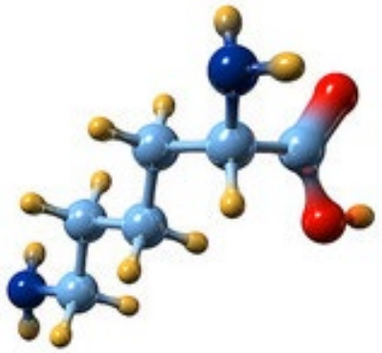
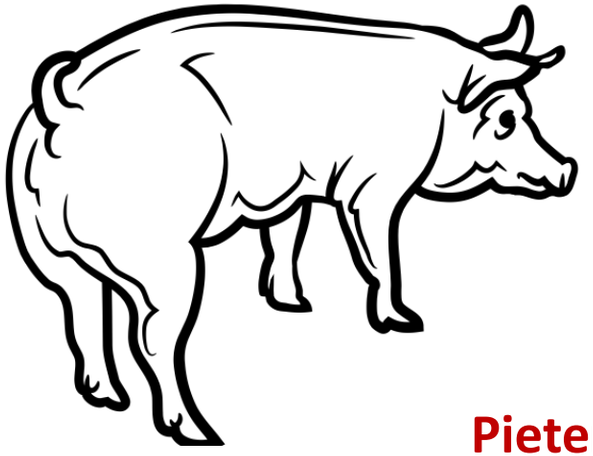
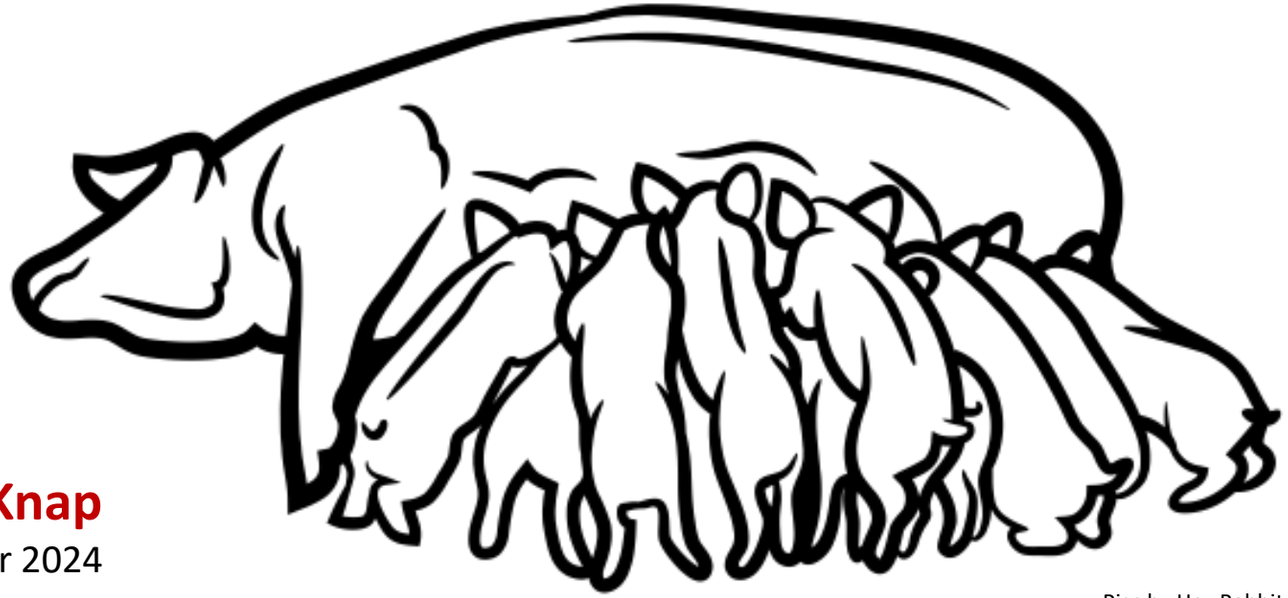


Genetic trends in lysine requirements

of growing-finishing pigs and reproductive sows,

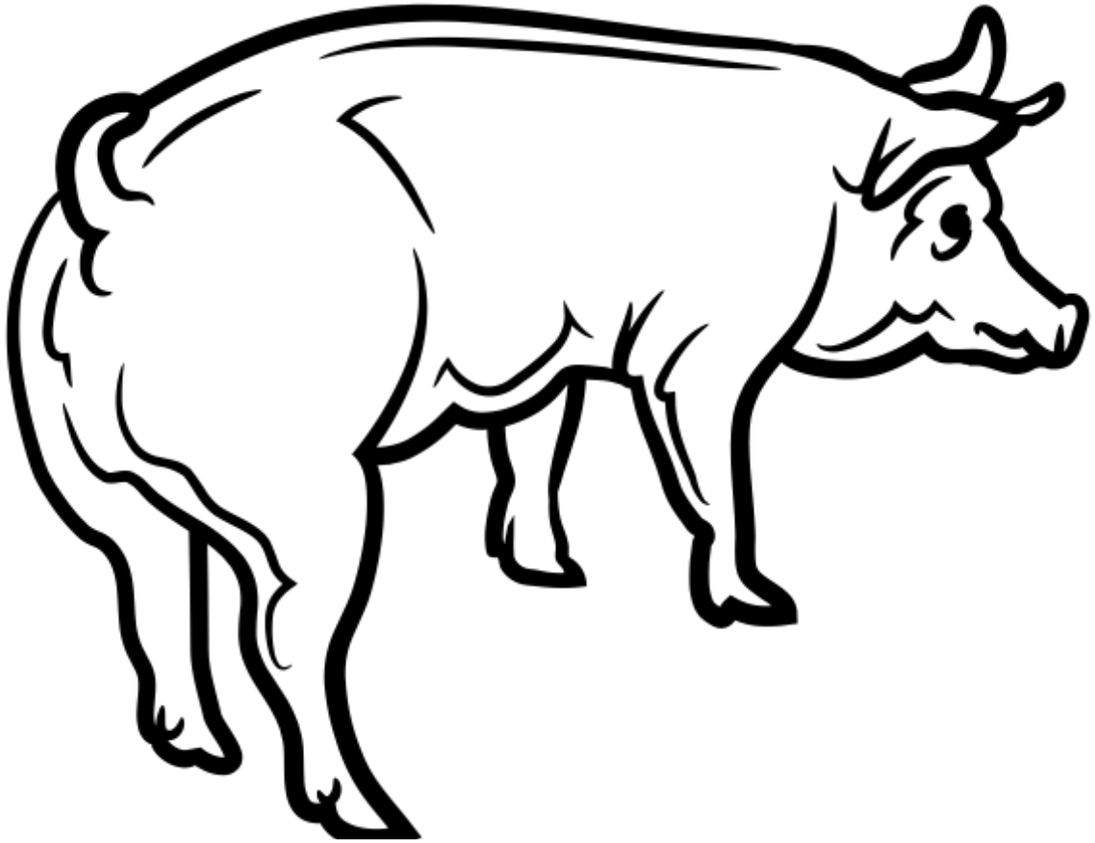
due to genetic trends in production traits





