

EFFECT OF REDUCED DIETARY PROTEIN AND AMINO ACID SUPPLY IMPOSED IN THE GROWER AND FINISHER PERIOD OR SOLELY IN THE FINISHER PERIOD ON GROWTH TRAITS AND CARCASS PROTEIN DEPOSITION EFFICIENCY IN PIGS

G. Bee, C. Kasper, P. Schlegel

Swine Research Unit, Agroscope Posieux, 1725 Posieux, Switzerland

TAP TO RETURN TO KIOSK MENU

Agroscope

Interactive!
Click on any of these bubbles to jump to each section

[Introduction](#)

[Methods](#)

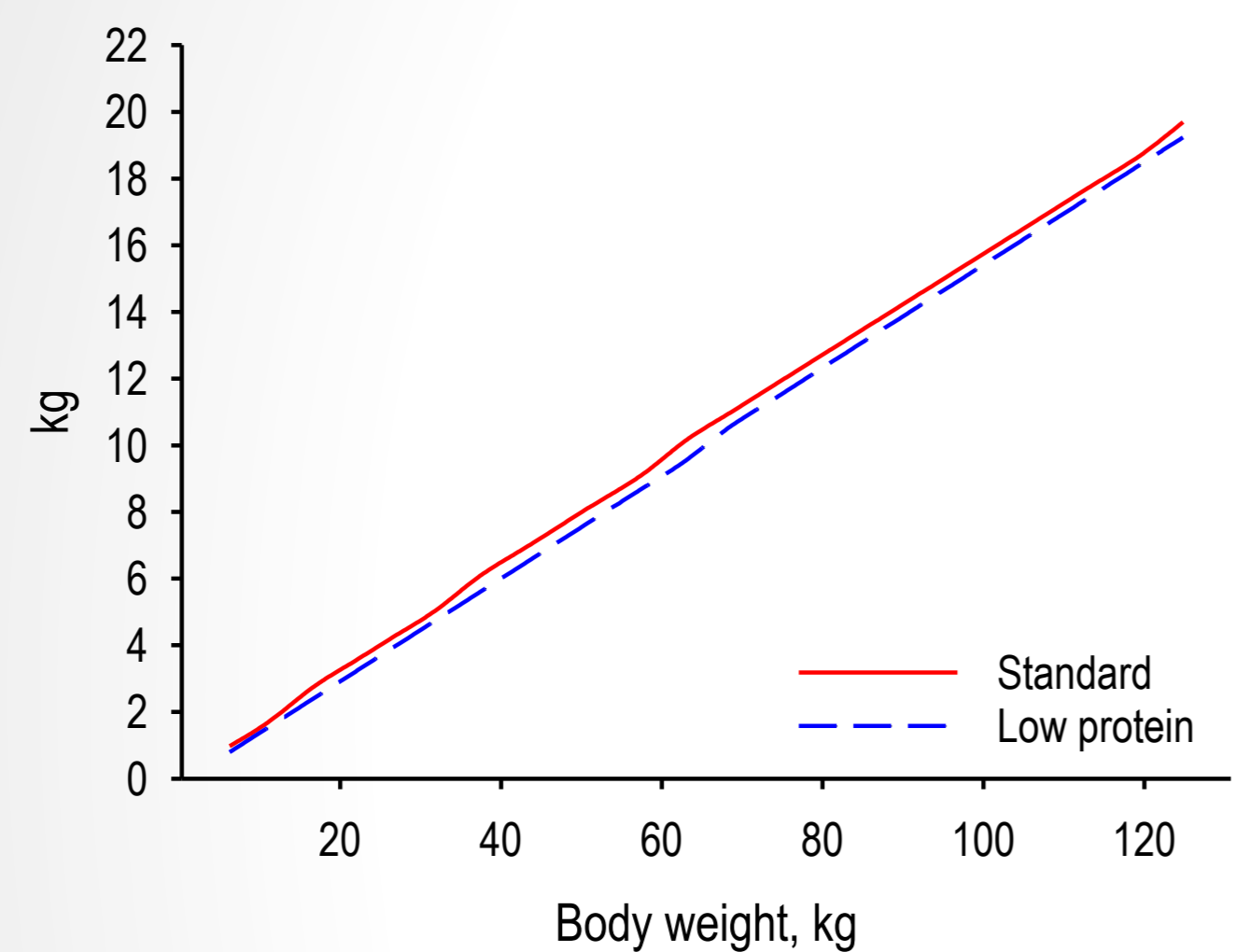
Results

[1](#), [2](#), [3](#)

