Modelling the effect of feeding strategy and feed prices on a population of pigs

N. Quiniou, B. Vautier, Salaün Y., van Milgen J., Brossard, L.
Changing the scale in nutritional recommendations: from the individual to the population

Is the "representative" pig a good indicator of the requirement at the population level?

Dietary characteristics

Feed allowance

Nutrient intake

Growth potential

Average daily gain

Protein deposition

Daily feed intake, kg/d

BW at a given age, kg

(average daily gain)

Carcass leanness

Lysine requirement, g/MJ NE

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Changing the scale in nutritional recommendations: from the individual to the population

NO the "representative" pig is not a good indicator of the requirement at the population level (Brossard et al., 2007)

Amino acid supply, % of the average pig
Changing the scale in growth modelling: from the individual to the population

- Feeding level
- Feed sequence
- Feeding conditions

2000 profiles

Housing conditions

2000 simulations

Response

Response of the virtual population

Deterministic model (InraPorc)

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Definition of different feed sequences: biphase / multiphase

From a virtual population of 2000 profiles generated from
- from average parameters / input of InraPorc software
- their variance – covariance matrix
(Vautier et al., 2012)

Average requirement: Feed sequence:

Ileal standardized digestible lysine, g/MJ NE

Body weight, kg

http://w3.rennes.inra.fr/inraporc

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Definition of different feed rationing plans: Ad lib / restriction

- Ad lib barrows
  - +27 g/d max 2.7 kg/d
- Ad lib gilts
  - +27 g/d max 2.4 kg/d

+90% Ad lib
+ Ad lib up to 2.4 or 2.7 kg/d
Calculations

- **Expected final BW – 115 kg on average for the pop.**
  - Slaughtering was simulated in 3 departure, every 7 days
    - 1st departure: min BW = 112 kg
    - "  + 7 d: min BW = 112 kg
    - "  + 14 d: all remaining pigs

- **Economic result per pig:**
  - Margin = Carcass (€/pig)
    - – Work (€/d) x fattening duration (d)
    - – Feed cost (€/pig)

- **Five contexts of feedstuff prices:**
  - 12 months from july to june
Variability of BW (CV, %) at the 1st departure

Plateau= 2.4 kg/d for gilts

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ADG

Barrows: max 2.4 kg/d
Barrows: max 2.7 kg/d
90% Ad lib
100% Ad lib

-10%
-5%
+5%
+10%
+15%
+20%
+25%
+30%
+35%

Level of AA:
Req. Population = +30% above M100

100% Ad lib
90% Ad lib
Ad lib before the plateau
+27 g/d before the plateau

Biphase
Multiphase – Ad lib

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Impact of the level of AA in the multiphase strategy and price of feedstuffs on the margin

The optimum level depends on the context

Δ margin, €/pig

90 95 100 105 110 115 120 125 130 135

M100 as the reference margin

-8 -6 -4 -2 0 2 4 6

2005/06
2006/07
2007/08
2008/09
2009/10

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Impact of the feeding strategy on the margin

Δ margin, €/pig (context 2007/08)

-8
-6
-4
-2
0
2
4
6
8
10
12
14

100% Ad lib
90% Ad lib
Ad lib before the plateau
+27 g/d before the plateau

Precision feeding approach = multiphase strategy adapted per pig

Barrows: max 2.4 kg/d
90% Ad lib
100% Ad lib

Biphase
Multiphase – Ad lib

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Impact of the feeding strategy on the N output

N output, g/pig

Context 2007/08 – 2009/10

- 100% Ad lib
- 90% Ad lib
- Ad lib before the plateau
- +27 g/d before the plateau

Precision feeding approach = a multiphase strategy adapted per each pig for a maximum ADG

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Conclusion

- The increase in AA supply is associated
  - with improved growth performance and economic return
  - with increased N output,
    except when a precision feeding approach is used

- The price of feed ingredients influences
  - the average amount of N output in a similar way for all feeding strategies
  - the optimum level of amino acids for economic return.
    This optimum should be evaluated monthly

- With a fixed multiphase strategy,
  - the lysine requirement of the population is 30% above the requirement of the average profile
    This conclusion will depend on the heterogeneity of the population considered

- The variability of final BW is
  - deteriorated when a poor multiphase strategy is used
  - improved when a rationing plan is used, not designed as a proportion of ad lib intake
    This conclusion should be evaluated when feed competition occurs in group-housed pigs