Pieter Knap

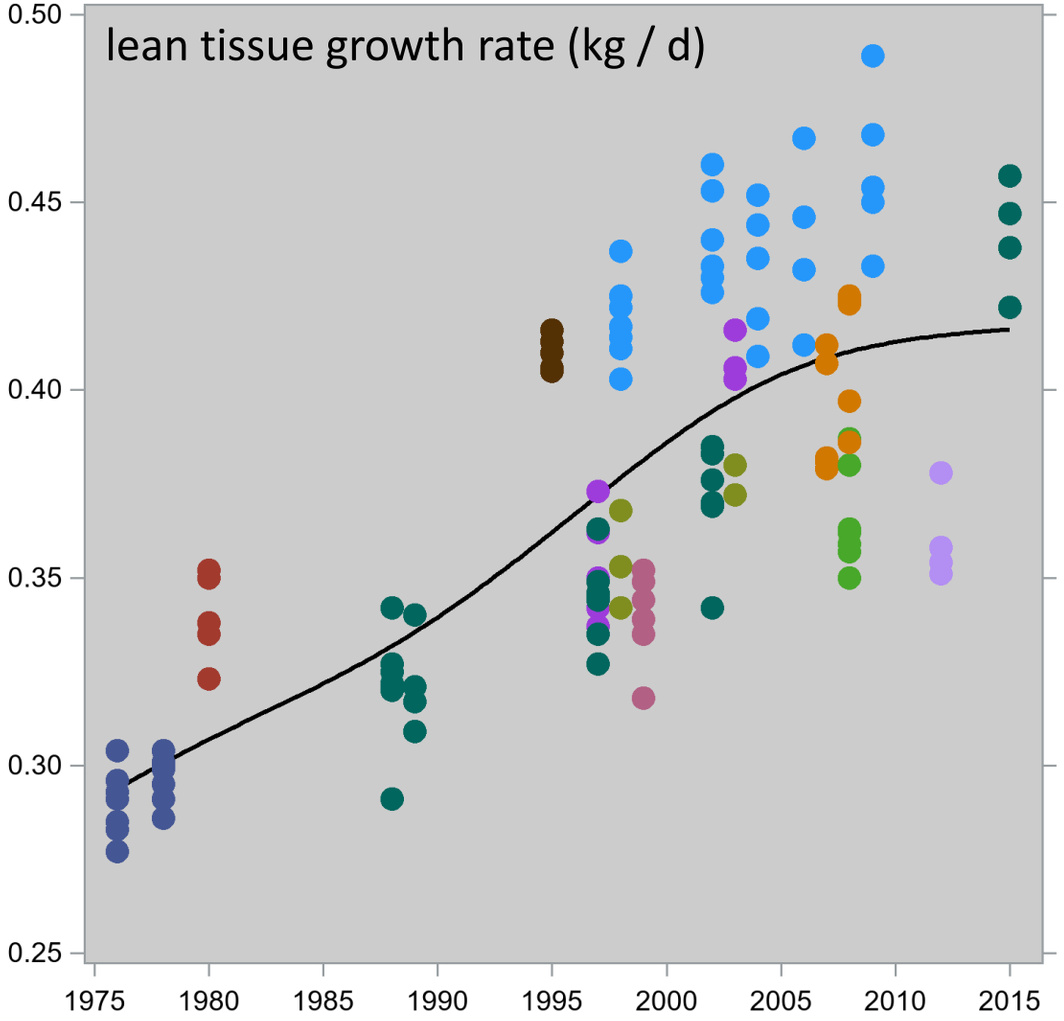
September 2024



Phenotypic trend:
lean tissue growth rate

- carcass growth rate
- carcass lean content
  - backfat depth
  - loin muscle depth

From 23 European & American CPE trials



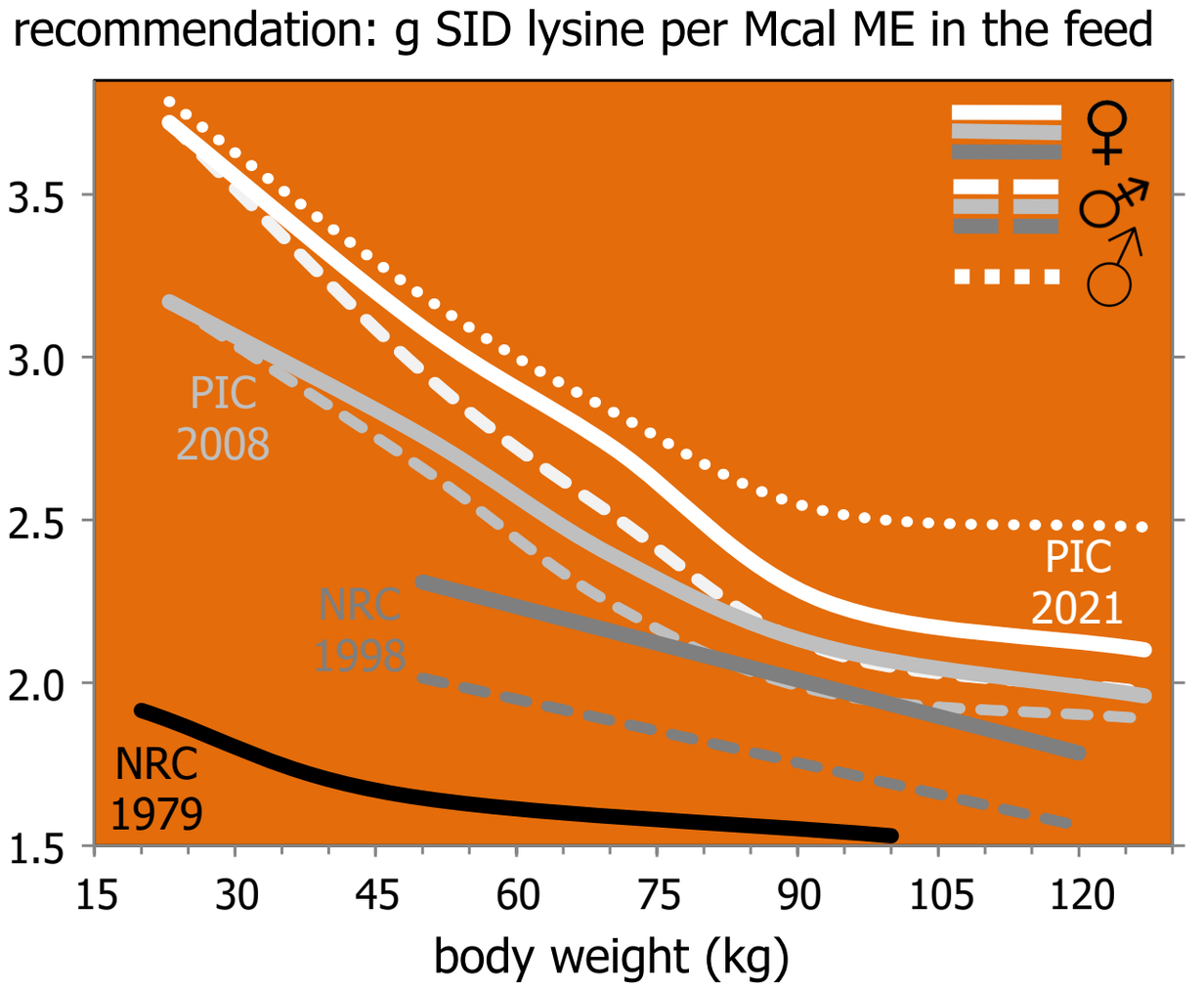
Phenotypic trend:
lean tissue growth rate

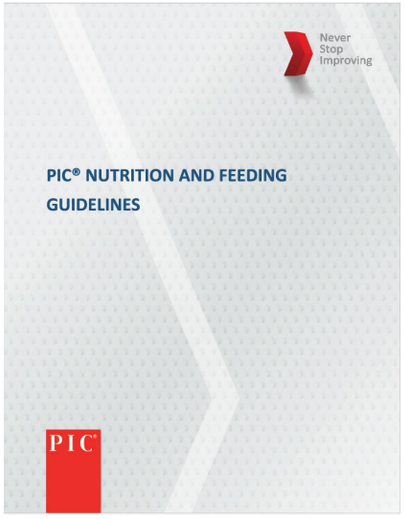
- carcass growth rate
- carcass lean content
  - backfat depth
  - loin muscle depth

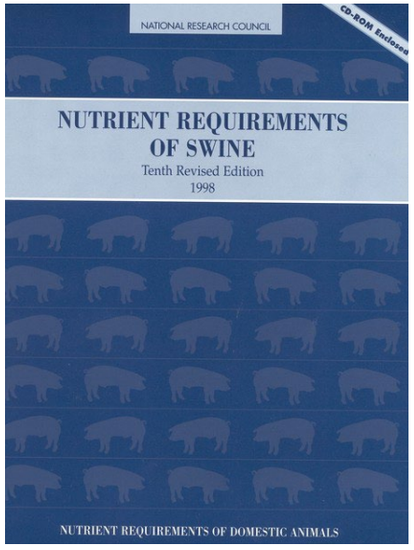
From 23 European & American CPE trials

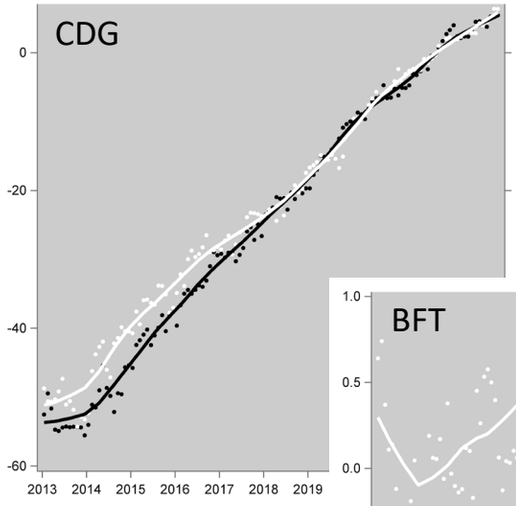
Must lead to a trend in nutrition:
more protein **deposition** → more protein **consumption**

