Using the CNCPS Model to Evaluate the Importance of Nitrogen Fractions in Dairy Rations

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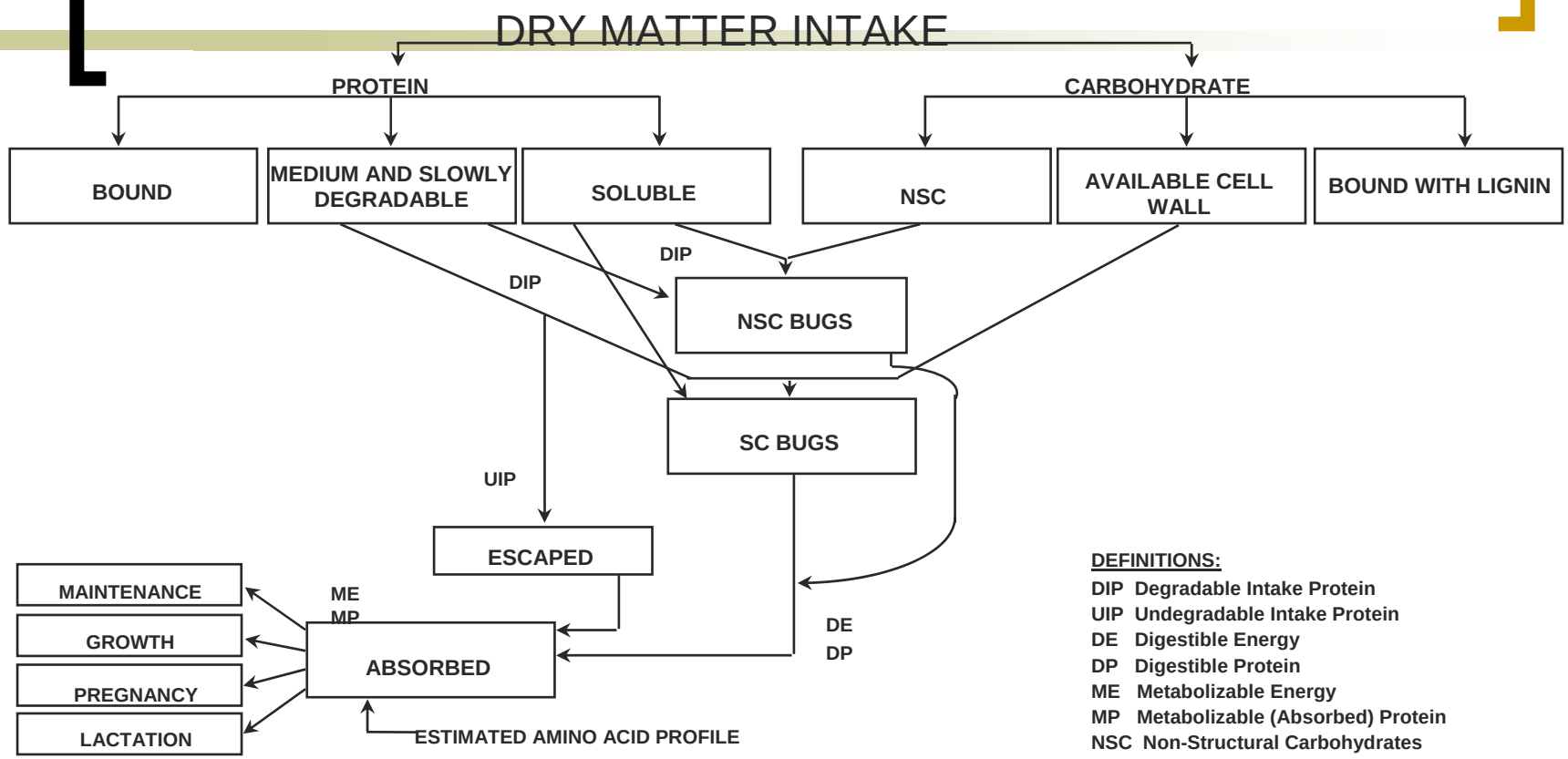
Why Use Models??

- Opportunity to evaluate management or nutritional strategies for potential impact on the dairy farm
- Explore options prior to implementation
- Evaluate current situation and define opportunities for change
- Design research trials

CNCPS Model

- Developed over 25+ years
- Nutrition model based on protein and carbohydrate nutrition
- Most recent (version 5) was released in 2003
- CPM-Dairy is a similar program
- Still needs refinement

