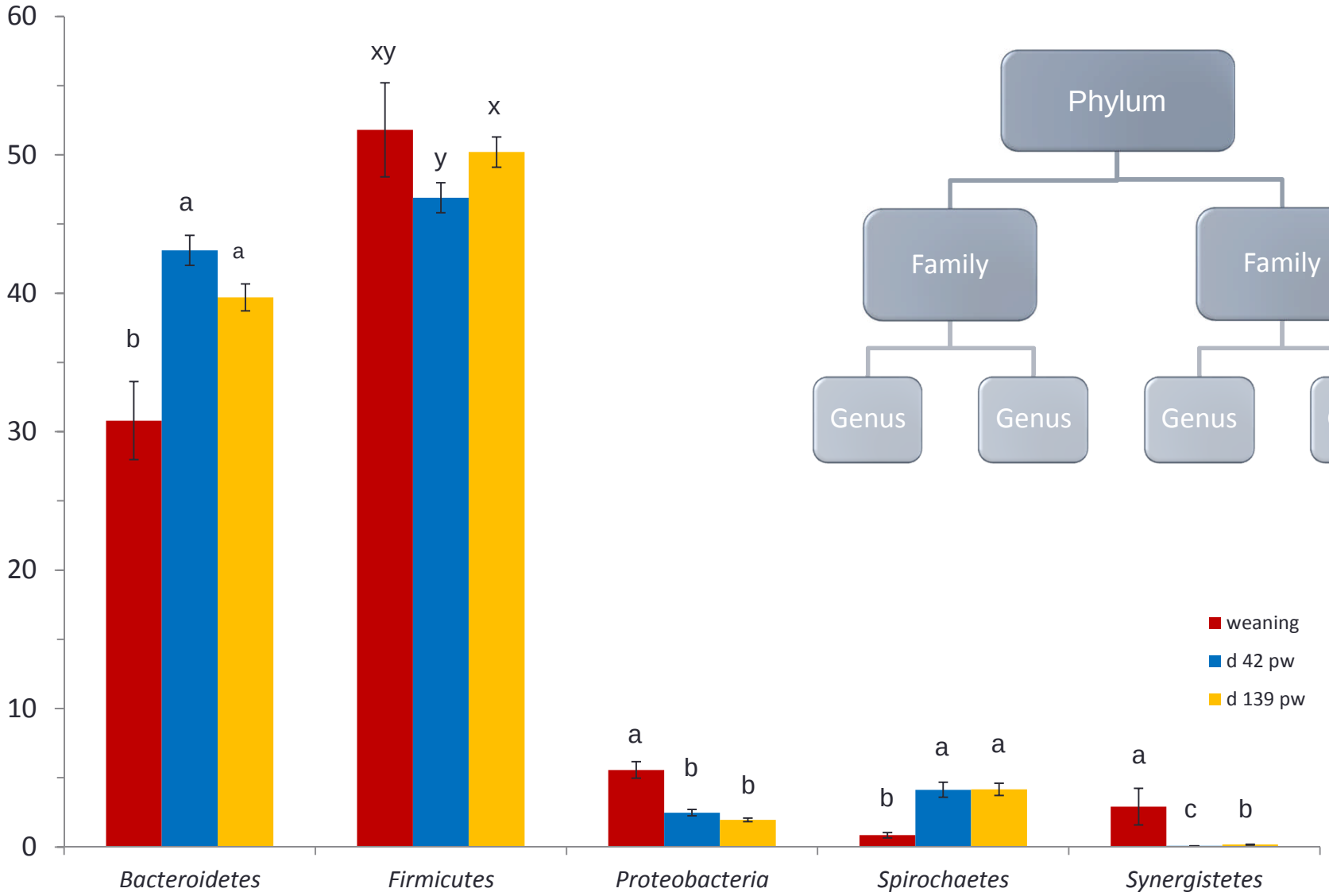
# Phylum – level differences in faecal microbiota over time







Columns within a group that don't share a common letter are significantly different ($^{a,b,c}P \leq 0.05$; $^{x,y}0.05 < P < 0.10$)
Standard errors represented by error bars

# Genus – level differences in faecal microbiota

| Taxon | Feed efficiency | | | 95% CI/5-95th percentiles | *P* value | Role in the intestine |
|---|---|---|---|---|---|---|
| | Good | Medium | Poor | | | |
| ***Streptococcus*** | $0.80^{b}$ | $1.00^{ab}$ | $2.09^{a}$ | 0.470-3.077 | 0.01 | **Some species pathogenic** |
| ***Campylobacter*** | $0.63^{x}$ | $0.40^{xy}$ | $0.36^{y}$ | 0.236-0.812 | 0.04 | Potentially pathogenic |
| ***Pseudobutyrivibrio*** | $0.09^{y}$ | $0.09^{y}$ | $0.17^{x}$ | 0.061-0.225 | 0.03 | Beneficial |
| ***Adlercreutzia*** | $0.000021^{a}$ | $0.000017^{a}$ | $0.000004^{b}$ | 0-0.000123 | 0.04 | Beneficial |

$^{a,b}P \leq 0.05$; $^{x,y}0.05 < P < 0.10$ ; Values within a row with a different superscript are different ($P < 0.05$).

**Better FE = better intestinal microbial profile?**

- relevance to be investigated further
- analysis of additional samples on-going - **confirmation**

# Conclusions

- RFI ranking
  - differences in ADFI and FCR
  - gender differences for ADG and FCR
  - requires extensive data manipulation
  - **FCR may be more practical in most circumstances**
  - **RFI – more useful than FCR to standardise FE ranking across sites**
- Major effects of **geographical site & boar** on growth performance
  - despite diets being formulated to common specifications
- Intestinal microbiota
  - 4/333 taxa differed by feed efficiency rank
  - functionality to be investigated further
  - major litter and time effects

**See poster**

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# Acknowledgements


- Pig Development Department farm staff
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- Waterford Institute of Technology

Agriculture and Food Development Authority

Waterford Institute *of* Technology

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# Thank you

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