Will my NMP limit how much DGS I can feed?

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Co-product challenge

- Concentrated nutrients remain
  - P, N
- Variability in product composition
  - Over-formulation or safety margins
- Issues with nutrient availability
  - ADIN
  - solP

750-lb steer example

Ingredient	*Percent of diet dry matter*			
Corn	81.5	72.9	62.7	47.5
Hay	10.0	10.0	10.0	10.0
DDGS	0	15	25	40
40% Pro Supp.	8.5	0	0	0
Gluten Balancer	0	2.1	2.3	2.5
Nutrient Content				
CP, %	12.6	12.6	14.6	17.8
P, %	0.35	0.42	0.47	0.55

152 DOF, 3.3 lb ADG, 6.90 F:G

Annual nutrient excretion

	Percent of DDGS in the diet			
	0	15	25	40
N excreted per steer, lb	60	60	72	89
P excreted per steer, lb	10	12	14	17

Excretion values based on ASABE Standard D384.2

Acreage needs (1,000-head feedlot)

	Percent of DDGS in diet			
	0	15	25	40
Corn acres for P	769	923	1,077	1,308
Corn acres for N	333	333	400	494
N deficit (lb/acre)	102	115	113	112

150 bushels per acre, 1.2 lb N/bushel; 60 lb P_2O_5/acre

50% N loss to volatilization

Lot is full 304 d

Corn acres needed for feed

	Percent of DDGS in the diet			
	0	15	25	40
Corn grain	670	601	518	390
DDGS	0	385	642	1,025
Total	670	986	1,160	1,415
P acres	769	923	1,077	1,308

18 lb DDGS/bushel

Use of Distillers Grains in Feedlot Diets:

Impact on Phosphorus Excretion

In Iowa, and nationally, states are increasing ethanol production in response to concerns over crude oil supplies. As a result, the market for corn distillers grains, the co-product of ethanol production from corn, is growing with questions raised regarding the ability of animal agriculture to consume all that will be available. In deciding whether or not to feed distillers grains in the feedlot and in deciding how much distillers grains to feed, one of the biggest issues raised is how much will phosphorus excretion be increased and what impact will that have on nutrient management planning. Trenkle (2006) reported that feeding 20 or 40 percent distillers grains with solubles (DGS) increased feedlot phosphorus in manure by 60 and 120 percent, respectively compared to feeding no DGS.

Diet Examples

To help provide some insight into the answers to these questions, consider four different feedlot rations and how these rations affect phosphorus and nitrogen flows through a feedlot. Diet composition of the four example diets are shown in Table 1. Diets were formulated for a steer that is on feed for 152 days, gaining 3.3 lb/day with a feed:gain of 6.90. Starting weight of steers is 750 lb with a finish weight of 1250 lb.

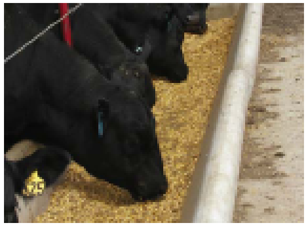

Table 1. *Diet composition of example rations containing varying amounts of distillers dried grains plus solubles (DDGS).*

Ingredient Content, % of diet dry matter	Percent of dry matter			
Corn	81.5	72.9	62.7	47.5
Hay	10	10	10	10
DDGS	0	15	25	40
40% liquid protein supplement	8.5	0	0	0
Hight Ca 'Gluten Balancer' supplement	0	2.1	2.3	2.5
Formulated composition				
Crude Protein, %	12.58	12.56	14.64	17.78
Phosphorus, %	0.35	0.42	0.47	0.55

Iowa State University
University Extension

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Evolution of nutrient accountability

- Nutrient management at increasingly larger scales

Nutrient accountability

- What is hauled to the field
- What is <u>produced</u>
  - Hauled to the field
  - Lost along the way
- Multimedia impacts

Changing the paradigm

- From ‘retention and/or treatment’
- To ‘balance and/or prevention (source reduction)’

