Enhancing the nutritional quality of beef

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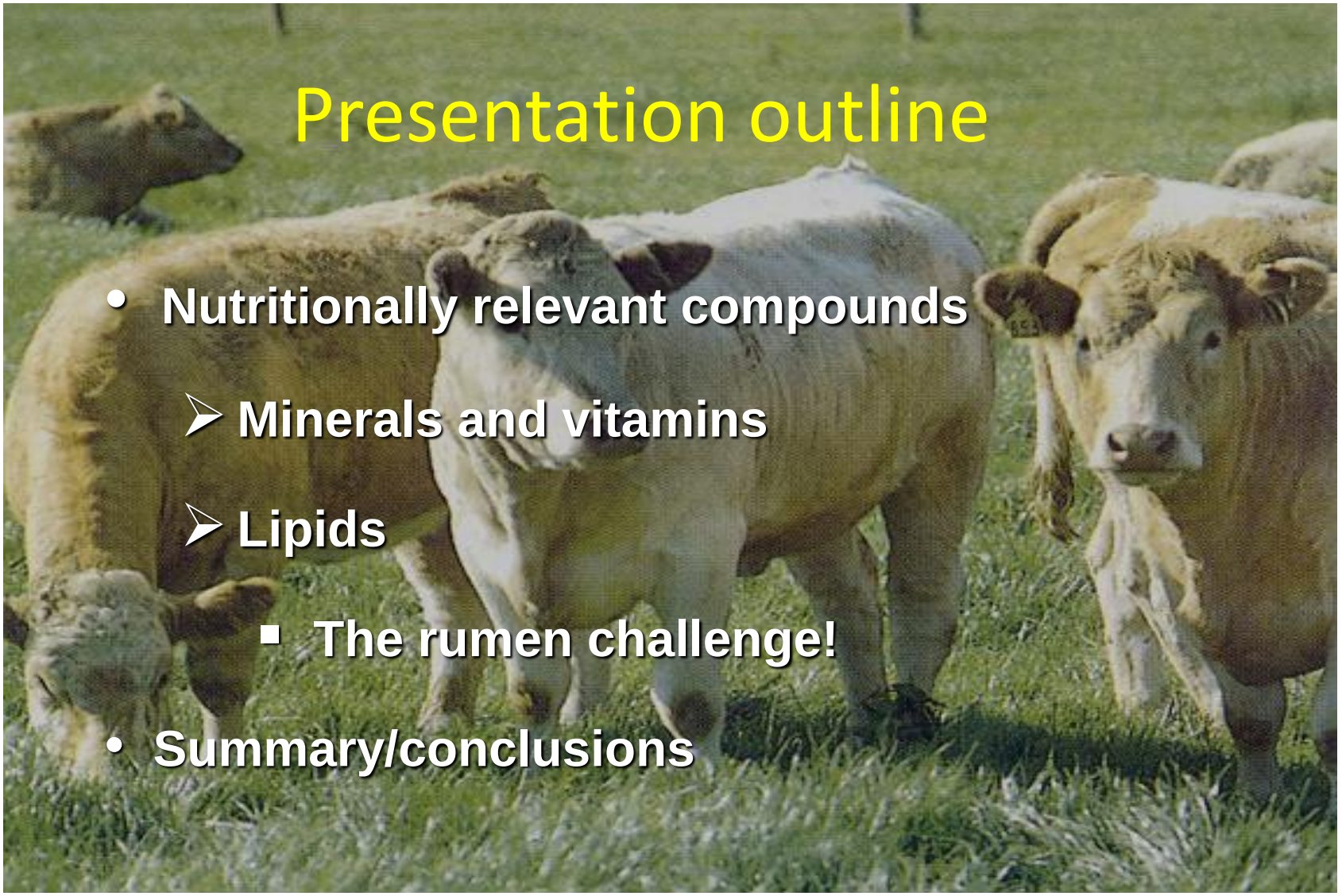