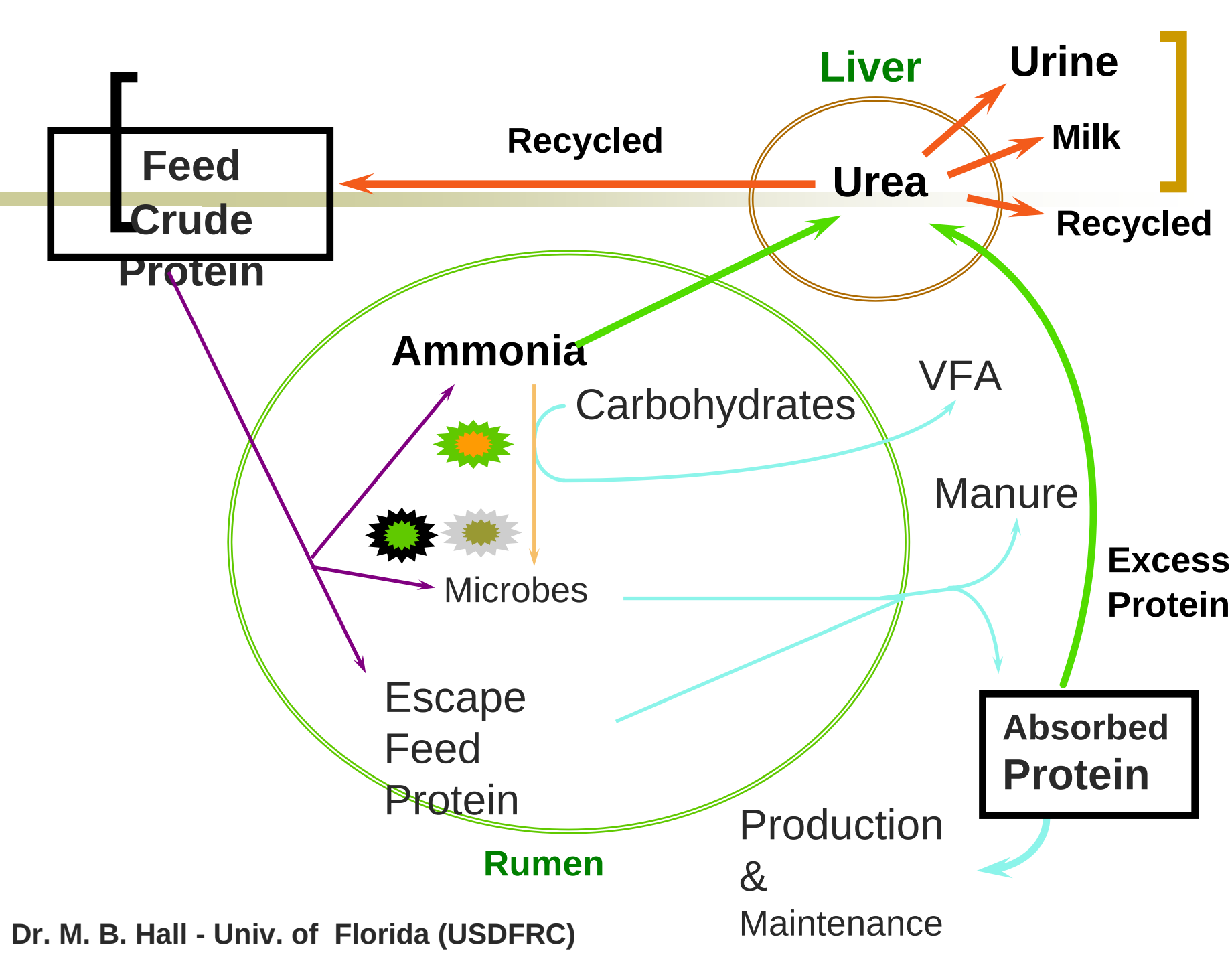
Summary of Feed Fractions: Protein and Carbohydrate in CNCPS and CPM Dairy



DEFINITIONS:

DIP Degradable Intake Protein
UIP Undegradable Intake Protein
DE Digestible Energy
DP Digestible Protein
ME Metabolizable Energy
MP Metabolizable (Absorbed) Protein
NSC Non-Structural Carbohydrates (Organic Acids, Sugars, Starch, Soluble Fiber [pectic substances, beta-glucans, etc.])
SC Structural Carbohydrates

