Selection for protein digestibility in pigs

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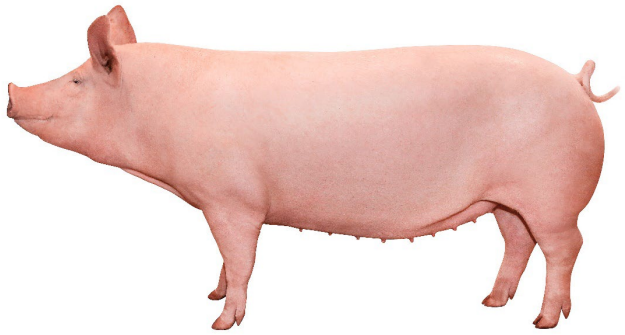

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Outline

1. Brief introduction to the trait
2. Canadian trial
3. Norwegian trial
4. Does selection for protein digestibility add?
5. Conclusions

Introduction

- Protein efficiency in animal production will become increasingly important, because
  - Cost of protein as a feed ingredient will increase
  - As will the cost for N-emissions

- Can genetic selection for improved apparent total tract protein digestibility (ATTDP) help in:
  - reducing feed costs
  - reducing the environmental impact of pig husbandry

Formula for apparent total tract digestibility

From a nutrionist's point of view

$$100 - ((100\ x\ \left(\frac{nutrient\frac{g}{kg}feces}{nutrient\frac{g}{kg}feed}\ x\ \frac{marker\ \frac{g}{kg}\ feed}{marker\ \frac{g}{kg}feces}\right))$$