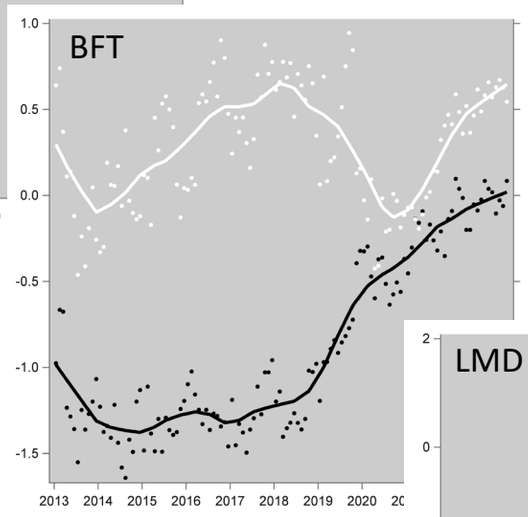
Quantify !

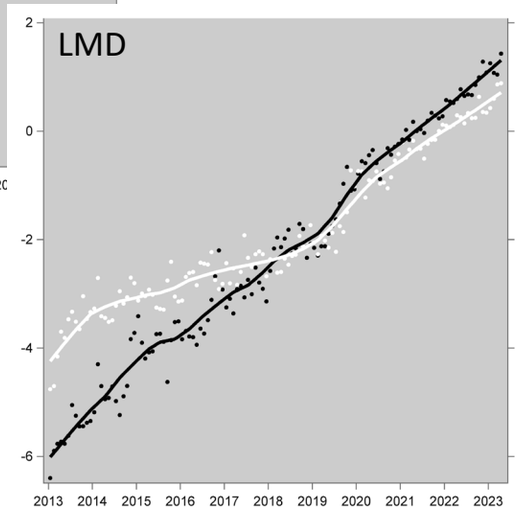






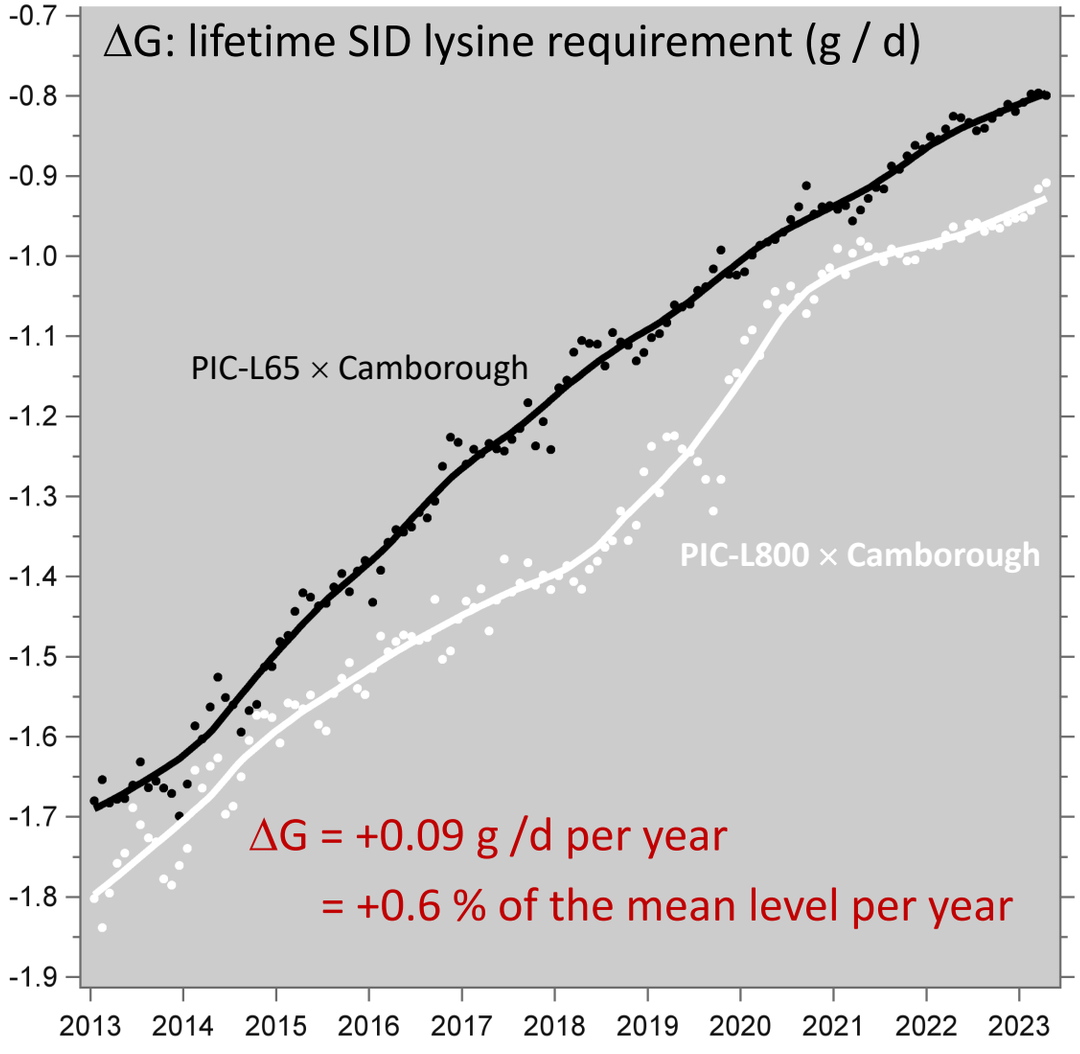


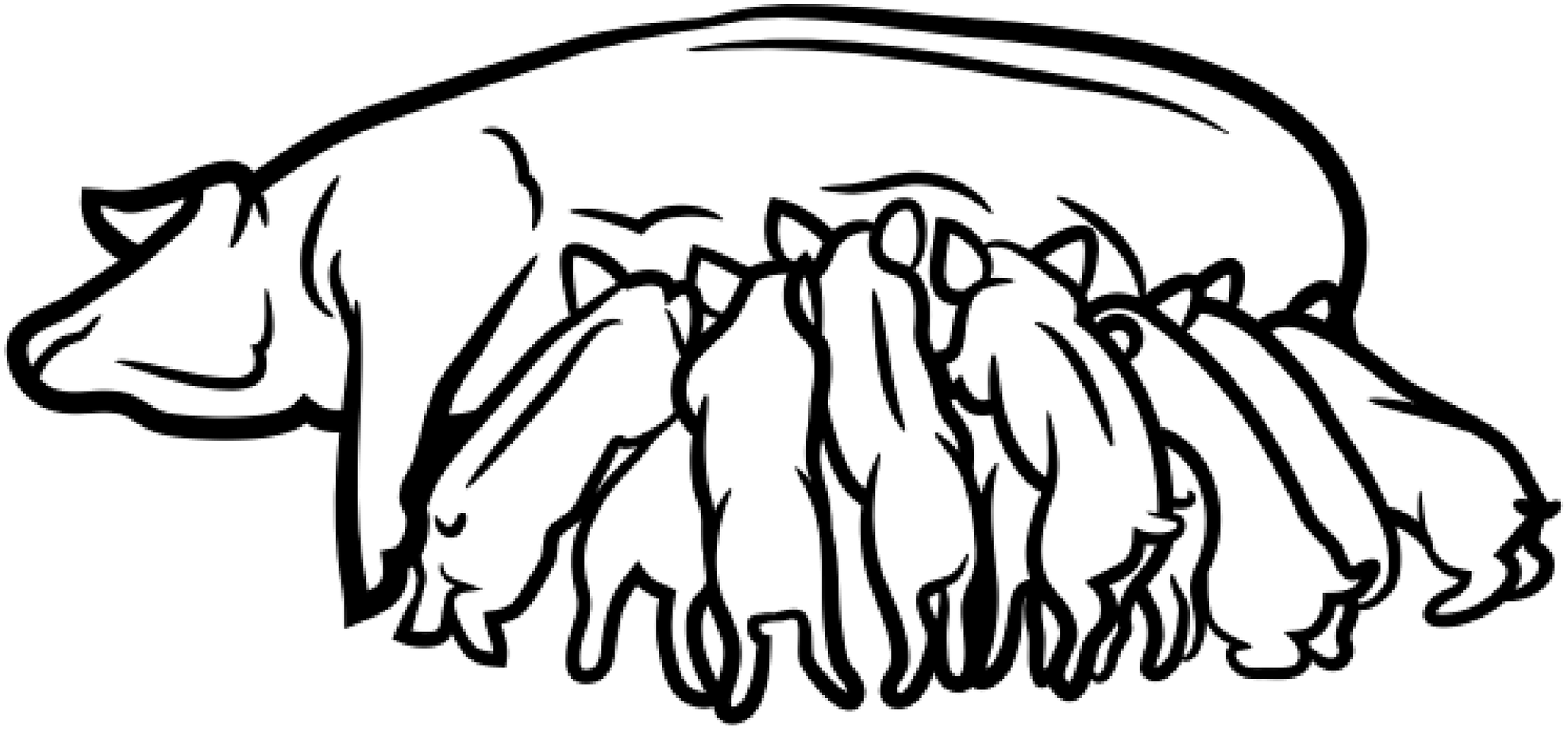




ΔG:

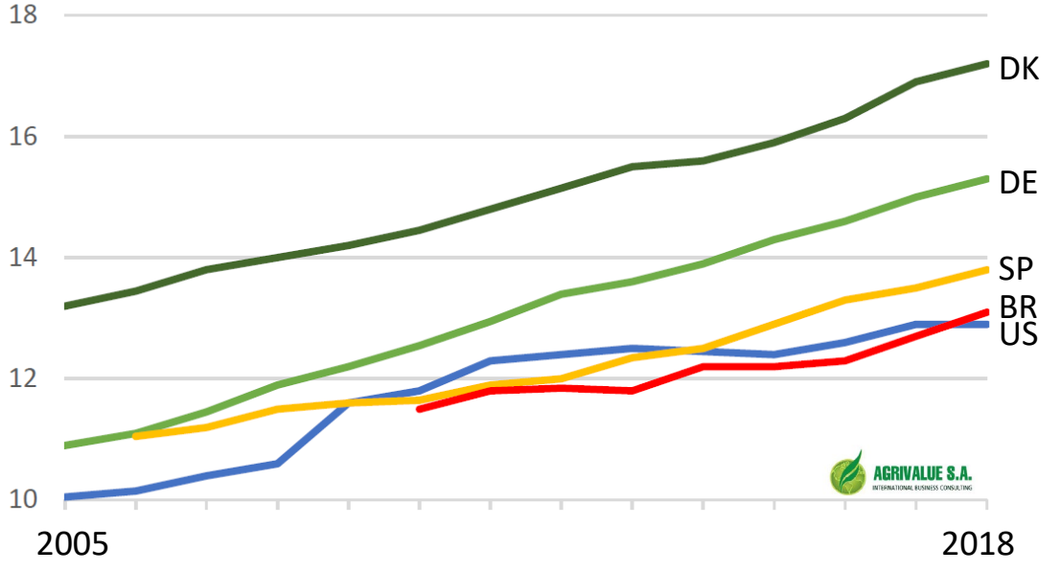
- carcass daily gain
- backfat depth
- loin muscle depth