Presentation outline

- Nutritionally relevant compounds
  - Minerals and vitamins
  - Lipids
    - The rumen challenge!
- Summary/conclusions

CORRIGENDA

Corrigendum to Regulation (EC) No 1924/2006 of the European Parliament and of the Council of 20 December 2006 on nutrition and health claims made on foods

(Official Journal of the European Union L 404 of 30 December 2006)

Regulation (EC) No 1924/2006 should read as follows:

REGULATION (EC) No 1924/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 20 December 2006

on nutrition and health claims made on foods

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 95 thereof,

Having regard to the proposal from the Commission,

Having regard to the Opinion of the European Economic and Social Committee (1),

Acting in accordance with the procedure laid down in Article 251 of the Treaty (2),

Whereas:

(1) An increasing number of foods labelled and ... the Community bear nutrition ... order to ensure a high level ... and to facilitate their ch... including impo... adequately ... quisi...

(2) ... ions) which have tradi... ...ate a particularity of a class of ... which could imply an effect on ... such as 'digestive' or 'cough drops', should ...pted from the application of this Regulation. ... It is ... the us...

(3) General ... 2000/13/E... ...of the Council of ... ...mation of the laws of the ... ...g to the labelling, presentation a... ...foodstuffs (3). Directive 2000/13/EC generally prohibits the use of information that would mislead the purchaser or attribute medicinal properties to food. This Regulation should complement the general principles in Directive 2000/13/EC and lay down specific provisions concerning the use of nutrition and health claims concerning foods to be delivered as such to the consumer.

(4) This Regulation sh... claims made ... inter ...

(6) Non-beneficial nutrition claims are not covered by the scope of this Regulation; Member States intending to introduce national schemes relating to non-beneficial nutrition claims should notify such schemes to the Commission and to other Member States in accordance with Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services (4).

(1) OJ C 110, 30.4.2004, p. 18.

(2) Opinion of the European Parliament of 26 May 2005 (OJ C 117 E, 18.5.2006, p. 187), Council common position of 8 December 2005 (OJ C 80 E, 4.4.2006, p. 43) and Position of the European Parliament of 16 May 2006 (not yet published in the Official Journal). Council Decision of 12 October 2006.

(3) OJ L 109, 6.5.2000, p. 29. Directive as last amended by Directive 2003/89/EC (OJ L 308, 25.11.2003, p. 15).

(4) OJ L 204, 21.7.1998, p. 37. Directive as last amended by the 2003 Act of Accession.

STATUTORY INSTRUME...

...D HEALTH CLAIMS MADE ON ...GULATIONS 2014

Regulation (EU) 1924/2006 & SI 11 2014

Nutrition claims for vitamins and minerals

‘Source of’ = 15% of Reference intake per 100g

‘High In’ = 30% of Reference intake per 100g

Nutrition claims for beef = “source of” or “high in”