Nutrient management

- Nutrient application
  - Nutrient distribution
- Nutrient retention
  - Engineered or biological control
    - Cover, acidification
  - Source control

Source reduction

- Reducing the production of potential pollutants
- Balancing the production of nutrients with the use of nutrients

Full accountability

	Percent of DDGS in diet			
	0	15	25	40
N lost	333	333	400	494

Forecasted scenario

	Percent of DDGS in diet			
	0	15	25	40
N excreted per steer, lb	60	60	72	89
Corn acres for N (old)	333	333	400	494
Corn acres for N (new)	666	666	800	988
Corn acres for P	769	923	1,077	1,308
Corn acres for feed	670	986	1,160	1,415

Source control

	Percent of DDGS in diet			
	0	15	25	40
CP, %	12.6	12.6	14.6	17.8

Life Cycle Assessment

- “Cradle-to-grave”
- Identifies environmental insults at each and every state of a product life cycle, from extraction of raw materials through final use or disposal
- Seeks to prevent the inadvertent transfer of pollutants from one state of use to another

EPA’s Sustainability Research Strategy

- Released for public comment – May 2006
- Move “beyond traditional end-of-pipe control strategies….focused on pollutant emissions.”
- A “more integrated, systems-based approach is required to meet the needs…”
- “…evolve our analysis and programs beyond traditional media-specific, ‘stovepipe’ approaches that have served the Agency and the nation well fro over three decades.”

Achieving sustainable environmental outcomes

- '…by investigating resources (air, water, land, ecosystems, and energy) in a systems-based context…'
- EPA's multiyear plan provides a framework for ORD to develop and deliver a suite of impact assessment tools, management practices, and innovative and clean industrial processes

