

Feed Logic Project 5: Efficacy of cysteamine as an in-feed growth promoter under commercial situations.

Introduction

Cysteamine is an orally active compound that increases the secretion of somatotropin in rats, sheep and fish, and is thought to work through the inhibition of somatostatin secretion, thus it is analogous to using exogenous sources of porcine somatotropin such as Reporcin. Ractopamine is an approved feed ingredient for pigs that repartitions nutrients toward increased lean deposition and has been shown to improve growth performance and carcass characteristics. Recent commercial validation work has shown that combining ractopamine and pST in the last two weeks of production increased average daily gain and improved feed efficiency by about 25% and resulted in overall feed:gain for females between 75 and 100kg of only 2.3:1. With cysteamine having a similar course of action to pST if we can achieve these levels within commercial operations the negative animal welfare and OH&S issues associated with pST may be resolved.

Hypothesis

The sole use of cysteamine and/or in combination with ractopamine results in increased feed efficiency in finisher gilts.

Methods

Treatments

To test the efficacy of cysteamine and ractopamine under commercial conditions five treatments were investigated (Table 1). Each treatment was fed for the final three weeks of production.

Table 1. Treatments used to assess the efficacy of cysteamine and ractopamine in finisher feeding regimes.

Treatment	Diet	Ractopamine	Cysteamine
A	Standard finisher	-	-
B	Standard finisher	5 ppm	-
C	Standard finisher	-	600 ppm
D	Standard finisher	5 ppm	600 ppm
E	High specification finisher	-	600 ppm

Treatment A was a negative control diet using standard specifications of finisher diet (normally containing 5ppm of ractopamine) used in this facility. Treatment B was a positive control using the current feeding program of the facility where ractopamine (5 ppm) is used in the finisher phase.

Treatment C pigs received the standard finisher feed with cysteamine (600 ppm), whilst treatment D contained both ractopamine (5ppm) and cysteamine (600 ppm). Treatment E was a higher specification diet, normally used with porcine somatotropin, incorporating cysteamine (600 ppm).

Diets

Four basal diets were formulated to meet the treatment requirements (Table 2). Composition of these diets can be found in Appendix 1. Finisher diets containing ractopamine and cysteamine (Diets 2 and 3 respectively) contain double the final concentration of these two compounds to allow for blending to occur. Treatment blends are shown in Table 3.

Table 2. Specifications of basal diets.

Diet	Name	MJ DE/kg	Total Avail Lys g/kg	Ractopamine	Cysteamine
1	FL5 DIET 1 – FINISHER CONTROL	13.5	7.4	-	-
2	FL5 DIET 2 - FINISHER+RACTOPAMINE	13.5	7.4	10 ppm	-
3	FL5 DIET 3 – FINISHER+CYSTEAMINE	13.5	7.4	-	1,200 ppm
4	FL5 DIET 4 - HI-SPEC FINISHER	14.5	12.3	-	-

Table 3. Blend ratios of basal diets to produce dietary treatments.

Treatment	Finisher phase			
	Diet 1	Diet 2	Diet 3	Diet 4
A	100%			
B	50%	50%		
C	50%		50%	
D		50%	50%	
E			50%	50%

Pigs and feeding

The experiment utilised 20 pens of pigs blocked on shed side (the two sides of the shed were filled a week apart, with one weeks age difference between sides) and average pen weight. Sides were run as experimental blocks, with events on the younger side occurring one week after the older side.

The FEEDLOGIC delivery system was used for feeding. Feeders were filled to capacity on the first day of the experiment with the allocated dietary treatment and an attempt was made to maintain the feeders at full capacity for the duration of the trial so that daily feed consumption could be recorded. Pigs were reweighed at the completion of the finisher phase (21 days). Delivery to the feeders was stopped approximately 15 hours prior to weighing and residual feed left in feeders on the final day of the trial was removed and weighed. Responses measured included average daily gain, feed intake and feed:gain ratio.

Statistical analyses

Differences between treatments were assessed using a simple on-way ANOVA. All analyses were conducted using Genstat 11th Edition.