Protein

Minerals
Iron
Zinc
Selenium
Potassium
Phosphorus

Vitamins
Niacin
Vitamin B6
Vitamin B12
Riboflavin

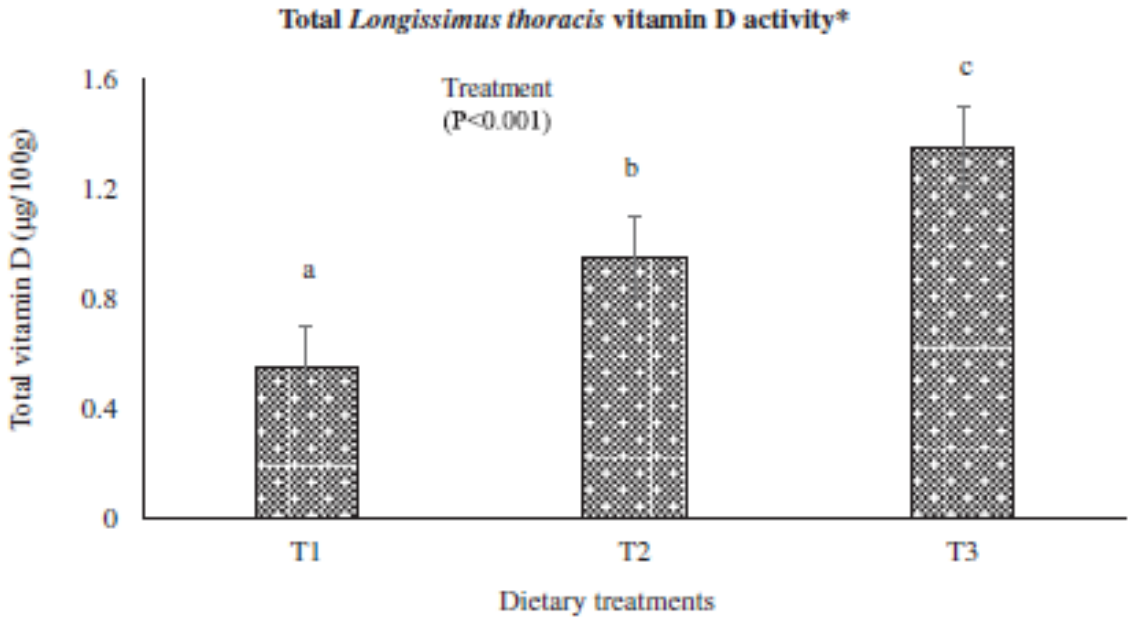
Commission Regulation (EU) No. 116/2010

Mineral concentration (mg/kg)

	Conc	GSR	GSN	Grass	Sig
Sodium	262	266	266	318	***
Iron*	14	16	14	21	***
Phosphorous*	1205	1140	1209	1422	***
Zinc*	36	41	40	50	***
Selenium*	0.25	0.56	0.63	1.49	***

Biofortification of beef

Meat Science 134 (2017) 103–110



(Duffy et al., 2017)

Biofortification of beef (µg/100g)

	Target	CON		SUPP	
Selenium	8.2	10	Source	12.6	Source
Vitamin K	11.3	11.2	Almost	22.3	Source
Vitamin D	0.8	0.5		1.5	Source
Vitamin E	1800	157		654	

(Huag et al., 2018)

Nutrition claims for fat/fatty acids

- Low total fat content (≤ 3 %)
- Low saturated fatty acid content (≤ 1.5%)
- High monounsaturated fatty acids (≥ 45% fatty acids)
- High polyunsaturated fatty acids (≥ 45% fatty acids)

