Four-State Dairy Nutrition & Management Conference

Using MUN to Manage Protein Feeding

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2020 4-State Dairy Nutrition and Management Conference Breakout Session

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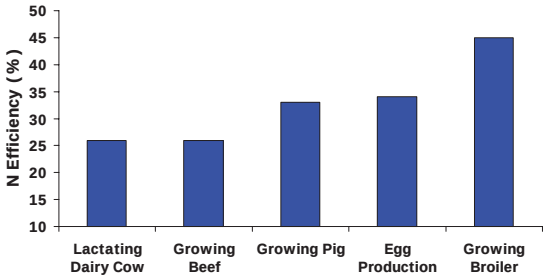
N Conversion Efficiencies for Different Production Systems



Bequette et al., 2003

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Dairy Nutrient Values – 5-year Average

Nutrient values derived using Sesame
Buckeye Dairy News: Vol 22, Issue 2 (March, 2020)

Nutrient	Cost/Unit	Daily Supply*	Cost/cow/d
NEL (3X, NRC 2001) MCal	$0.08	35.4 Mcal	$2.83
Metabolizable Protein (NRC) Lbs	$0.43	5.44 lbs	$2.34
Effective NDF (forage NDF) Lbs	$0.14	10.4 lbs	$1.46
Non-effective NDF (Total NDF – Forage NDF) Lbs	-$0.02	7.3 lbs	-$0.15
Total Cost for Energy, Protein and Fiber			$6.48

* 1600 lb cow, 80 lbs milk/d, 3.0% protein, 3.5% fat

https://dairy.osu.edu/newsletter/buckeye-dairy-news/volume-22-issue-2/milk-prices-costs-nutrients-margins-and-comparison
Sesame can be licensed and used for local markets

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Environmental Impact of Waste N

Eutrophication

Air Quality and High N Rain

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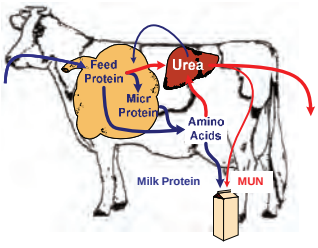
RDP/RUP and MUN



What Goes In MUST Come Out!

RDP = Ruminally Degraded Protein
RUP = Ruminally Undegraded Protein

CP = RDP + RUP
MP = Digestible (Microbial Protein + RUP)

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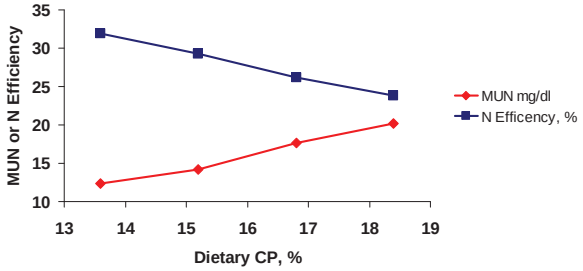
Effects of Dietary Protein (RDP) on MUN and N Efficiency



Cyriac et al., 2006

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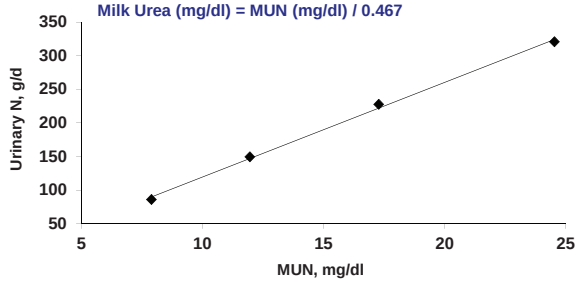
Relationship of MUN and Urinary N Output



Burgos et al., 2007

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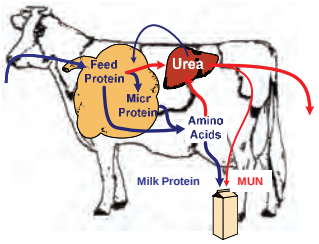
MUN Responses to RDP/RUP

Does it Matter where the Water Enters the Pool?



Ruminally available CHO?

