

# COW SUPPLEMENTATION: GETTING THE BEST BANG FOR YOUR BUCK

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## How do we get the best bang for the buck?

- 2 aspects:
  - Biology: Use the right feeds to provide the right nutrients
  - Economics: price the best feeds to provide the right nutrients



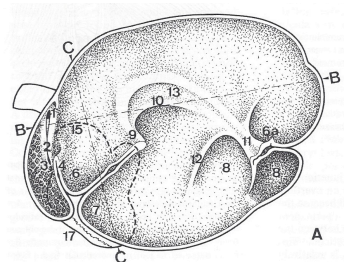
## Low Quality Forage

- 7% or less crude protein
- High in fiber
- Can be grazed or harvested

## Ruminant Digestive Anatomy

- 4 compartment stomach
    1. Reticulum
    2. Rumen
    3. Omasum
    4. Abomasum
- } Site of microbial fermentation

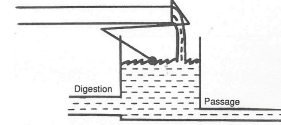
## Reticulum and Rumen of the Cow Stomach



## Value of microbial fermentation

- Microbes provide enzymes that digest fiber
  - Releases energy – shared by microbes and the cow
    - Cow absorbs volatile fatty acids (VFA)
  - Releases other nutrients encased by fiber
    - Sugar, starch, lipids – also shared

## Ruminant Digestive Physiology



- Fill determines intake in lower quality diets
- Digestion and passage empty the rumen
  - Particle size reduction key to passage
  - Rates determine how quickly it empties
- Rates of digestion and passage slower in lower quality feeds

## Forage Intake Approximations

Type of forage	Digestibility (%)	Intake (%BW)
Lush pasture	>65	2.75-3.5
Mod. Qual. Past.	60	2.5-3.2
Good Qual. Grass hay	55	2.0-2.5
Mod. Qual. Grass hay	45-50	1.5-2.0
Poor Qual. Grass hay	40	1.0-1.5
Straw	35	<1.0

## Expectations of a Supplement

- Overcome nutrient deficiency
- Overcome limitations on digestion and intake
  - Improve microbial function
- Feeding for 2: microbes and the cow

## Some factors affecting success of achieving supplementation goals

- Type of supplement
- Supplemental feedstuffs
- Comparative pricing

## Type of supplement

- Supplements typically classified into:
  - Protein supplements
    - high in protein relative to other nutrients
    - examples: soybean meal, cottonseed meal
  - Energy supplements
    - low in protein relative to other nutrients
    - examples: corn, barley, sugar beet pulp
  - Both contain protein and energy
    - a matter of relative concentration

## Low Quality Forage

- 7% or less crude protein
- OR**
- TDN:CP > 7
  - High in fiber

## What type of supplement should be used?

- For low quality forages, protein is the first limiting nutrient
- Energy available in the forage (fiber) is of little use without protein to stimulate microbial digestion

## Protein supplements with low quality forage

- Provides nitrogen for rumen microbe growth
- Promotes improved fiber digestion
- Rates of digestion and passage are increased
- Promote increased intake of low quality forage

## Associative Effects

- Interaction between feeds in combination that alters nutritional value compared to each fed alone
  - Results in performance different than expected from the individual feeds

## Positive Associative Effect

- Increased nutrient value greater than the addition of nutrients from a supplement
  - Increase in digestibility and intake of low-quality forage

## Response to grain-based energy supplements

- Depressed fiber digestion
  - Microbial growth not stimulated
  - Microbial shift from fiber to starch digesting bacteria species
  - Fiber digesting bacteria digest starch first
- Decreased forage intake
- No net increase in energy intake

## Negative Associative Effect

- Reduced nutritional value of the diet resulting from combining high starch feeds with low quality forages
  - digestibility and intake of dietary fiber decreased by changes in the rumen microbes

## Effect of Protein Concentration on Forage Utilization by Cattle

	% CP in supplement			
	0	12	27	41
Fiber digestion, %	37.9	29.9	39.9	38.6
Forage intake, %BW	.9	.8	1.4	1.2

from DelCurto et al., 1990. J. Anim. Sci.

## Effect of Protein Concentration on Cow-Calf Performance

	% CP in supplement		
	13	25	39
Weight loss, lb	-193	-122	-97
BCS loss	-1.8	-1.4	-.7
Pregnancy rate, %	87	93	93

from DelCurto et al., 1990. J. Anim. Sci.

## Characteristics of Various Potential Supplemental Feedstuffs

## High Protein Supplements

	CP	TDN
Corn grain	9	88
Soybean meal	49	84
Cottonseed meal	46	77

## Moderate Protein Supplements

	CP	TDN
Corn grain	9	88
Distiller's grains	31	96
Wheat middlings	17	75
Corn gluten feed	23	80
Field peas	23	85

## Energy Supplements

	CP	TDN
Corn grain	9	88
Soyhulls	12	74
Sugar beet pulp	9	76

## Comparative Pricing of Potential Supplemental Feedstuffs

## Pricing Supplements on an Equal CP Basis

- Adjust for differences in
  - Feed price, delivered
  - Crude protein content
  - DM content
- Calculate \$ per ton of CP

## Cost on Protein Basis

	Feed \$/ton	DM (%)	CP (%)	CP \$/ton
Soybean meal	290	89	49	665
DDGS	120	91	31	425
WDGS	42	36	31	376
Alfalfa hay	90	89	18	562
20 % range cake	180	85	20	1059
30 % range cake	250	85	30	980
27 % tub	750	95	27	2924

## Pricing Wet vs. Dried Distiller's Grains

- Adjust for difference in moisture content
- Adjust delivered \$ for trucking cost
- Calculate \$ per lb of DM delivered

## Delivery Price Comparison

	distiller's grains	
	dried	wet
cost per ton, as is	\$120	\$42
dry matter content, %	91	36
cost per ton of DM	\$132	\$117
trucking cost per loaded mile	\$4	\$4
truck payload	25	25
\$ per ton as is per loaded mile	\$0.16	\$0.16
\$ per ton of DM per loaded mile	\$0.18	\$0.44

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mileage to breakeven		58

## Alternatives for Protein Supplements

- Non-protein nitrogen (NPN)
  - e.g. urea
- Alfalfa hay

## Conclusions

### Getting the best bang for the buck

- Biology: Use the right feeds to provide the right nutrients
  - Protein causes a positive associative effect
- Economics: price the best feeds to provide the right nutrients
  - Consider cost per *delivered* unit of needed nutrient