⇒ You need a marker; and

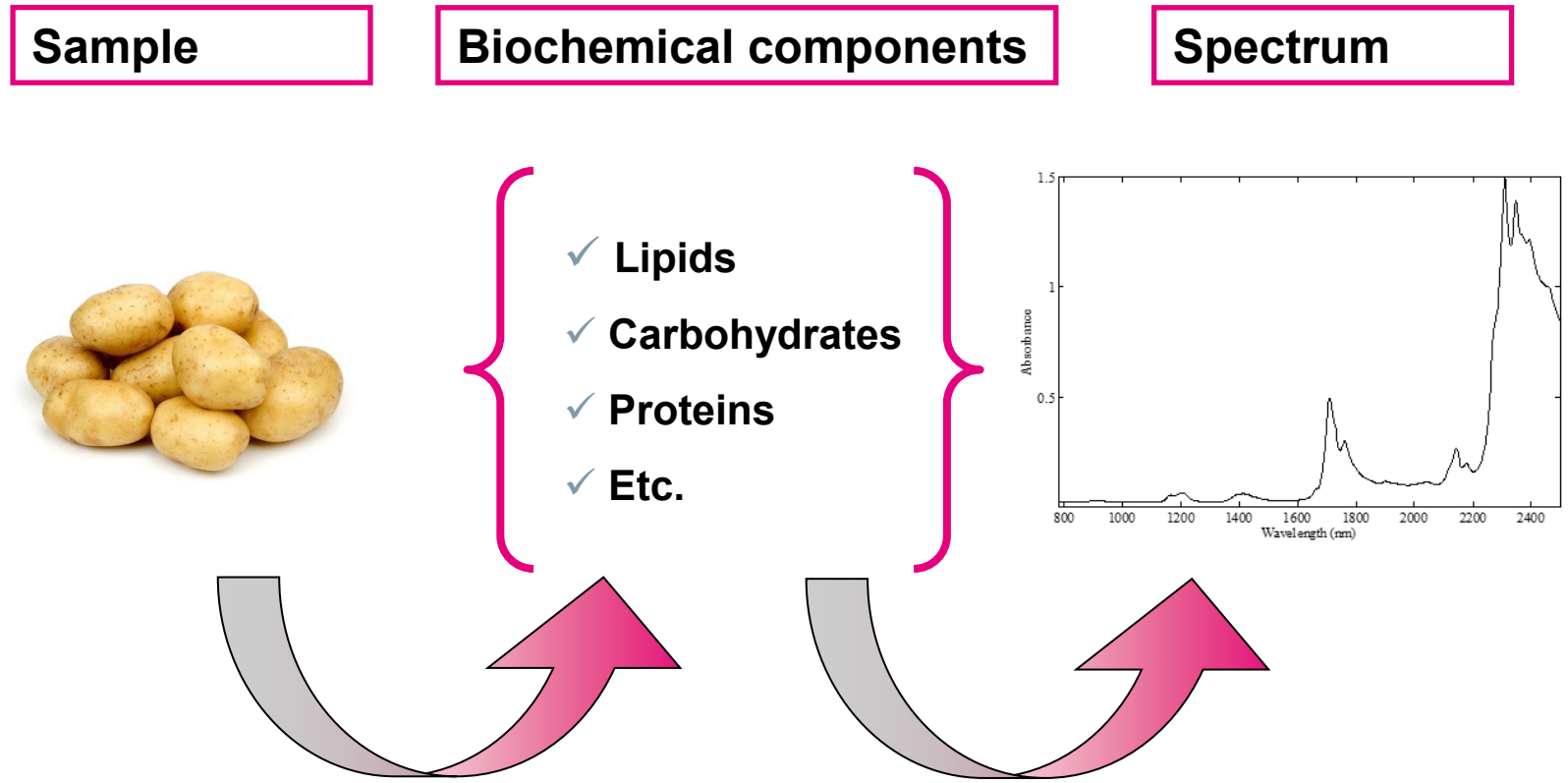
⇒ Fecal and feed samples

- Prerequisite for application in a breeding program:
  - Easy to measure & instantly available (NIR)
  - Affordable (fresh samples)
  - (socially) acceptable marker

ATTD other ingredients

Biochemical components

trait	h^2
ATTD_DM	0.11
ATTD_ADF	0.60
ATTD_NDF	0.08
ATTD_Energy	0.15
ATTD_P	0.04
ATTD_Ca	0.00
ATTD_Ash	0.00



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Delta Canada

Canadian Agricultural Partnership (CAP)

Genetic parameters

Trait	σ_A^2	h^2
ADG (g/d)	4,831	0.43 ± 0.24
DFI (g/d)	43,721	0.64 ± 0.24
Pd (g/d)	347	0.56 ± 0.25
ATTD-CP[1]	5.3	0.49 ± 0.23
ATTD-CP[2]	5.9	0.55 ± 0.23

[1,2] 307 Chemical analysis only

CAP Canada

Genetic parameters

Trait	σ_A^2	h^2	c^2
ATTD-CP[2]	5.9	0.55 ± 0.23	-
ATTD-CP[3]	4.5	0.27 ± 0.07	0.08 ± 0.04

[2] 307 Chemical analysis only (see previous slide)
[3] 1683 NIRS observations on oven-dried samples only

Norway, TN Duroc Delta

- Hov Martinsen et al.

Genetic analyses of nutrient digestibility measured by fecal near-infrared spectroscopy in pigs

- 2.000 freeze dried samples (300 + 1.700)
- Marker chemically analyzed AIA (Acid Insoluble Ash)

Norwegian University of Life Sciences

Nofima

Genetic parameters

	σ^2_A	σ^2_{Pen}	σ^2_E	h^2
ATTD CP, %	4.9	2.3	20.0	0.20

Genetic correlations

Norway, TN Duroc Delta

	Feed 40-120kg	Days 40-120kg
ATTD-CP, %	-0.54 (0.11)	0.11 (0.14)

CAP Canada

Genetic parameters

Trait	σ_A^2	h^2	c^2
ATTD-CP[2]	5.9	0.55 ± 0.23	-
ATTD-CP[3]	4.5	0.27 ± 0.07	0.08 ± 0.04

[2] 307 Chemical analysis only (see previous slide)
[3] 1683 NIRS observations on oven-dried samples only

Genetic correlations

Trait	r_g ATTD-CP
DFI (kg/d)	-0,15 ± 0,17
FCR (kg/kg)	-0,21 ± 0,19

Conclusions

- NIRS is a suitable technique to measure digestibility in pigs
- Using NIRS instead of chemical analyses reduces genetic standard deviation by ± 13%
- The genetic correlations between ATTD-CP and DFI or FCR is low and not significantly different from 0, indicating that genetic selection on ATTD-Cp has the potential to add genetic gain over and above selection on DFI and/or FCR

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