

Effect of chicory root and age on the gastrointestinal ecosystem and accumulation of skatole and androstenone in back-fat of male and female pigs

***Bent Borg Jensen
Animal Science, Aarhus University, Denmark***





Background

Chicory root

Background:

The European Commission and representatives of pig producers, pork industry and animal welfare organizations have joined a voluntary declaration of ceasing surgical castration by pigs by January 2018.

The present presentation is part of a bigger Danish research project:

“Production of organic male pigs without castration (No-cast)”

 Organic RDD



Androstenone and **skatole** is the main components of boar taint

Boar-taint is an off-flavour and off-odour released upon heating of meat from sexually mature male pigs.

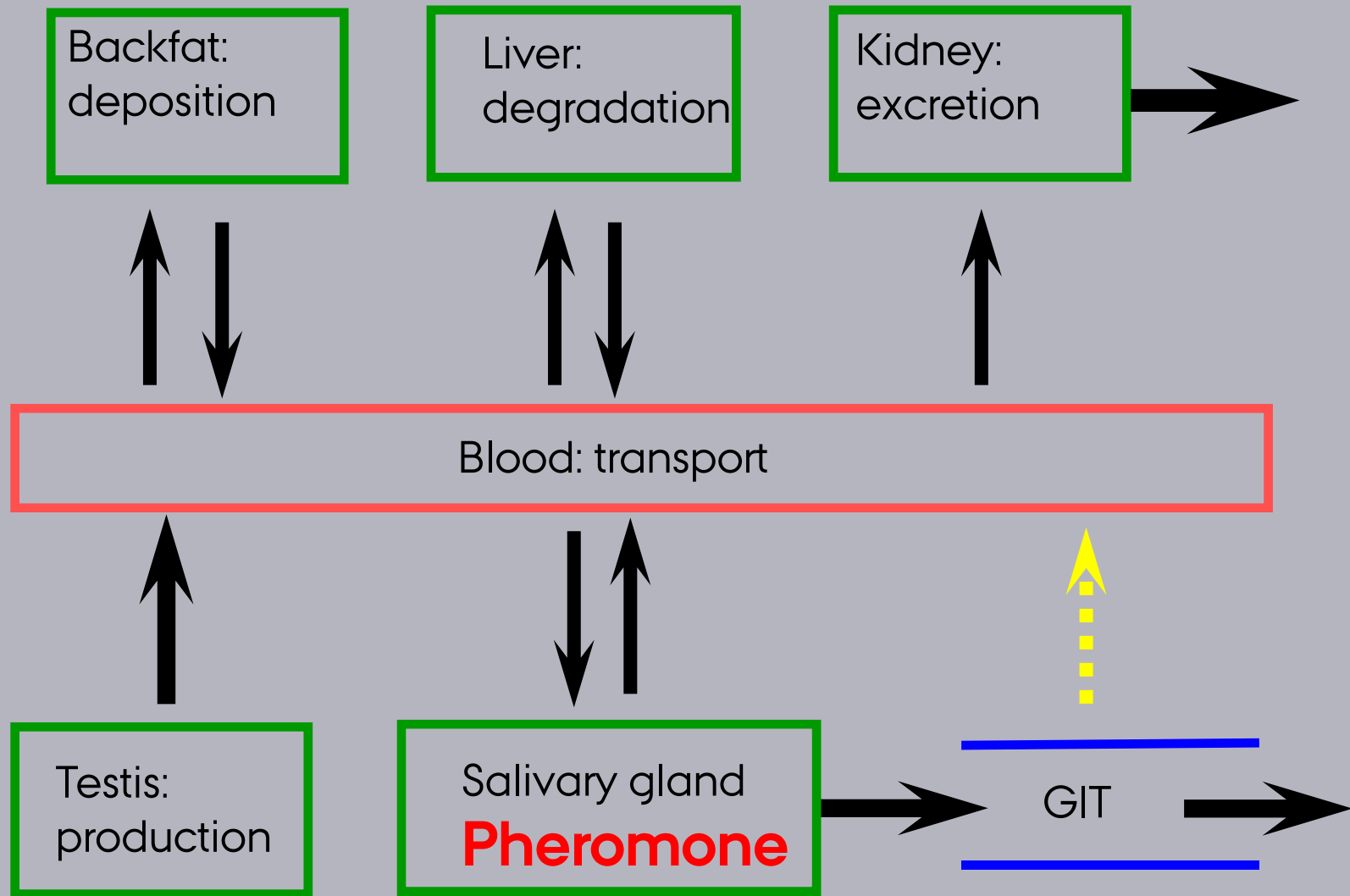


Androstenone:

A male pheromone produced in the Leydig cells of the testis.

Urine-like odour (**not** all people sensitive, female more than males)