Commission Regulation (EU) No. 116/2010

- Source of omega -3 fatty acids

  300mg “grass” ALA/100g and / 100 kcal

  40mg “marine” EPA +DHA/100g and 100 kcal

- High in omega -3 fatty acids

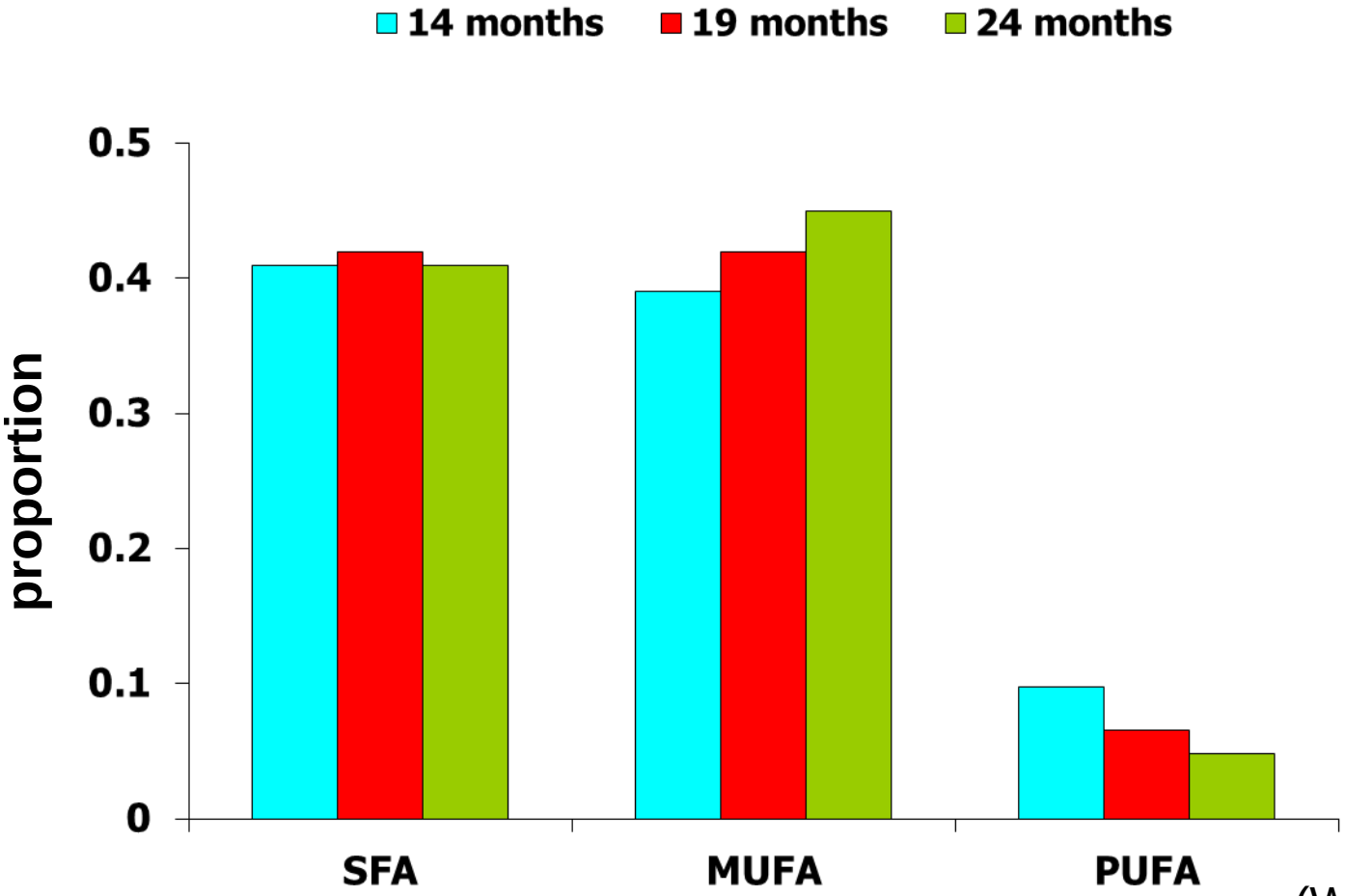
  600mg ALA/100g and 100 kcal

  80mg EPA + DHA/100g and 100 kcal

Commission Regulation (EU) No. 116/2010

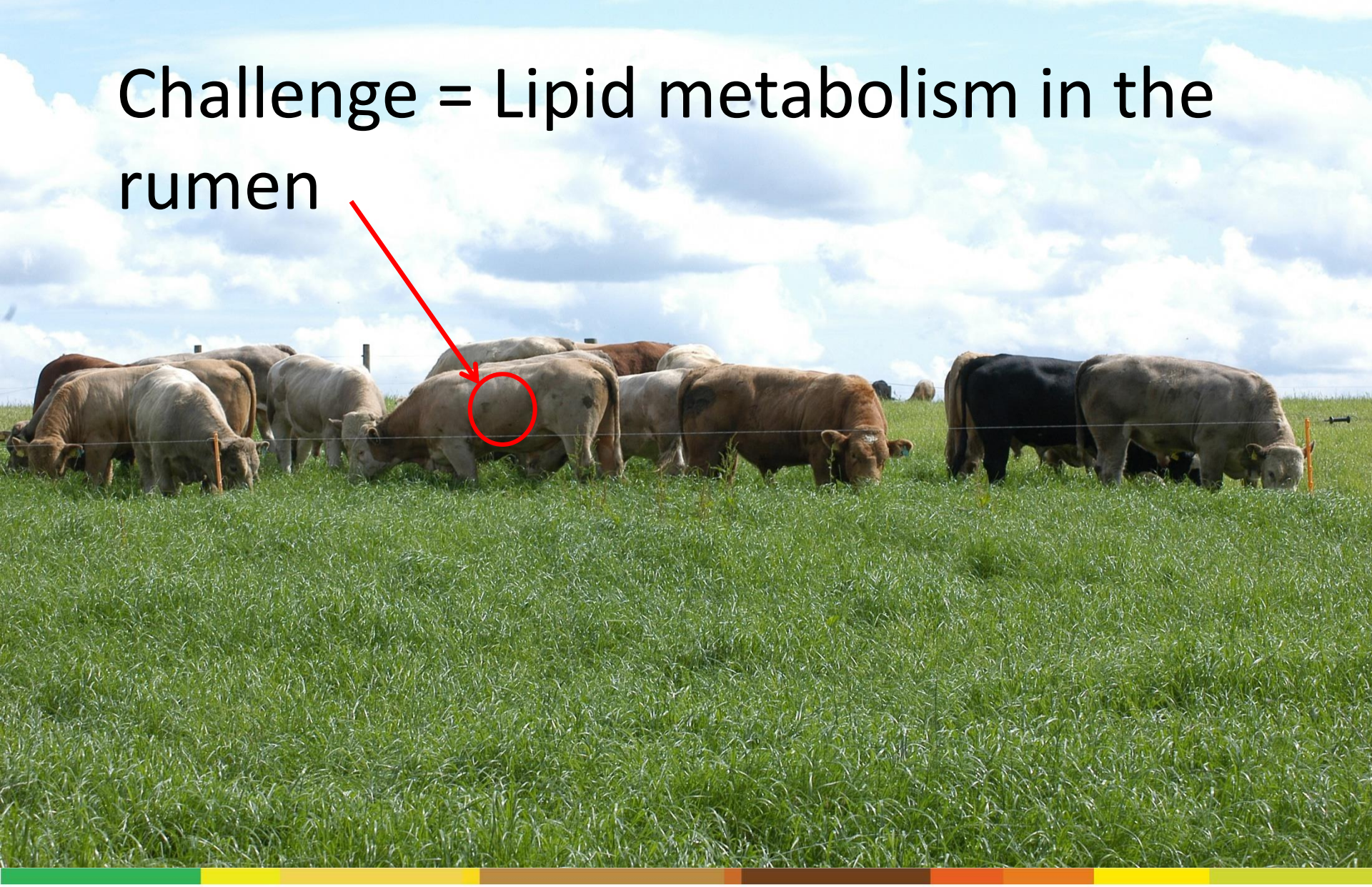
Intramuscular fat (IMF)

Fatty acids in beef: Duration of feeding



(Warren et al., 2004)

Challenge = Lipid metabolism in the rumen



Sources of dietary fatty acids

- Forages - grass 60% alpha-linolenic acid (C18:3 n-3)
- Oils and oilseeds

  rapeseed C18:1n-9 oleic acid

  sun/safflower C18:2n-6 linoleic acid

  linseed C18:3n-3 alpha-linolenic acid

- Fish oil and marine algae - long chain EPA and DHA

Fatty acid concentration (g/100g)