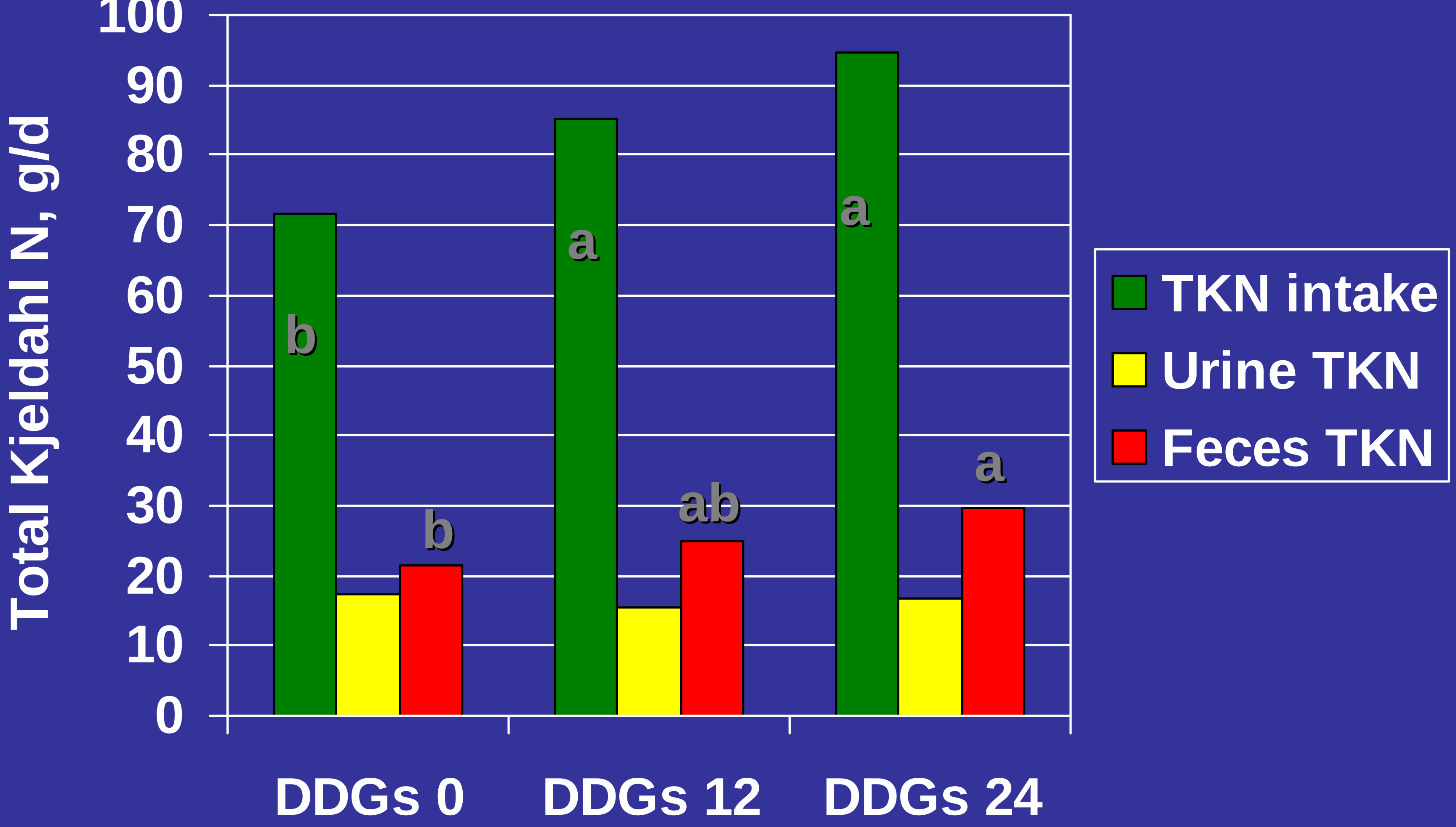
DGS issues

- Distribution of manure P
- Are air emissions a bigger challenge?