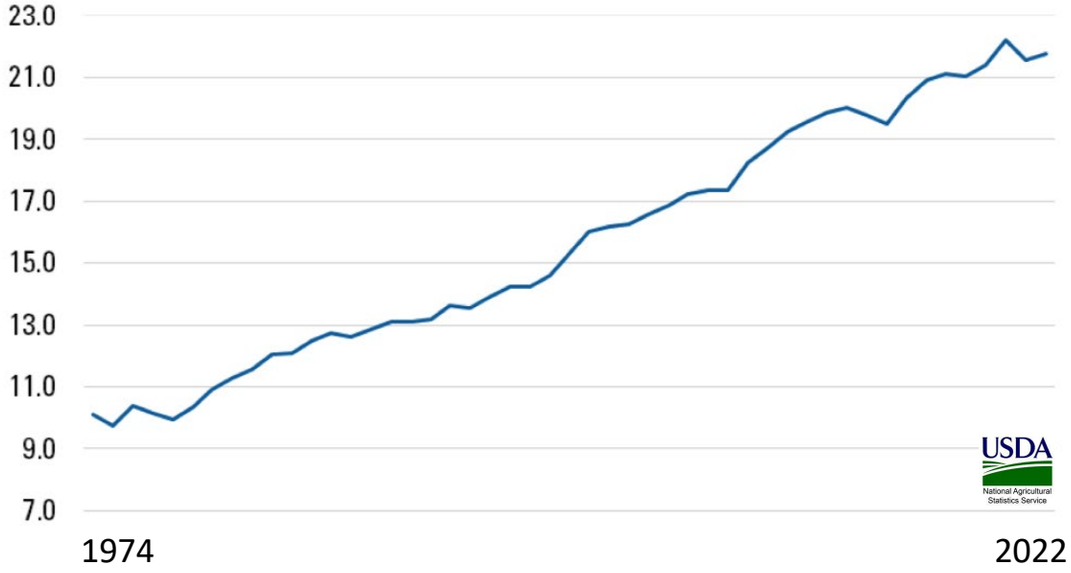


PIC®

piglets born alive per litter

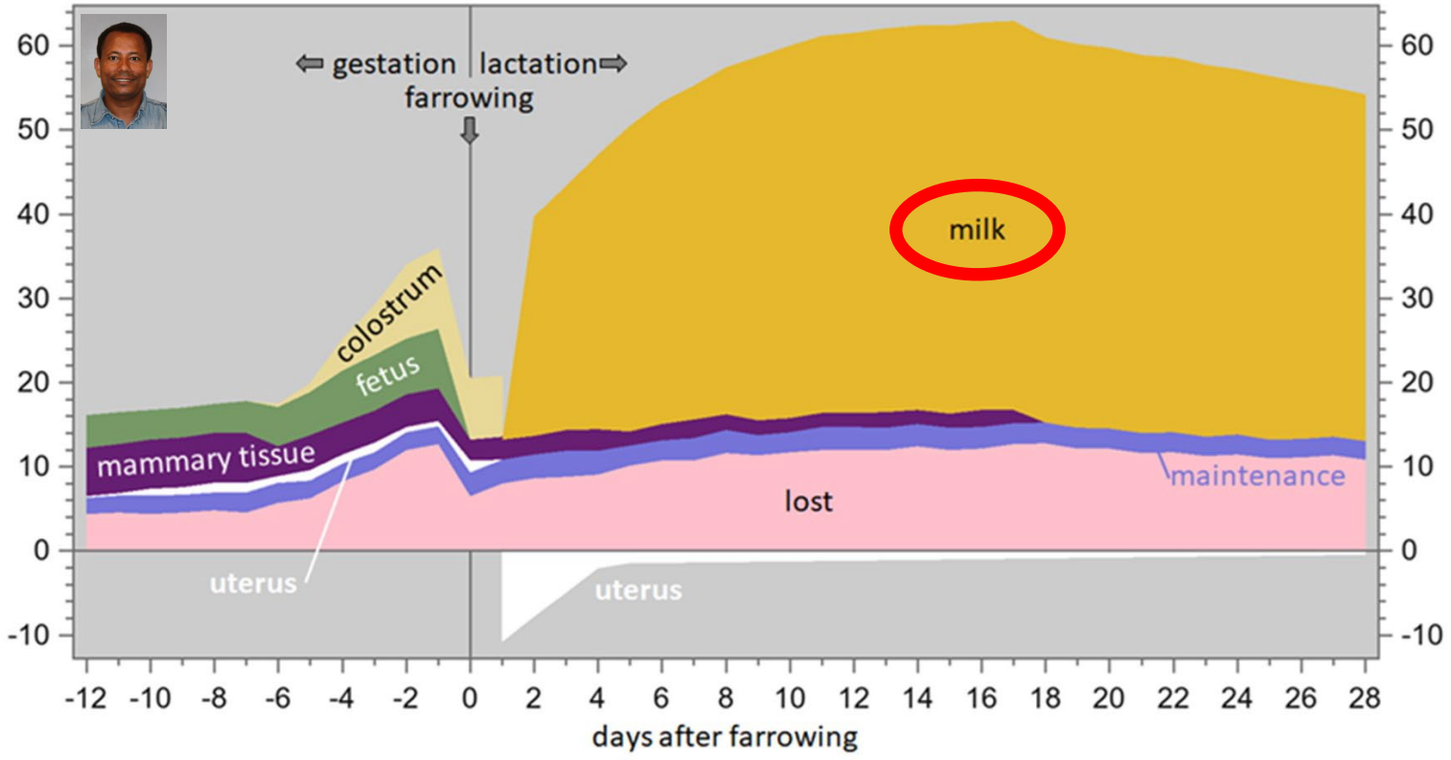


piglets weaned per sow per year: USA



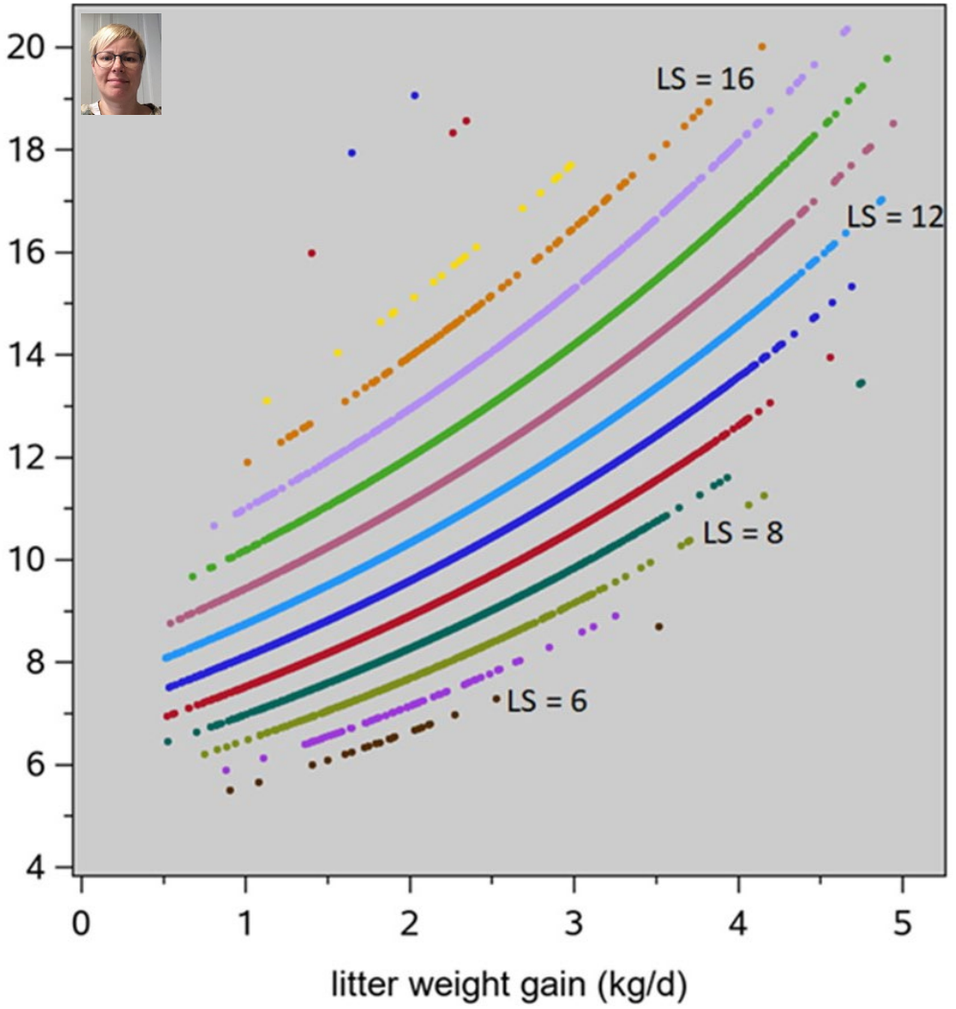
PIC®

partitioning of SID lysine (g / d)

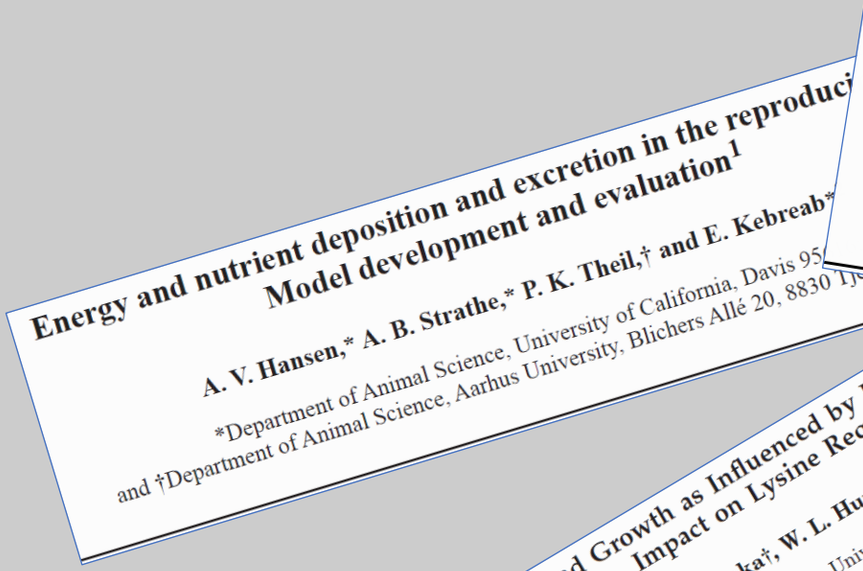