Results

There was no significant difference in starting weight ($p=0.995$, table 4). Average daily gain ($p=0.692$), average daily feed intake ($p=0.987$) and feed:gain ratio ($p=0.503$) did not differ significantly between treatments during the finisher period (figure 1).

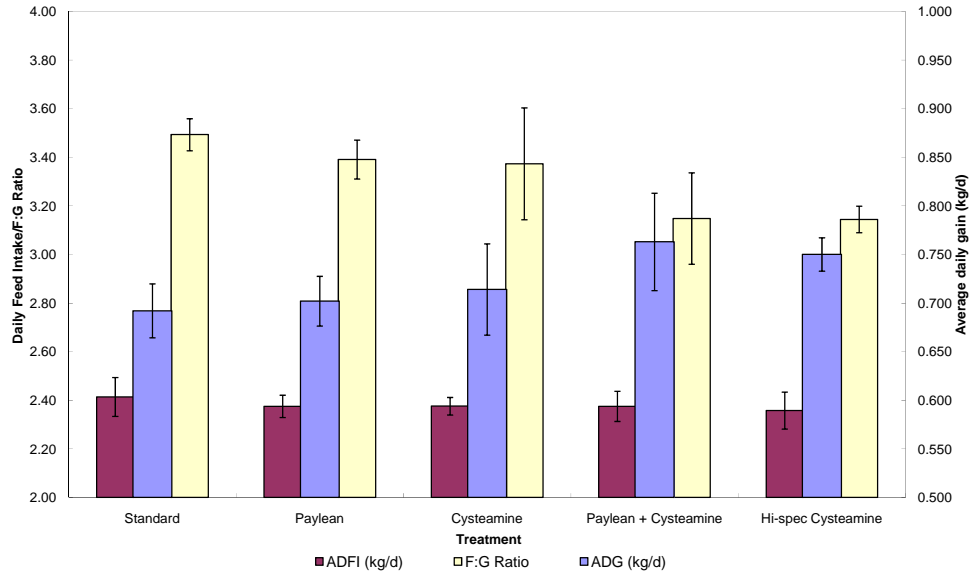


Figure 1. Average daily feed intake (ADFI), average daily gain (ADG) and feed:gain ratio (F:G Ratio) for each treatment group (mean \pm SE) during the finisher phase.

Table 4. Parameter values showing treatment means and p-values for treatment and block factors and their interaction.

Parameter	Treatment					SED	p-value		
	Control finisher	Control finisher with ractopamine	Control finisher with cysteamine	Control finisher with ractopamine & cysteamine	High specification finisher with cysteamine		Treatment	Block	Treatment x Block
N. (Pens)	4	4	4	4	4				
Days on trial	21	21	21	21	21				
Start weight (kg)	76.1	76.5	77.4	76.3	77.1	5.07	0.995	0.442	0.998
Final weight (kg)	90.6	91.3	92.4	92.3	92.8	5.31	0.973	0.376	0.972
ADG (kg/d)	0.692	0.702	0.714	0.763	0.750	0.08	0.692	0.628	0.836
ADFI (kg/d)	2.41	2.38	2.38	2.38	2.36	0.15	0.987	0.901	0.929
F:G Ratio	3.49	3.39	3.37	3.15	3.14	0.33	0.503	0.721	0.889

Discussion

These results indicate that there was no significant effect in production efficiency through the use of cysteamine whether used in the presence or absence of ractopamine. However, the lack of response to simple paylean use in this experiment suggests some external factor is affecting results.

Whilst these results suggest that cysteamine has limited application, a response was seen through the use of a high specification diet, with a 5% improvement in average daily gain and a 7% improvement in feed:gain when comparing the high specification treatment with the comparable standard finisher diet containing cysteamine.

It is proposed that an investigation of cysteamine and ractopamine at this higher specification be conducted to ascertain whether the response shown was due to diet density or cysteamine use.

Acknowledgements

Thanks to Dr Chris Richards, Country Vet Wholesaling Pty Ltd for the supply of Porcimax.