Production, transport, degradation and excretion of androstenone



Skatole

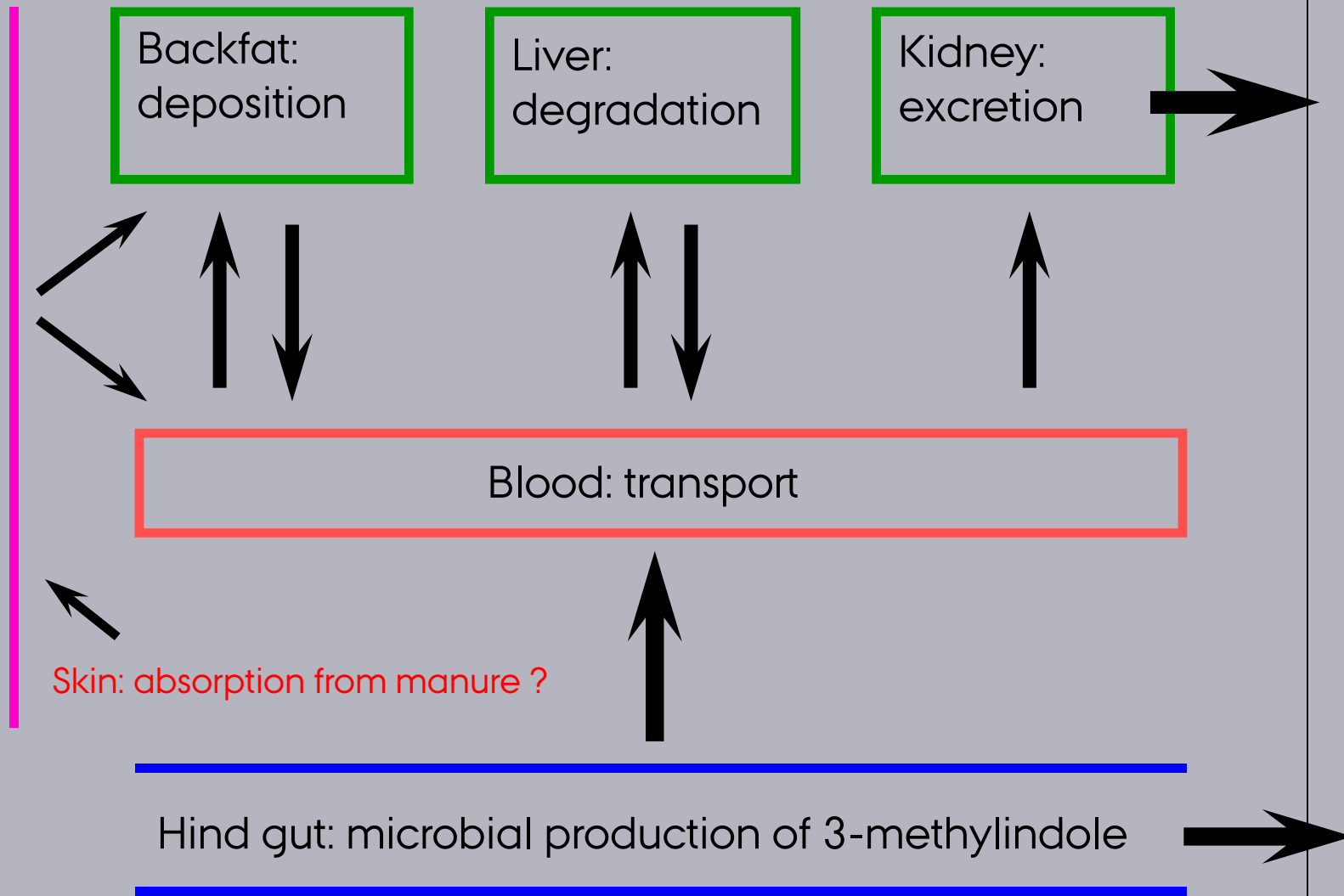
Skatole is produced in the large intestine of pigs by bacterial degradation of the amino acid tryptophane

Fecal-like odour (all people sensitive)

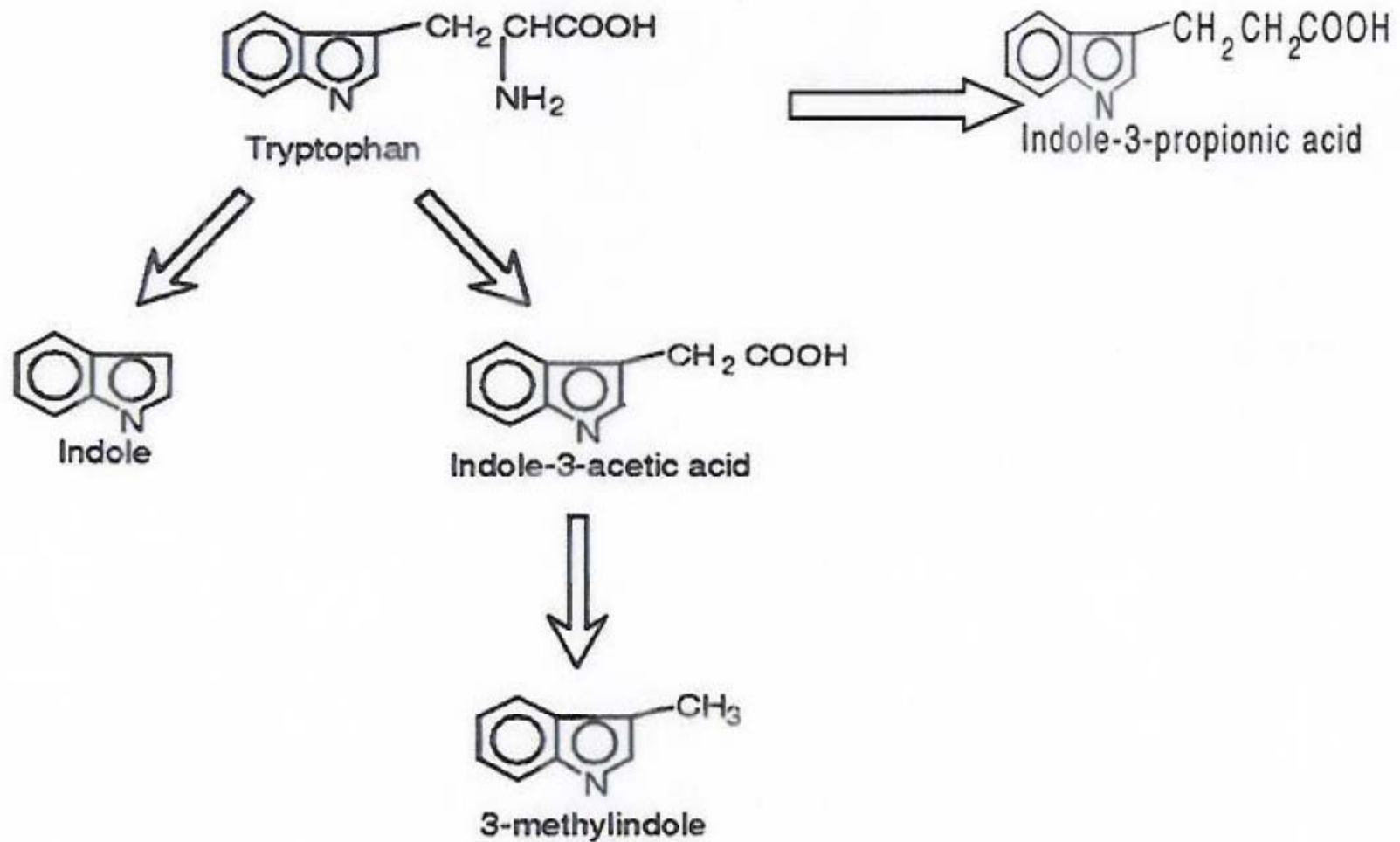
No difference in the production between male or female pigs

