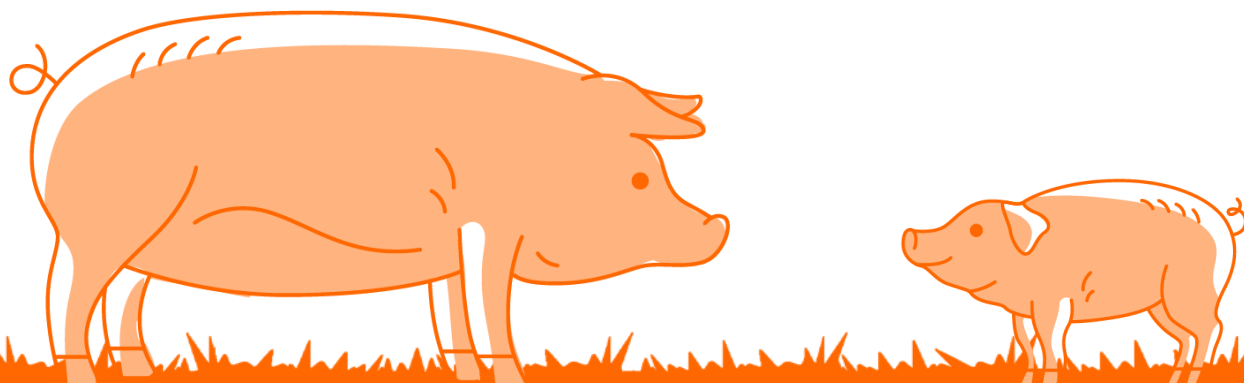




Modular approach for the R&D of novel feed supplements for improved sustainability of pig production: case study of humic-rich prebiotic fiber product development



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Introduction

Improving pig performance and supporting their resilience towards a variety of microbial, physical or physiological stress factors by

- feed products or
- enrichment materials

has a positive impact on the sustainability of pork production.



