The effect of suckler cow genotype and stocking rate on dry matter intakes and methane emissions

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Introduction (I)

- Agriculture produces about 43% of the UK's annual methane emissions
  - 85% of methane (CH_4) from enteric fermentation

- Methane emissions are an inevitable by-product of ruminant production

- UK Climate Change Act (2008) committed to reduce GHG emissions by 80% by 2050 (compared to 1990 levels)

- 'Non-dairy' cattle account for 48% of methane emissions from animal sources in the UK

Introduction (II)

- There is a paucity of methane emission data from beef cattle, particularly on fresh/grazed diets for:
  - suckler cows
  - growing cattle
  - different breeds

- Agricultural Greenhouse Gas Inventory Research Platform set up to address these knowledge gaps and improve the UK national inventory

Aim

To evaluate the dry matter intake and methane emissions from grazing suckler cows of contrasting genotypes

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Materials and Methods (II)

- Experimental design: 2 x 2 factorial design
  - 2 suckler cow genotypes
  - 2 stocking rates

- 48 spring calving suckler cows
  - 24 Limousin x Holstein Friesian (LH) (by-product of dairy herd)
  - 24 Stabiliser (ST) (selected beef composite)

	LH	ST
Live weight (kg)	535	567
Body condition score (1-5 scale)	2.9	3.0

Balanced for parity and days from calving

Materials and Methods (I)

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- 48 spring calving suckler cows
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- 2 stocking rates
  - High (HS): 40
  - Low (LS): 60 ratio

- 4 balanced treatment groups containing 12 cows
  - ST, HS
  - ST, LS
  - LH, HS
  - LH , LS

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Materials and Methods (II)

- Cows grazed a perennial ryegrass (*L. perenne*) sward

- Grass samples collected every 4 days for NIRS analysis of quality

- DMI estimated using the *n*-alkane technique (Richmond *et al., 2013)*
  - cows dosed once per day with C32 n-alkane for 10 days
  - faeces samples collected for 5 days commencing day 7 (7-12)
  - estimated based on ratios of C32 and C33 in the consumed forage and corresponding faeces samples

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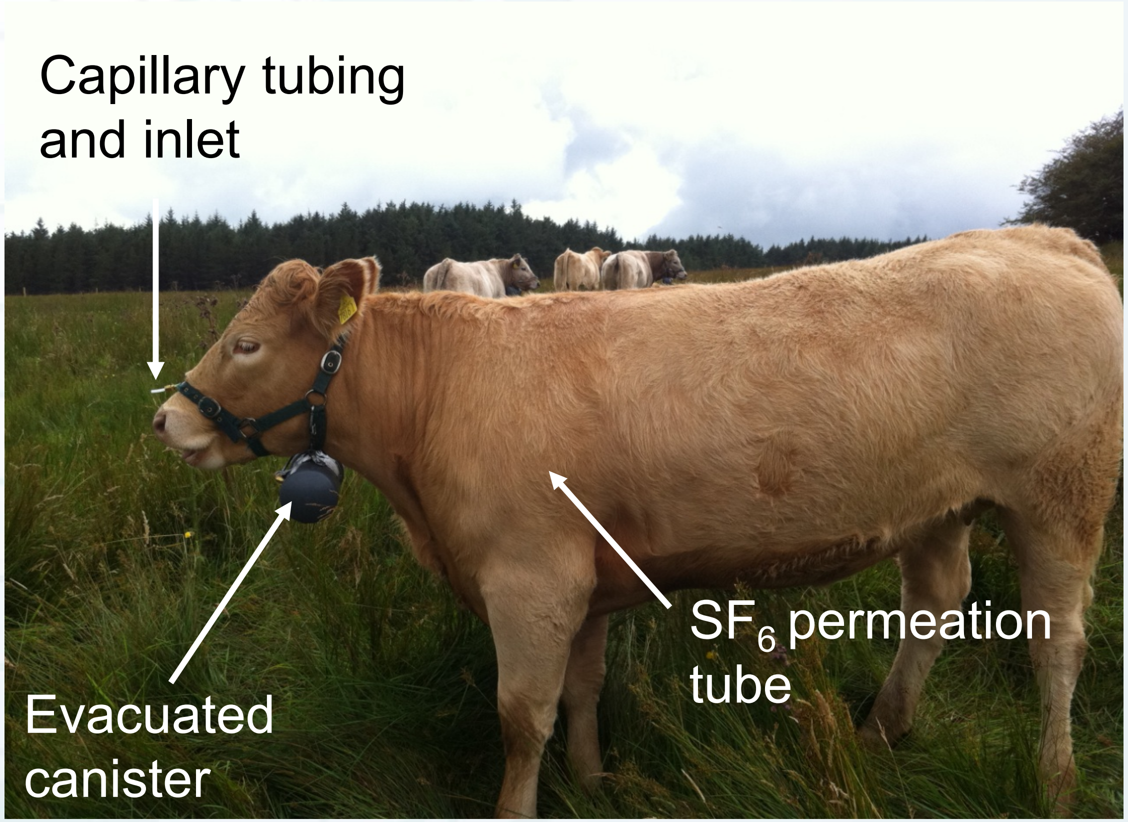
Materials and Methods (II)