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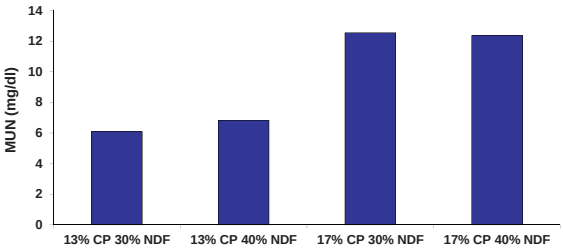
Effects of Protein and CHO on MUN



Kaufman and St-Pierre., 2001

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High Salt Reduces MUN

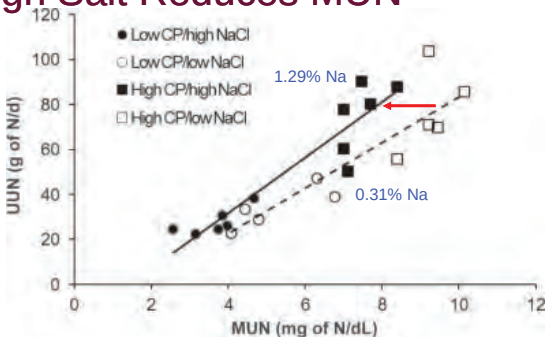

Figure 2. Relationship between MUN concentration (mg of N/dL) and urinary urea nitrogen excretion (UUN; g of N/d) for low NaCl (3.1 g of Na/kg of DM; dashed regression line) and high NaCl (12.9 g of Na/kg of DM; solid regression line) diets.

Spek et al., 2013

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Genetics and MUN

Effect	Estimate	SE	*P*<
Intercept	-166	26	0.002
Dietary CP, % of DM	5.4	1.1	0.0001
Dietary NDF, % of DM	2.84	0.45	0.0001
Milk Yield, kg/d	0.66	0.12	0.0001
Milk Protein, %	37.7	7.3	0.0001
CP x NDF	-0.038	0.018	0.03
CP x Milk Yield	-0.0194	0.0057	0.001
CP x Milk Protein	-0.73	0.24	0.003
NDF x Days in Milk	-0.00005	0.00002	0.009
NDF x Milk Protein	-0.65	0.11	0.0001
Milk x Milk Protein	-0.073	0.023	0.002
Random Effects			
Herd	**1.6**		**0.08**
Cow(Herd)			**0.0001**

Aguilar et al., 2012

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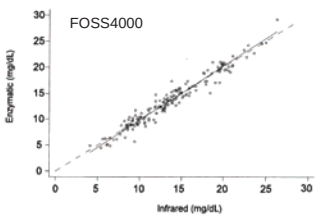
Are MUN Data Reliable?



Arunvipas et al., 2003 Can. J. Vet Res.

Table 1. Percent recovery of urea nitrogen among analytical methods.

Method	Recovery(%)[1]	SE(%)
Bentley	92.1[a]	2.76
CL-10	85.0[b]	2.76
Foss4000	47.1[c]	9.88
Foss6000	95.4[a]	10.1
Skalar	95.1[a]	7.61

[a,b,c]Means within a column with unlike superscripts differ ($P < 0.05$).
[1]Recovery = (Treated MUN - Control MUN)/4 mg/dL.

Peterson et al., 2004 JDS

United DHIA - Bentley
$0.25 / cow for full test
$10 for a single bulk tank sample

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Monitor MUN to Achieve Optimum Return

1. Establish a baseline for your herd
   - Balance ration to NRC 2001 or equivalent
   - Feed ration for 2 weeks and Measure MUN (~11 mg/dl)
2. Systematically reduce RUP (0.25% units at a time)
   - For example, CP from 16.5% to 16.25% via RUP ($0.06/c/d)
   - Keep RDP and energy constant
   - Feed for 1 week; Monitor MUN and milk yield
   - MUN should ↓ by ~0.5 mg/dl
   - Any milk loss will be half of NRC predicted loss
   - Calculate Income/Feed Cost (IOFC)
   - If greater, retain reduction and lower another 0.25%
3. Reduce RDP by 0.5% of Diet DM while holding RUP constant
   - Same approach as for RUP, e.g. 16% to 15.5% ($0.02/c/d)
   - RDP ≥ 9% of DM is safe
   - ↓ DMI is first sign of deficiency
4. MUN at maximal IOFC is target for the herd
   - Can operate at 8 or below
   - May require RPAA → IOFC
   - High MUN = overfeeding protein
   - Low MUN = lost milk

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Summary

1. Excess N harms the environment and cost $
   - Environmental regulations are not going away!!!!!
2. Feed to requirements
   - 2001 RDP requirements are too high
   - MP Requirements → AA in 2021
3. Feeding Management is Critical
   - Monitor feeds for nutrient content
   - Balance to requirements
   - Monitor programs for feeding accuracy
   - Verify milk processor MUN accuracy
   - Monitor MUN as a process indicator

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