However the hepatic degradation is insufficient in some male pigs resulting in accumulating levels in the adipose tissue

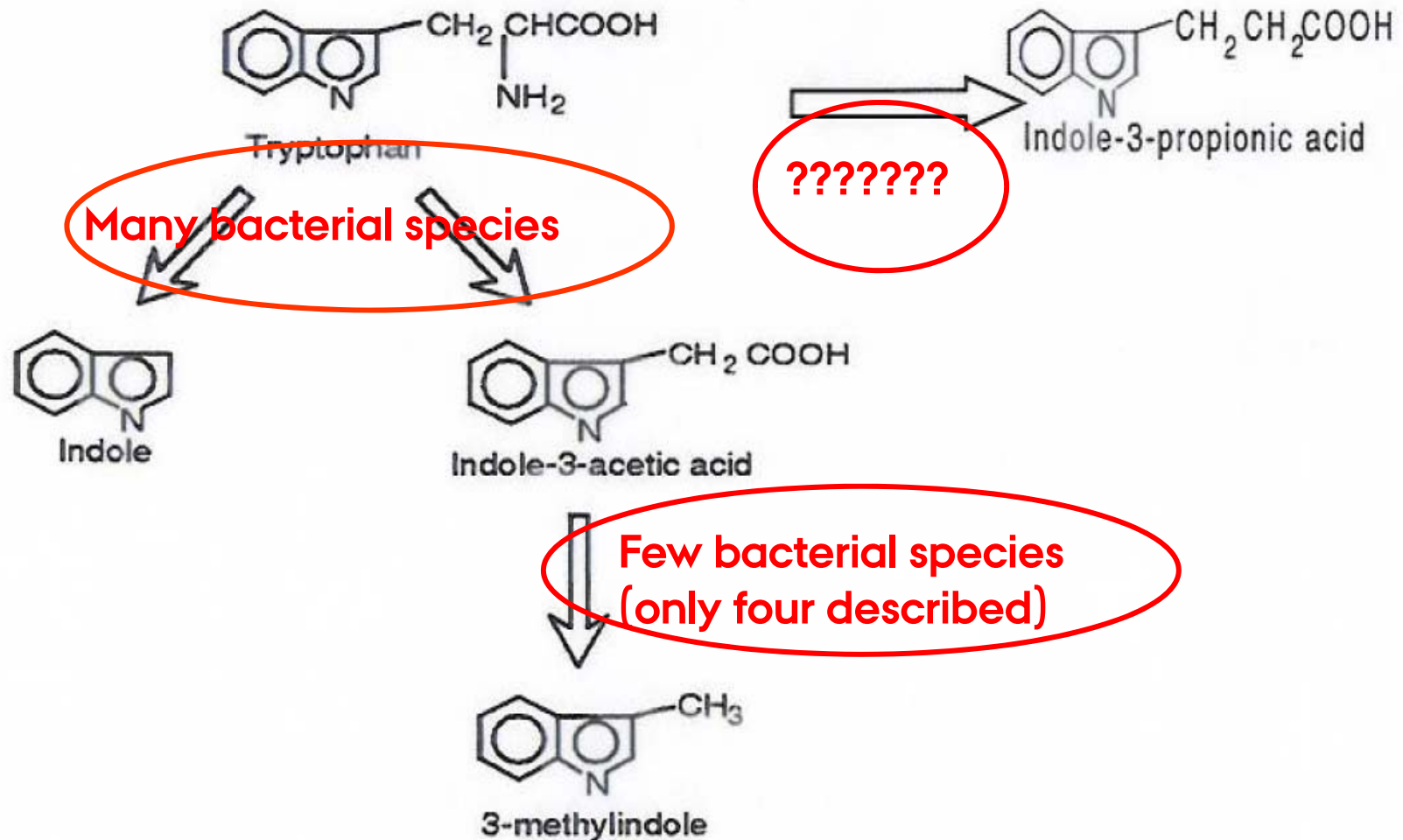
Production, transport, degradation and excretion of skatole



Microbial metabolism of tryptophan



Microbial metabolism of tryptophan



Aim:

*To investigate if chicory root, **age** and **sex** affect the
gastrointestinal ecosystem
and the accumulation of skatole and androstenone in
back-fat*

A photograph of a large field of chicory plants in September. The plants are lush green and densely packed. In the background, there is a line of trees and a small house with a gabled roof. The sky is bright and clear.

Material and methods

Field with chicory roots in September

Experimental design

- › Two-factorial experiment (n=72, 36 males and 36 females, 12 weeks at the start of the experiment)
- › Pigs slaughtered at three times (after 5, 9 and 12 weeks on the experimental diets)