Revised 3/98, M.B. Hall (Revised 7/00, L. E. Chase

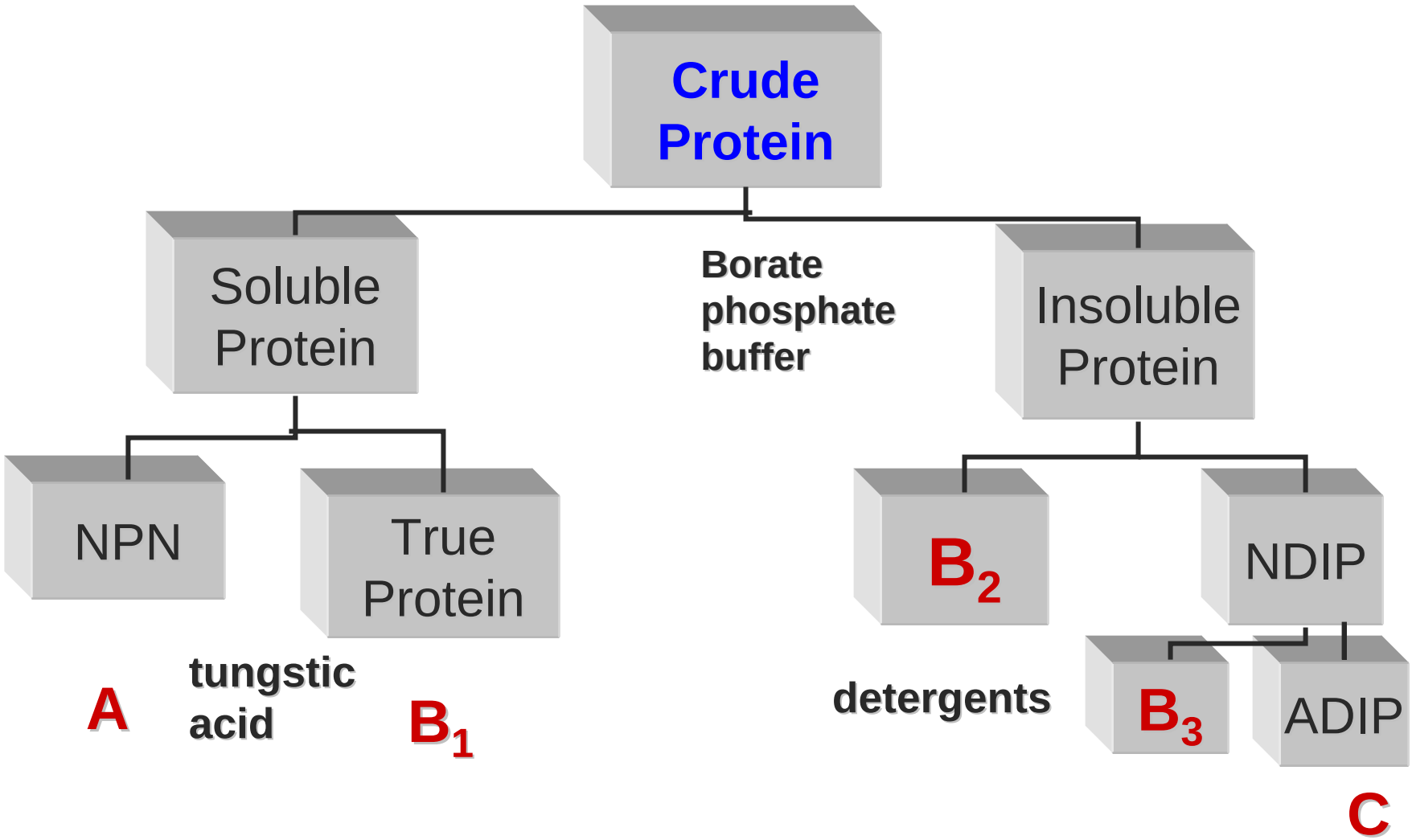


Dr. M. B. Hall - Univ. of Florida (USDFRC)

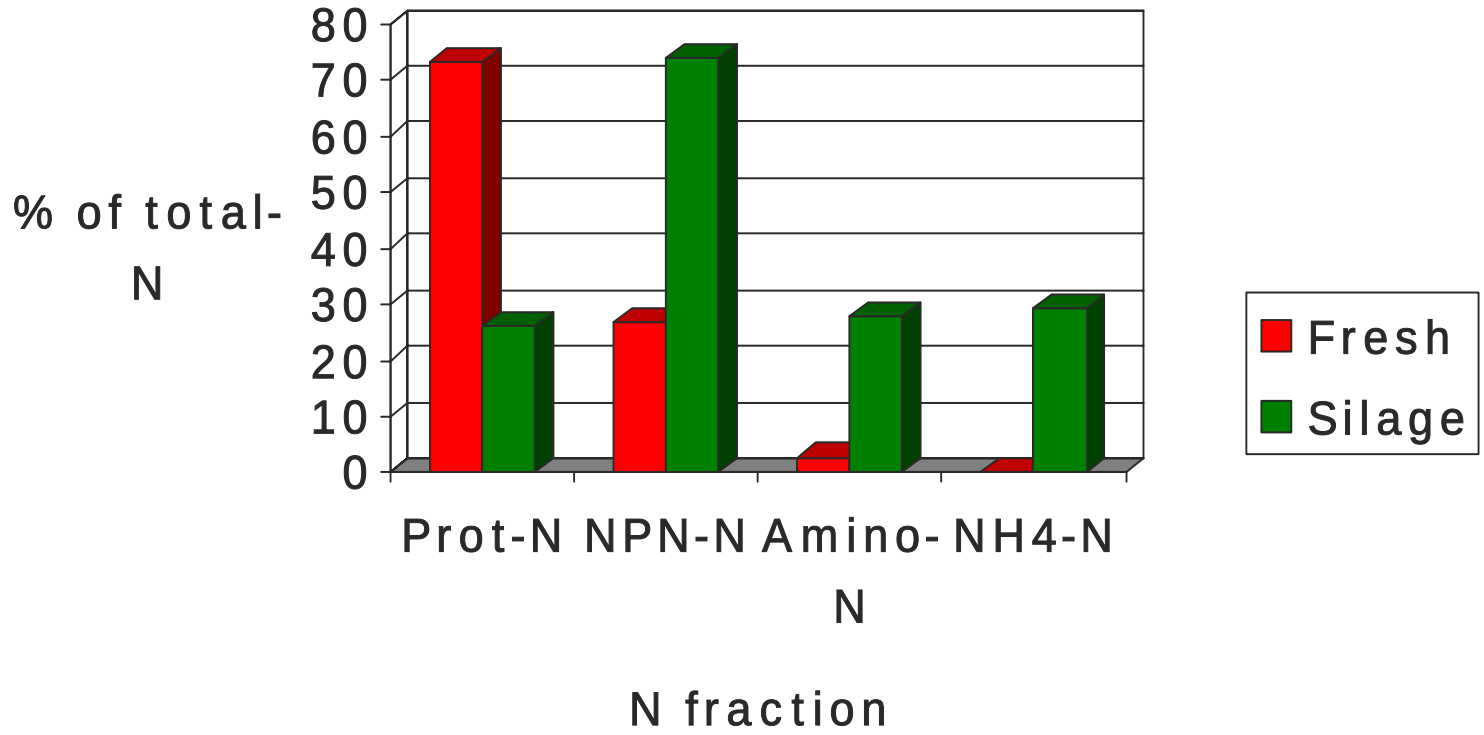
Nitrogen Fractions in Silage

- True protein
- NPN compounds
- Ammonia, amino, amide, amine, nitrate, amino acids
- Amines = putrescine, cadaverine