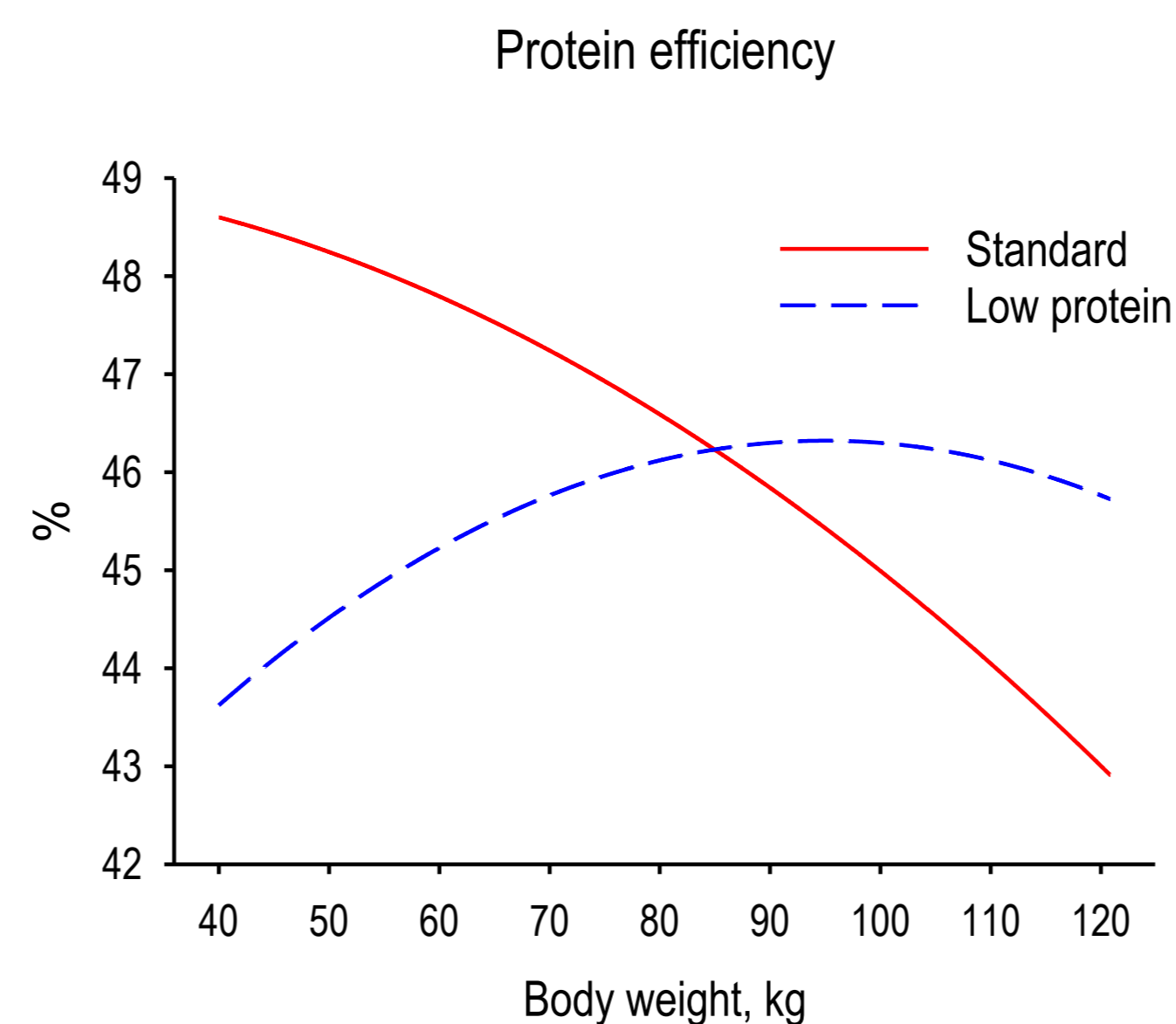
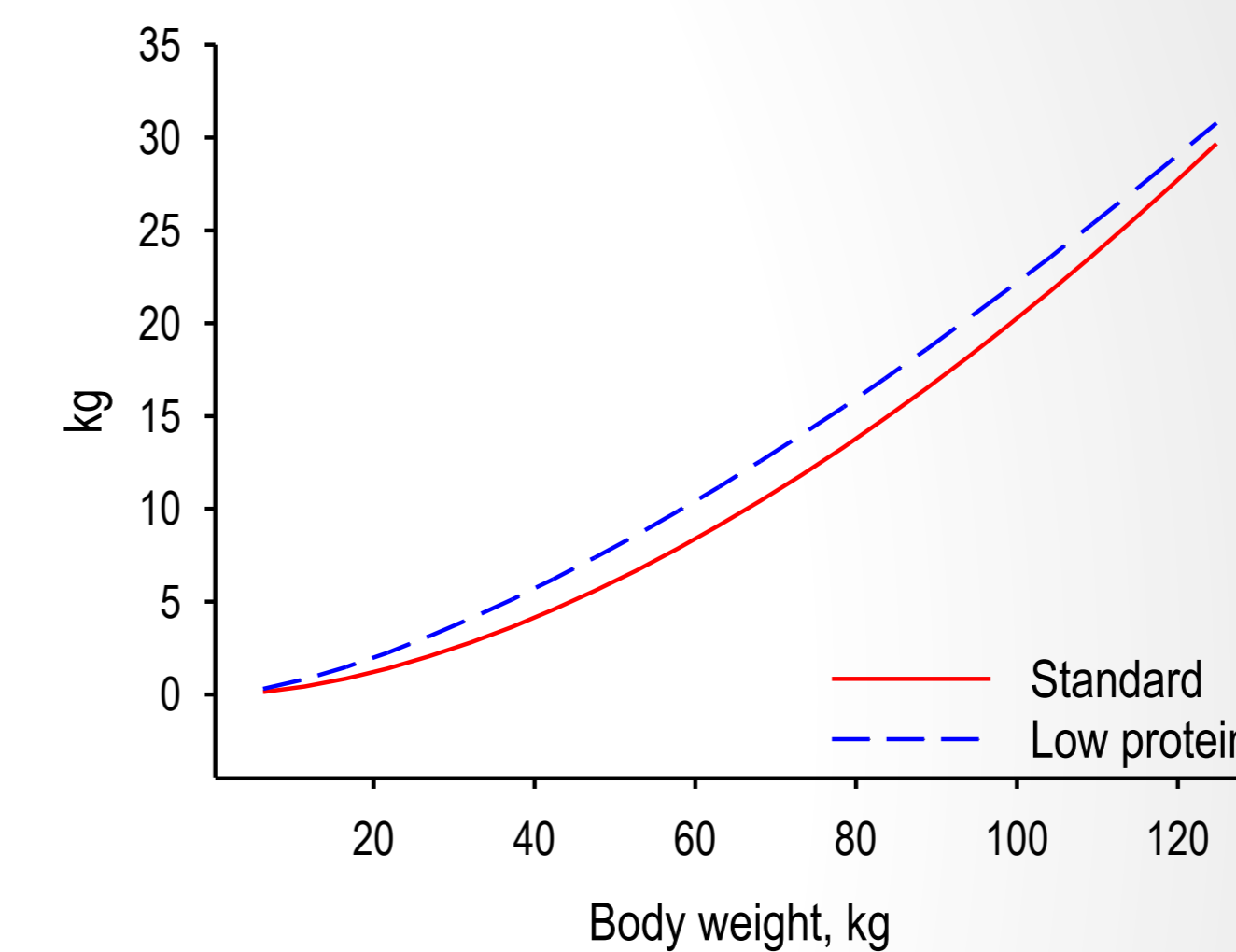
[Discussion](#)

Above 65 kg empty body weight (BW),
protein deposition is greater in pigs fed protein-restricted compared to standard diets
(Ruiz-Ascacibar et al. 2017, Ruiz-Ascacibar et al. 2019)