Nudelworm

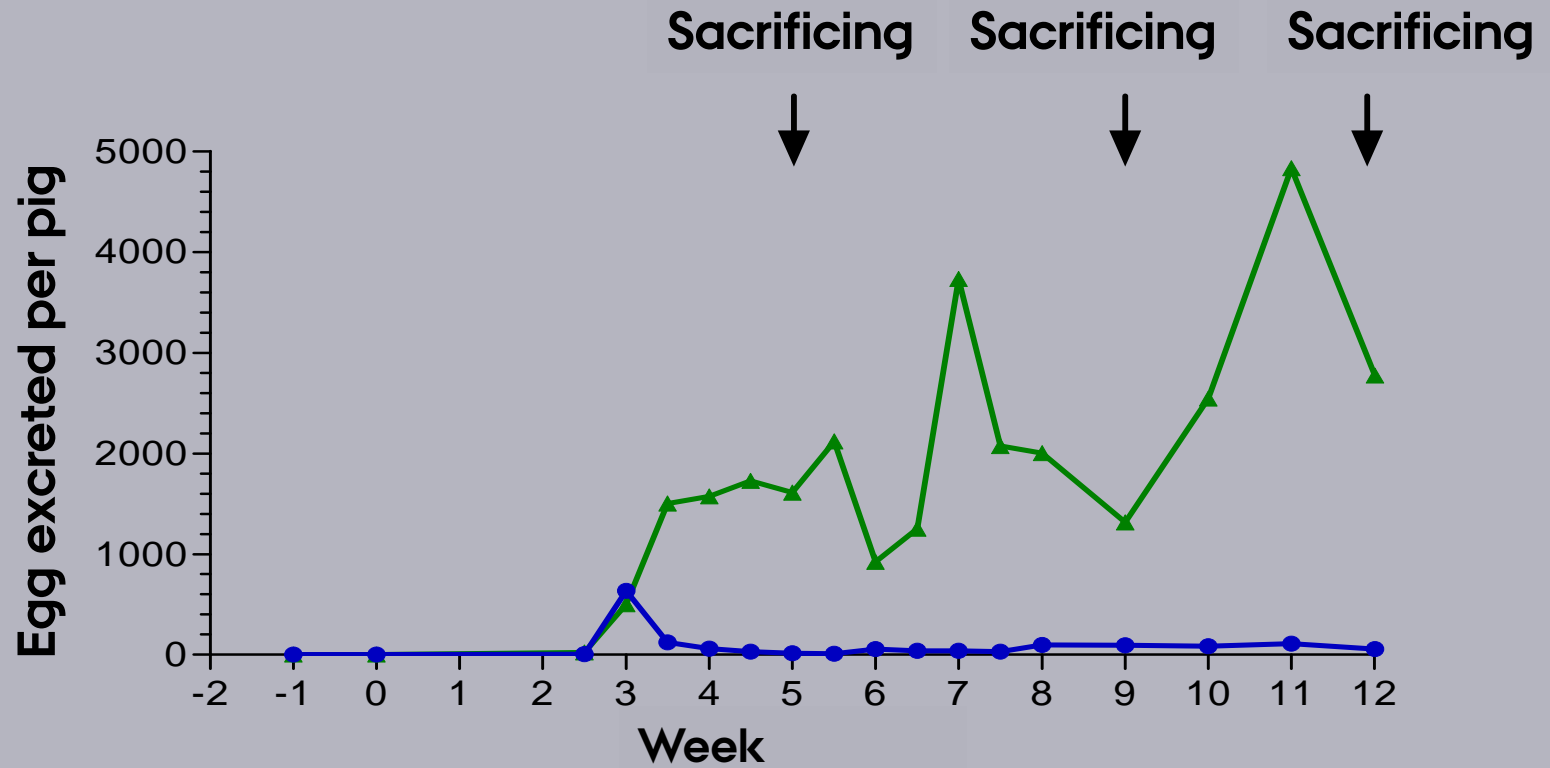
	- Chicory root	+ Chicory root (25%)
- worm	Control (n=3x6)	Chickory (n=3x6)
+ worm	Worm (n=3x6)	Chickory + worm (n=3x6)

Experimental diets:

Standard Danish pig diet based on wheat/barley as carbohydrate source and soy bean as protein source

	Control	Chicory
Wheat	55.9%	28.8%
Barley	20.0%	20.0%
Chicory root(a)	25.0%	0.0%
Soy bean	12.0%	9.9%