Protein Fractions – CNCPS

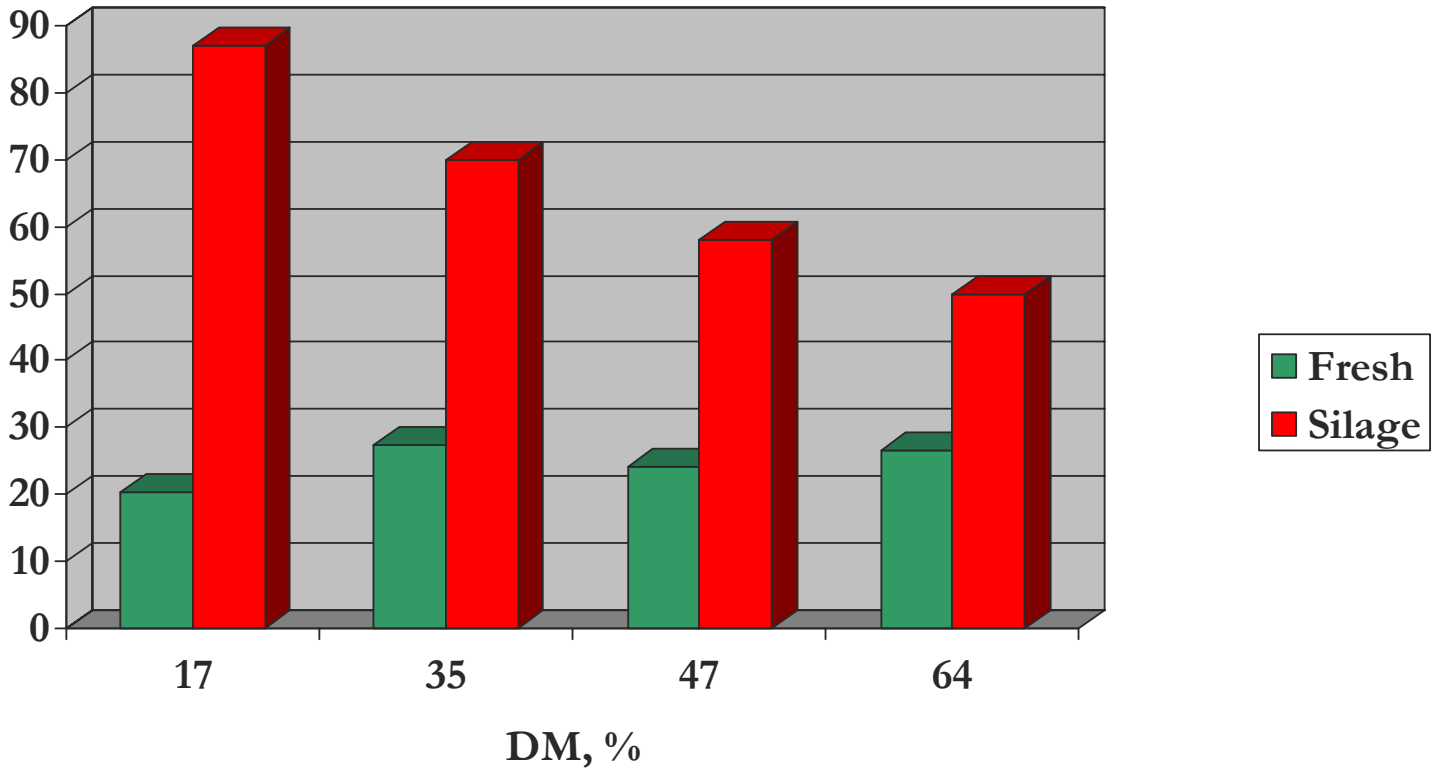


Nitrogen Compounds in Fresh Forage and Silage



Oshima et.al.,1979

NPN as a % of Total-N in 1st Cutting Alfalfa



Muck, 1987

Proteolysis

- The breakdown of true protein to amino acids and other simpler N compounds
- Extent determined by plant type, pH, wilting, temperature, protease activity, fermentation, DM

- More proteolysis = More breakdown (more NPN)