Modified from Figure 2b of Feyera & Theil (2017)

total milk protein production (kg / lactation)



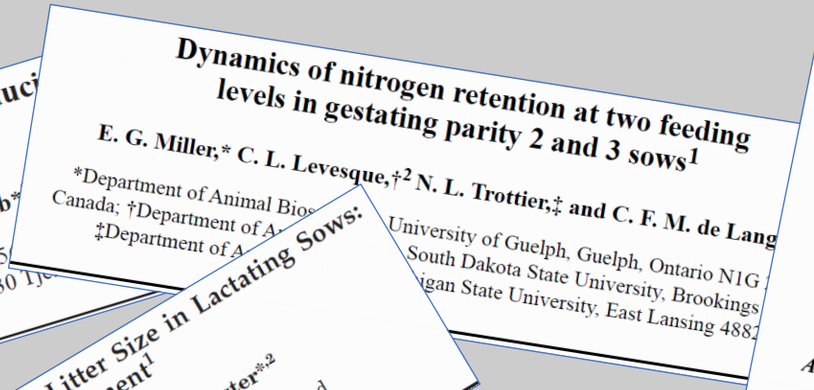
Based on prediction equations of Hansen et al. (2012)



Energy and nutrient deposition and excretion in the reproduci
Model development and evaluation[1]