12 9 '03

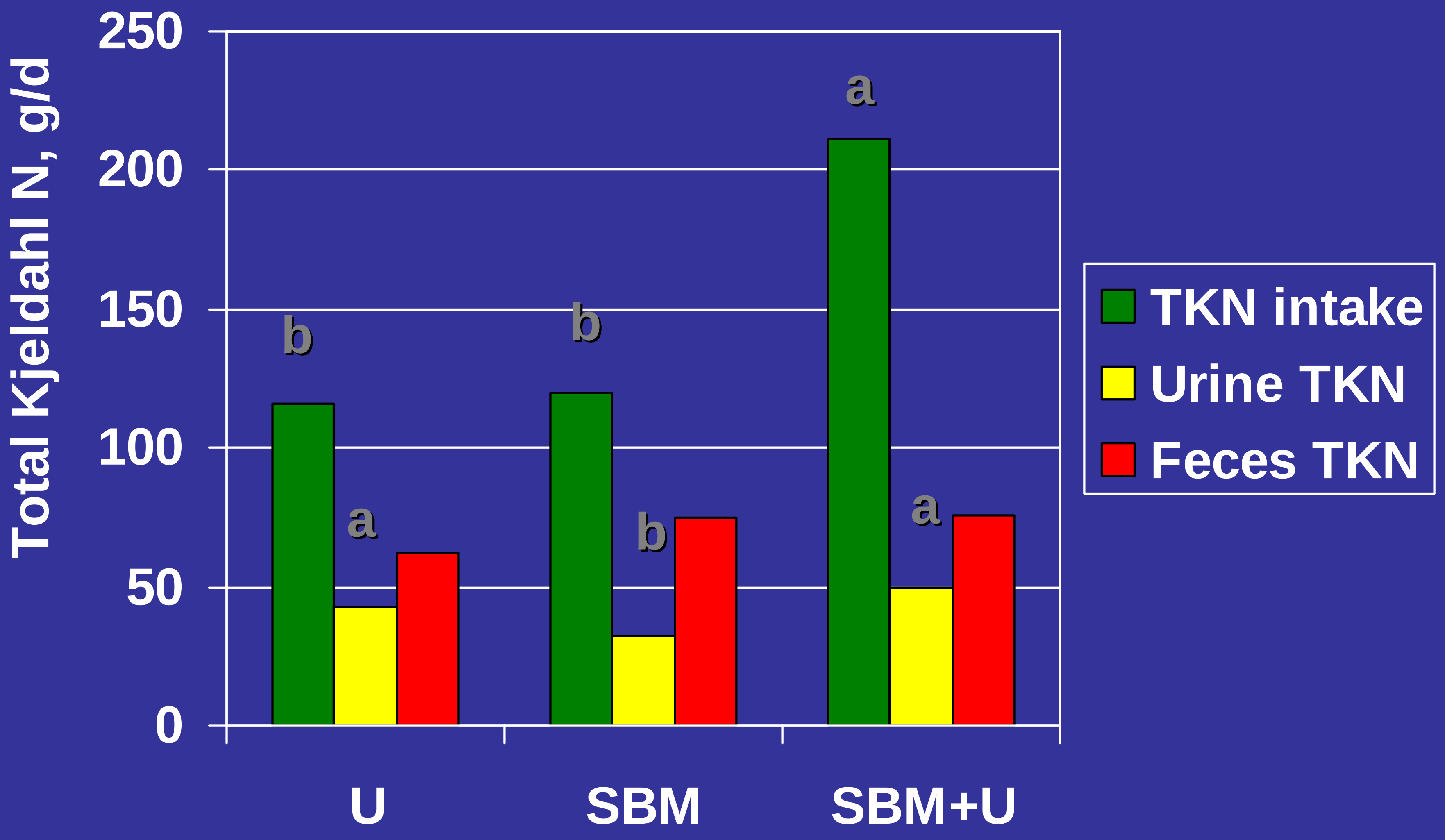

1A
2A
3A
4A
1B
12 13 '03

Nitrogen metabolism



	DDGs0	DDGs12	DDGs24
CP-analyzed, % DM	13.3	10.5	12.8
DIP-formulated, % CP	78	57	54

Nitrogen metabolism



Ammonia emissions

	NH_3-N emitted, mg (96 h)	Air exhausted, L (96 h)	NH_3-N emitted, mg/L	NH_3-N emitted, mg/d	NH_3-N emitted, % of initial TKN (96 h)
DDGs 0	920[a]	16773	0.057[a]	230[a]	24.3[a]
DDGs 12	155[b]	16460	0.009[b]	38.6[b]	3.98[b]
DDGs 24	209[b]	16594	0.012[b]	52.3[b]	4.34[b]
SEM	94.9	759	0.006	5.42	2.93
Diet P =	< 0.001	0.960	< 0.001	< 0.001	< 0.001
Period P =	< 0.001	0.565	< 0.001	< 0.001	0.002
Diet x Period P =	< 0.001	0.403	< 0.001	< 0.001	0.002

Ammonia emissions

	NH_3-N emitted, mg (96 h)	Air exhausted, L (96 h)	NH_3-N emitted, mg/L	NH_3-N emitted, mg/d	NH_3-N emitted, % of initial TKN (96 h)
U	679	14624	0.0446	170[a]	10.0
SBM	395	12480	0.0290	98.8[b]	5.48
SBM+U	387	14976	0.0254	96.7[b]	5.34
SEM	170	1203	0.011	22.0	2.04
Diet P =	0.381	0.297	0.449	0.027	0.197

Emissions from swine, dairy, poultry?

- Swine experience – recent ISU study
  - ↑ H_2S
  - ↑ NH_3
  - But…. 20% ↑ in diet CP
- Broiler study at ISU – Feb – April 2007
- Laying hen work – funding solicited

Other items…

- How much more available to non-ruminants is the P in DGS?
- Are we feeding this as an energy or a protein feed?
  - Impacts on N content of the diet

Take home message

- Nutrient management extends beyond the field… we need to approach it from that perspective