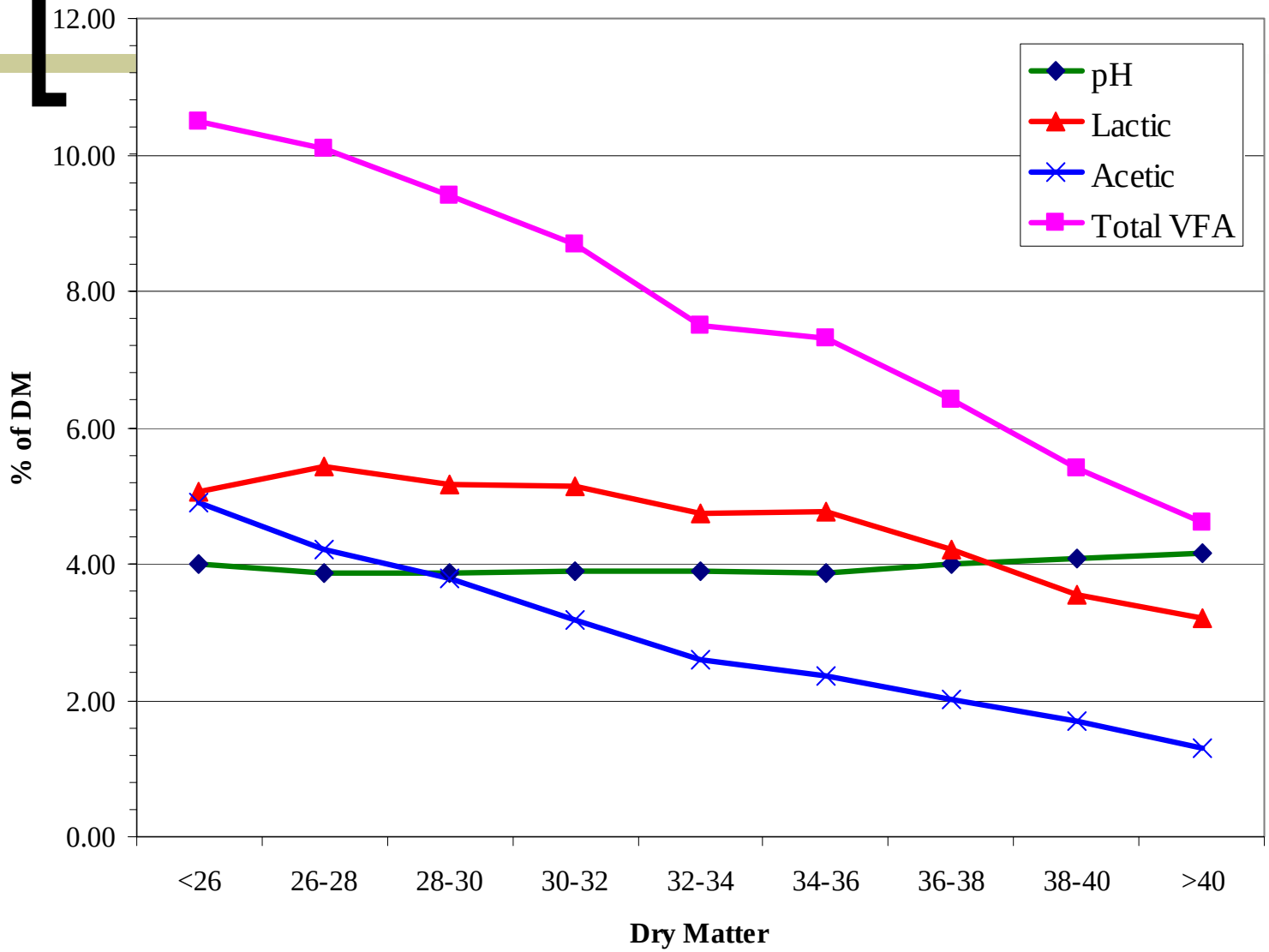
Forage Soluble Protein Levels

- Dairy One Forage Lab
- Samples analyzed between 5/03 and 4/04
- Soluble protein is expressed as % of CP
- Normal range = Mean = or – 1 SD
- Normal range represents about 67% of the total samples