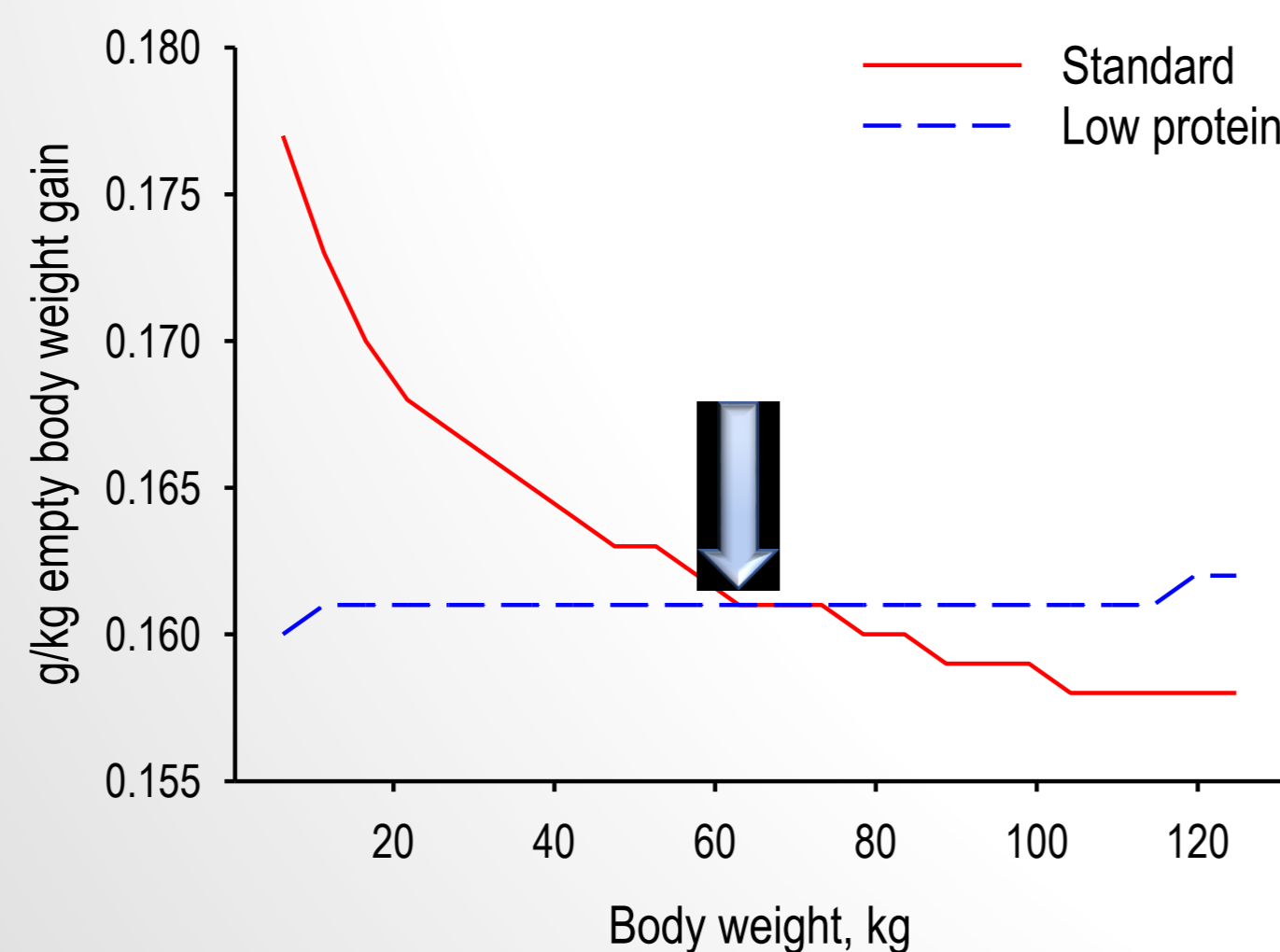
Protein content of the empty body depending on the dietary protein content



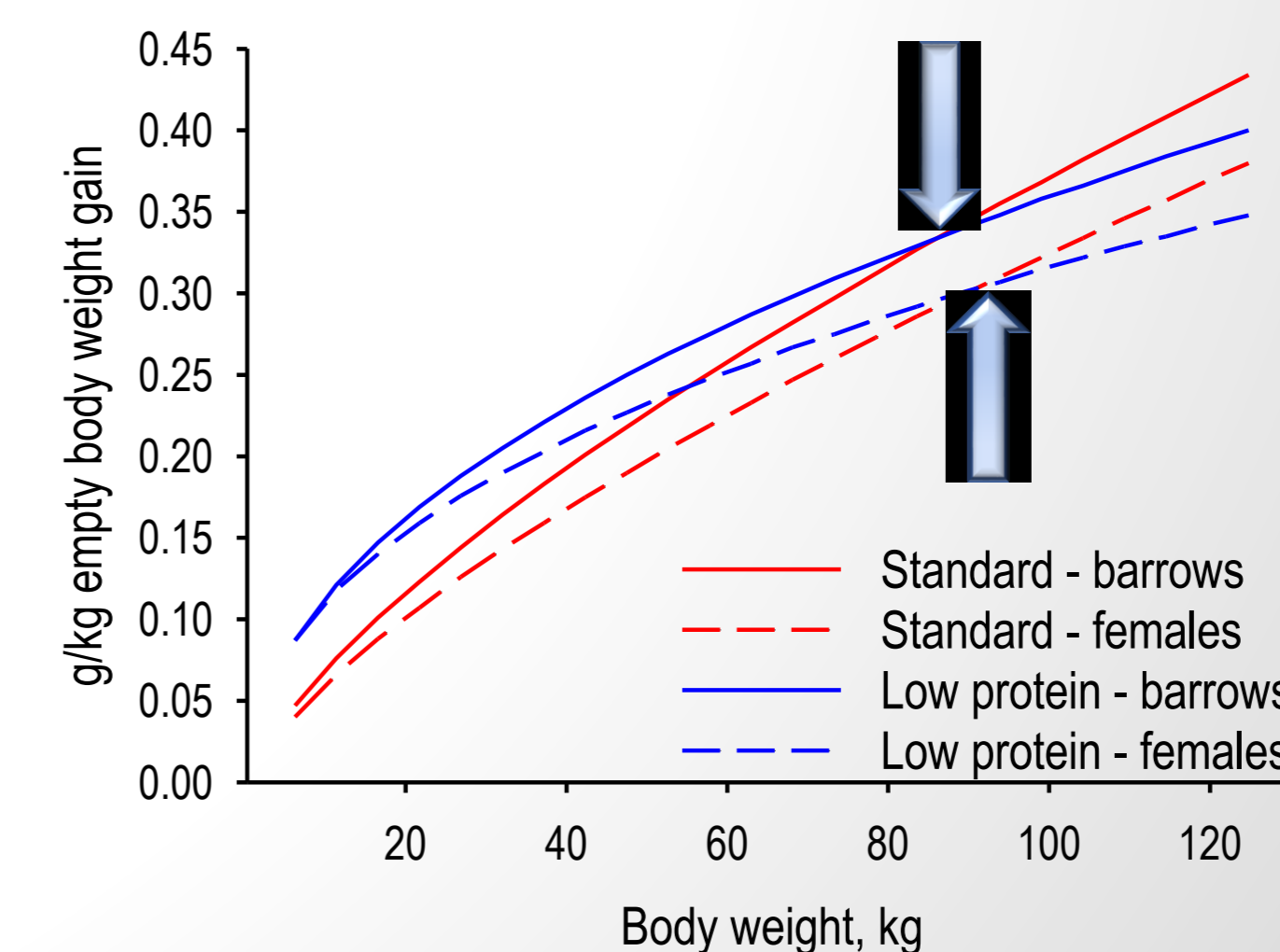
Fat content of the empty body depending on the dietary protein content



Protein deposition rate



Fat deposition rate



References

Ruiz-Ascacibar, I., P. Stoll, M. Kreuzer, and G. Bee. 2019. Dietary crude protein and amino acid restriction has a different impact on the dynamic of protein, amino acid and fat deposition in entire male, castrated and female pigs. *Animal* 13(1):74-82.
Ruiz-Ascacibar, I., P. Stoll, M. Kreuzer, V. Boillat, P. Spring, and G. Bee. 2017. Impact of amino acid and CP restriction from 20 to 140 kg BW on performance and dynamics in empty body protein and lipid deposition of entire male, castrated and female pigs. *Animal* 11(3):394-404.