APPENDIX 1 – DIET FORMULATIONS

```

=====
:
: Single-Mix Tools (FM) MCLEAN FARMS {19} FEBRUARY 2009 FULL PRINT 22:24 30/01/09 0001 :
: 27-October-2006/643.5r ( 29) Plant=0088 Rob :
=====

```

Formula basic data

```

-----
Code      :      50000      Name      : FL5 DIET 1 - FINISHER CONTROL 30-01-09

Sell price:      0.0      Batch [Kg]:      1500.0      Group code:
Cost       :      265.791      Created  : 30/01/09      Version   :
Margin    :      -265.637      Updated  : 30/01/09      FM origin : KPE 60
Tonnes    :      0.0      User name: Rob      VM key   : KPE 60

```

```

External reference:
Script file name :

```

Raw material	%	[Kg]	Tonnes
10200 BARLEY 10.0	23.266667	349.0	0.0
14320 WHEAT 15.0	62.306667	934.6	0.0
16020 MILLRUN 16.0	5.8	87.0	0.0
40100 BLOOD MEAL 90.0	2.333333	35.0	0.0
40660 MEAT MEAL 50.0	4.666667	70.0	0.0
47000 LIMESTONE (FINE)	0.6	9.0	0.0
49005 SALT (FINE)	0.2	3.0	0.0
52810 CHOLINE CHLORIDE 60%	0.046667	0.7	0.0
53000 DL METHIONINE	0.02	0.3	0.0
53150 L-LYSINE SULPHATE (51% LYSINE)	0.4	6.0	0.0
53200 L-THREONINE	0.006667	0.1	0.0
53810 ZNP 3801 PHYTASE (SORGHUM) - 60G/KG	0.1	1.5	0.0
PCP4005 CHM PIG GROWER PMX (MCLEAN) - 2.5 KG/T	0.253333	3.8	0.0
-----			-----
	100.0	1500.0	0.0
-----			-----

Analysis

[VOLUME] % :	100.0	THREONINE % :	0.569618	CHOLINE MG/KG :	1112.653333
DRY MATTER % :	88.945067	TRYPTOPHAN % :	0.184377	FAT/EE % :	2.433533
MOISTURE % :	10.7016	M+C % :	0.615028	W3_FA % :	0.150965
PROTEIN % :	17.35042	ALLYSPIG % :	0.741309	W6_FA % :	0.816487
NITROGEN % :	2.72544	CALCIUM % :	0.904297	W3+W6_FA % :	0.967452
C_FIBRE % :	3.520053	PHOSPHORUS % :	0.576885	#ALLYS/DEP :	0.05492
DE_PIG_MJ MJ/KG :	13.498013	AV_PHOS % :	0.421157	#MET/LYS :	0.301518
ME_PIG_MJ MJ/KG :	0.066	#CAL/PHO :	1.567551	#M+C/LYS :	0.666818
ISOLEUCINE % :	0.535783	#CAL/AVPHO :	2.147172	#TRY/LYS :	0.199903
LYSINE % :	0.922333	SODIUM % :	0.146136	#THR/LYS :	0.617584
METHION % :	0.2781	SALT % :	0.377807	#ISO/LYS :	0.5809

```

=====
:
: Single-Mix Tools (FM) MCLEAN FARMS {19} FEBRUARY 2009 FULL PRINT 22:24 30/01/09 0002 :
: 27-October-2006/643.5r ( 29) Plant=0088 Rob :
=====

```

Formula basic data

```

-----
Code      :      51000      Name      :  FL5 DIET 2 - FINISHER + RACTOPAMINE 30-01-09

Sell price:      0.0      Batch [Kg]:      1500.0      Group code:
Cost      :      307.724      Created   : 30/01/09      Version   :
Margin   :      -307.637      Updated  : 30/01/09      FM origin :  KPE 60
Tonnes   :      0.0      User name: Rob      VM key   :  KPE 60

```

```

External reference:
Script file name :

