Effects of the replacement of cereal in the diet by other energy sources on fatty acid profile of lambs' meat

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Aims of the work

Replacement of the starchy feedstuff (cereal) by other energy sources in oil supplemented diets

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Prevent the *trans*-10 shift

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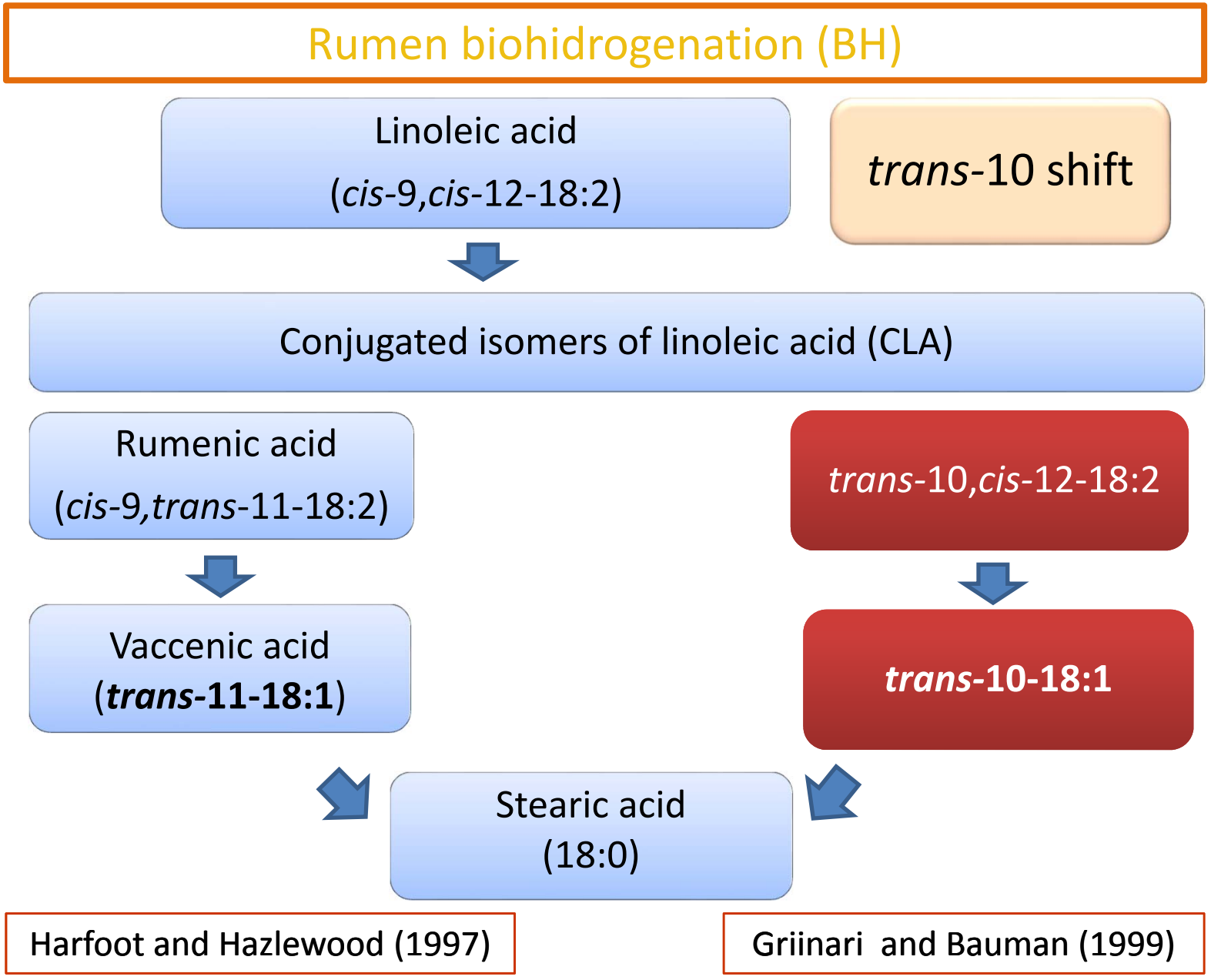
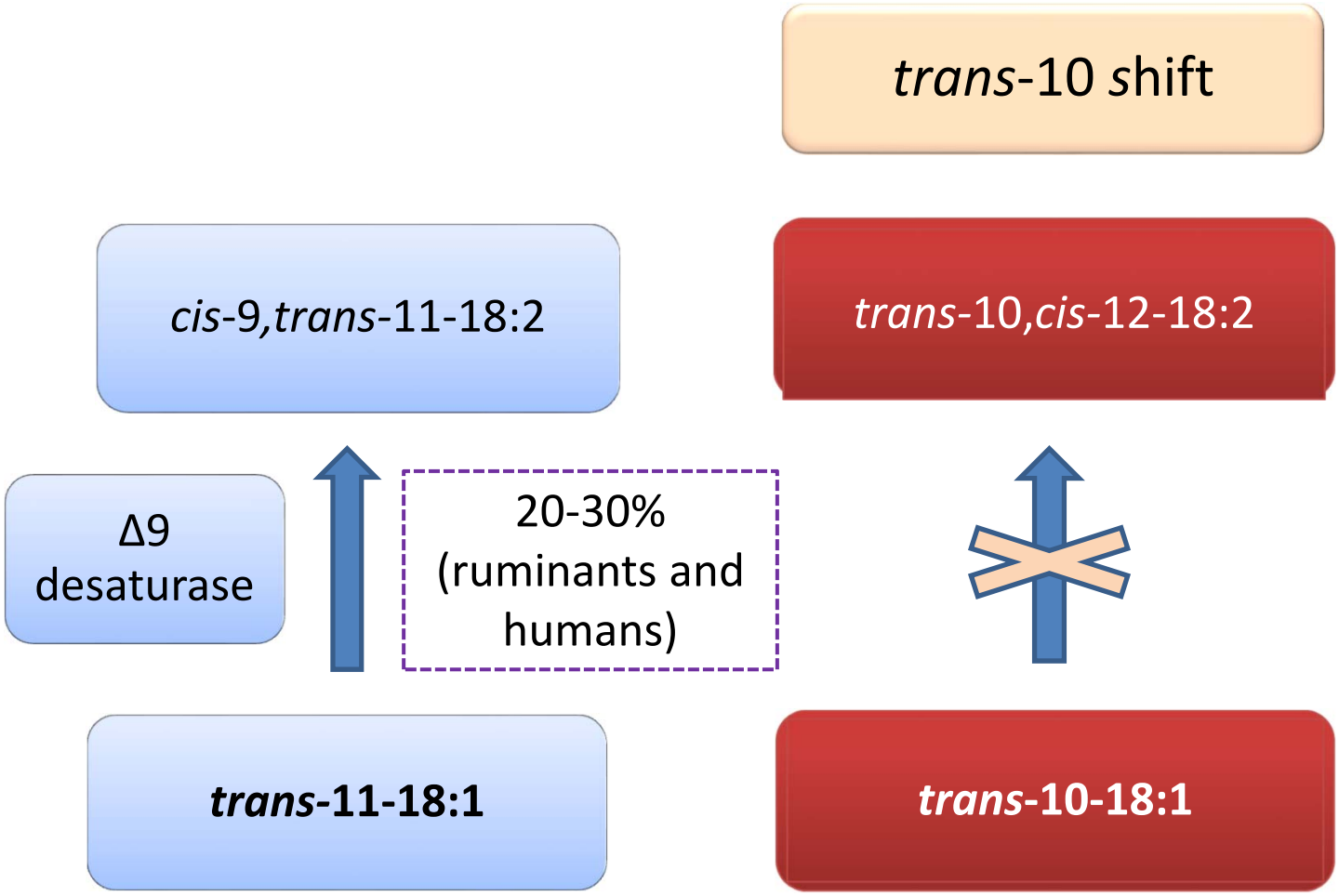
Increase *trans*-11-18:1 and *cis*-9,*trans*-11-18:2 deposition (meat and subcutaneous fat)

What is the *trans*-10 shift?