EFFECT OF REDUCED DIETARY PROTEIN AND AMINO ACID SUPPLY IMPOSED IN THE GROWER AND FINISHER PERIOD OR SOLELY IN THE FINISHER PERIOD ON GROWTH TRAITS AND CARCASS PROTEIN DEPOSITION EFFICIENCY IN PIGS

G. Bee, C. Kasper, P. Schlegel

Swine Research Unit, Agroscope Posieux, 1725 Posieux, Switzerland

TAP TO RETURN
TO KIOSK MENU

Agroscope

Interactive!
Click on any of these bubbles to
jump to each section

[Introduction](#)

[Methods](#)

[Results](#)

[1, 2, 3](#)

[Discussion](#)

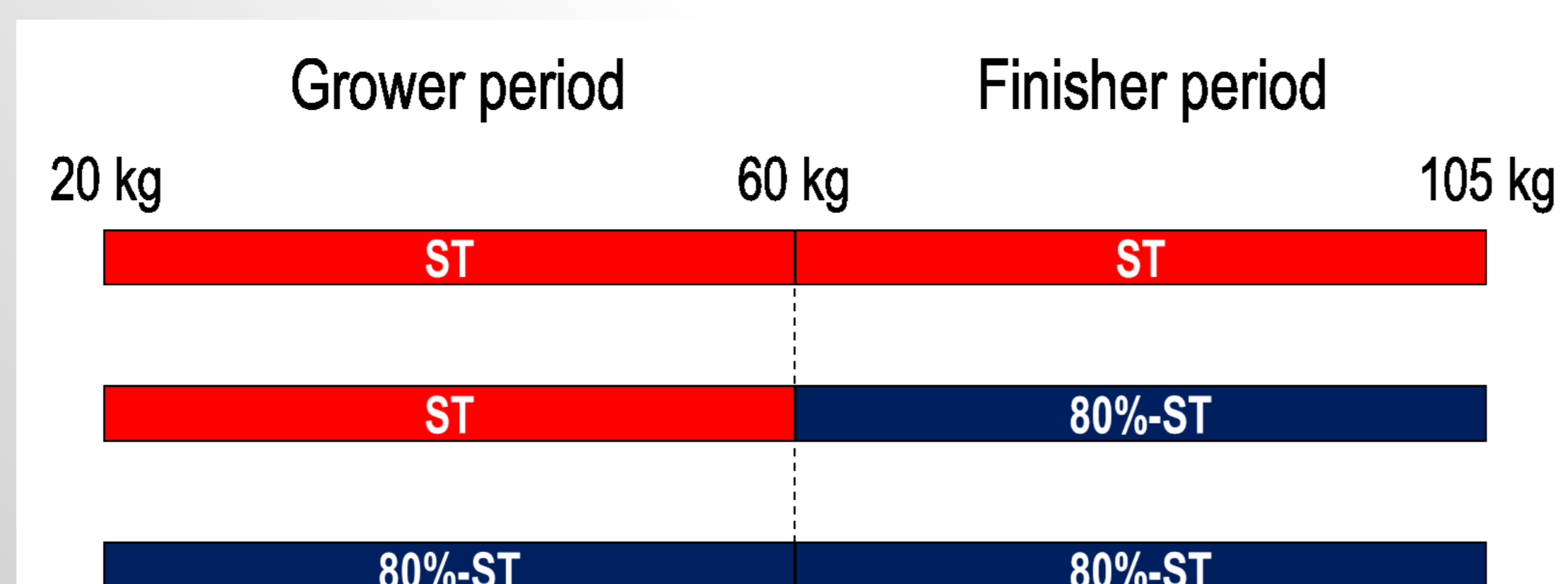
ANIMALS AND DIETS

BREED: 48 Swiss Large White pigs from 12 litters
BW RANGE: 22 to 110 kg
HOUSING: 1 large pen equipped with 8 automatic feeders and individual pig recognition system
FEEDING: *Ad libitum* access to the grower and finisher diets

Analyzed composition (g or MJ/kg as-fed) of the standard and reduced protein (80% of standard) grower and finisher diet

	Grower diets		Finisher diets	
	ST	80%-ST	ST	80%-ST
Dry matter	898	894	894	895
Crude protein	165	132	151	121
Crude fat	24	25	21	21
Crude fiber	39	42	37	37
Lysine	10.2	8.2	8.0	6.5
Methionine + Cystine	5.6	4.9	5.1	4.2
Threonine	6.6	2.7	5.3	4.4
Tryptophan	2.0	1.5	1.9	1.5
Calculated energy content				
DE (MJ/kg)	13.2	13.2	13.2	13.2
Crude protein/DE	12.4	9.9	11.4	9.1

EXPERIMENTAL DESIGN



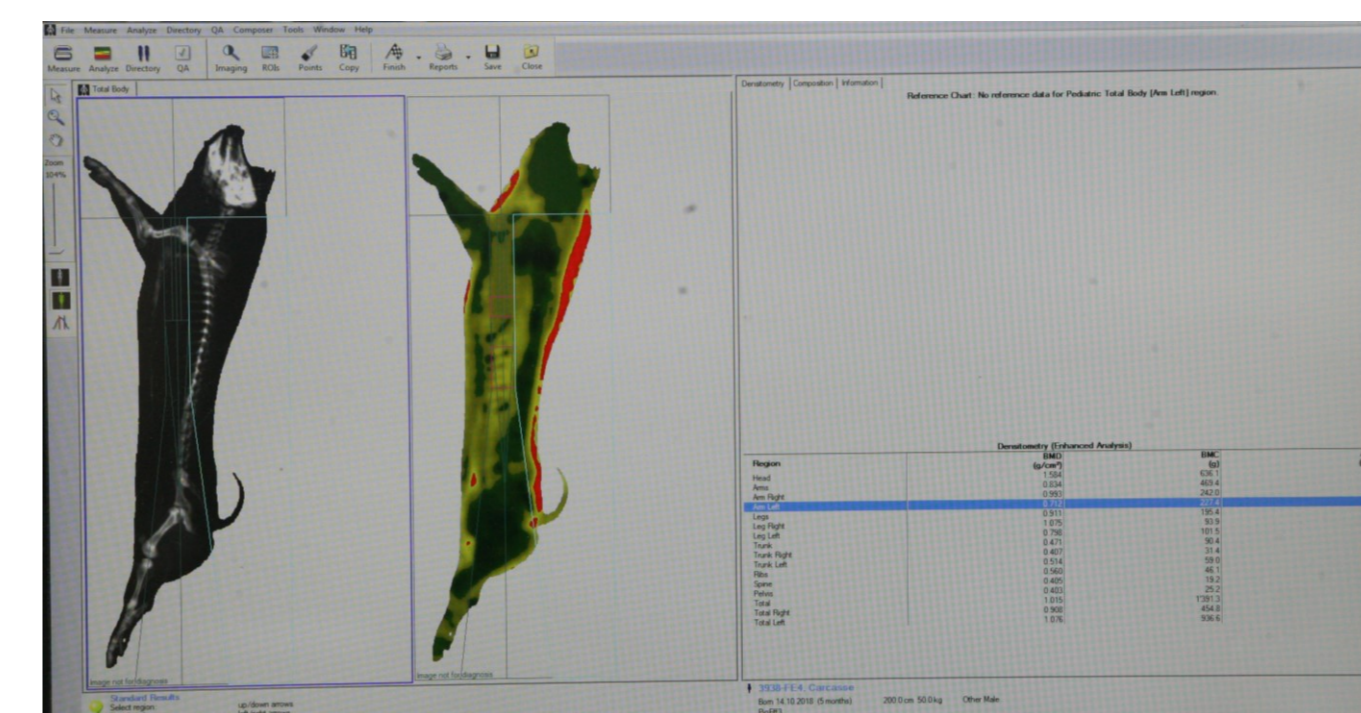
TRAITS OF INTEREST

GROWTH PERFORMANCE

- Average daily gain
- Average daily feed intake
- Protein intake

CARCASS COMPOSITION (DUAL-X-RAY-ABSORPTIOMETRY)