```

Raw material	%	[Kg]	Tonnes
10200 BARLEY 10.0	23.266667	349.0	0.0
14320 WHEAT 15.0	62.523333	937.85	0.0
16020 MILLRUN 16.0	5.533333	83.0	0.0
40100 BLOOD MEAL 90.0	2.333333	35.0	0.0
40660 MEAT MEAL 50.0	4.666667	70.0	0.0
47000 LIMESTONE (FINE)	0.6	9.0	0.0
49005 SALT (FINE)	0.2	3.0	0.0
52810 CHOLINE CHLORIDE 60%	0.046667	0.7	0.0
52960 PAYLEAN (RACTOPAMINE) ELANCO	0.05	0.75	0.0
53000 DL METHIONINE	0.02	0.3	0.0
53150 L-LYSINE SULPHATE (51% LYSINE)	0.4	6.0	0.0
53200 L-THREONINE	0.006667	0.1	0.0
53810 ZNP 3801 PHYTASE (SORGHUM) - 60G/KG	0.1	1.5	0.0
PCP4005 CHM PIG GROWER PMX (MCLEAN) - 2.5 KG/T	0.253333	3.8	0.0
	100.0	1500.0	0.0

Analysis

[VOLUME] % :	100.0	THREONINE % :	0.569284	CHOLINE MG/KG :	1111.853333
DRYMATTER % :	88.952233	TRYPTOPHAN % :	0.184226	FAT/EE % :	2.4272
MOISTURE % :	10.694433	M+C % :	0.614946	W3_FA % :	0.150555
PROTEIN % :	17.340253	AILYSPIG % :	0.740792	W6_FA % :	0.81342
NITROGEN % :	2.723813	CALCIUM % :	0.904054	W3+W6_FA % :	0.963975
C_FIBRE % :	3.499703	PHOSPHORUS % :	0.5752	#AILYS/DEP :	0.054879
DE_PIG_MJ MJ/KG :	13.498647	AV_PHOS % :	0.420544	#MET/LYS :	0.301733
ME_PIG_MJ MJ/KG :	0.066	#CAL/PHO :	1.57172	#M+C/LYS :	0.66732
ISOLEUCINE % :	0.535542	#CAL/AVPHO :	2.149725	#TRY/LYS :	0.199916
LYSINE % :	0.921516	SODIUM % :	0.146089	#THR/LYS :	0.617769
METHION % :	0.278052	SALT % :	0.377783	#ISO/LYS :	0.581153

```

=====
:
: Single-Mix Tools (FM) MCLEAN FARMS {19} FEBRUARY 2009 FULL PRINT 22:24 30/01/09 0003 :
: 27-October-2006/643.5r ( 29) Plant=0088 Rob :
=====

```

Formula basic data

```

-----
Code      :      52000      Name      : FL5 DIET 3-FINISHER+CYSTEAMINE 30-01-09

Sell price:      0.0      Batch [Kg]:      1500.0      Group code:
Cost       :      277.991      Created  : 30/01/09      Version  :
Margin    :      -277.607      Updated  : 30/01/09      FM origin : KPE 60
Tonnes    :      0.0      User name : Rob      VM key   : KPE 60

```

```

External reference:
Script file name :

```

Raw material	%	[Kg]	Tonnes
10200 BARLEY 10.0	23.333333	350.0	0.0
14320 WHEAT 15.0	62.653333	939.8	0.0
16020 MILLRUN 16.0	5.2	78.0	0.0
40100 BLOOD MEAL 90.0	2.4	36.0	0.0
40660 MEAT MEAL 50.0	4.666667	70.0	0.0
47000 LIMESTONE (FINE)	0.6	9.0	0.0
49005 SALT (FINE)	0.2	3.0	0.0
52810 CHOLINE CHLORIDE 60%	0.046667	0.7	0.0
52970 CYSTEAMINE (PORCIMAX) 600G/T	0.12	1.8	0.0
53000 DL METHIONINE	0.02	0.3	0.0
53150 L-LYSINE SULPHATE (51% LYSINE)	0.4	6.0	0.0
53200 L-THREONINE	0.006667	0.1	0.0
53810 ZNP 3801 PHYTASE (SORGHUM) - 60G/KG	0.1	1.5	0.0
PCP4005 CHM PIG GROWER PMX (MCLEAN) - 2.5 KG/T	0.253333	3.8	0.0
	100.0	1500.0	0.0