Desaturation in the tissues



Importance of the *trans*-10 shift

Predominance of *trans*-10-18:1 in detriment of *trans*-11-18:1

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Decrease of *cis*-9,*trans*-11-18:2 in the tissues

Dairy ruminants → milk fat depression

trans-10-18:1 is potentially deleterious to human health - cardiovascular disease

When does the *trans*-10 shift occur?

Concentrate-based diets

- High content of starch
- Low content of forrage
- Oils rich in polyunsaturated fatty acids (PUFA)

Occurs even without lipid supplementation

Aims of the work

Replacement of the cereal by other energy sources in oil supplemented diets

- Cereal (barley)
- Dehydrated citrus pulp
- Dehydrated sugar beet pulp
- Soy hulls

Experiment

National Institute of Agronomic and Veterinary Research (INIAV)

Material and methods

40 lambs Merino Branco (2/pen)

20 pens

6 weeks

Determination of daily ingestion and weekly weight

Treatments

4 diets

Basal diet

Forage (20%)

Dehydrated lucerne

Concentrate (80%)

Wheat bran

Soybean meal

Fish (1%) and soybean (5.9%) oils

Minerals and vitamins

Alternative energy sources

(52%)

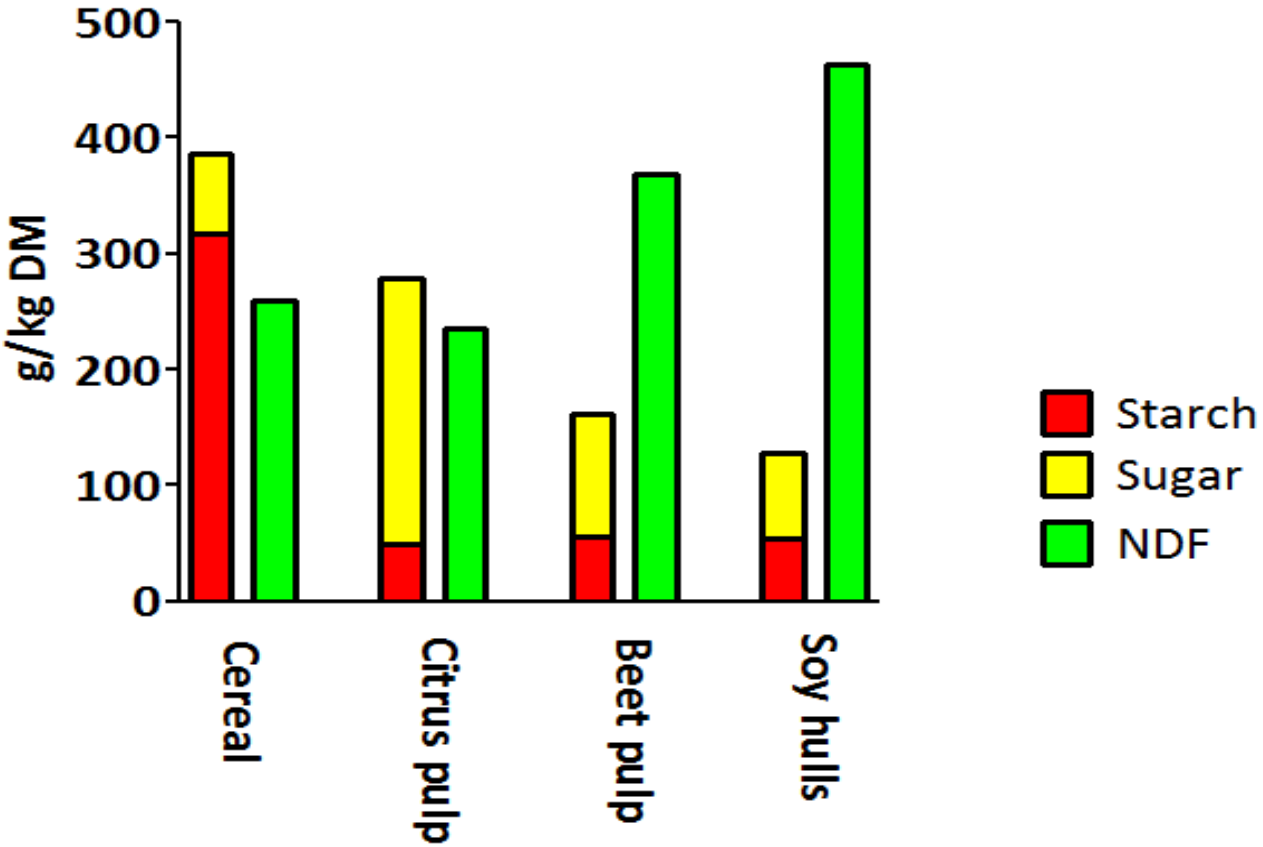
Cereal (barley)