a): containing 65.2% fructan on a dry matter basis



Paracites in the feed

Chicory in the feed

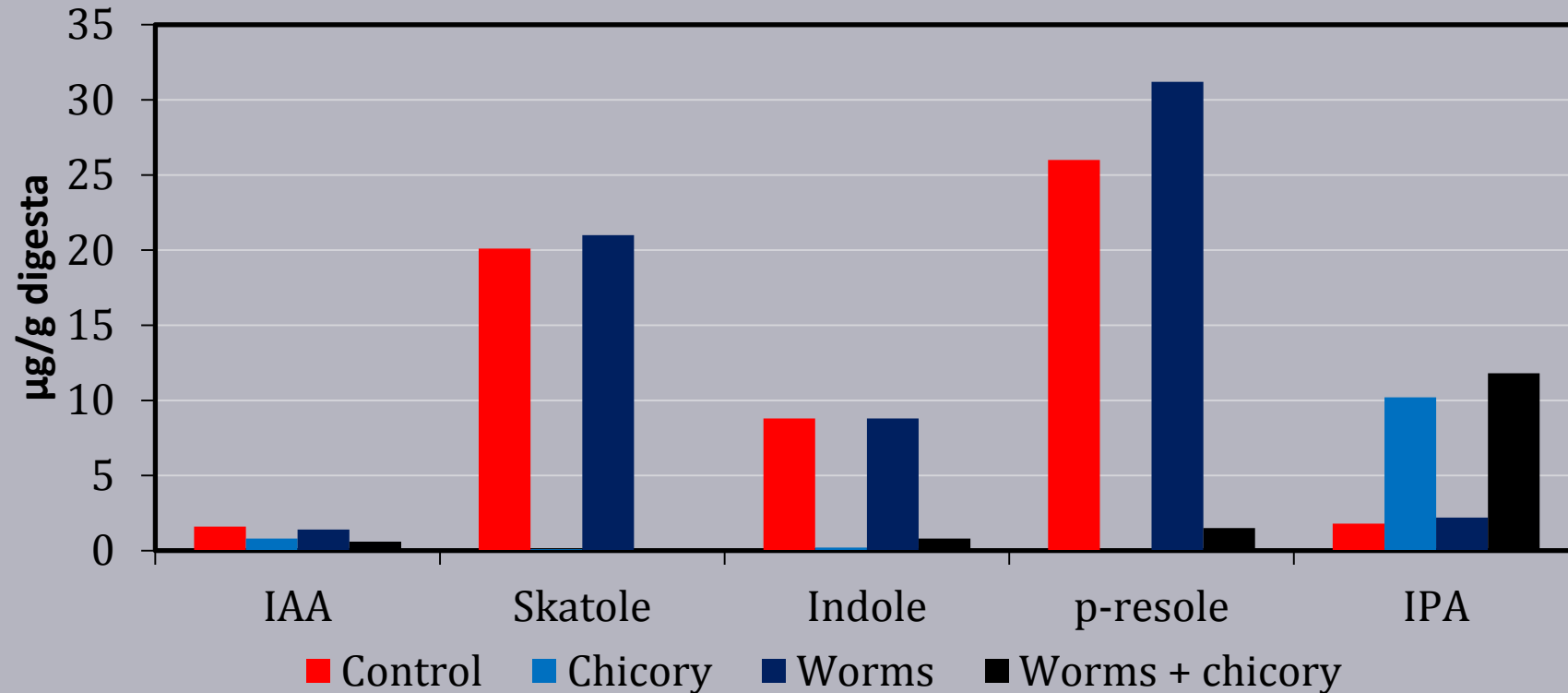
- Chicory
- ▲ Control

Results



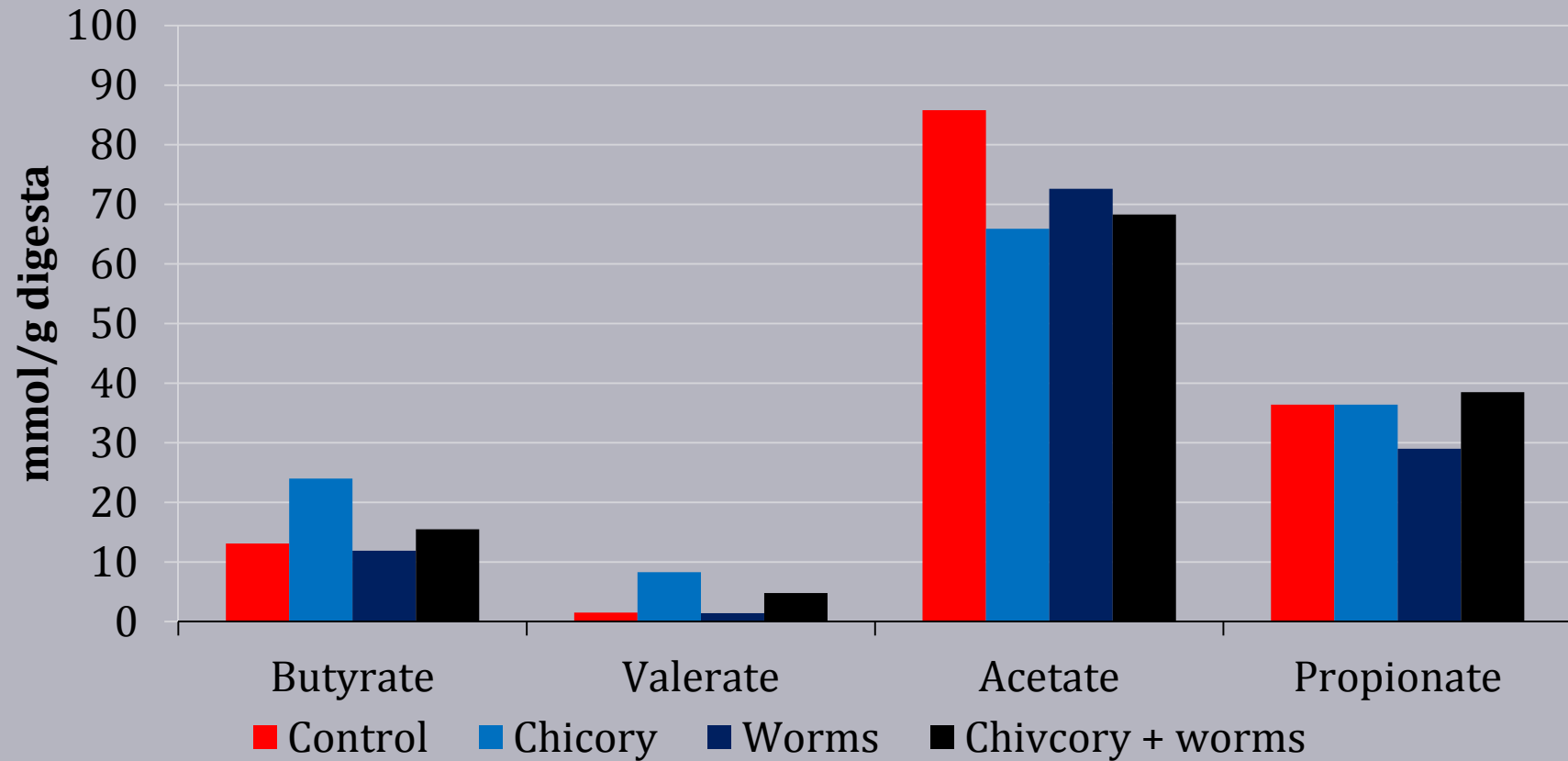
Harvest of chicory roots

Indoles and p-cresole in digesta from the large intestine (all pigs)