	Conc	GSR	GSN	Grass	Sig
Total	6.1	4.8	4.4	4.3	***
Saturated	2.6	2.2	1.9	1.8	***
Monounsaturated (%)	49.9	45.9	47.8	47.8	***
Polyunsaturated (%)	5.7	5.9	6.2	6.9	***
Omega-3	0.04	0.07	0.08	0.10	***
Omega-6	0.21	0.14	0.14	0.13	***

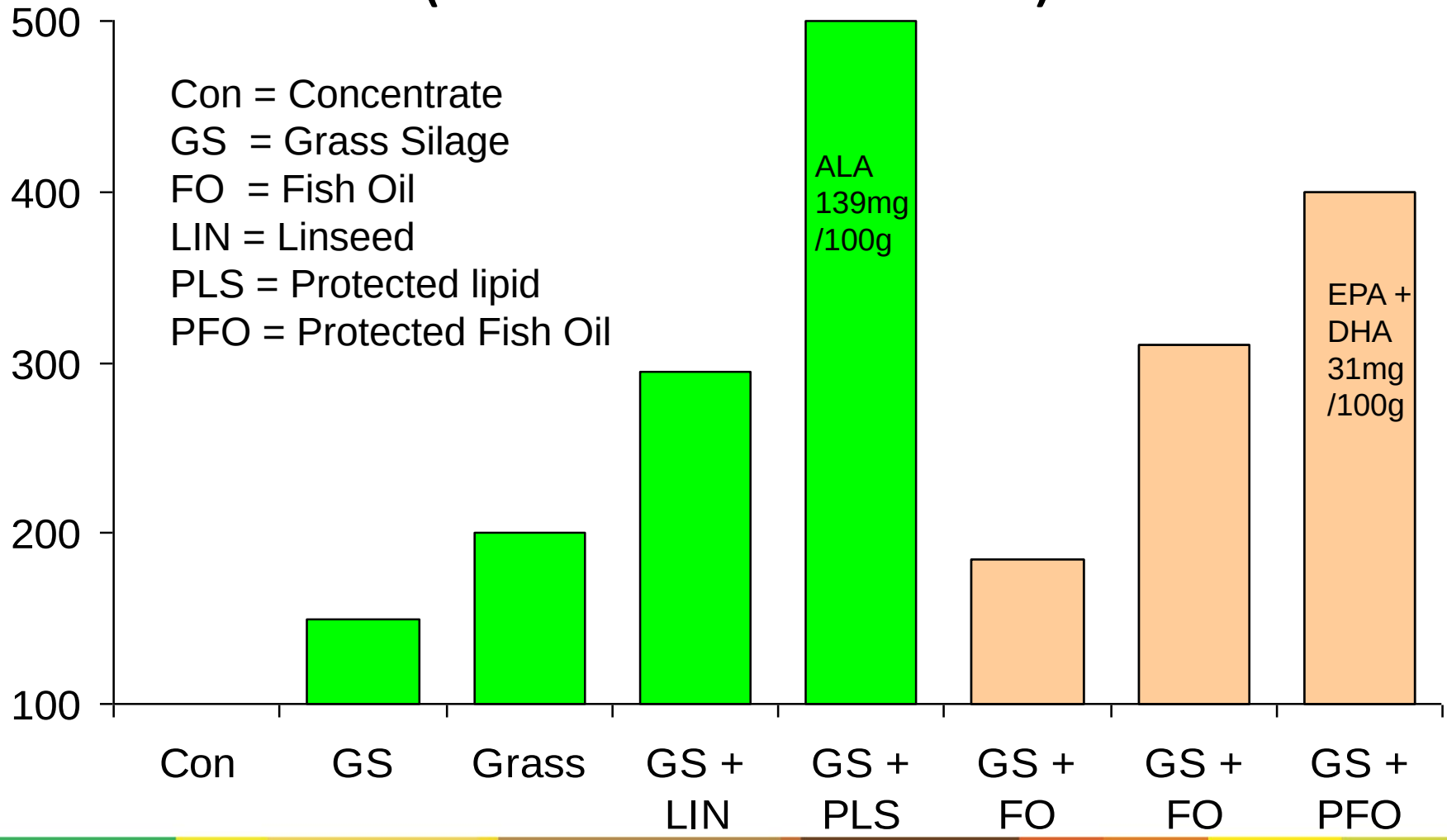
Effect of different sources of oil