Dehydrated citrus pulp

Dehydrated sugar beet pulp

Soy hulls

Composition of the diets



Lambs were slaughtered

Lipid analysis

Subcutaneous fat

Longissimus thoracis muscle

Lipid analysis

Extraction of total lipids

Dichloromethane:methanol (2:1 v/v)

Evaluation of fatty acid (FA) methyl esters

Combined transesterification

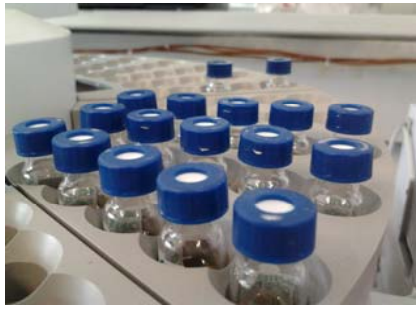
Quantification with gas chromatography

Column SP-2560, 100 m, 0.25 mm i.d., 0.20 µm

Identification with mass spectrometry

Separation of CLA isomers (muscle)

High efficiency liquid chromatography (3 Ag+ - HPLC columns)



Statistic analysis

Mixed procedure of SAS

Experimental unit=pen

Lambs within pen were considered as subsampling

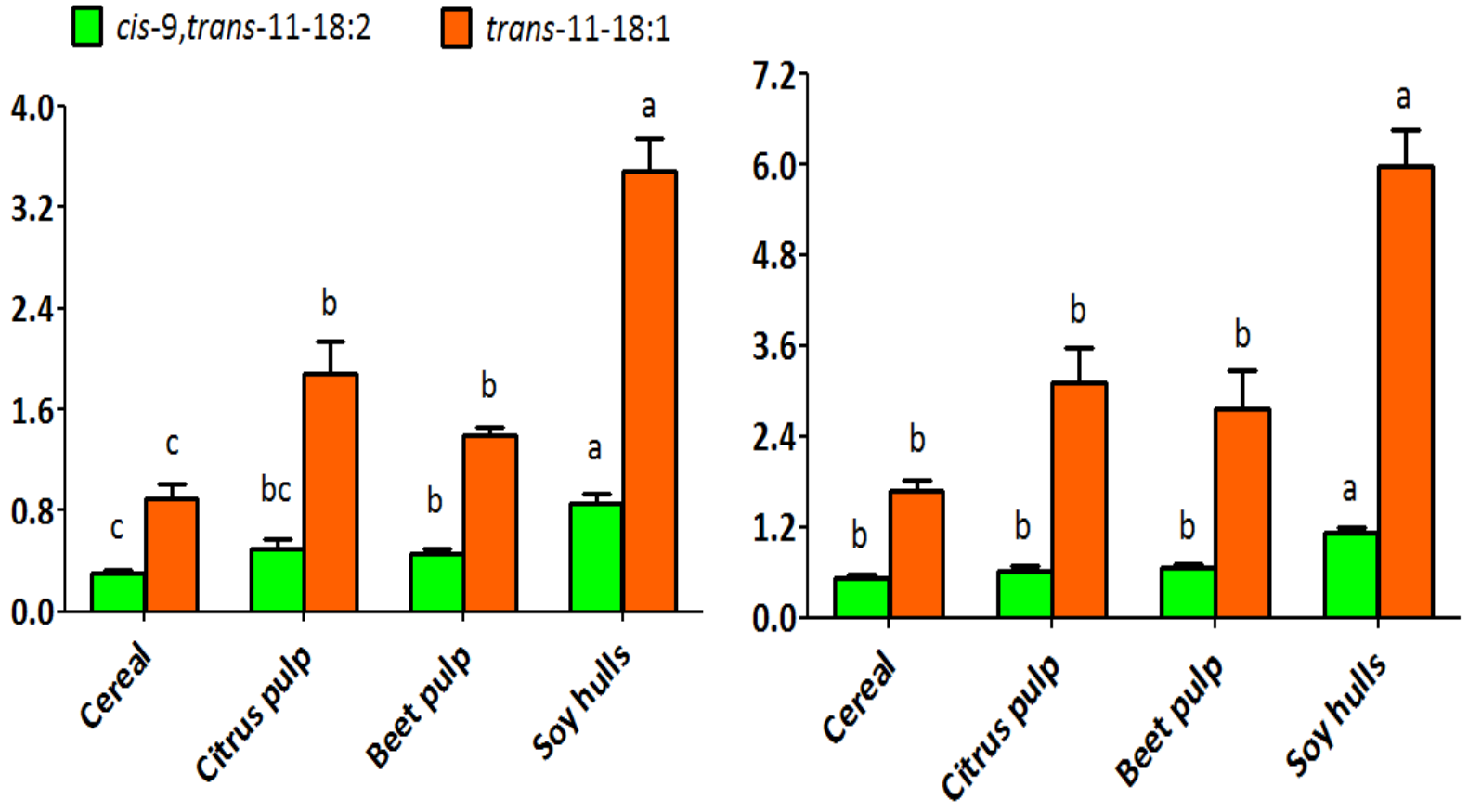
Level of significance $\alpha=0.05$

Results

cis-9,*trans*-11-18:2 and *trans*-11-18:1 (% total FA)

