The effect of forage source and supplementary rumen protected methionine on the efficiency of nitrogen use autumn calved dairy cows offered a low crude protein diet

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Introduction

- Primary focus of nutrition in recent years has been the environment
- Dairy cows excrete large portions of ingested N
- This N can be lost to the environment as…
  - Ammonia (NH_3)
  - Nitrous oxide (N_2O)
  - Nitrate leachate
- These are governed by international legislation
  - Gothenburg Protocol
  - EU 2020
  - Nitrates Directive

Nutrition and Nitrogen excretion

- Reducing dietary crude protein or N intake has been shown to reduce N excretion *(Mulligan et al. 2004)*
- However low amino acids (AA) may limit production of which methionine is the 1st limiting AA *(NRC, 2001)*
- Grass silage is noted for high levels of rumen fermentable N and low and/ or low rumen fermentable energy
- Maize silage is known to improve ENU vs. grass silage *(Burke et al., 2007)*

Objectives of Experiment

1. To evaluate the effect of forage source; grass silage (GS) vs. maize silage (MS) and…
2. The effect of supplementary rumen protected methionine on…

   The ENU in lactating dairy cows offered a low crude protein diet

Materials and Methods

- 2*2 factorial latin square design
- 4 diets 4 periods
- 2 animals per diet per period
  - 1 primiparous + 1 multiparous
  - Balanced for parity, milk yield, protein yield and days in milk
- Animals were housed in metabolic stalls
- 3 day stall adjustment period
- 5 day nitrogen balance per period
- 2 weeks for dietary readjustment

Dietary Treatments

- All diets were fed as total mixed rations once daily
- 4 diets
    - GS based TMR (T1)
    - GS based TMR + rumen protected methionine (T2)
    - MS based TMR (T3)
    - MS based TMR + rumen protected methionine (T4)
- Iso-energetic and iso-nitrogenous
- Met UFL and PDI requirements for production
- T1 + T3 deficient in methionine
- T2 + T4 adequate in methionine

Dietary Ingredients

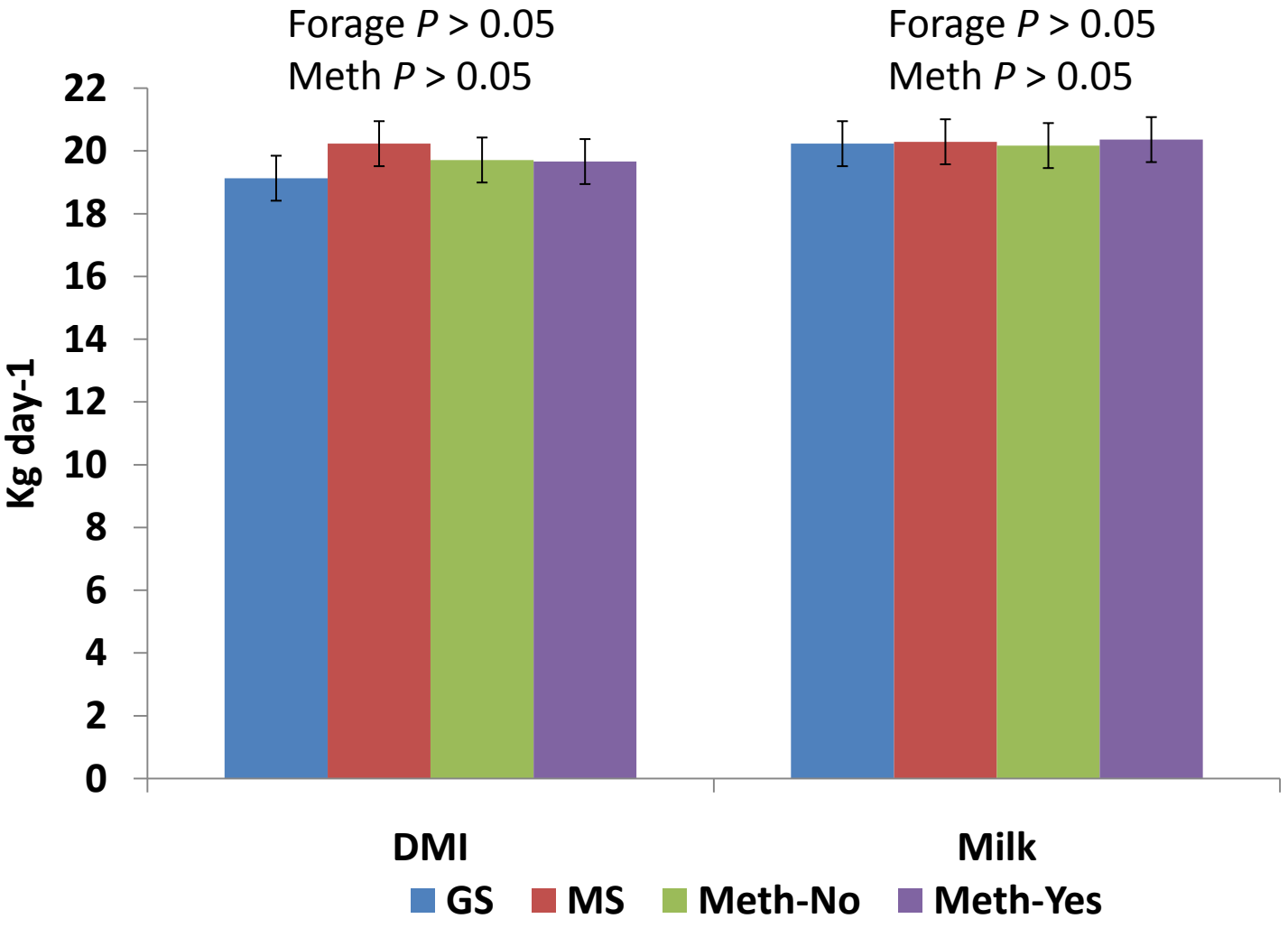
	T1	T2	T3	T4
Ingredients (g kg DM^{-1})				
Grass Silage	460	460	120	120
Maize Silage	100	100	520	520
Barley Straw	0	0	20	20
Rolled Barley	210	210	80	80
Sugar Beet Pulp	130	130	120	120
Soybean	90	90	130	130
Metasmart	0	2.1	0	2.1
Calcium	0	0	4.7	4.7
Minerals / Vitamins	10	10	10	10
Grass : Maize	82 : 18	82 : 18	18 : 82	18 : 82
Forage : Concentrate	56 : 44	56 :44	64 : 36	64 : 36