No effect of worms
Significant effect of chicory

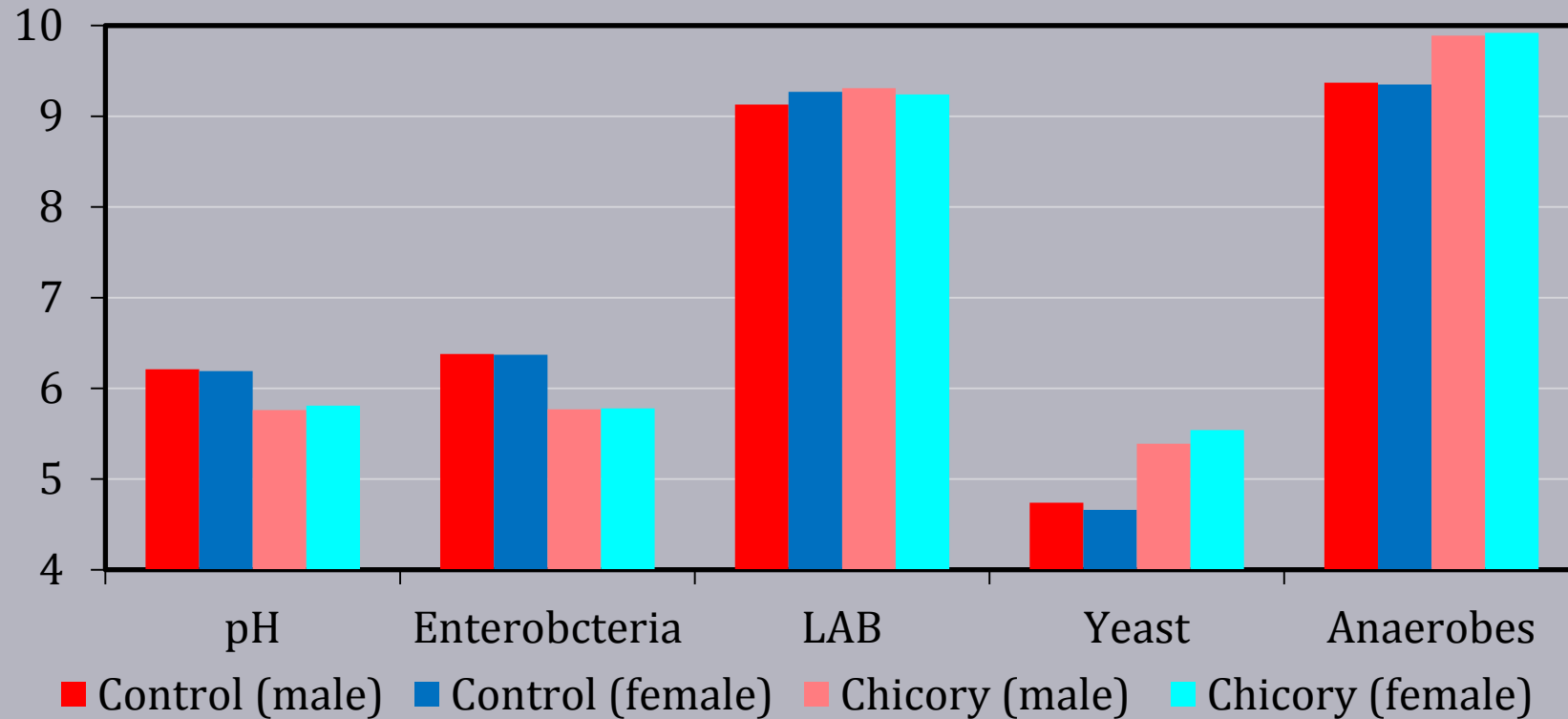
SCFA concentration in digesta from the caecum



No effect of worms

Significant effect of chicory roots on butyrate and valerate

pH and various populations of microorganisms in digesta (log CFU/g digesta) from the caecum of male and female pigs

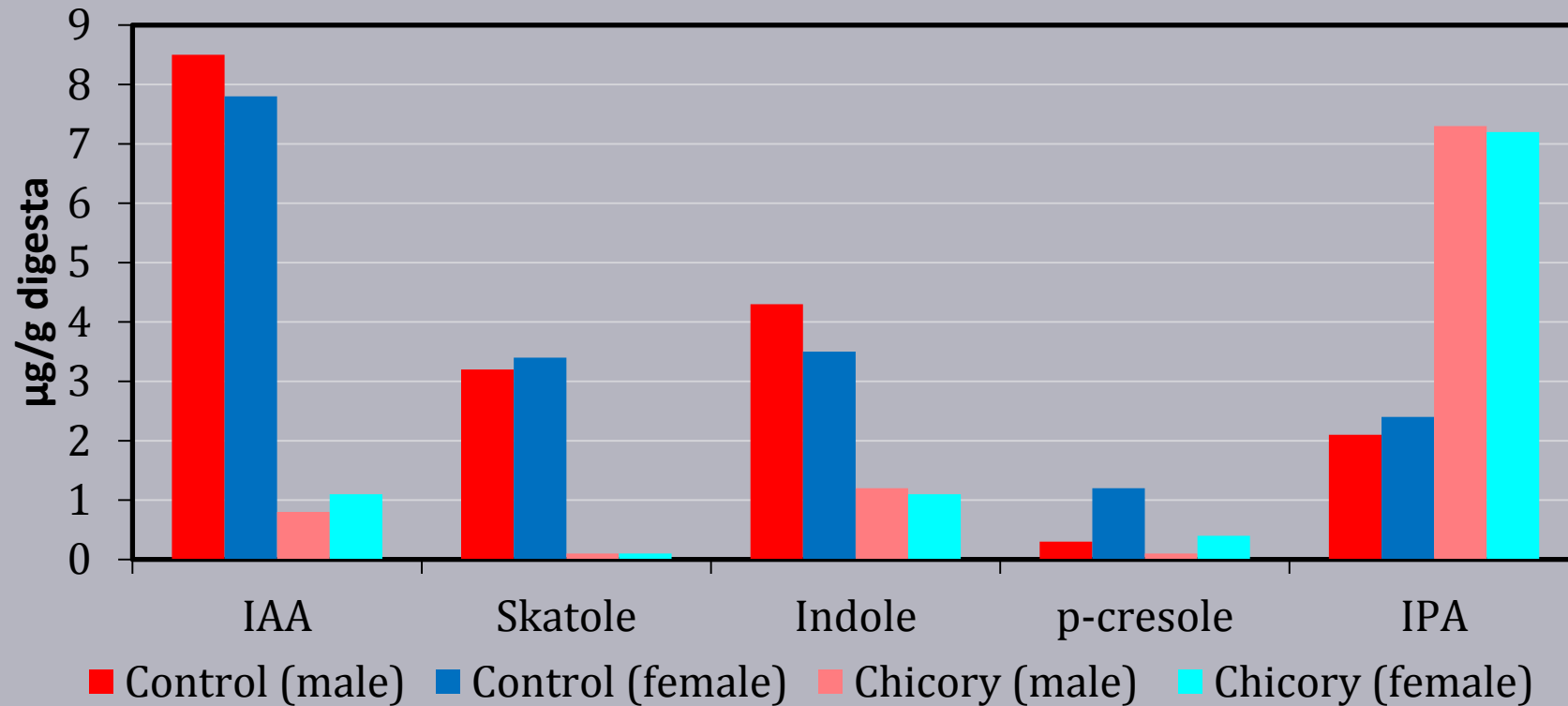


No effect of sex

No effect of worms

Significant effect of chicory (except LAB)