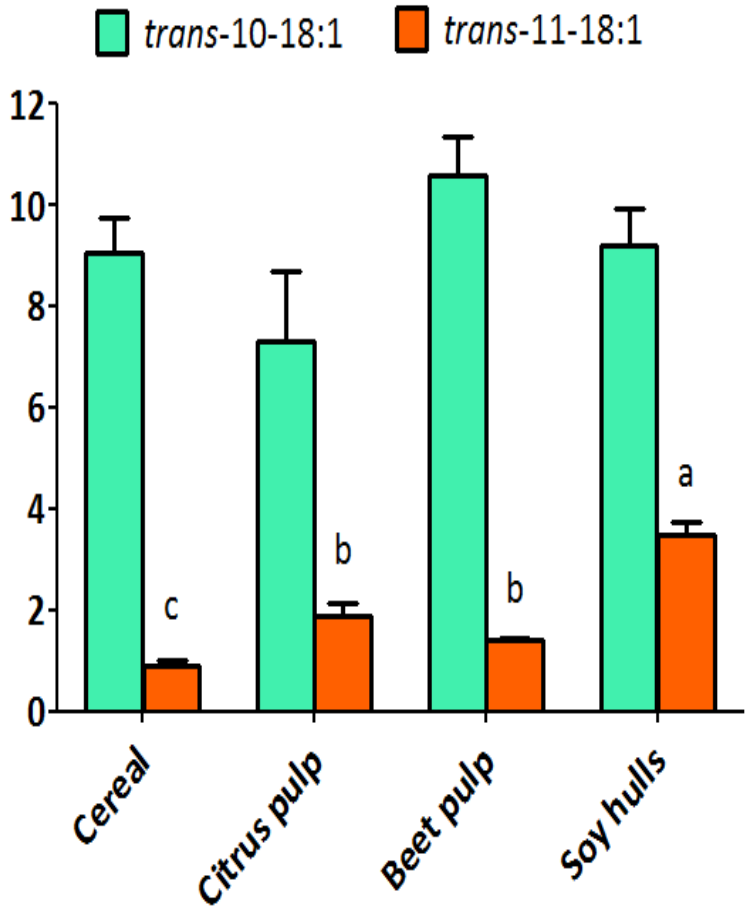
Muscle

Subcutaneous fat

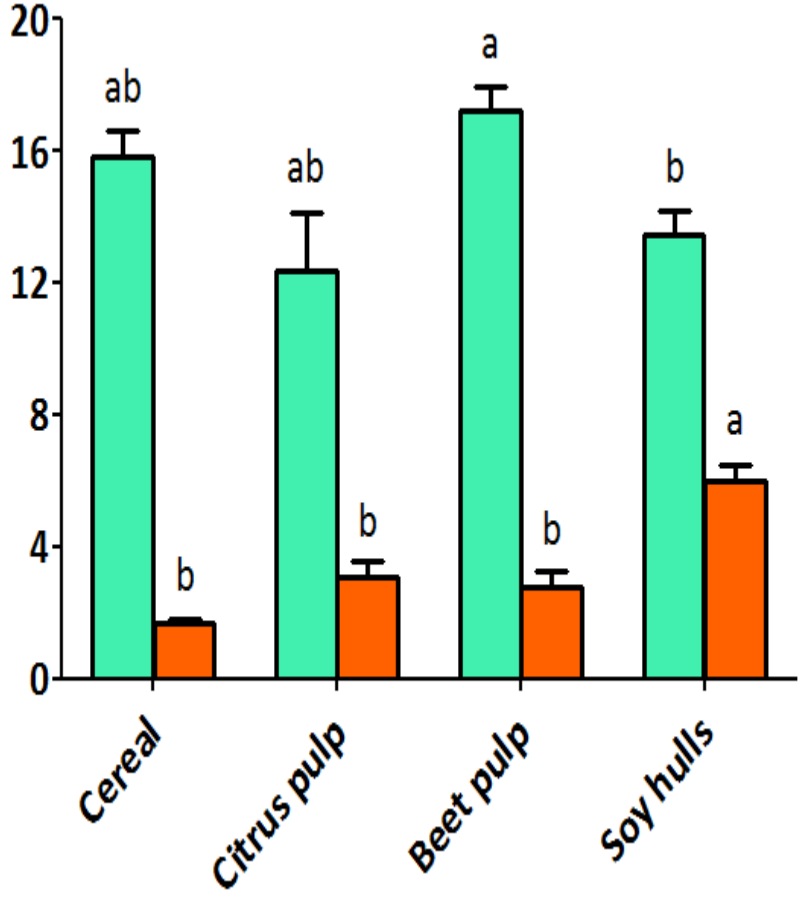


trans-10-18:1 and *trans*-11-18:1 (% total FA)