Dietary Composition

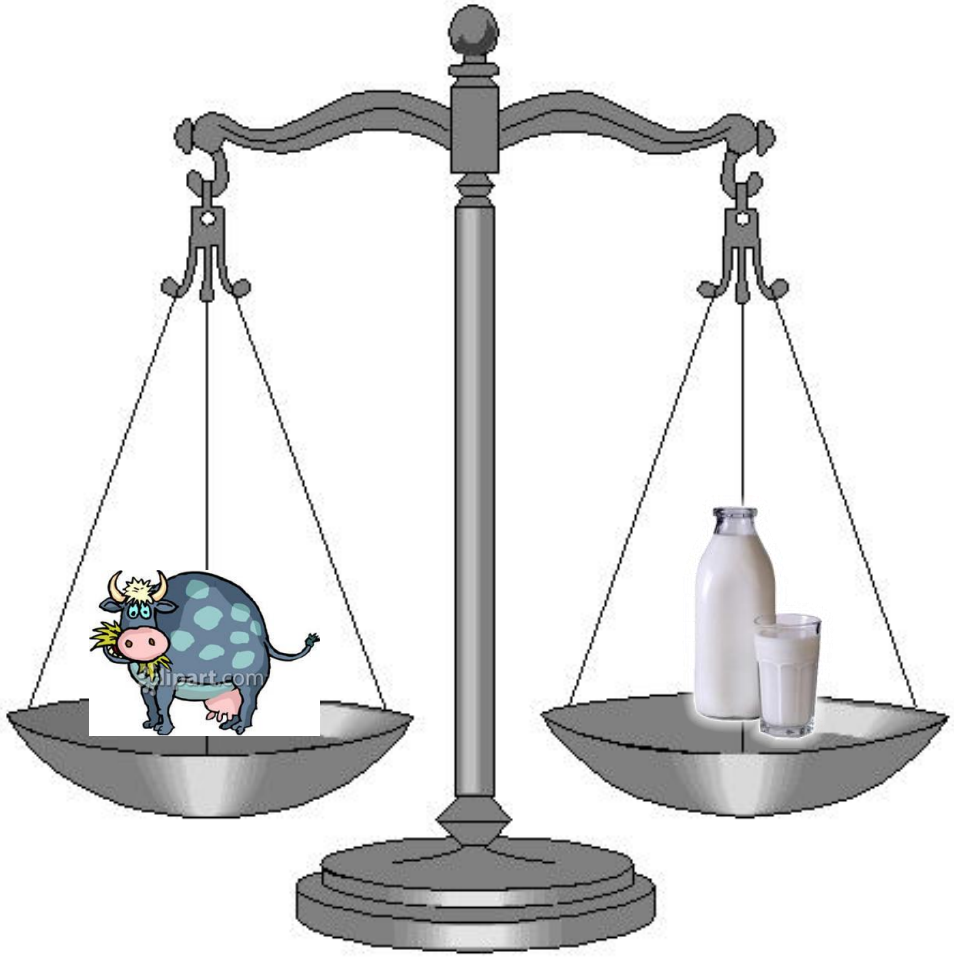
	T1	T2	T3	T4
DM *(g kg^{-1})*	363	365	400	410
Energy *(UFL kg DM^{-1})*	0.96	0.95	0.97	0.97
Composition *(g kg DM^{-1})*				
DMD	739	737	739	733
CP	132	132	133	134
Starch	146	147	178	177
NDF	500	514	591	583
ADF	216	205	223	229
Ash	64	62	60	58
PDIN	94	95	100	101
PDIE	96	97	100	101
PDIA	44	46	49	50