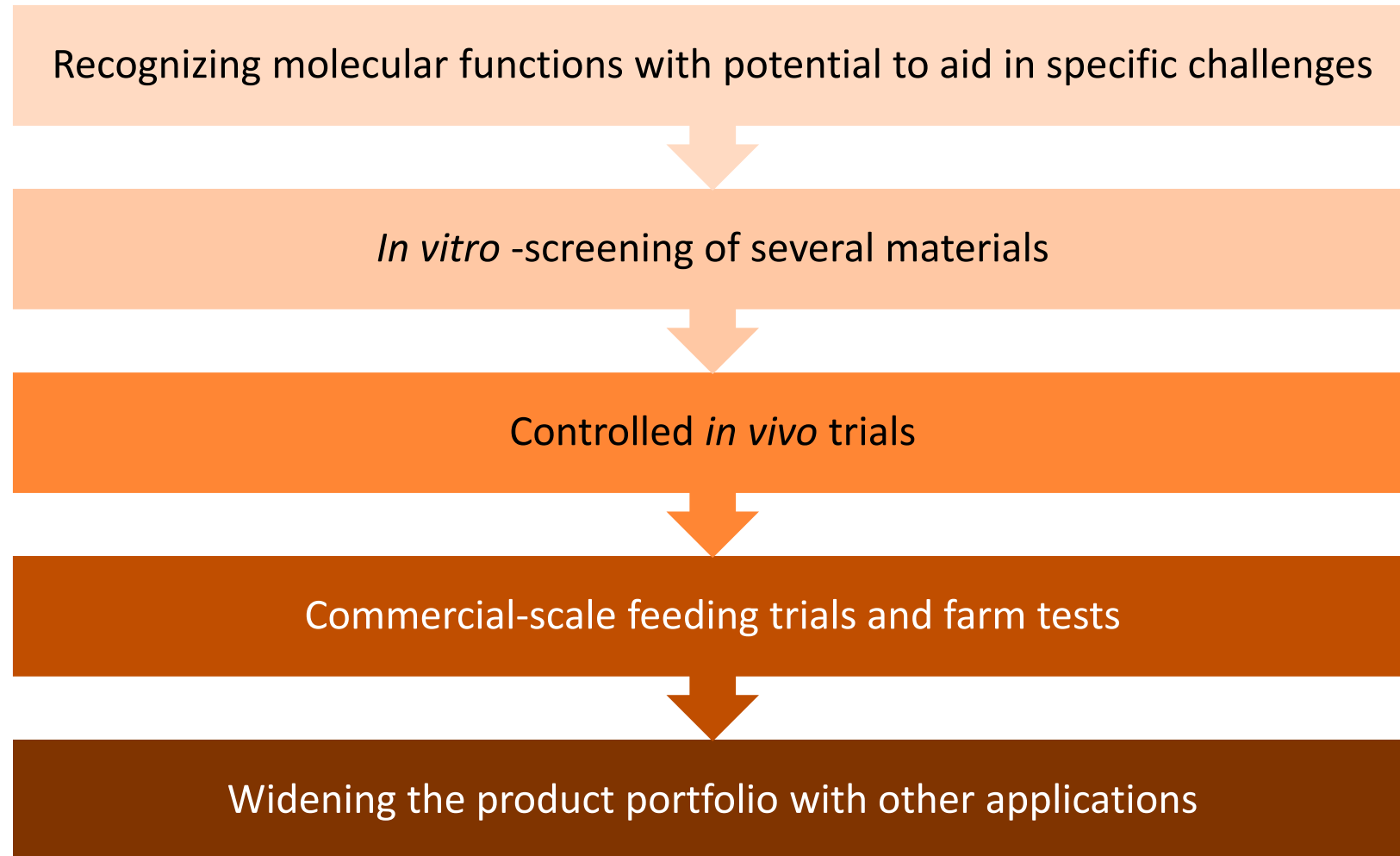


Needed for successful product discovery:

- Defined target
- Funding
- Human resources
- Research and industry partners
- **Systematic approach**



Five modules for product innovation





Case-study

- Humic acid -rich, prebiotic fiber product
- Produced from selected, sustainably produced peat
- First application: Enrichment material for piglets

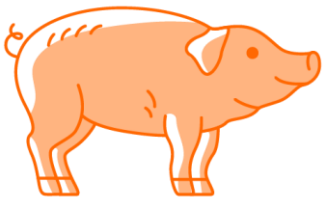
Module 1

Customer need: Sustainable, high-fiber enrichment material with extra benefits for piglets

Method: Literature search + discussions with potential industry and research partners

Results:

- Scientific literature indicated that prebiotic fiber and humic acids have potential to benefit the microbiota and homeostasis of piglet gut
- These molecules are abundant in some types of peat
- Teaming up with an industry partner (Neova Oy, Finland)
- Planning the research in collaboration with R&D providers

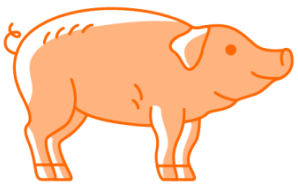
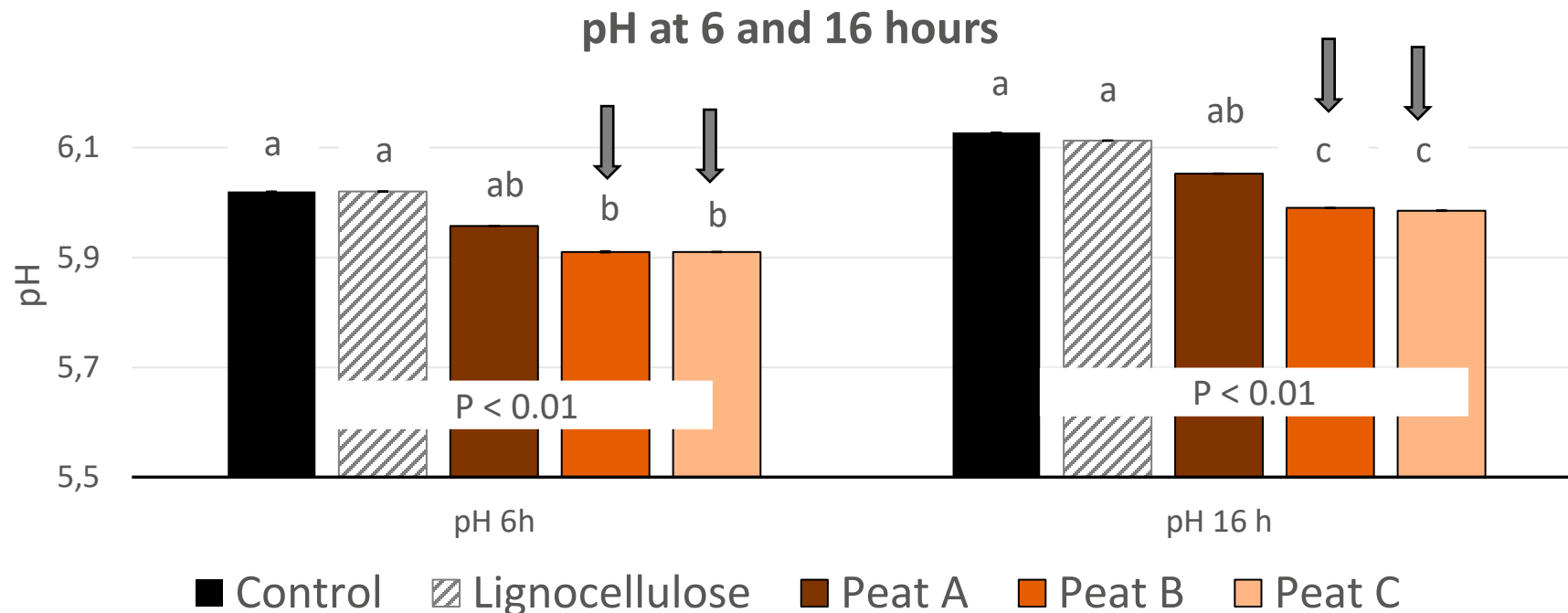