A. V. Hansen,* A. B. Strathe,* P. K. Theil,† and E. Kebreab*

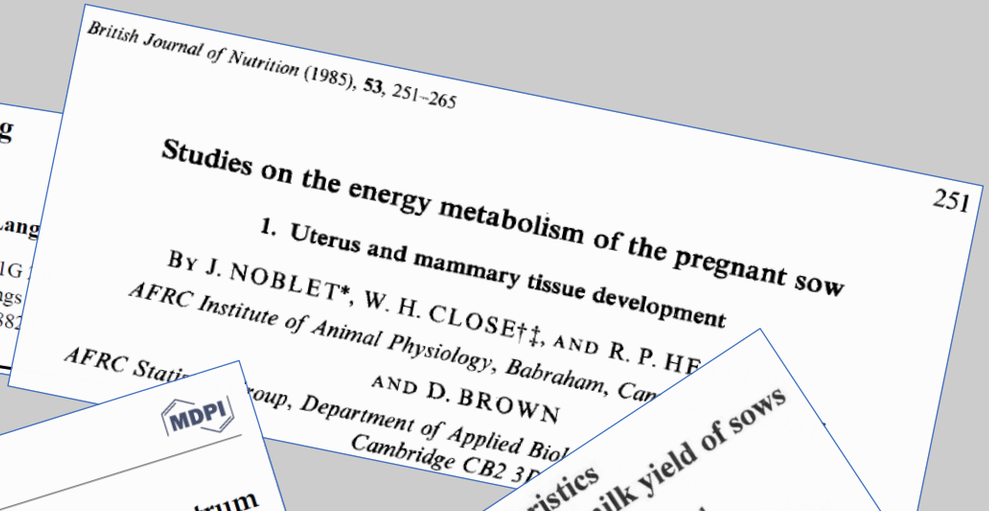
*Department of Animal Science, University of California, Davis 95
and †Department of Animal Science, Aarhus University, Blichers Allé 20, 8830 Tj



Dynamics of nitrogen retention at two feeding
levels in gestating parity 2 and 3 sows[1]

E. G. Miller,* C. L. Levesque,†[2] N. L. Trottier,‡ and C. F. M. de Lang

*Department of Animal Bios
Canada; †Department of A
‡Department of A
University of Guelph, Guelph, Ontario N1G
South Dakota State University, Brookings
igan State University, East Lansing 488



British Journal of Nutrition (1985), 53, 251–265

251

Studies on the energy metabolism of the pregnant sow

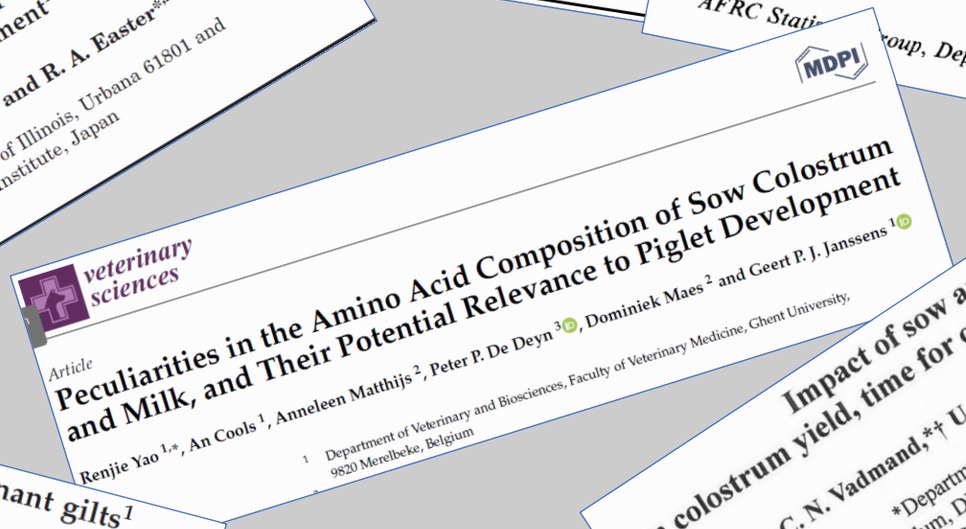
1. Uterus and mammary tissue development

BY J. NOBLET*, W. H. CLOSE†‡, AND R. P. HE
AFRC Institute of Animal Physiology, Babraham, Ca
AND D. BROWN
AFRC Stati
roup, Department of Applied Biol
Cambridge CB2 3

Mammary Gland Growth as Influenced by Litter Size in Lactating Sows:
Impact on Lysine Requirement[1]

S. W. Kim*, I. Osaka†, W. L. Hurley*, and R. A. Easter*[,2]

*Department of Animal Sciences, University of Illinois, Urbana 61801 and
†Hokkaido Animal Science Institute, Japan



MDPI

veterinary sciences

Article

Peculiarities in the Amino Acid Composition of Sow Colostrum
and Milk, and Their Potential Relevance to Piglet Development

Renjie Yao [1,*], An Cools [1], Anneleen Matthijs [2], Peter P. De Deyn [3], Dominiek Maes [2] and Geert P. J. Janssens [1]

1 Department of Veterinary and Biosciences, Faculty of Veterinary Medicine, Ghent University,
9820 Merelbeke, Belgium

Characterization of mammary gland development in pregnant gilts[1]

F. Ji,* W. L. Hurley,‡ and S. W. Kim*†[2]

*Department of Animal and Food Sciences and †Institute for Pig Research and Education, Texas Tech
University, Lubbock, TX 79409; and ‡Department of Animal Sciences, University of Illinois, Urbana 61801

Impact of sow and litter characteristics
on colostrum yield, time for onset of lactation, and milk yield of sows

C. N. Vadmand,*† U. Krogh,* C. F. Hansen,† and P. K. Theil*[1]

*Department of Animal Science, Aarhus University,
Research Center Foulum, DK-8830 Tjele, Danmark; †Department of Large Animal Science,
Faculty of Health and Medical Science, University of Copenhagen, DK-1870 Frederiksberg C, Denmark

PIC®

$$\text{lysreq}_{\text{fetus}} = (0.060737 + 0.00012754 \times \text{BW}) \times \text{TNB} \times \text{PBWT} \times e^{-0.0011 \times \text{TNB}} \quad (25)$$

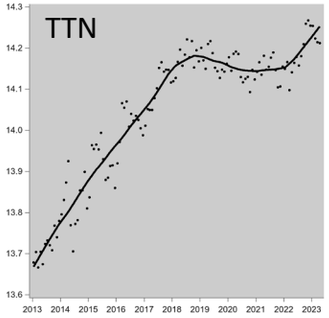
$$\text{lysreq}_{\text{placenta}} = (1.40627 + 0.002953 \times \text{BW}) \times (0.0001235 \times \text{P}_{\text{fetus,116}} - 0.0176) = \\ = 0.2871 \times \text{lysreq}_{\text{fetus}} - 0.0352 \quad (26)$$

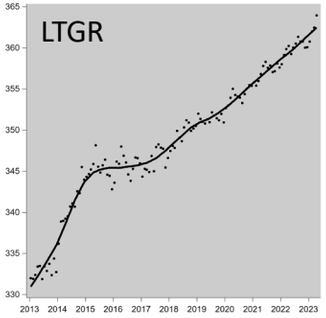
$$\text{lysreq}_{\text{uterus}} = 0.243988 + 0.00051235 \times \text{BW} \quad (27)$$

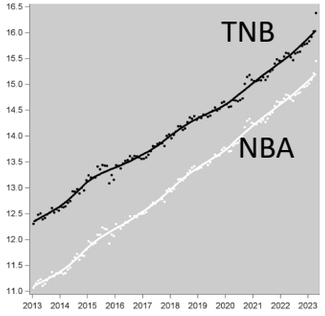
$$\text{lysreq}_{\text{udder,gestation}} = (0.0490929 + 0.00010309 \times \text{BW}) \times \text{TTN} \quad (28)$$

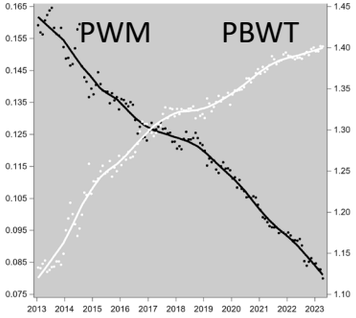
$$\text{lysreq}_{\text{colostrum}}\ (\text{g/d}) = 2.712 + 0.4931 \times \text{NBA} \times \text{PBWT} \quad (33)$$

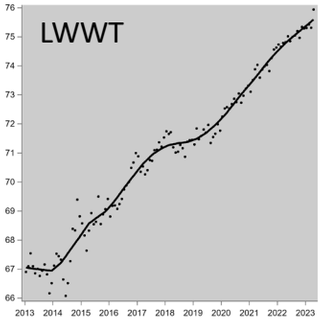
$$\text{lysreq}_{\text{milk}}\ (\text{g/d}) = 10.4 + 1.85 \times \text{LSL} + (0.9124 \times \text{LSL} - 1.316) \times \text{LWG} \quad (34)$$



