Behavioural tests to screen the satiating properties of dietary fibre sources in adult pigs

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#### Definitions

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- **Dietary fibre (DF)**
  - Edible parts of plants or analogous carbohydrates
  - Neither digested nor absorbed in the small intestine
  - Fermented partially or completely in the colon  
    (AACC, 2001)

- **Satiety**
  - Period of time following a meal when hunger and desire to eat are inhibited  
    (Le Magnen, 1982)
Beneficial role of DF to induce satiety

↑ Satiety  ↓ Hunger  ↓ Food intake
(Body weight loss)

(Howarth et al, 2001)

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### Our project

**“Fermentation in the gut to prolong satiety”**

- Estimate the contribution of DF to the regulation of satiety
- Identify the working mechanisms by which DF affect satiety
- Pig as a model for humans/self

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Our project

“Fermentation in the gut to prolong satiety”

- Similar digestive function
- Similar diet (omnivorous)
- Better standardization
- Easier access to body tissues

- Pig as a model for humans/self
Pilot study – Measuring satiety in pigs

Objectives

- To develop reliable behavioural tests for assessing satiety in adult pigs
<table>
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<th>Animals and housing</th>
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<tr>
<td>10 adult female pigs</td>
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<tr>
<td>Housed in pairs (5 x 2)</td>
</tr>
<tr>
<td>Individually fed in 2 separate boxes</td>
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<tr>
<td>Enrichment</td>
</tr>
<tr>
<td>- No edible materials → Toys</td>
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</table>
Diets (1)

- Standard commercial pig diet
- Twice daily (7:30 and 16:00)
  - week 1 → Food provided *ad libitum* (2h/day)
  - weeks 2-4 → Food provided at 80% of *ad libitum* food intake (AFI) determined in week 1

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**Part 1**

**AFI**
- Diet: Commercial
- Feeding level: Ad libitum (2h/day)

**Training**
- Diet: Commercial
- Feeding level: 0.80 AFI
### Diets (2)

- **Standard commercial pig diet**
- **Twice daily (7:30 and 16:00)**
  - 2 treatments; cross-over (round I & II)
  - H → High feeding level (75% of AFI);
  - L → Low feeding level (60% of AFI);

#### Part 2

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<th>Training</th>
<th>Tests (I)</th>
<th>Tests (II)</th>
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<td>Diet: Commercial</td>
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<td>Feeding level: Ad libitum (2h/day)</td>
<td>Feeding level: 0.80 AFI</td>
<td>Feeding levels: 0.75 AFI (H) 0.60 AFI (L)</td>
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**Background**

- Objectives
- Methods
- Results
- Discussion
- Conclusion
- Questions
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| **Behavioural tests ➔ Feeding motivation**  
  (reversal satiety) |
| - Operant consumer-demand test |
| - Runway test |
Operant consumer-demand test

- 1h, 3h and 7h after morning meal (on 3 different days)
- Fixed Ratio (FR5) vs. Progressive Ratio (PR1)
Runway test

- 1h, 3h and 7h after morning meal (on 3 different days)
- Latency to reach end of the route (walktime)

Total distance = 22.5 m
Results operant test

Rewards earned on PR1

Values are least square means ± SEM. * P<0.05 vs. High (75%)
Results operant test

Rewards earned on FR5

Values are least square means ± SEM.
Results runway test

Values are least square means ± SEM.

Runway walktime

Time to reach feed (s)

Time after morning meal (h)

- Values are least square means ± SEM.
General discussion

- **PR1: most sensitive**
  - 1h and 3h:
    - $H \rightarrow \downarrow$ feeding motivation $\uparrow$ satiety
    - $L \rightarrow \uparrow$ feeding motivation $\downarrow$ satiety
  - 7h: $\uparrow$ feeding motivation (all animals)
    - time of test (15h) close to time of afternoon meal (16h)
- **FR5: less sensitive**
- **Runway**
  - Reflected differences in feed intake only in round I, but not anymore after round II
    - Small contrast between feeding levels
## Conclusion & Future work

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| - Rewards earned in Operant consumer-demand test reliably reflected changes in satiety  
  - Pigs on a low feeding level showed a higher feeding motivation (cf. lower satiety) than pigs on a high feeding level |
| - Final results of Runway test did not reflect changes in satiety |
| - Operant consumer-demand and runway tests are currently being used in a large experiment to screen the satiating properties of fibres |
| - In general, tests work well and correlate nicely |
Thank you for your attention

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Questions?

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