Module 2

Target: First selection of peat types

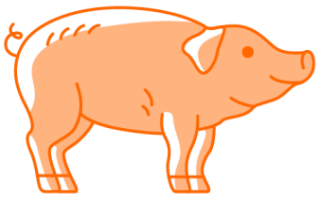
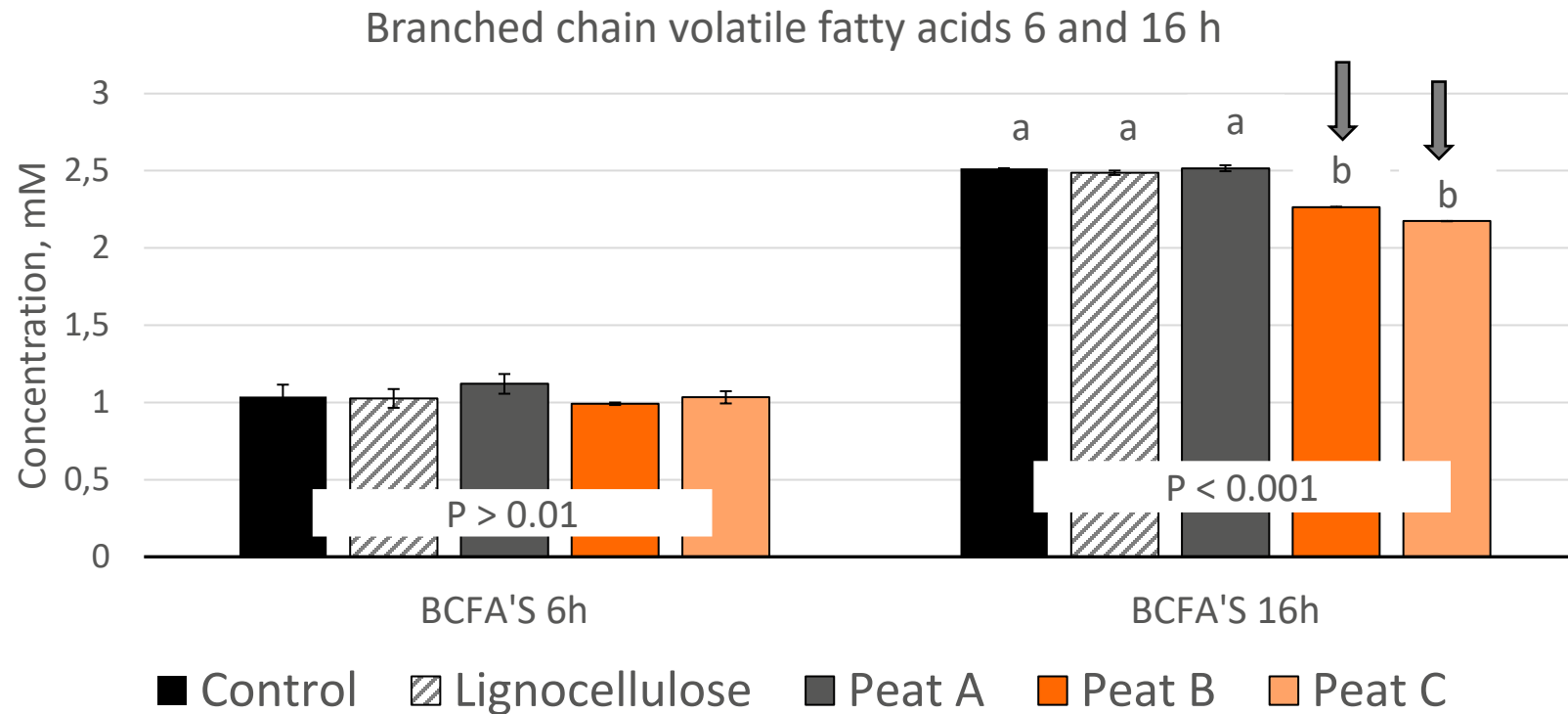
Method: Comparing three peat types and lignocellulose (wood fiber) in an *ex vivo* fermentation model of authentic colonic microbiota of piglets

Results: Peats B and C positively affected the fermentation: lower pH, better VFA profile



Module 2

Results: Peats B and C significantly reduced the production of branched chain volatile fatty acids in the colonic fermentation model. They were selected into Module 3.