Forage Soluble Protein, % of CP

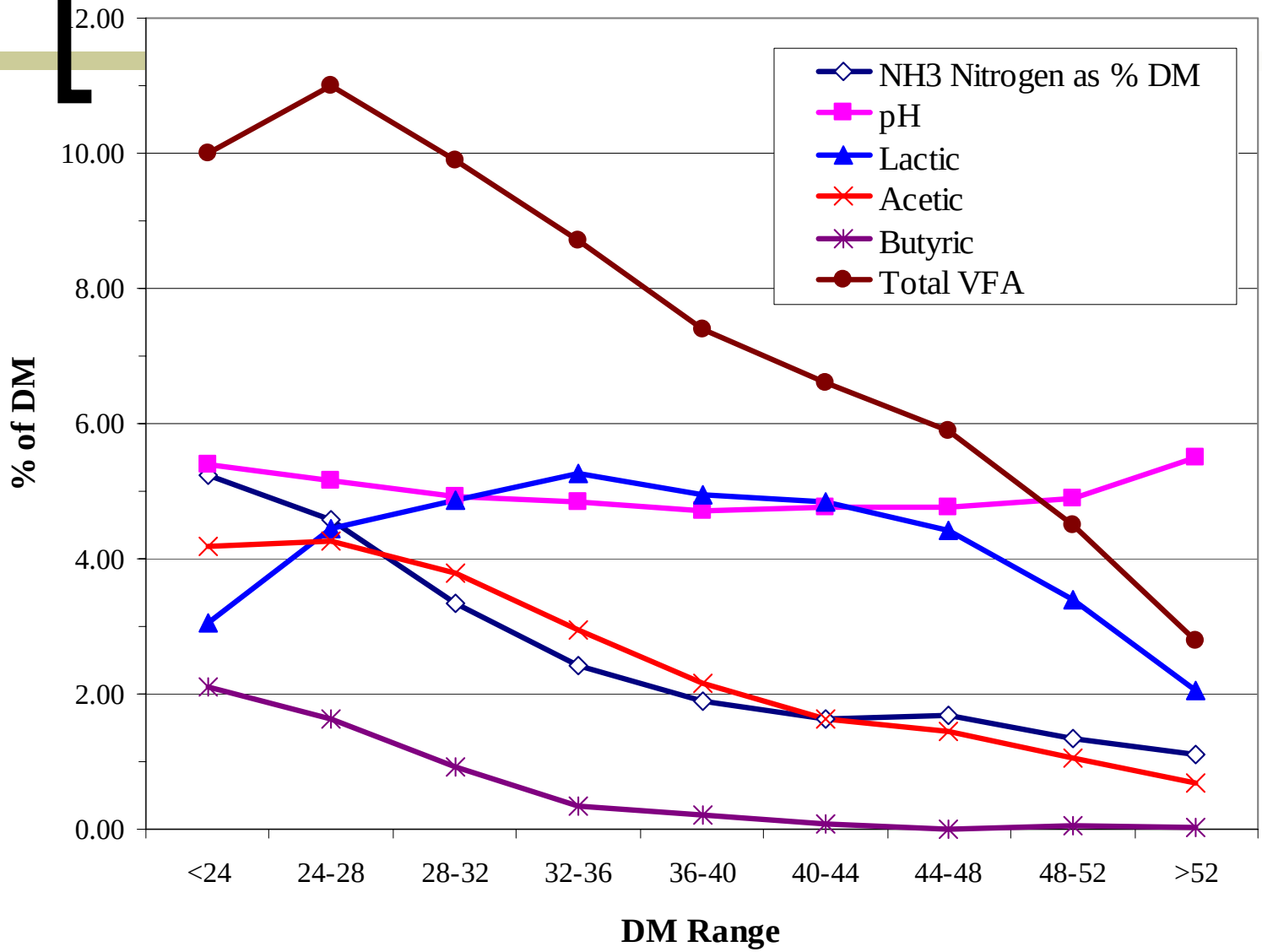
Item	Legume Silage	Grass Silage	Corn Silage
Average	59.5	50.65	51.7
NR- Low	50.8	40.8	41.8
NR – High	68.1	60.5	61.6