Analysis

[VOLUME] % :	100.0	THREONINE % :	0.571156	CHOLINE MG/KG :	1110.893333
DRYMATTER % :	88.962533	TRYPTOPHAN % :	0.184655	FAT/EE % :	2.4184
MOISTURE % :	10.684133	M+C % :	0.615712	W3_FA % :	0.149843
PROTEIN % :	17.373087	AILYSPIG % :	0.744628	W6_FA % :	0.809027
NITROGEN % :	2.729067	CALCIUM % :	0.903872	W3+W6_FA % :	0.958869
C_FIBRE % :	3.475693	PHOSPHORUS % :	0.573023	#AILYS/DEP :	0.055167
DE_PIG_MJ MJ/KG :	13.497707	AV_PHOS % :	0.419819	#MET/LYS :	0.300917
ME_PIG_MJ MJ/KG :	0.066	#CAL/PHO :	1.577376	#M+C/LYS :	0.665346
ISOLEUCINE % :	0.535403	#CAL/AVPHO :	2.153006	#TRY/LYS :	0.199541
LYSINE % :	0.925401	SODIUM % :	0.146208	#THR/LYS :	0.617198
METHION % :	0.278469	SALT % :	0.378193	#ISO/LYS :	0.578563


```

=====
:
: Single-Mix Tools (FM) MCLEAN FARMS {19} FEBRUARY 2009 FULL PRINT 22:24 30/01/09 0004 :
: 27-October-2006/643.5r ( 29) Plant=0088 Rob :
=====

```

Formula basic data

```

-----
Code      :      53000      Name      :  FL5 DIET 4-HI-SPEC FINISHER 30-01-09

Sell price:      0.0      Batch [Kg]:      1500.0      Group code:
Cost      :      379.23      Created   : 30/01/09      Version   :
Margin    :      -378.841      Updated  : 30/01/09      FM origin :  KPE 60
Tonnes    :      0.0      User name: Rob      VM key    :  KPE 60

```

```

External reference:
Script file name :

```

Raw material	%	[Kg]	Tonnes
14320 WHEAT 15.0	62.64	939.6	0.0
33170 CANOLA MEAL 38.0 [EXP]	10.0	150.0	0.0
34580 SOYBEAN MEAL 45.0	14.8	222.0	0.0
40100 BLOOD MEAL 90.0	3.0	45.0	0.0
40660 MEAT MEAL 50.0	5.8	87.0	0.0
45100 TALLOW	2.733333	41.0	0.0
49005 SALT (FINE)	0.2	3.0	0.0
53000 DL METHIONINE	0.06	0.9	0.0
53150 L-LYSINE SULPHATE (51% LYSINE)	0.4	6.0	0.0
53200 L-THREONINE	0.013333	0.2	0.0
53810 ZNP 3801 PHYTASE (SORGHUM) - 60G/KG	0.1	1.5	0.0
PCP4005 CHM PIG GROWER PMX (MCLEAN) - 2.5 KG/T	0.253333	3.8	0.0
	100.0	1500.0	0.0

Analysis

[VOLUME] % :	100.0	THREONINE % :	0.937877	CHOLINE MG/KG :	1199.42
DRYMATTER % :	89.5642	TRYPTOPHAN % :	0.295626	FAT/EE % :	5.7198
MOISTURE % :	10.082467	M+C % :	0.923322	W3_FA % :	0.208365
PROTEIN % :	25.80046	AILYSPIG % :	1.232308	W6_FA % :	0.826707
NITROGEN % :	4.07296	CALCIUM % :	0.914004	W3+W6_FA % :	1.035072
C_FIBRE % :	3.70372	PHOSPHORUS % :	0.706772	#AILYS/DEP :	0.084977
DE_PIG_MJ MJ/KG :	14.50168	AV_PHOS % :	0.460364	#MET/LYS :	0.301401
ME_PIG_MJ MJ/KG :	0.066	#CAL/PHO % :	1.293209	#M+C/LYS :	0.610304
ISOLEUCINE % :	0.90712	#CAL/AVPHO % :	1.985394	#TRY/LYS :	0.195405
LYSINE % :	1.51289	SODIUM % :	0.159016	#THR/LYS :	0.619924
METHION % :	0.455986	SALT % :	0.39244	#ISO/LYS :	0.599594