Module 3

Target: Final selection of the peat type for enrichment material use

Method: Controlled *in vivo* trial with weaned piglets. Two peat types were heated (over 80°C), pelleted and extensively tested for ensuring the microbiological safety.



Enrichment material treatments

- 1. Control (no enrichment materials)
- 2. Peat A pellets
- 3. Peat B pellets

- 10 pens/treatment
- 19±2 piglets/pen

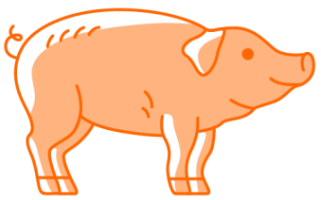
Module 3

Results:

- Both peat types were suitable as enrichment materials: the piglets liked to chew and eat them
- Piglets in Peat A group had a better weight gain and daily weight gain than the control group (Table 1)

Table 1. Performance results of the *in vivo* trial. Statistics: ANOVA and Tukey's test

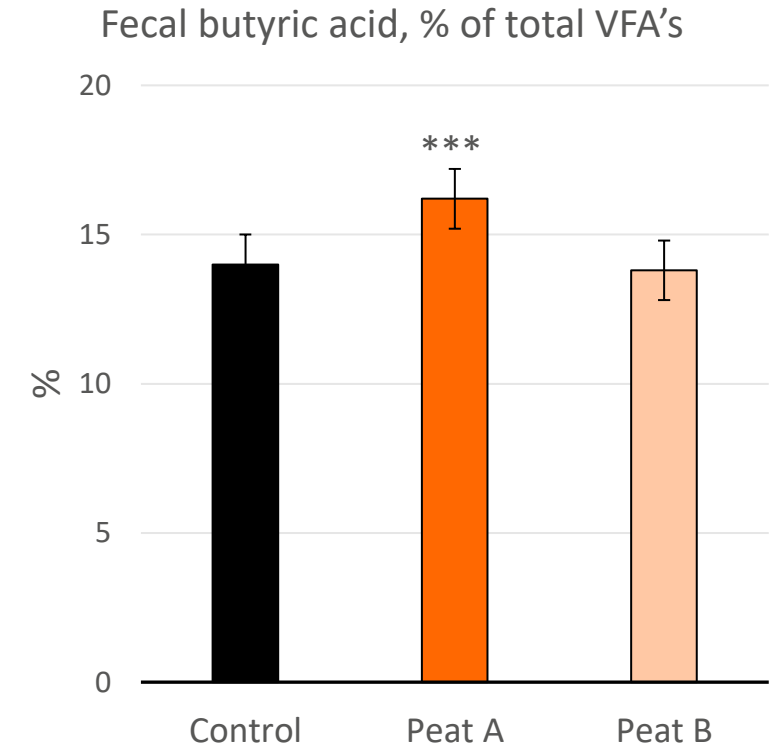
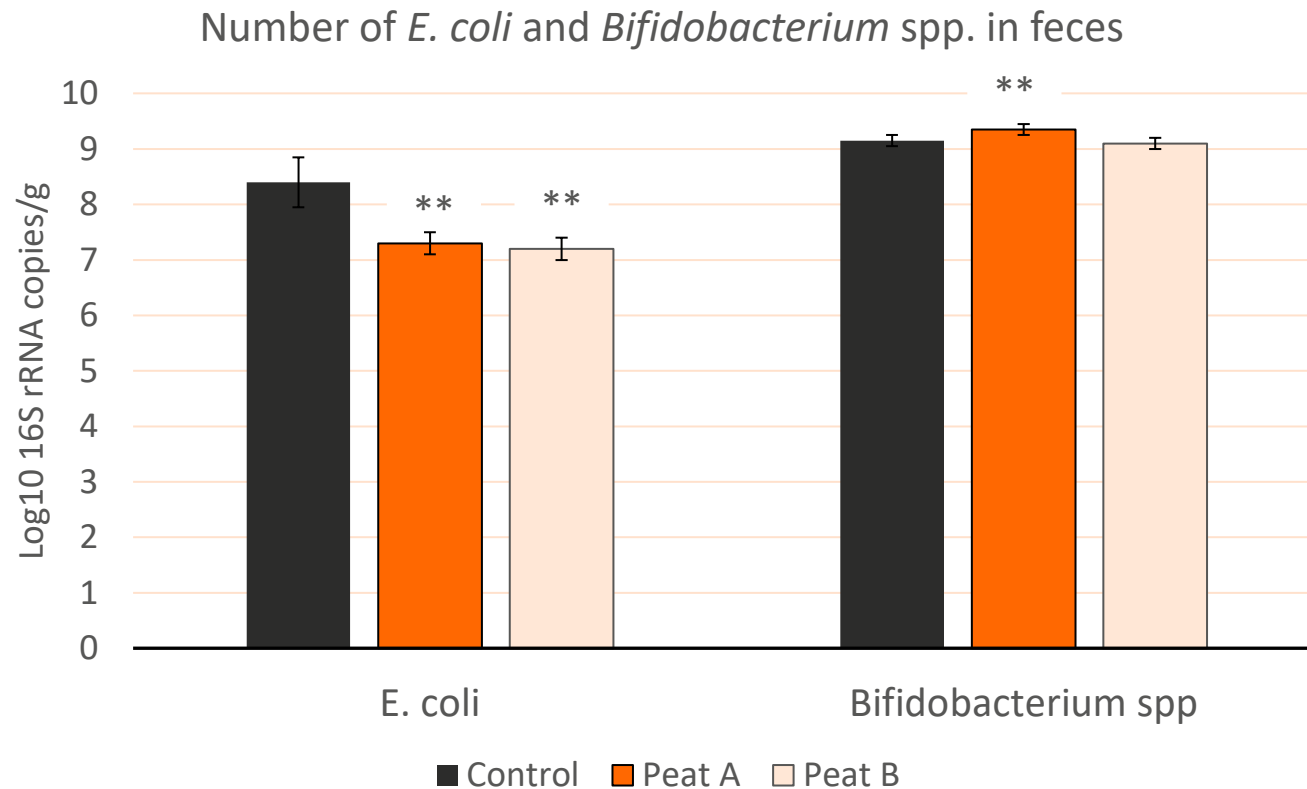
Item	Control	Peat A	Peat B	P-Value
Number of piglets, day 0	190	168	176	-
Total feed intake per piglet, kg	15.7	15.4	15.5	-
Peat intake, relative to feed intake, %	0	2.5	2.1	-
Piglet weight, day 0, kg	10	10.1	10.6	0.279
Piglet weight, day 28, kg	18.9	20.8	20.9	0.094
Weight gain, days 0-28, kg	8.8 ^b	10.7 ^a	10.3 ^{ab}	0.036
Daily weight gain, g	303 ^b	370 ^a	353 ^{ab}	0.045
Mortality, %	6.3%	2.4%	3.4%	< 0.1