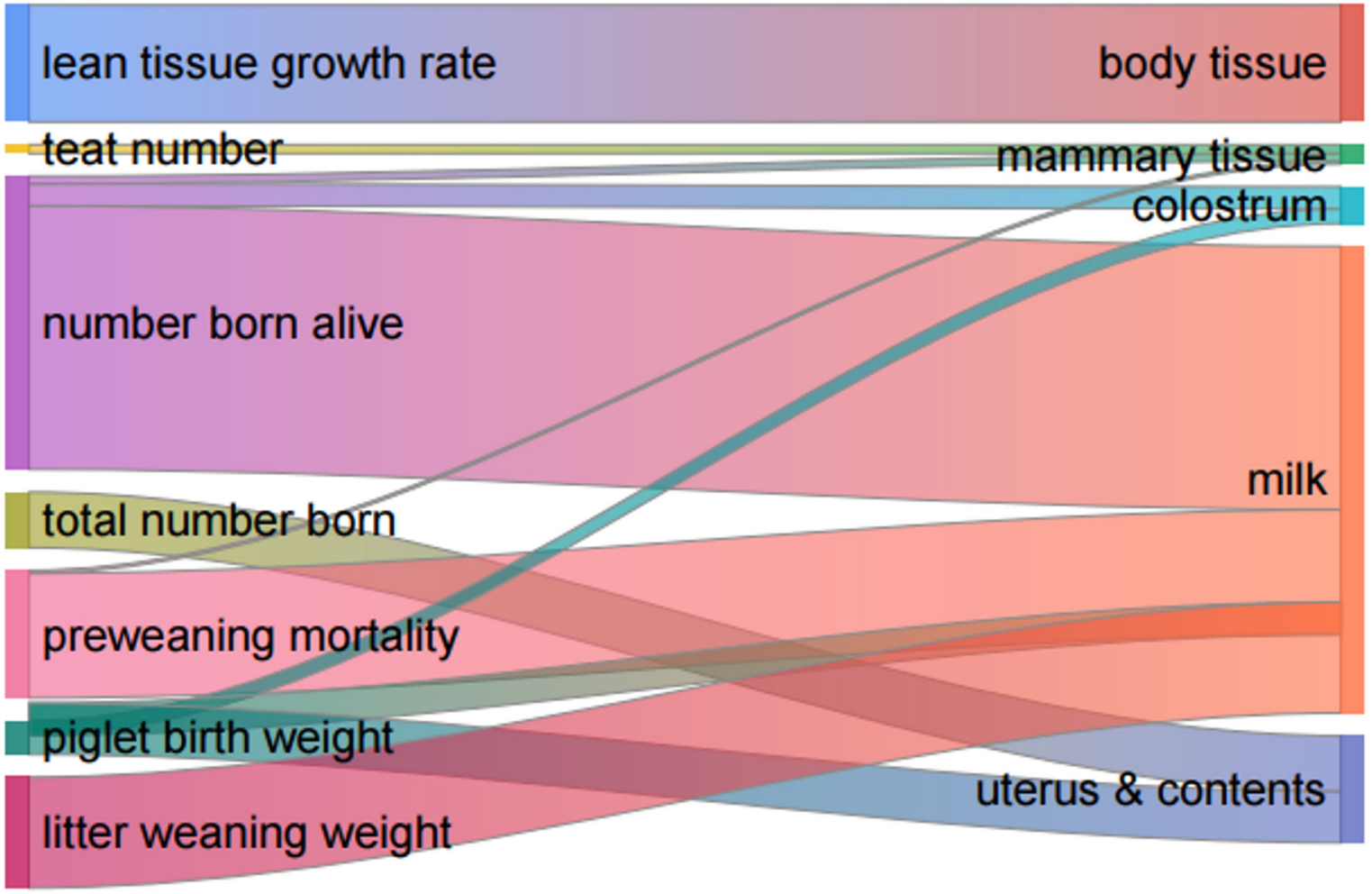








a change in ... → a change in protein deposition in ...

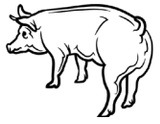


Genetic trends of lysine requirement (g / d)

- gestational processes: deposition of protein in tissue
  - body (7 + 116 days)
  - mammary glands (116 + 7 days)
  - uterus & fetus & placenta (116 days)
  - +0.10 g /d per year
  - = +1 % of the mean level per year

- lactational processes: synthesis of protein in
  - colostrum (7 days)
  - milk (21 days)
  - +0.37 g / d per year
  - = +2 % of the mean level per year