Indoles and p-cresole in digesta from the caecum of male and female pigs



No effect of sex

Significant effect of chicory

Androstenone and skatole in back fat

	Control		Control worm		Chicory root		Chicory root worm	
	Male N=9	Female N=9	Male N=9	Female N=9	Male N=9	Female N=9	Male N=9	Female N=9
Androstenone ($\mu\text{g/g}$)	1.48	0.01	1.21	0.00	1.24	0.01	1.53	0.01
Skatole (ng/g)	108	57	93	55	0	0	0	1

No androstenone in females

No effect of treatment on androstenone

Significant effect of chicory root on skatole

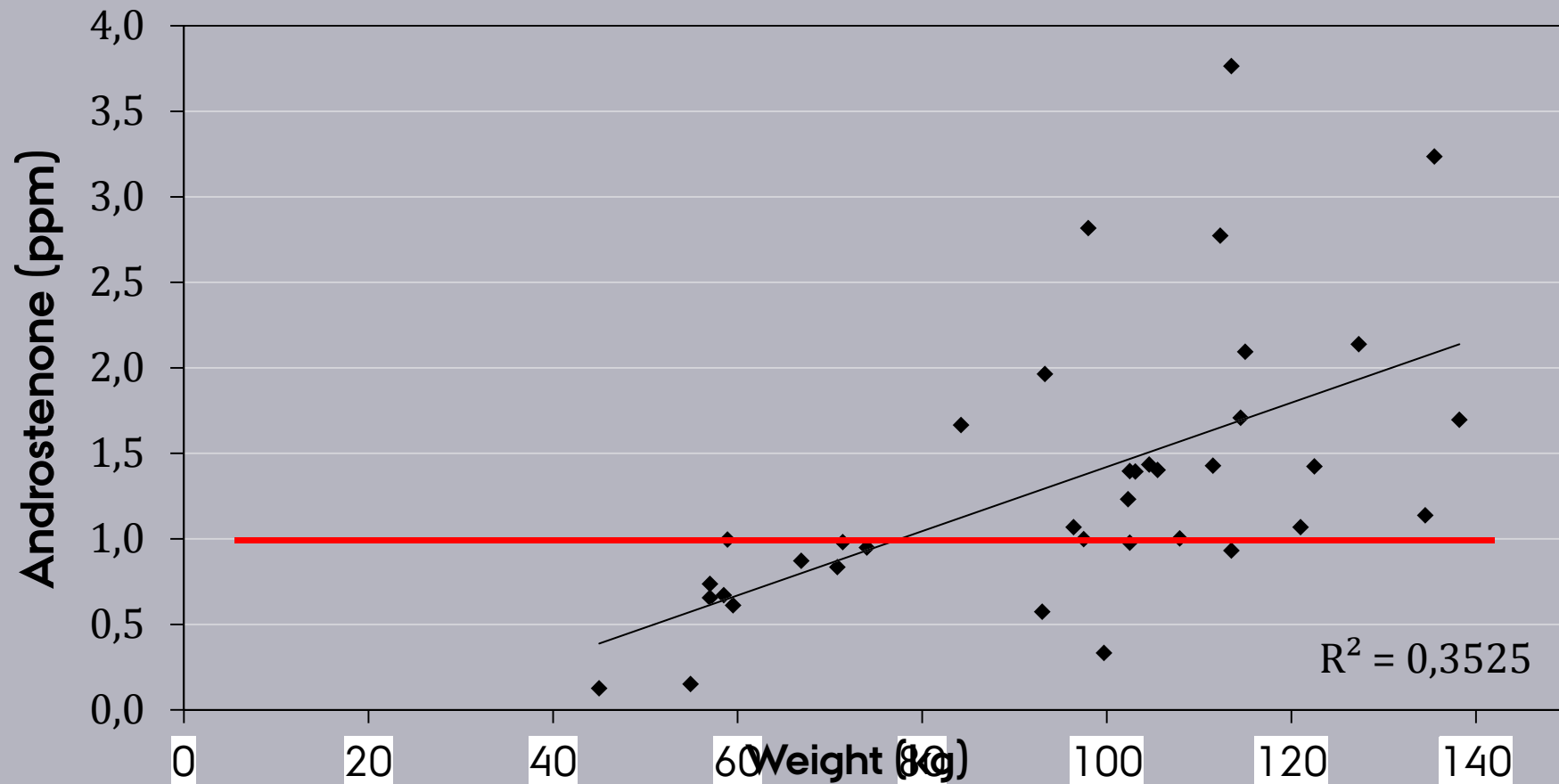
Significant effect of sex on skatole

Sorting out level:

Skatole 250 ng/g

Androstenone (1 $\mu\text{g/g}$)

Correlation in male pigs (N=36) between live weight at slaughter and androstenone in back fat