- Hot carcass weight
- Nutrient composition of the carcass
 - at 22 kg BW
 - at slaughter



NUTRIENT DEPOSITION AND DEPOSITION EFFICIENCY

- Daily deposition rate of carcass protein and fat
- N-deposition efficiency

BASIS TO CALCULATE THE PROTEIN AND FAT CONTENT OF THE CARCASSES

- at 22 kg BW
based on data of Ruiz-Ascacibar et al. (2019)
 - Protein: 120 g/kg BW
 - Fat: 76 g/kg BW
 - Gross energy: 7.03 MJ/kg BW
- at slaughter
 - Protein (g): $-469.34 + 0.45 \times D_{LM}$
 - Fat (g): $-532.46 + 1.73 \times D_{FM} + 0.07 \times D_{LM}$
 - Gross energy (kJ): $-35.63 + 72.11 \times D_{FM} + 14.44 \times D_{LM}$

D_{LM} = DXA-lean mass (g), D_{FM} = DXA-fat mass (g)

REFERENCES

Ruiz-Ascacibar, I., P. Stoll, M. Kreuzer, and G. Bee. 2019. Dietary crude protein and amino acid restriction has a different impact on the dynamic of protein, amino acid and fat deposition in entire male, castrated and female pigs. *Animal* 13(1):74-82.
Mitchell, A., A. Scholz, and J. Conway. 1998. Body composition analysis of pigs from 5 to 97 kg by dual-energy x-ray absorptiometry. *Appl. Radiat. Isot.* 49(5-6):521-523.

EFFECT OF REDUCED DIETARY PROTEIN AND AMINO ACID SUPPLY IMPOSED IN THE GROWER AND FINISHER PERIOD OR SOLELY IN THE FINISHER PERIOD ON GROWTH TRAITS AND CARCASS PROTEIN DEPOSITION EFFICIENCY IN PIGS

G. Bee, C. Kasper, P. Schlegel

Swine Research Unit, Agroscope Posieux, 1725 Posieux, Switzerland

TAP TO RETURN TO KIOSK MENU

Agroscope

Interactive!
Click on any of these bubbles to jump to each section

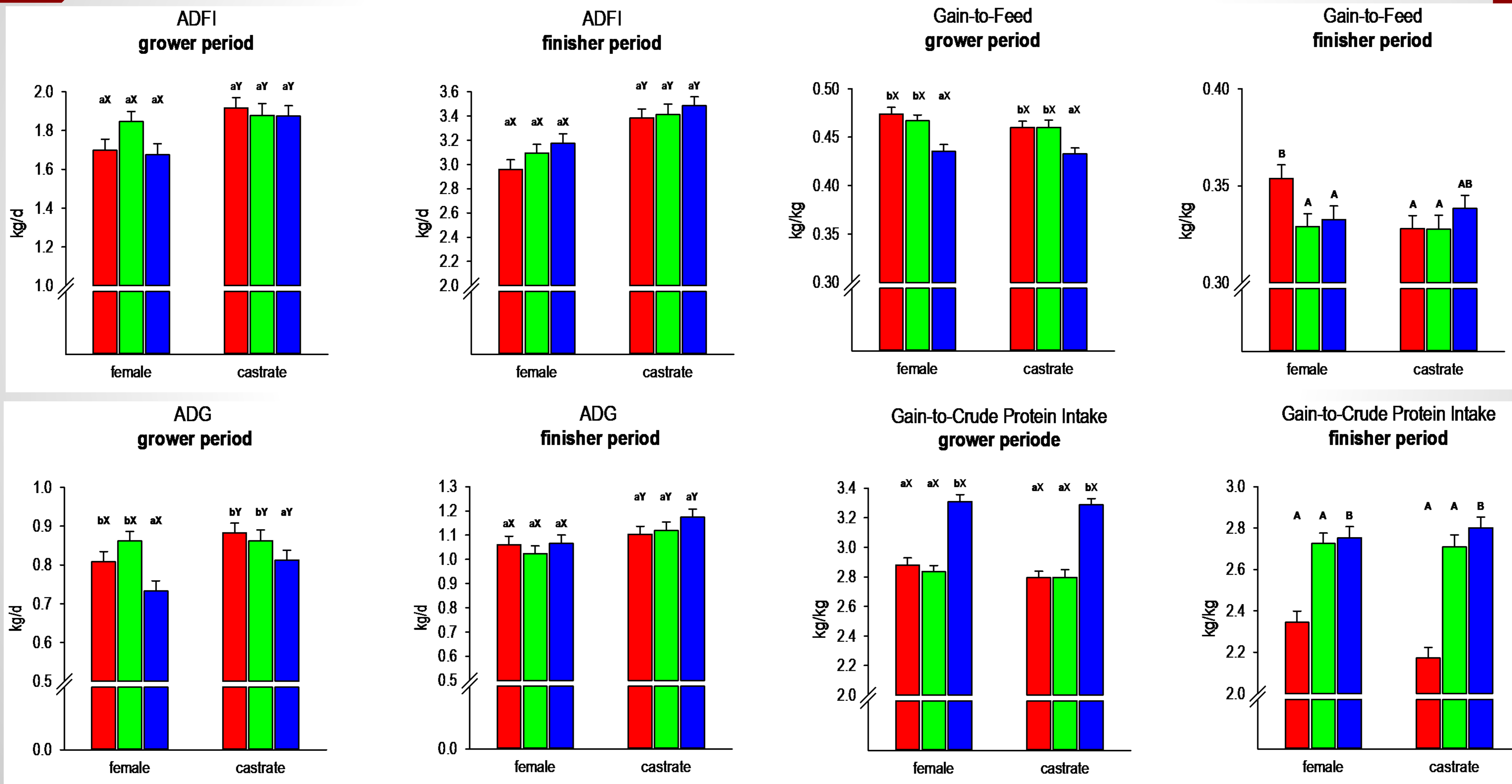
[Introduction](#)

[Methods](#)

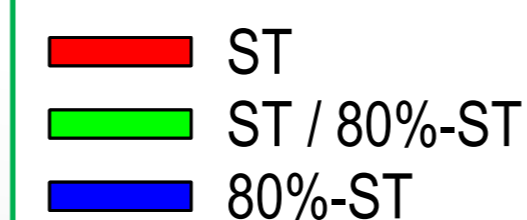
Growth performance traits in the grower and finisher period

Results
1, 2, 3

[Discussion](#)



a-c: bars with different superscripts denote differences at $P < 0.05$, regardless of the sex
X, Y: bars with different superscripts denote differences at $P < 0.05$, regardless of dietary treatments
A, B: bars with different superscripts denote differences at $P < 0.05$