Fatty acids	Control	Linseed	Fish oil	Linseed/ fish oil	s.e.d.	Sig.
18:3*n*-3	22	43	26	30	5.6	**
20:5*n*-3	11	16	23	15	1.9	***
22:5*n*-3	15	15	16	16	0.7	NS
22:6*n*-3	2.2	2.4	4.6	4.9	0.52	***

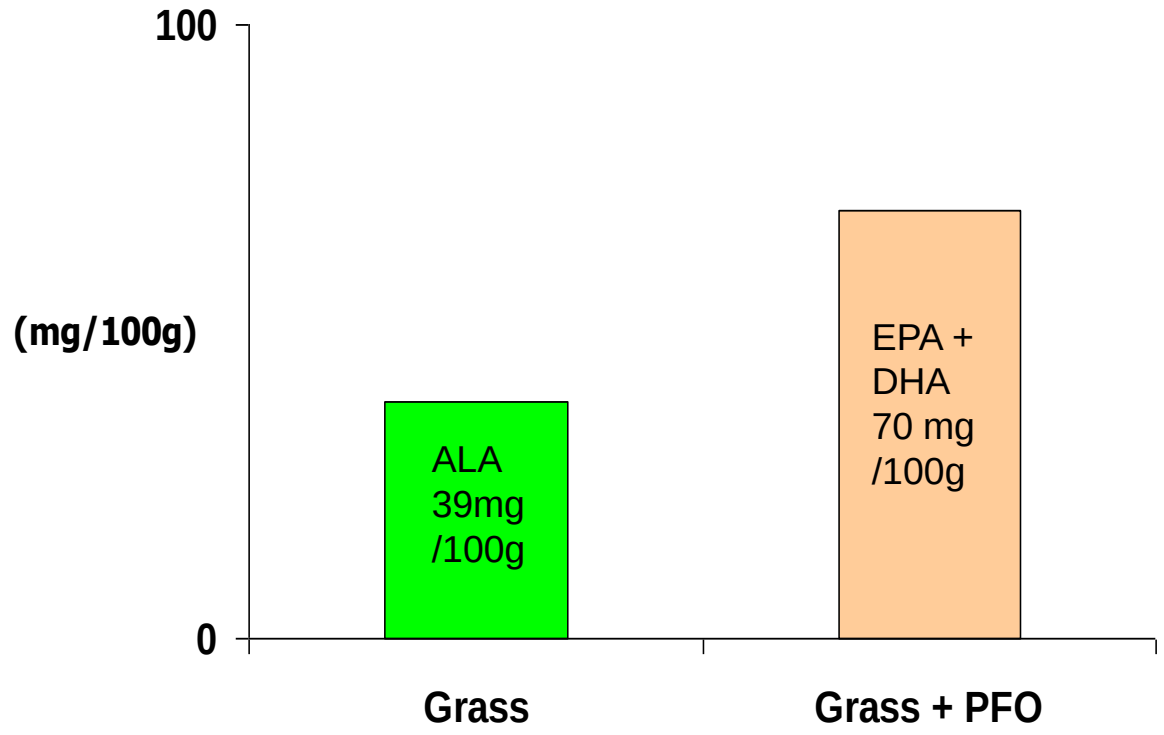
(mg/100 g tissue)

(Scollan et al. 2001)

Omega-3 PUFA concentrations in beef (Concentrate = 100)