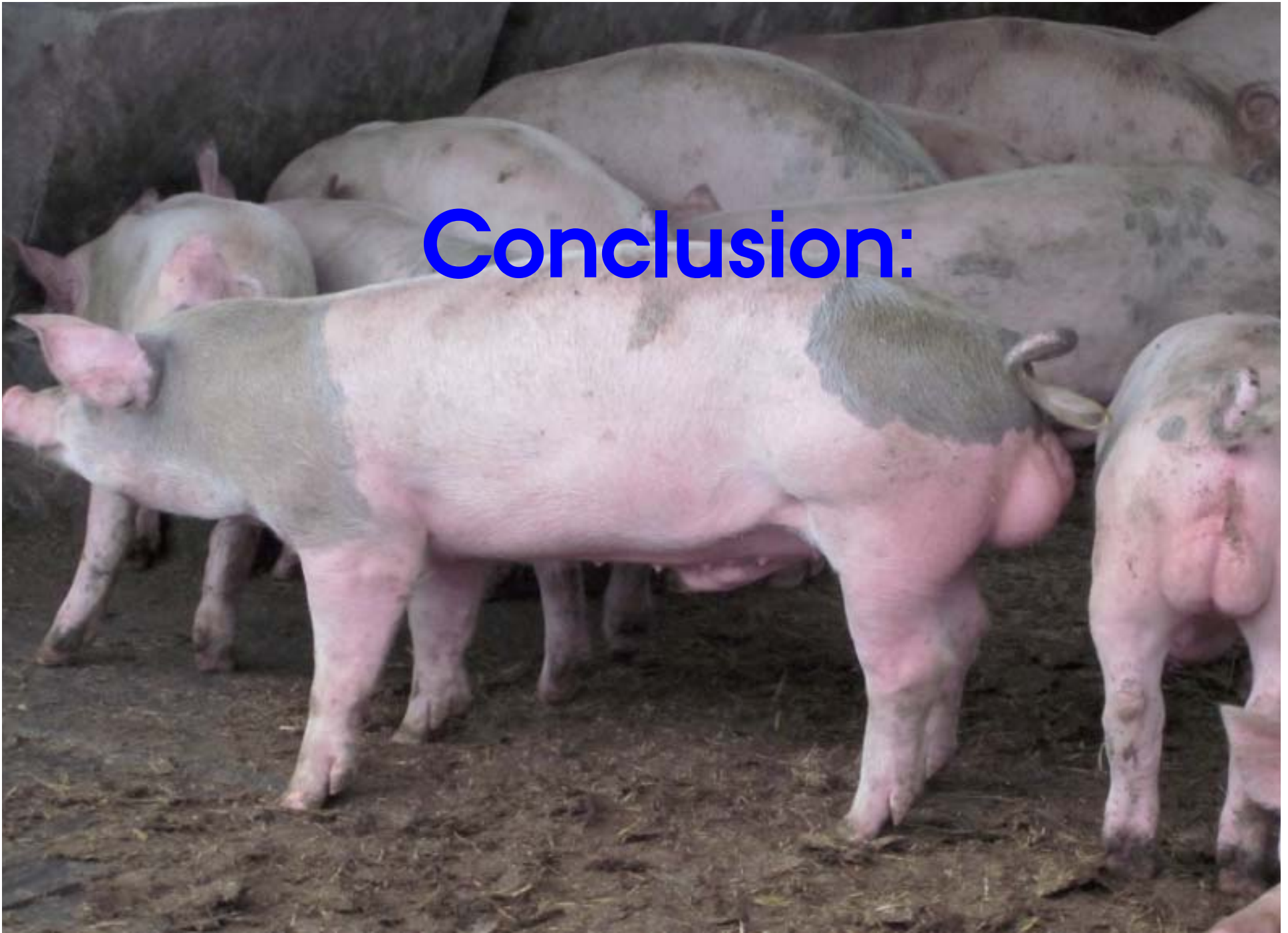
Effect of age on androstenone and skatole in back fat of male pigs

Age	17 weeks	21 weeks	24 weeks
Weight of pigs	66,3 kg N=12	98,2 kg N=12	118,0 kg N=12
Androstenone (µg/g)	0,80_a	1,14_b	1,99_c
> 1 ppm androstemone	1/12	8/12	11/12
Skatole (ng/g)	109	59	125

Significant effect of age on androstenone

No effect of age on skatole

Conclusion:



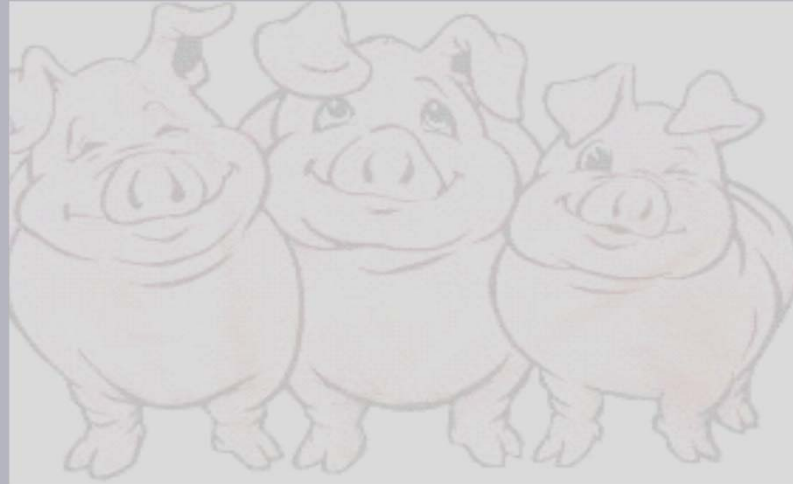
Conclusion:

- No effect of **sex** (and age) on the gastrointestinal ecosystem
- No effect of **sex** on skatole production (concentration) in the gut
- No effect of **age** on skatole concentration in the hind gut and in back-fat
- Significant effect of **chicory root** on skatole concentration in the hind gut and in back-fat
- Feeding **chicory root** change the fermentation of tryptophan from the production of IAA to the production of IPA
- No effect of **chicory root** on androstenone in back fat
- Significant effect of **age** and **sex** on androstenone in back fat.

Concept to avoid (reduce) boar taint in organic pig production:

Feed 15% chicory root four days before slaughter

Slaughter at a live weight at 80 kg



Thank you for your attention

Quistens?

Organic RDD