Results

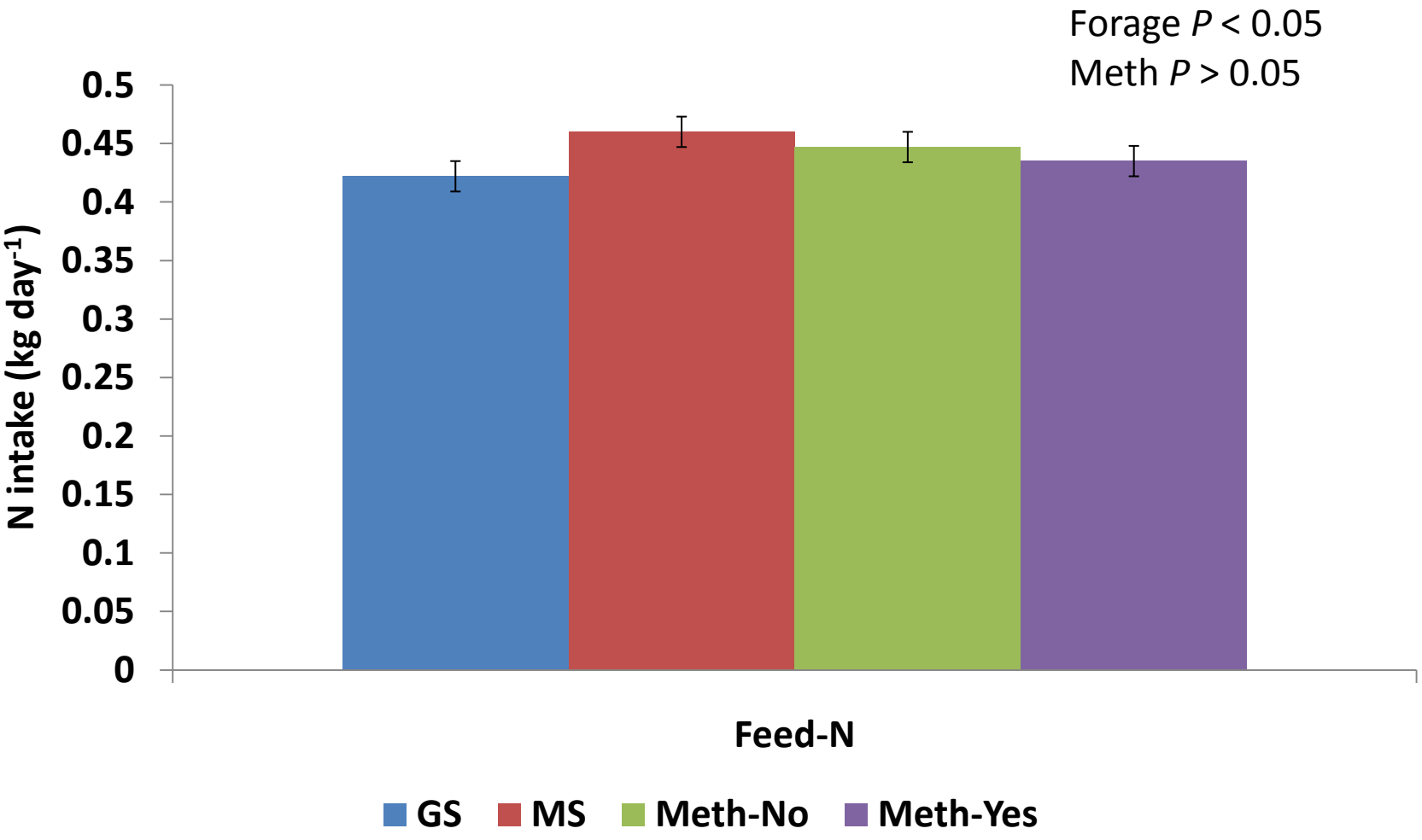
Dry matter intake and Milk Production



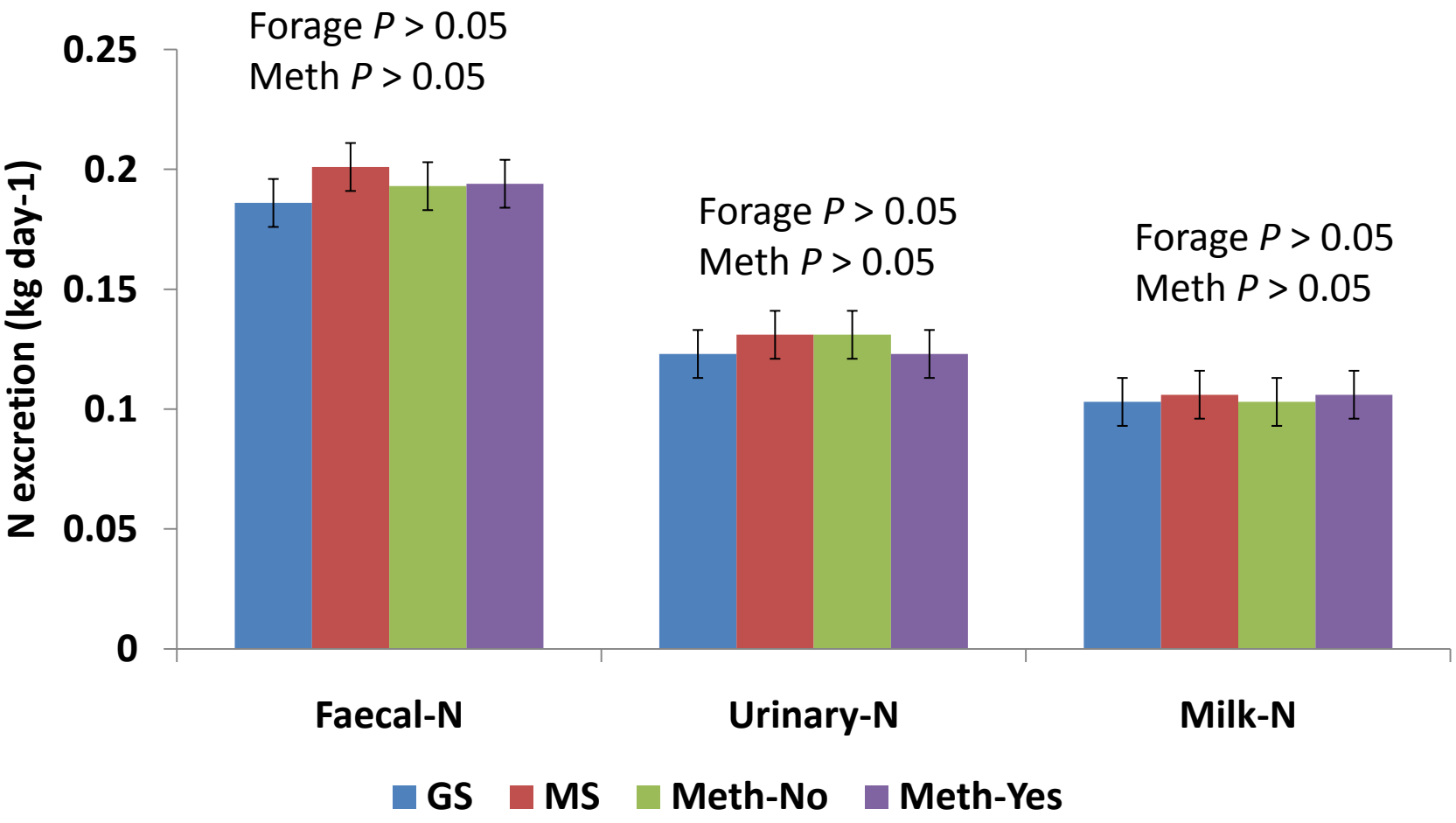
Nitrogen Balance



Feed Nitrogen intake

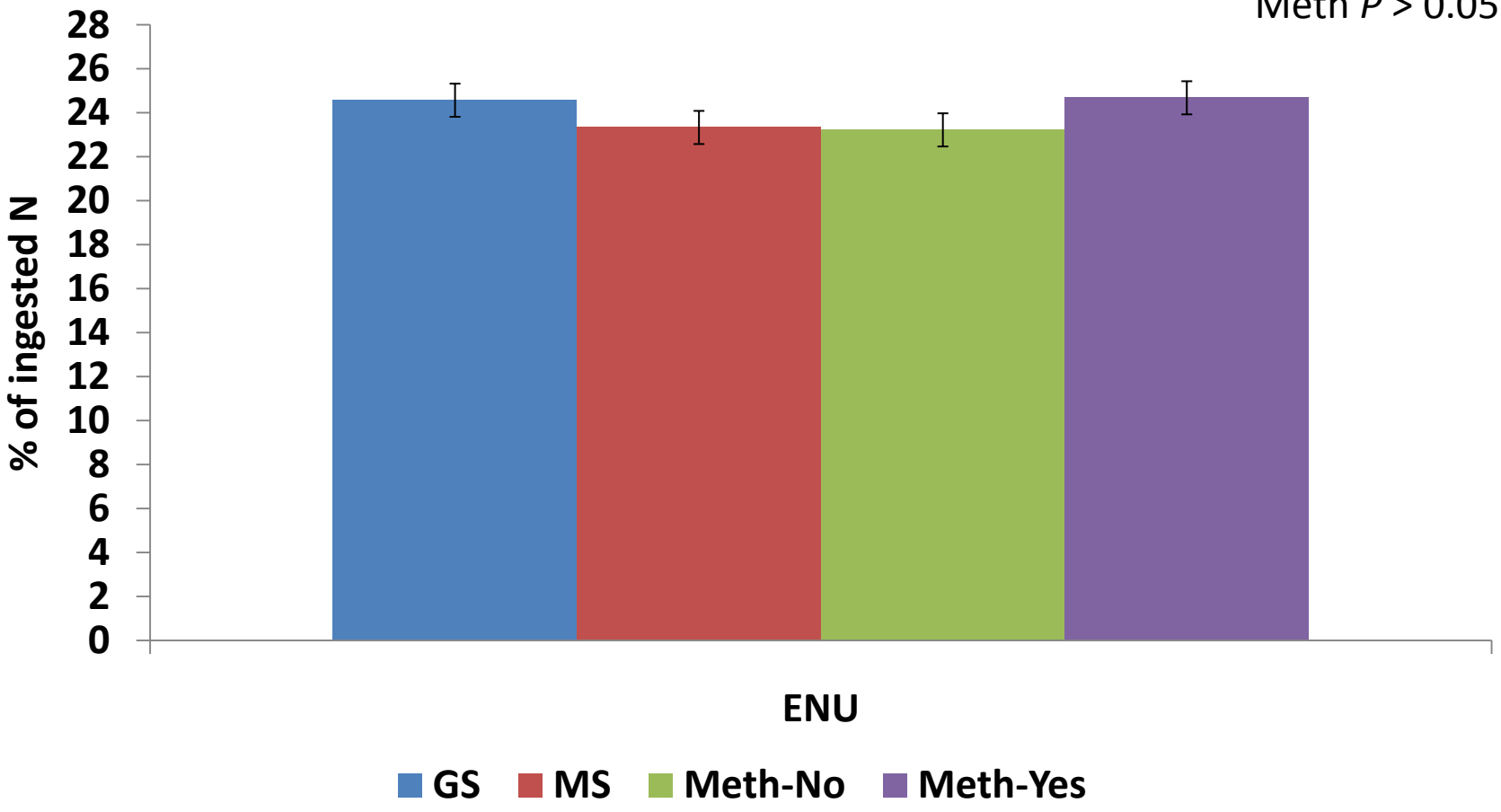


Nitrogen Excretion