EFFECT OF REDUCED DIETARY PROTEIN AND AMINO ACID SUPPLY IMPOSED IN THE GROWER AND FINISHER PERIOD OR SOLELY IN THE FINISHER PERIOD ON GROWTH TRAITS AND CARCASS PROTEIN DEPOSITION EFFICIENCY IN PIGS

G. Bee, C. Kasper, P. Schlegel

Swine Research Unit, Agroscope Posieux, 1725 Posieux, Switzerland

TAP TO RETURN
TO KIOSK MENU

Agroscope

Interactive!
Click on any of these bubbles to
jump to each section

[Introduction](#)

[Methods](#)

Results
[1](#), [2](#), [3](#)

[Discussion](#)

Growth performance traits

Overall

	Treatment (T)			Sex (S)		SEM	P-value	
	ST	ST / 80%-ST	80%-ST	Female	Castrate		T	S
BW								
Start grower	22.1	22.3	21.9	22.0	22.2	0.69	0.78	0.60
Start finisher	64.3	65.1	63.8	64.3	64.5	1.18	0.45	0.82
At slaughter	109.9	109.3	110.7	109.3	110.7	1.39	0.29	0.06
ADG, g/d	0.954	0.959	0.925	0.911	0.981	0.0286	0.16	< 0.01
Total Feed intake, kg	224.3 ^a	227.3 ^a	236.4 ^b	225.3	233.5	5.41	< 0.01	< 0.01
ADFI, kg/d	2.43	2.50	2.45	2.33	2.58	0.066	0.42	< 0.01
Gain-to-feed, kg/kg	0.392 ^b	0.383 ^{ab}	0.376 ^a	0.388	0.379	0.0061	< 0.01	0.02
Gain-to-CP intake, kg/kg	2.505	2.774	3.013	2.789	2.738	0.0413	< 0.01	0.04

a,b: Least square means with different superscripts denote differences at $P < 0.05$, regardless of the sex

EFFECT OF REDUCED DIETARY PROTEIN AND AMINO ACID SUPPLY IMPOSED IN THE GROWER AND FINISHER PERIOD OR SOLELY IN THE FINISHER PERIOD ON GROWTH TRAITS AND CARCASS PROTEIN DEPOSITION EFFICIENCY IN PIGS