  - +0.09 g /d per year
  - = +0.6 % of the mean level per year



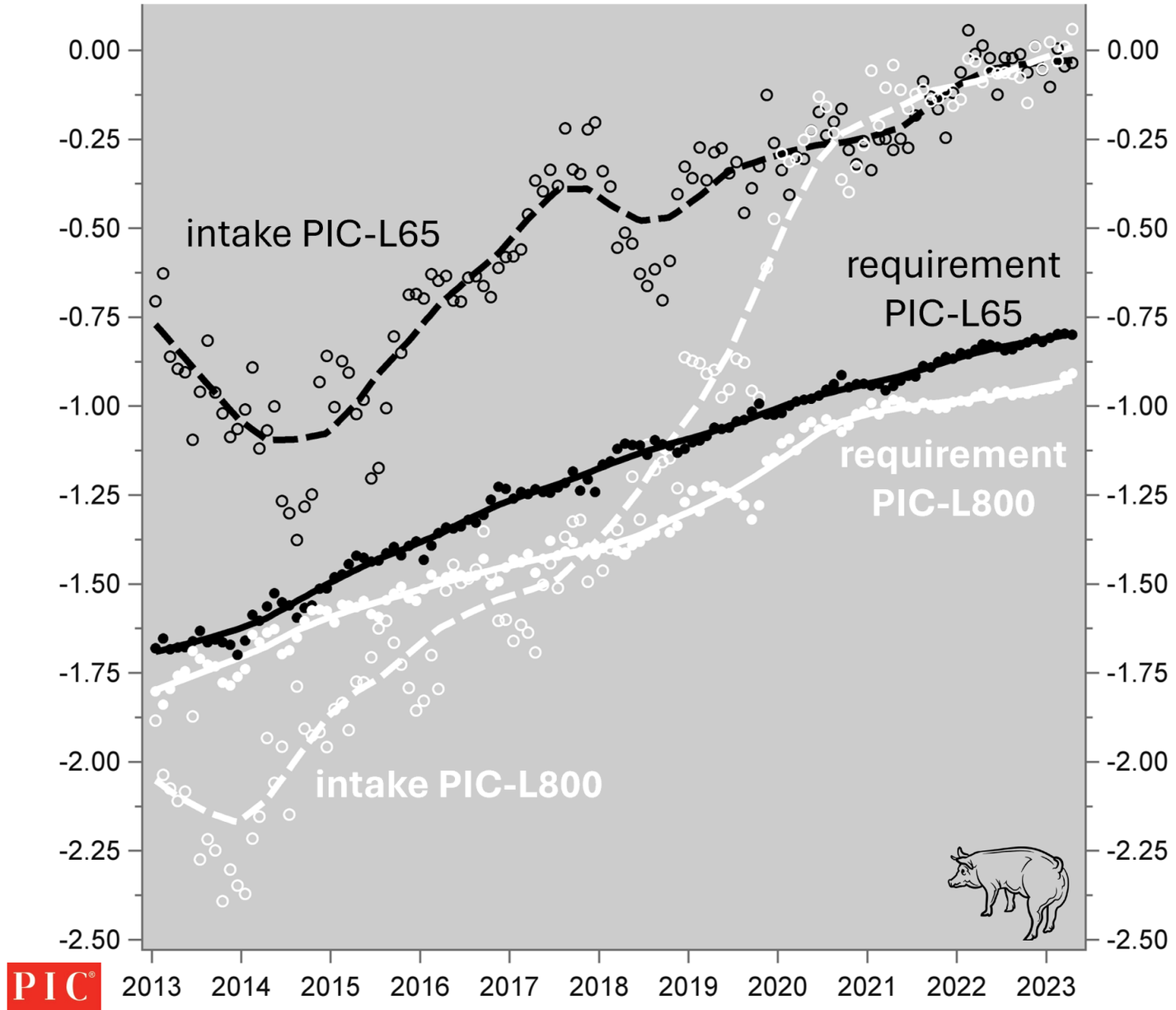
PIC®

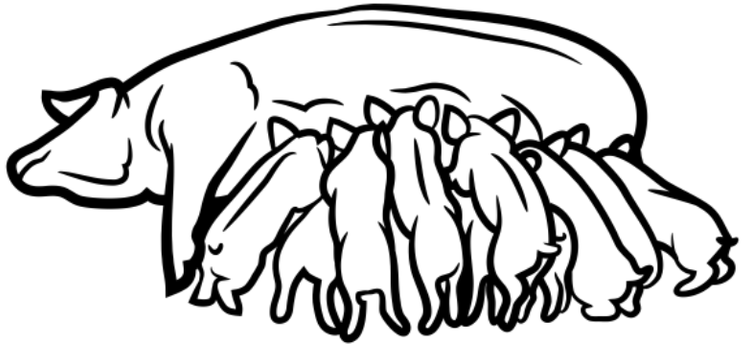
Must lead to a trend in nutrition:

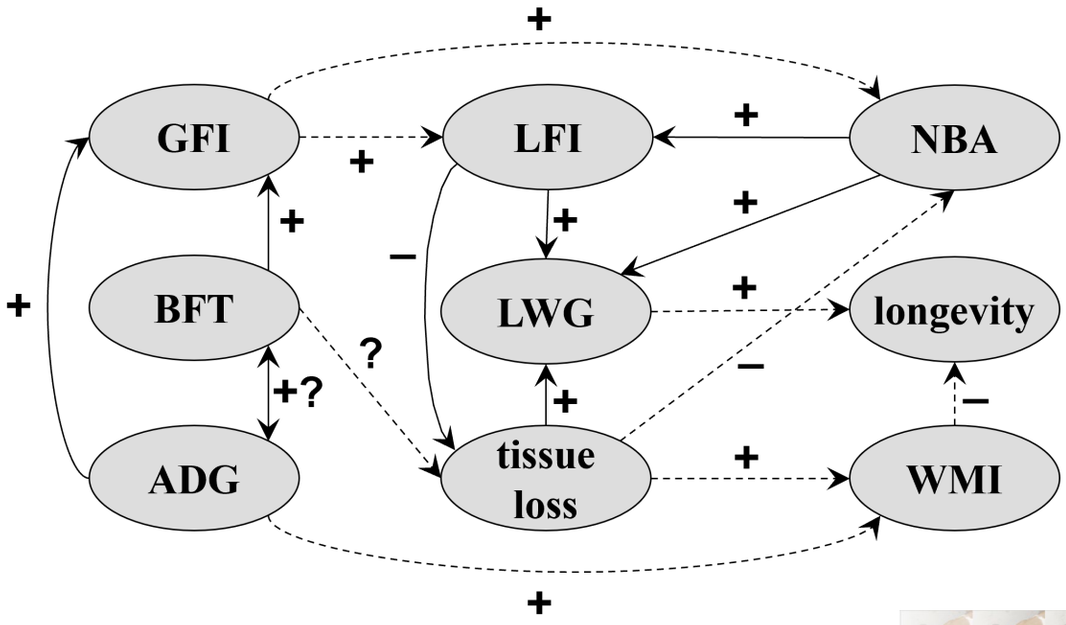
- more protein **deposition** → more protein **consumption**
  - more protein consumption → more protein % in the feed
    - more protein % in the feed → higher feed price ☹
      → more nitrogen excretion ☹
  - more protein consumption → higher feed consumption
    - higher feed consumption → ΔG in feed intake

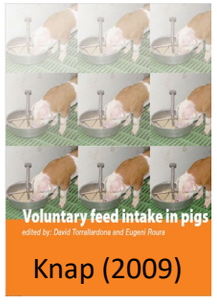
PIC®

lifetime SID lysine intake & requirement (g/d)

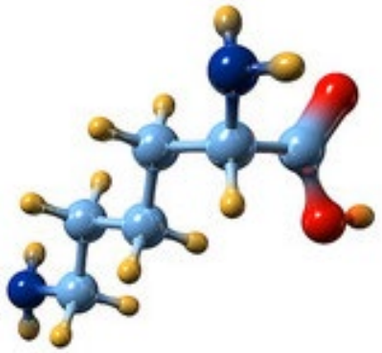








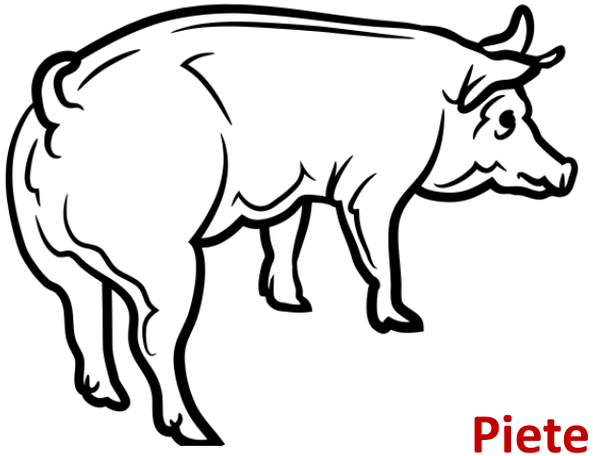
Knap (2009)

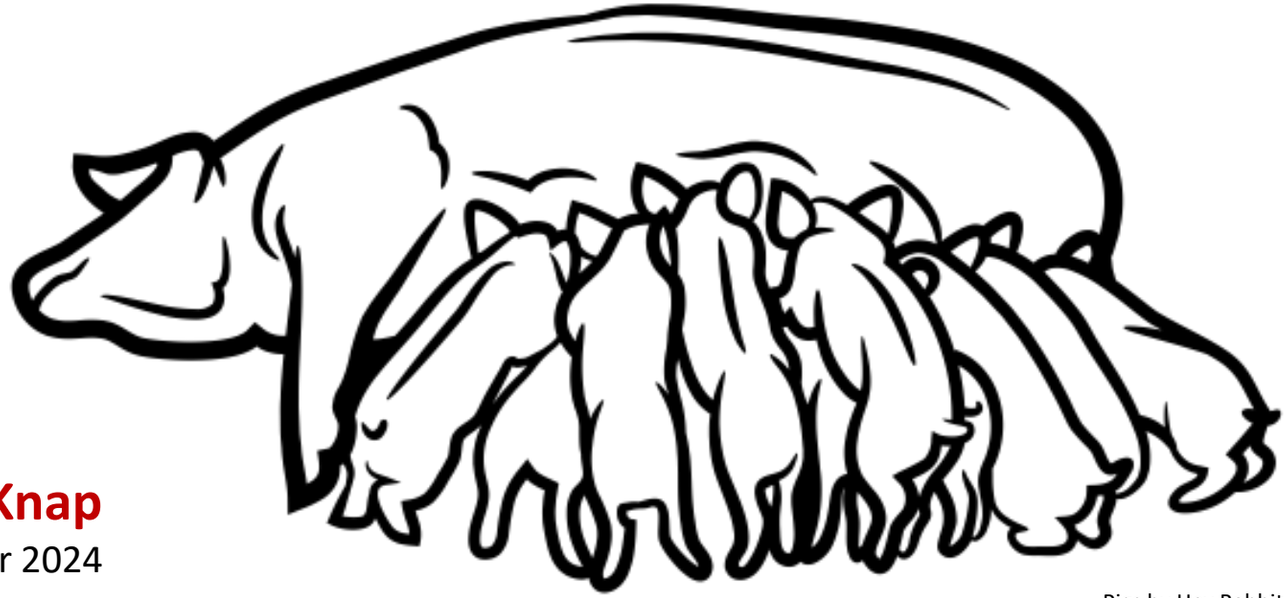


Genetic trends in lysine requirements

of growing-finishing pigs and reproductive sows,

due to genetic trends in production traits





Pieter Knap

September 2024