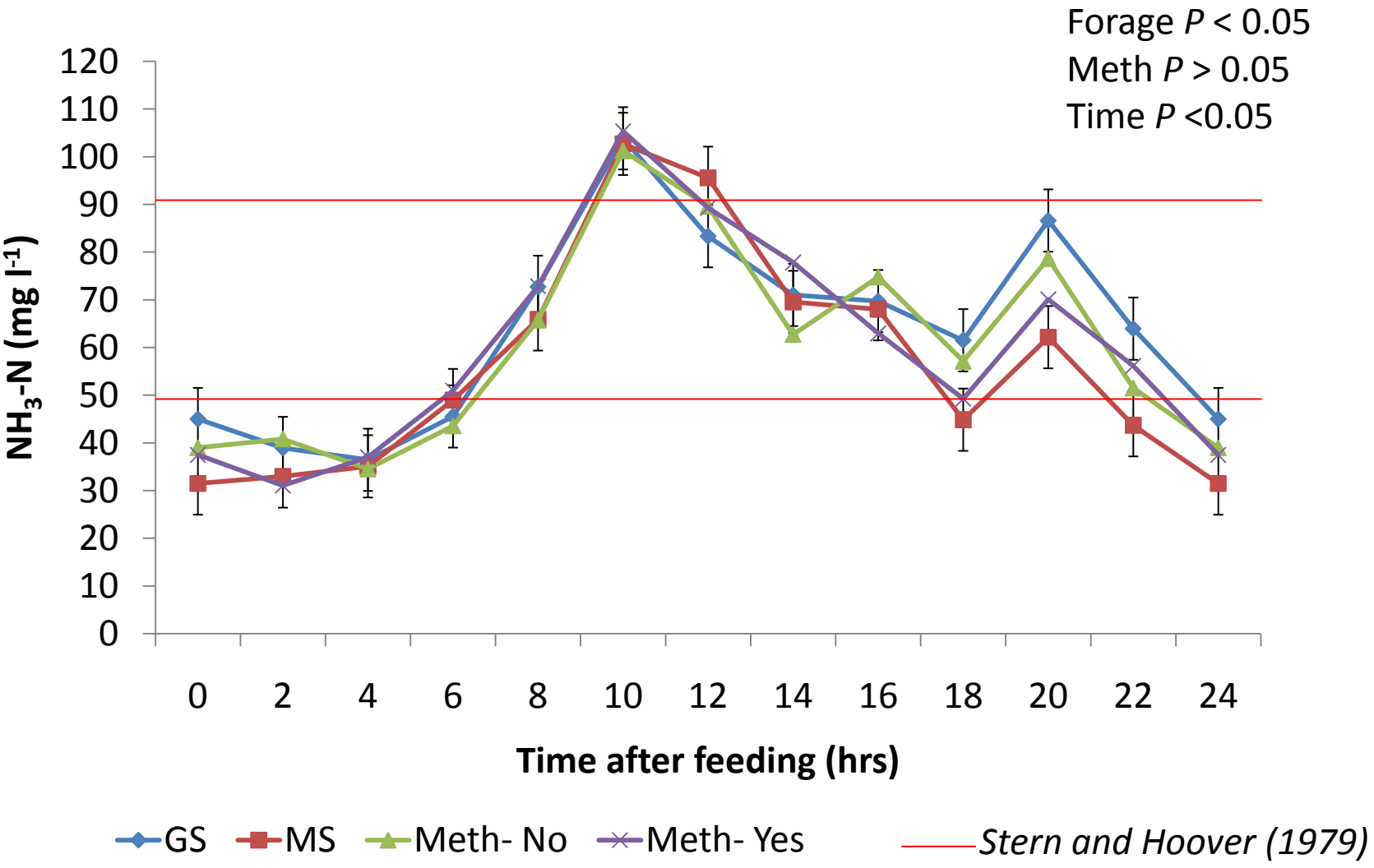


Efficiency of Nitrogen Use

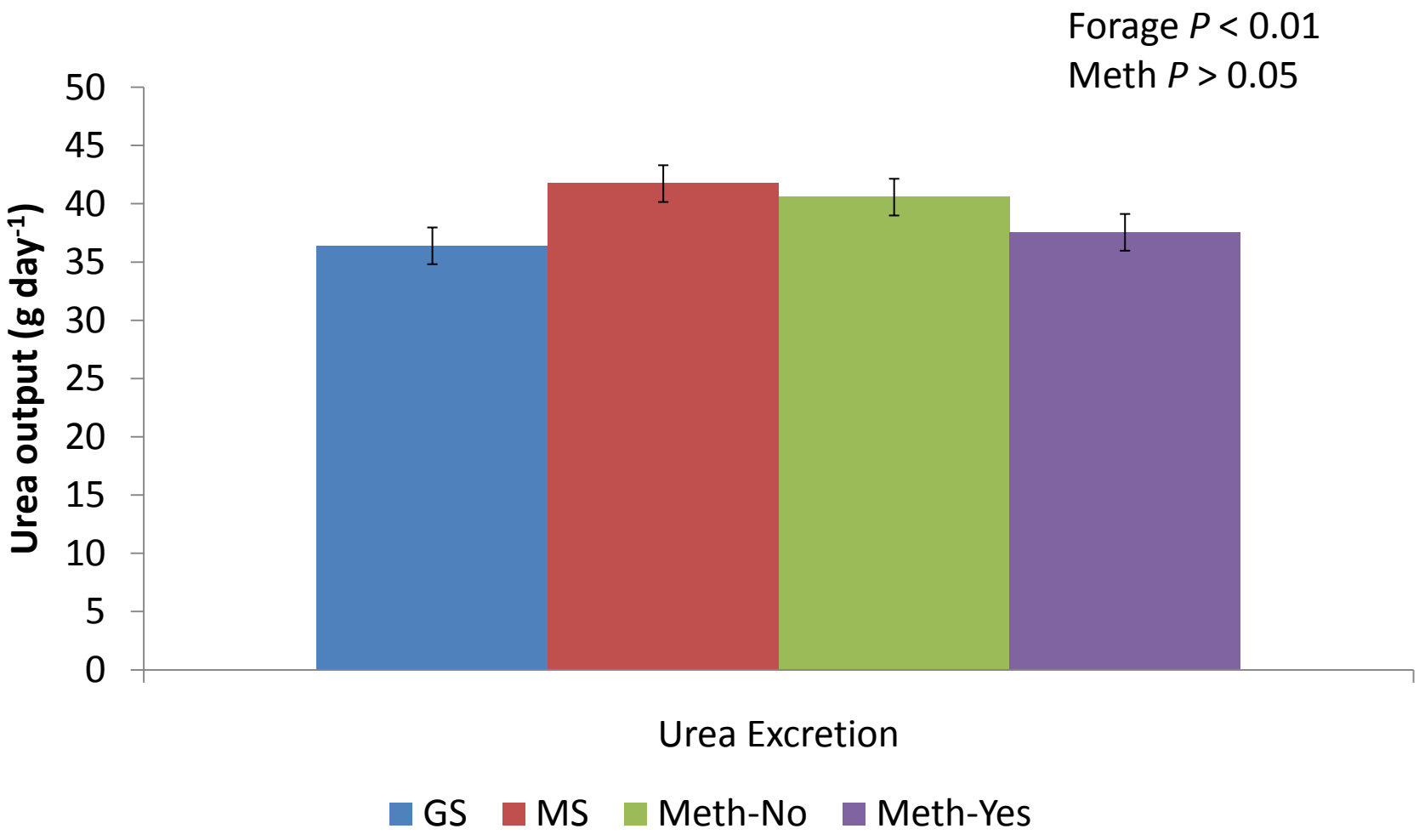
Forage $P > 0.05$
Meth $P > 0.05$



Rumen Ammonia Nitrogen



Urinary Urea Excretion



Conclusions

- In the present experiment…
  - Replacing GS with MS did not improve ENU
  - Methionine supplementation did not improve ENU
  - GS based diets had higher rumen NH_3-N vs. MS based diets however…
  - MS based diets had higher UUN excretion vs. GS based diets
  - Grass silage used in this experiment may partly account for the lack of effect of forage on N balance

Acknowledgements

This research was funded under the national development plan through the Research Stimulus Fund administered by the Irish Department of Agriculture, Fisheries and Food

Additionally I would like to acknowledge the assistance of the farm and laboratory staff at UCD Lyons Research Farm


Thank you for your time
Your questions are welcome