G. Bee, C. Kasper, P. Schlegel

Swine Research Unit, Agroscope Posieux, 1725 Posieux, Switzerland

TAP TO RETURN TO KIOSK MENU

Agroscope

Interactive!
Click on any of these bubbles to jump to each section

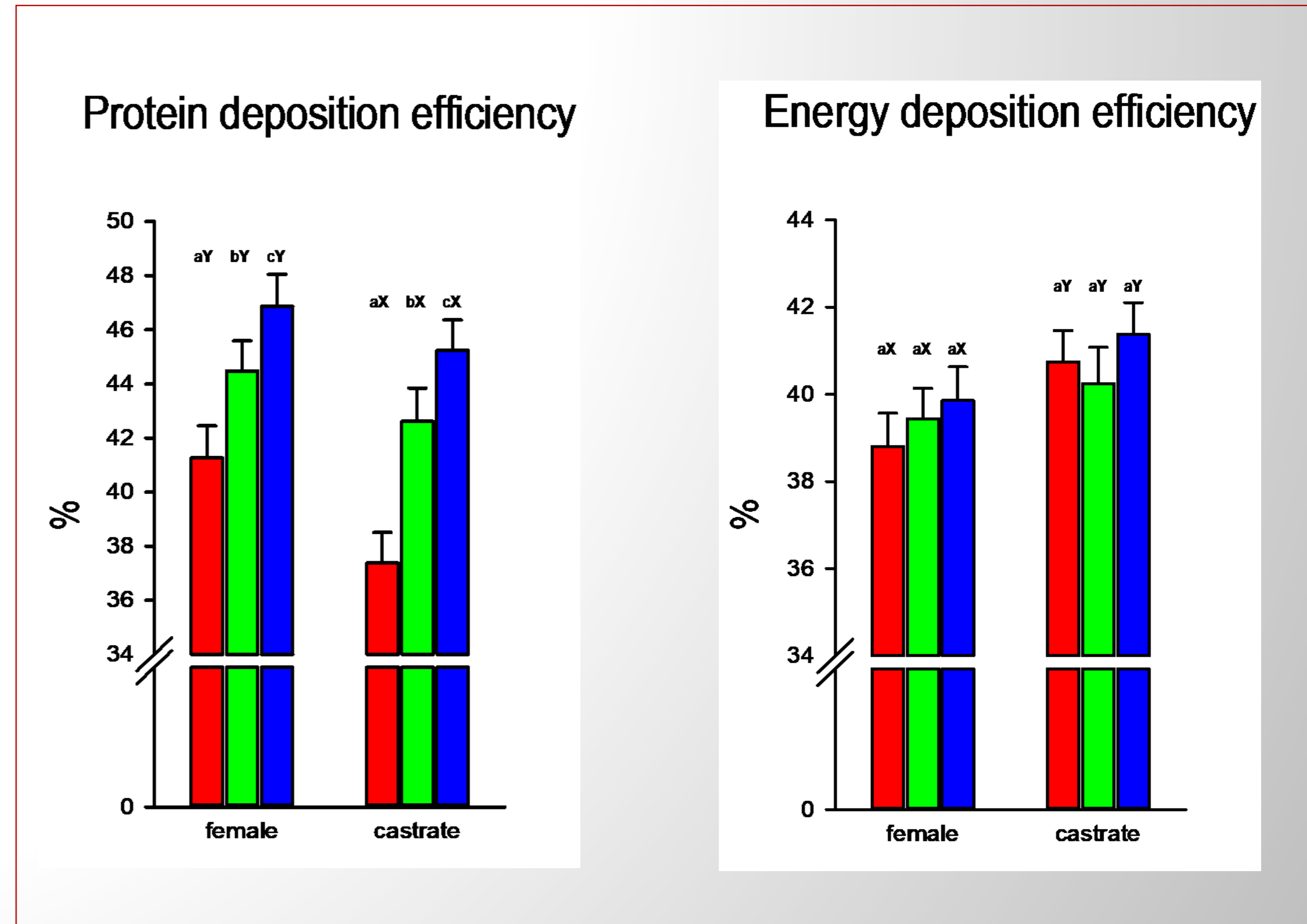
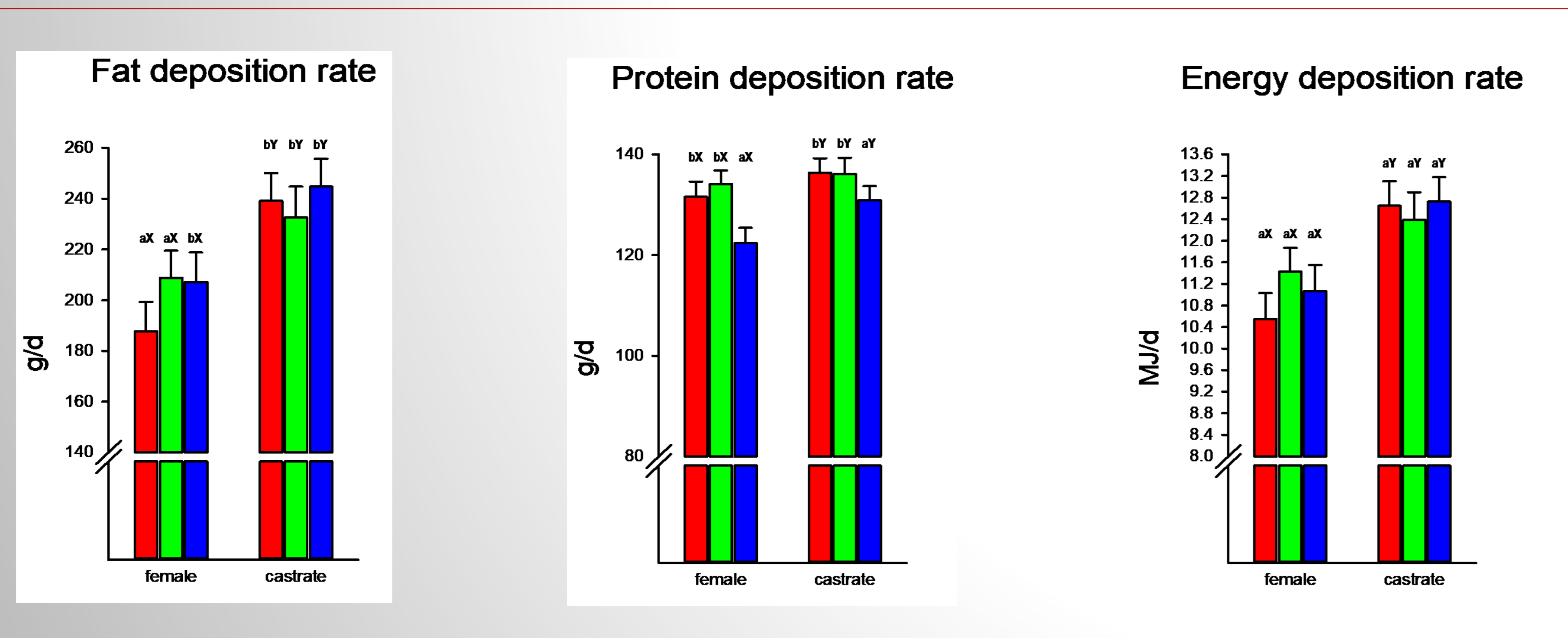
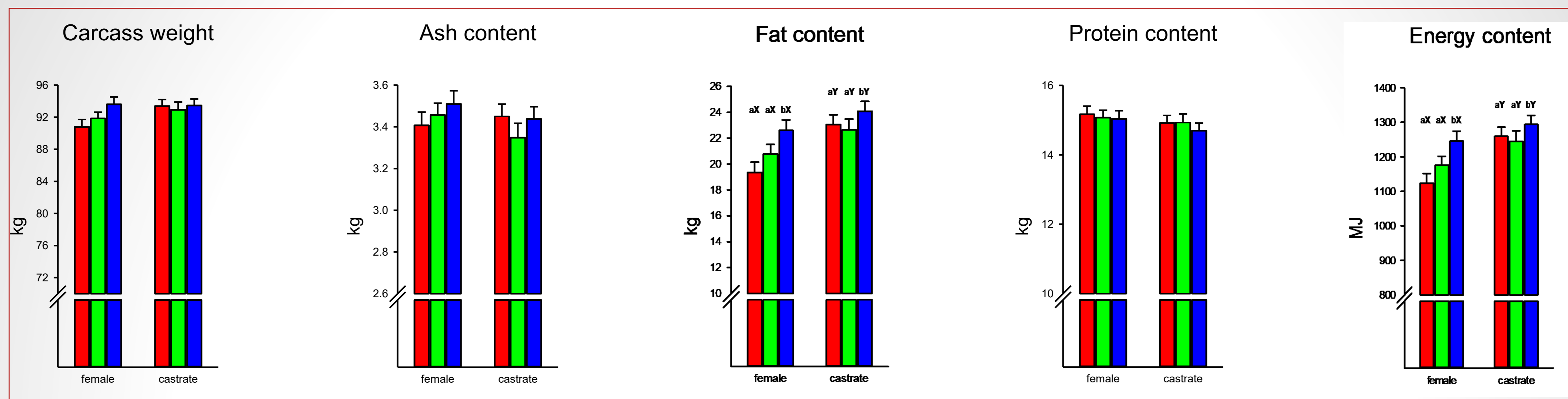
[Introduction](#)

[Methods](#)

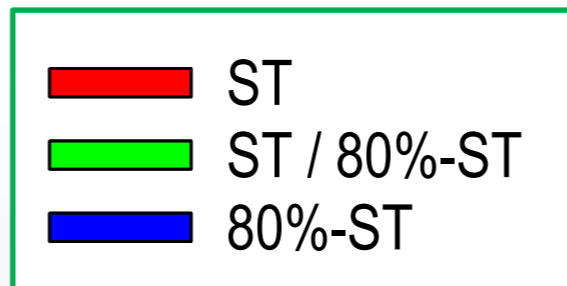
Carcass nutrient content, deposition rate and deposition efficiency

Results
1, 2, 3

[Discussion](#)



a-c: bars with different superscripts denote differences at $P < 0.05$, regardless of the sex
X, Y: bars with different superscripts denote differences at $P < 0.05$, regardless of dietary treatments