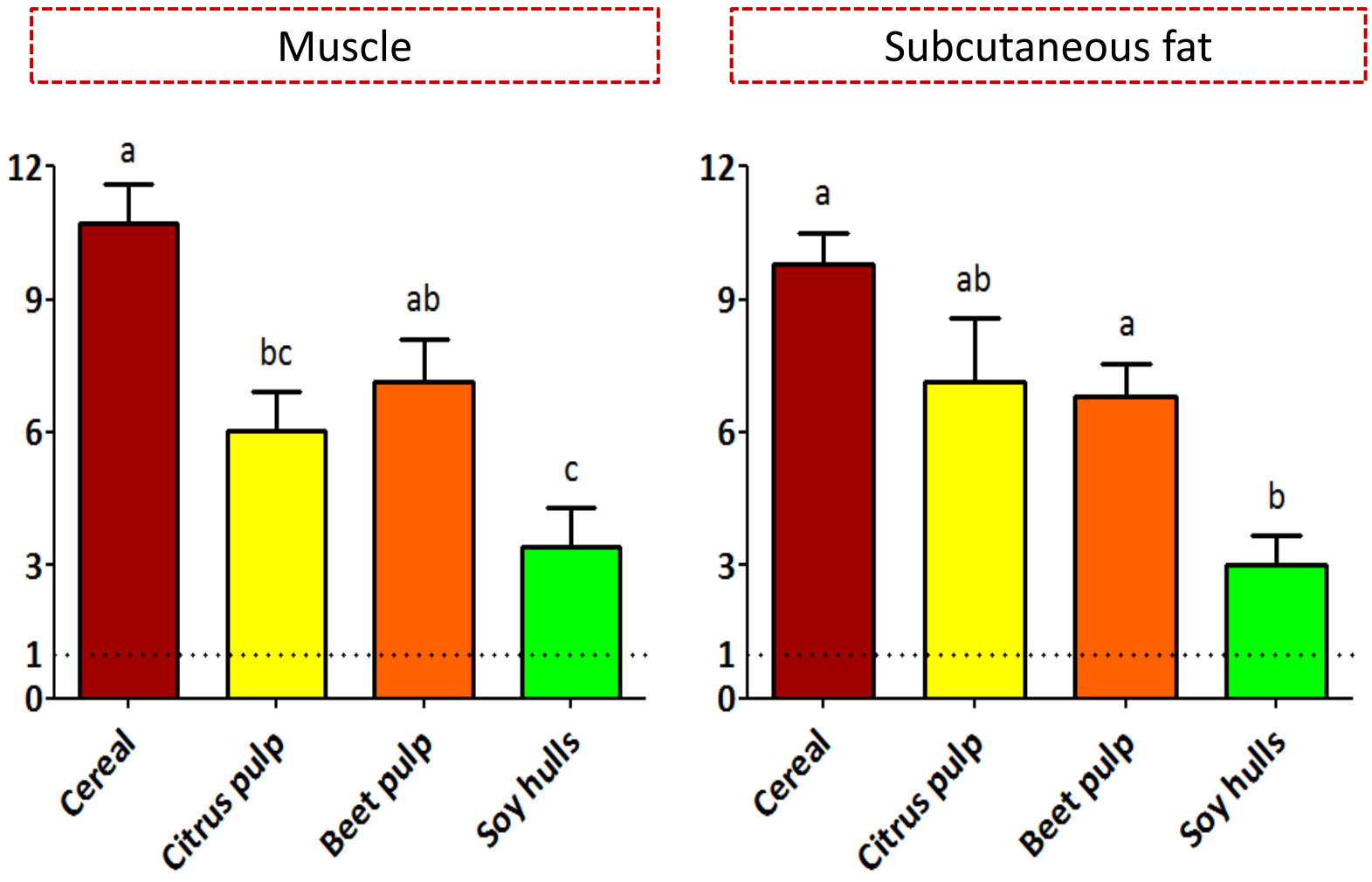
Muscle



Subcutaneous fat



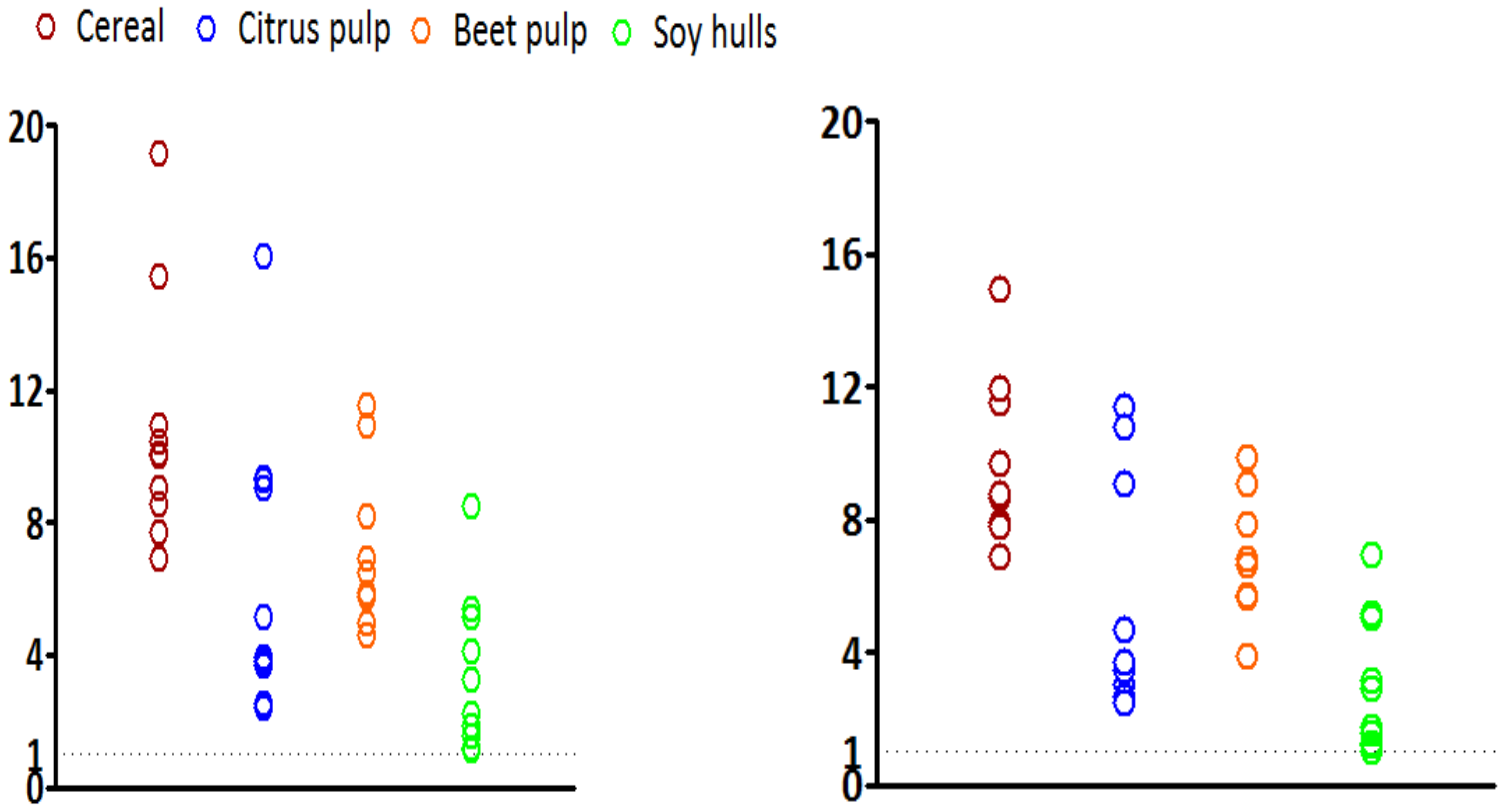
trans-10-18:1/*trans*-11-18:1 ratio



trans-10-18:1/*trans*-11-18:1 ratio - individual variability

Muscle

Subcutaneous fat