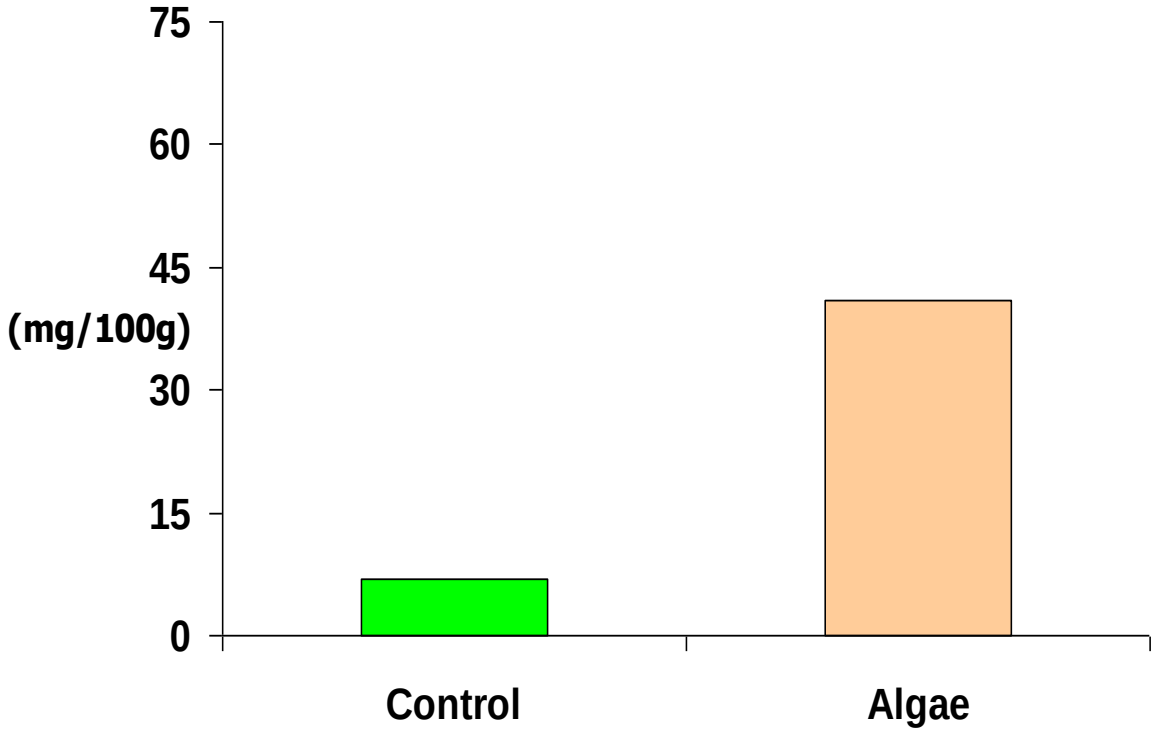


Omega-3 PUFA concentrations in beef



(Moloney *et al*., unpub)

EPA + DHA concentrations in beef



(Phelps *et al*., 2016)

Beef: A source of omega – 3 fatty acids !

Nutritional quality of beef

- Compared to concentrate-fed beef, grass-fed beef had a higher concentration of:

  Na, Mg, P, K, Ca, Mn, Fe, Cu, Zn and Se and vitamin E

- Ration didn't change those nutrients that can be labelled "source of"

- Dietary fortification with minerals (?) and vitamins has potential to increase concentrations in beef

Nutritional quality of beef

- Dietary effects on muscle fatty acid composition greater than breed effects
- Muscle fatty acid composition reflects dietary composition: effects are small!
- Nutritional quality (omega-3) can be enhanced by lipid supplementation: greatest effect seen with ruminally–protected lipid

Waitrose UK

http://www.waitrose.com/home/inspiration/about_waitrose/about_our_food/omega-3-chicken.html

Consumption of grass-fed beef has the potential to change the composition of dietary fatty acids and to improve population adherence to dietary recommendations

Suggests that habitual consumption of grass-fed beef is a potential public health strategy to improve dietary fat quality.

Thank you