Compared to the **STANDARD (RED LINE)**

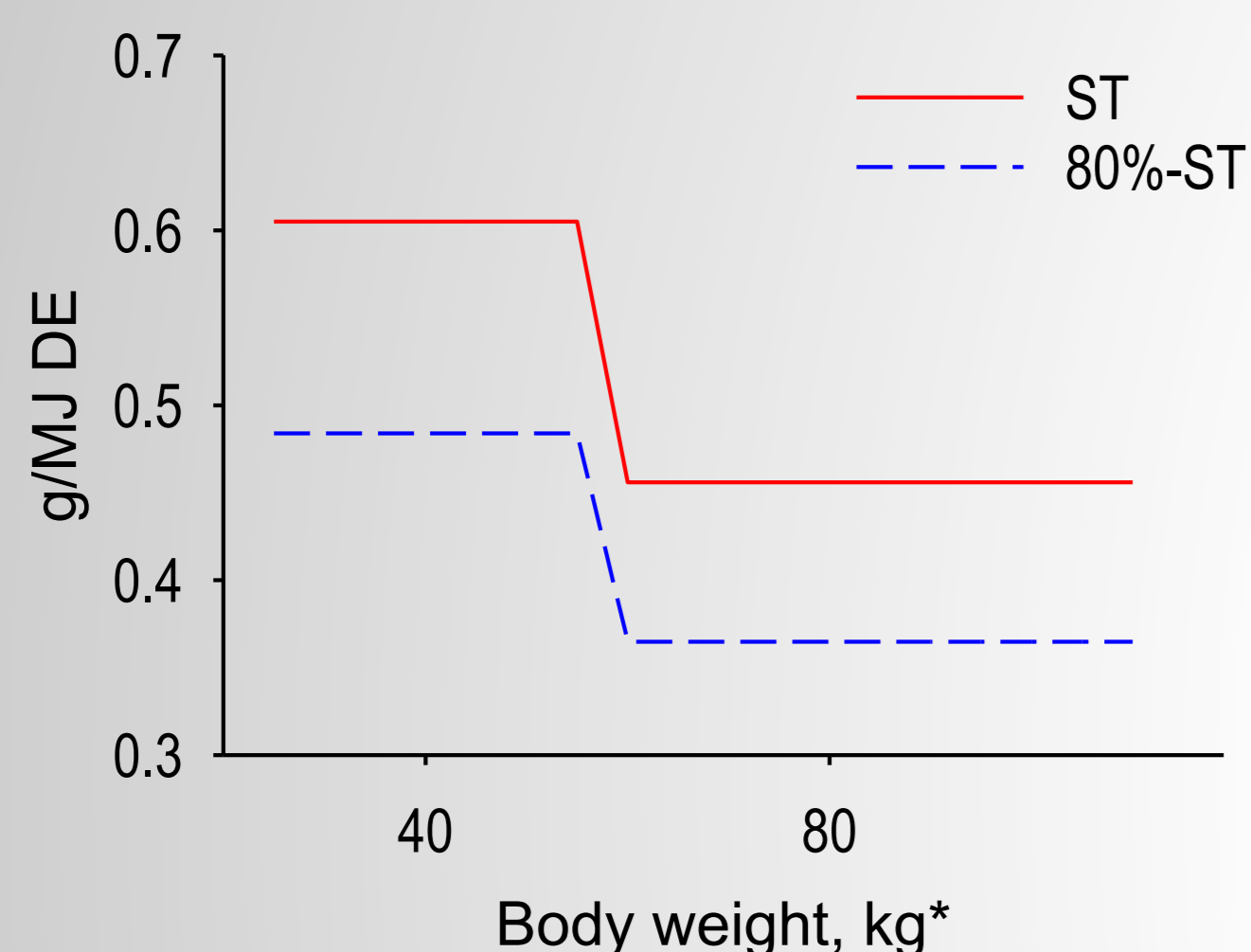
reducing the digestible essential amino acid content of the grower and finisher diet (blue line).

- has hardly any effects on the overall growth rate
- **but** impaired feed efficiency
- **but** markedly improved N-efficiency and thus should decrease the N-losses via feces and urine

reducing the digestible essential amino acid content **only** in the finisher diet (green line)

- had **no effect** on overall growth rate
- has **no effect** on feed efficiency
- improved the N-efficiency and thus should decrease the N-losses via feces and urine

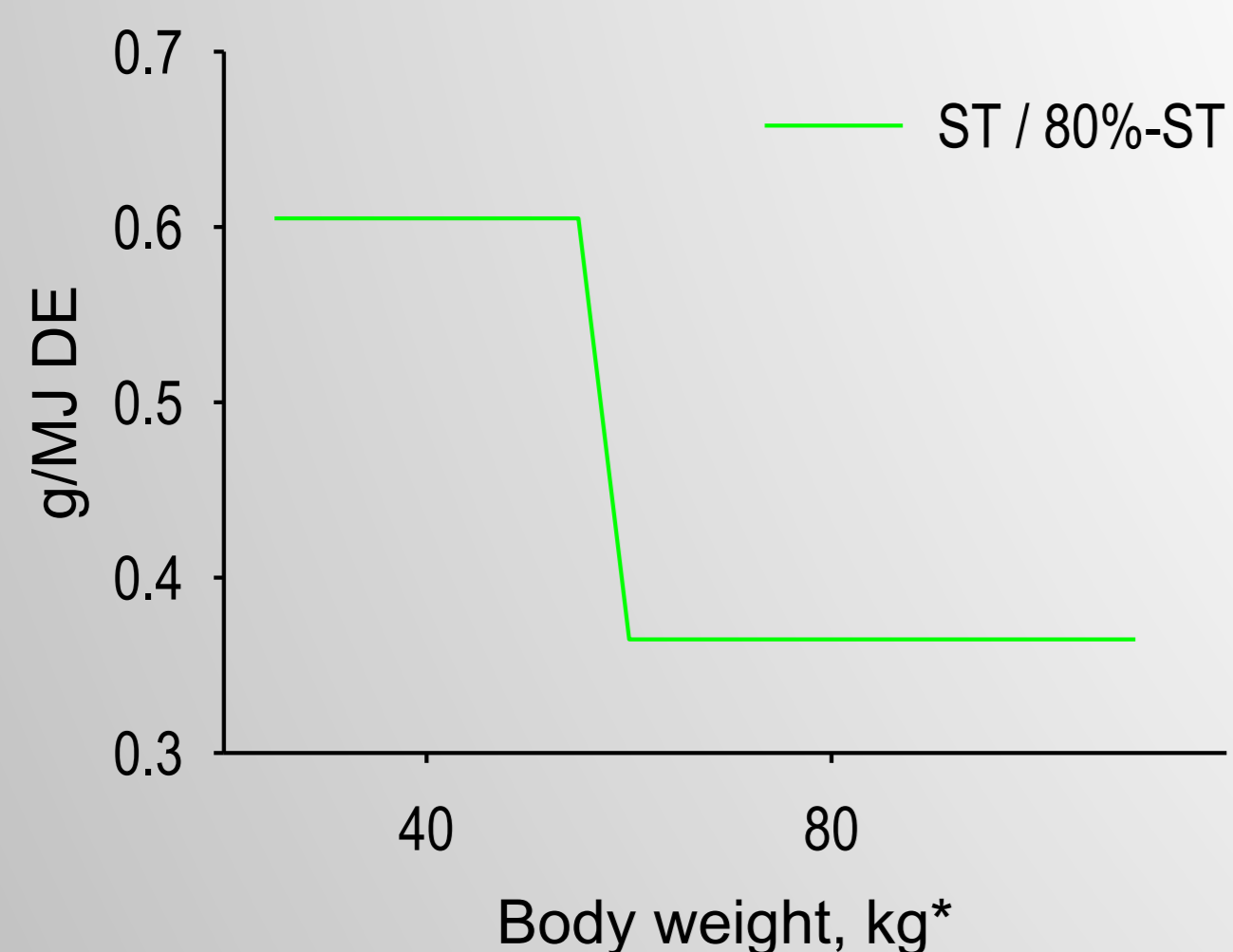
Digestible lysine recommendations



* Body weight used to define d-lysine recommendation

$$d\text{-lysine (g/MJ DE)} = 0.895 - 0.913 \times (BW/100) + 0.491 \times (BW/100)^2 - 0.045 \times (BW/100)^3$$

Digestible lysine recommendations



* Body weight used to define d-lysine recommendation

$$d\text{-lysine (g/MJ DE)} = 0.895 - 0.913 \times (BW/100) + 0.491 \times (BW/100)^2 - 0.045 \times (BW/100)^3$$