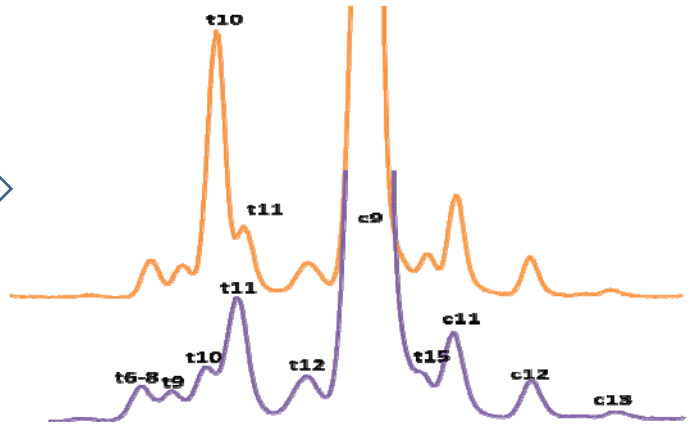
Implications

Low starch and high NDF intake
did not prevent the *trans*-10 shift

trans-10-18:1/*trans*-11-18:1 ratio ≥ 3

High accumulation of *trans*-10-18:1 (7.32 to 17.20 % total FA)

***trans*-10 shift**



The starch is not indispensable for *trans*-10 shift´s induction

Possible determinant factors for *trans*-10 shift

Type of NDF?

Rate of ruminal fermentation?

Other hypotheses?????

Thank you for your attention!