Figure 2. The Effect of DM on Corn Silage Fermentations



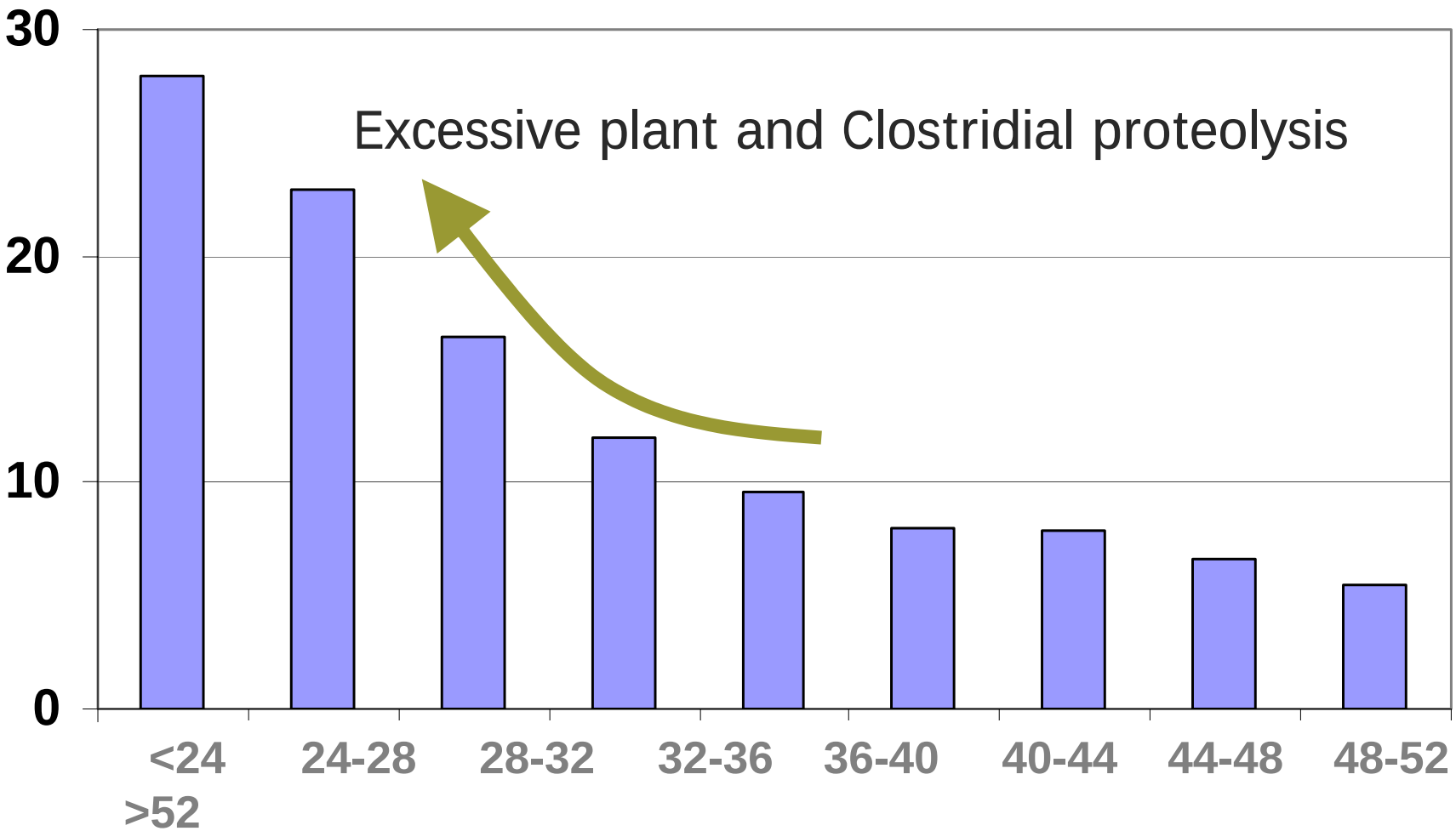
Source: CVAS Analytical Services

Figure 1. The effect of DM on legume silage fermentations



Source: CVAS Analytical Services

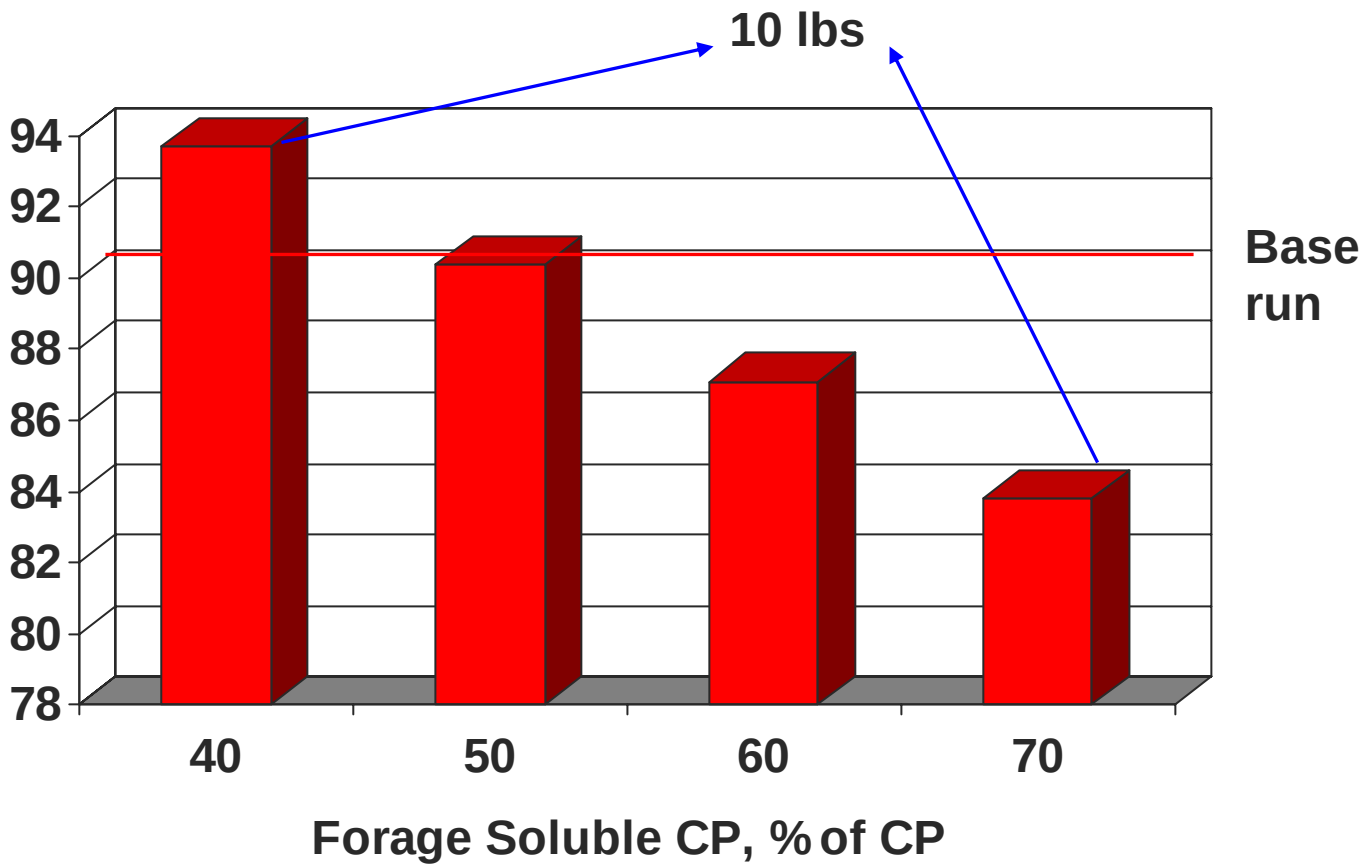
Silage DM versus Ammonia N (% of CP) in Alfalfa Silage – Cumberland Valley