- CH_4 emissions estimated daily using the SF_6 technique



- Data analysed using ANOVA

Results (I)

Table 1:*Mean chemical composition of vegetation for the four treatments*

	ST LS	ST HS	LH LS	LH HS	Breed	s.e.m.	Stocking rate	s.e.m.
ADF (g/kg)	301	308	303	312	NS	2.3	NS	2.3 *
NDF (g/kg)	537	550	549	552	NS	8.6	NS	8.6
GE (MJ/kg)	18.2	18.2	18.4	18.2	NS	0.11	NS	0.11
WSC (g/kg)	130	131	134	149	NS	7.0	NS	7.0
CP (g/kg)	149	145	148	128	NS	7.4	NS	7.4

- There was no significant effect on grass quality

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Results (II)

The effect of genotype on dry matter intake and methane emissions

	Genotype			
	ST	LH	s.e.m.	Sig
DMI, kg/d	15.4	13.8	0.56	*
CH_4, g/d	274	245	8.6	*
CH_4, g/d per kg DMI	18.6	17.2	0.58	NS
CH_4, g/d per kg BW	0.47	0.42	0.015	NS

- ST cows had a significantly higher DMI relative to the LH cows
- ST cows emitted significantly higher amounts of methane on a daily basis

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Results (II)

The effect of stocking rate on dry matter intake and methane emissions

	Stocking rate			
	HS	LS	s.e.m	Sig
DMI, kg/d	14.5	14.6	0.43	NS
$CH_{4,}$ g/d	262	258	8.7	NS
$CH_{4,}$ g/d per kg DMI	17.7	18.0	0.55	NS
$CH_{4,}$ g/d per kg BW	0.44	0.44	0.013	NS

- Stocking rate had no significant effect on intake and methane emissions
- There were no significant interactions

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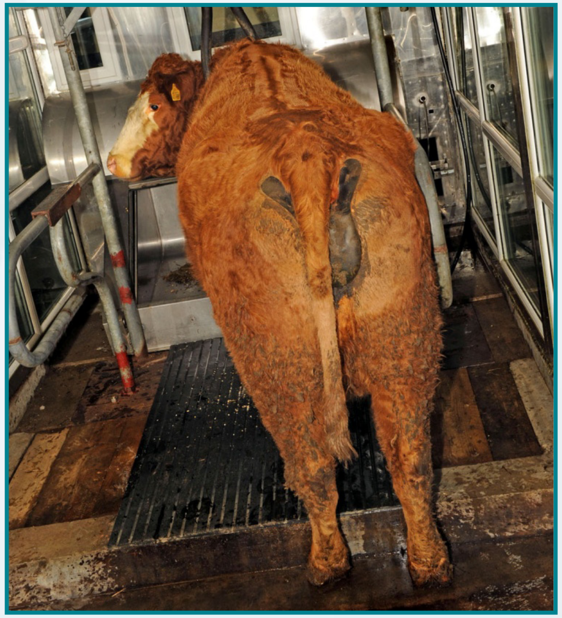
Conclusion

- The higher DMI in the ST cows relative to the LH cows resulted in the higher daily CH_4 emission

- Data suggest DMI is the main driver in CH_4 production



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