Module 3

Results:

- Beneficial effects on fecal microbiota.
- Overall, Peat A showed better responses than Peat B



Module 4

Target: Testing the final product in farms

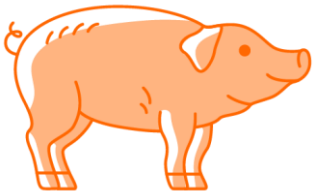
- Commercial farms in Finland
- Questionnaire to farmers to collect opinions

Results:

Positive feedback from farms

- Good palatability
- Less tail biting
- lower diarrhoea frequency

Commercial production started in August 2024



8-mm pellets

Module 5

Widening the product portfolio to other applications

- Fiber source for the feeds of piglets, sows and fattening pigs
 - *In vivo* – trials indicated positive effects on intestinal microbiota
- Fiber source for poultry feeds
 - *In vivo* – trial with broiler chickens indicated beneficial effects on weight gain and FCR, microbiota analysis is ongoing
- Potential for ruminant diets
 - First *in vitro* experiment is ongoing

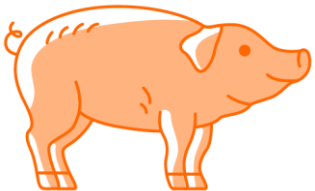


Conclusions and implications

The 5-step modular product development pathway has proven its efficacy in producing novel innovations for animal farming.

First starting with the application of enrichment material for pigs, the humic-acid rich prebiotic fiber will likely later be used in multiple applications for pigs, poultry, and other farm animals.

A committed and skilled industry and research partner network has proven to be invaluable in the process.





Thank you!

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