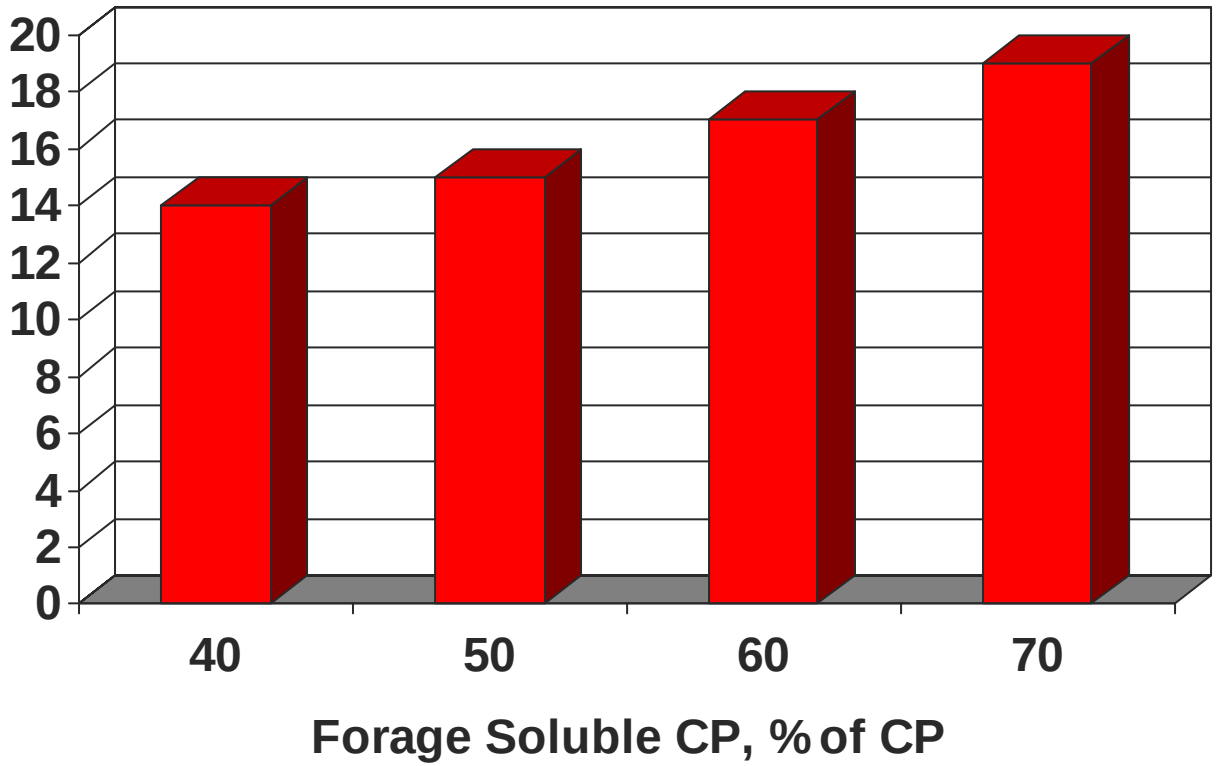
What's the Impact on MP Predicted Milk?

- Used the CNCPS program
- 2nd lactation cow, 100 DIM, 90 lbs. milk/day
- 56% forage in the total ration
- 1:1 ratio of AS and CS (DM basis)
- CS = 8.5% CP, 45% NDF
- AS = 20% CP, 40% NDF

MP Predicted Milk, lbs/day



Predicted MUN, mg%



Is High Soluble CP a Problem?

- What evidence do you have of a “problem” from using these forages?
- Ammonia smell in the barn?
- High MUN?
- BCS loss (using energy to excrete CP)
- More fluid manure (more urine)

Improving the Efficiency of N Use at the Farm Level

- Using management practices that reduce proteolysis (lower % of total-N in the soluble and NPN fractions) may be on of the best strategies to improve the efficiency of N use

- Most of these are management factors that the producer has control over (except the weather)

How Can Proteolysis be Reduced?

- Forage type – Red clover and timothy seem to have lower NPN levels than alfalfa
- Processing – Decreasing the hours of field wilting time can decrease proteolysis
- Protease inhibitors – Have potential
- Silo management – Rapid filling, packing, etc. can lower proteolysis
- Silage treatments – Acids may lower

What Are The Options?

- 1. Can you feed less of the high soluble CP forage?
  - More of the other forages
  - Add some dry hay
- 2. Select supplemental CP sources that are lower in soluble CP (HT SBM versus SBM, roasted soybeans, etc.)

What Are The Options – 2?

- Select carbohydrate sources that break down rapidly in the rumen (increase use of the ammonia)
  - Barley versus corn
  - Molasses or sugar
  - Corn grain particle size (fine)

What Are the Options – 3?

- Feeding management
  - TMR if possible
  - If conventional system, increase the number of times the forages are fed
  - Match grain feeding times with forage feeding times
  - Feed the grain energy source as close to the forage feeding times as possible

What Are the Options – 4?

- Work with the producer relative to forage management practices to lower soluble CP in next years crop
- Decrease field wilting time – wide swaths, dry faster
- Harvest at right DM and maturity
- Fill the silo fast, pack and seal
- Consider LAB inoculants

Summary

- Controlling the protein fractions in forages is one way to improve the efficiency of nitrogen use and decrease nitrogen excretion to the environment on dairy farms
- Forage management is the first and most important step in this process

Summary - 2

- Ration adjustments can help but can only help to ***minimize*** the problem of high levels of soluble CP and NPN in forages

MILK. FRESH
SQUEEZED DAILY.

THANKS!