

# Managing Feed Protein for Health and Profit

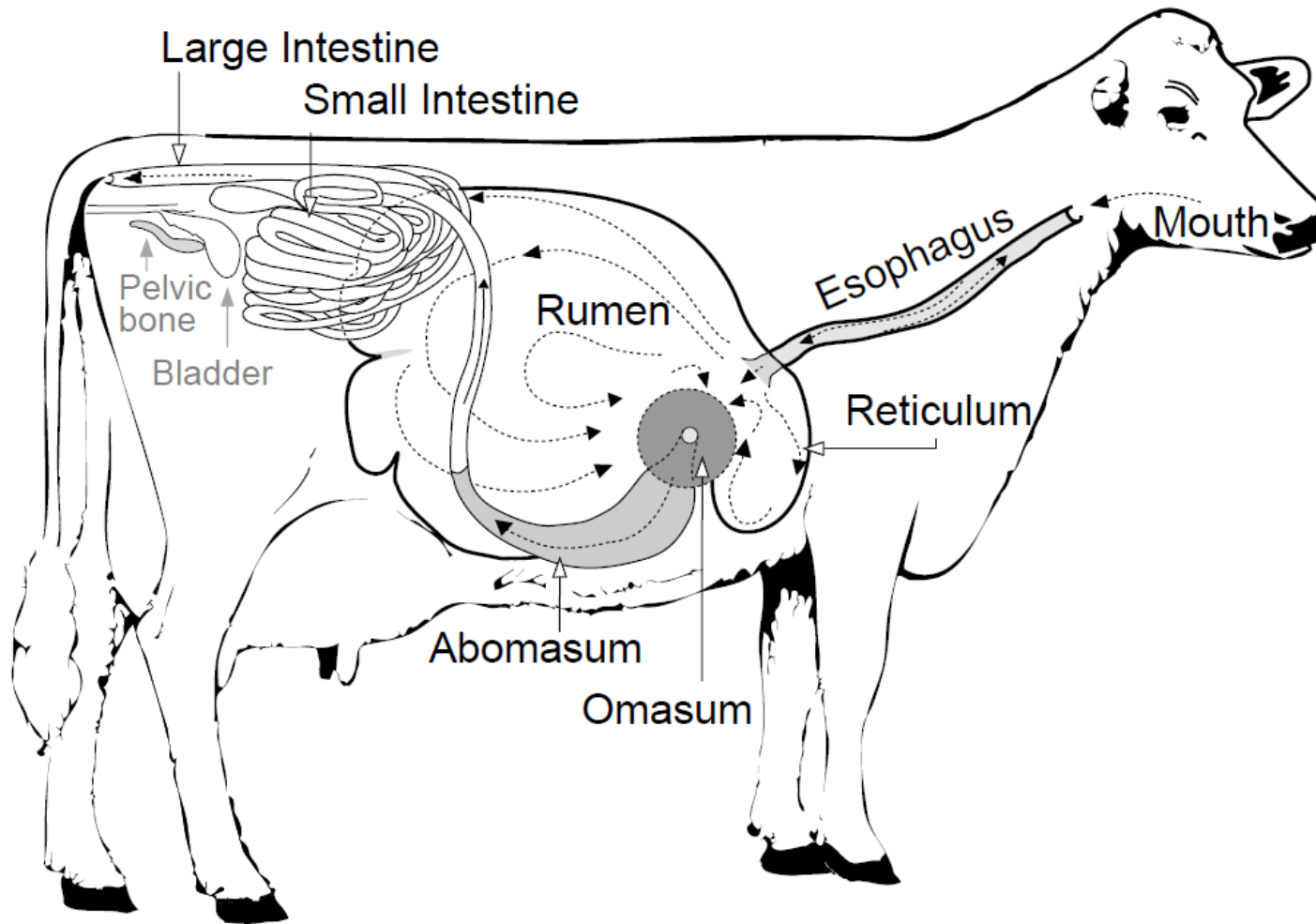
Matt Walpole and Timothy Mutsvangwa  
Department of Animal and Poultry Science

[matthew.walpole@usask.ca](mailto:matthew.walpole@usask.ca)



UNIVERSITY OF  
SASKATCHEWAN

# The Cow and Its Rumen

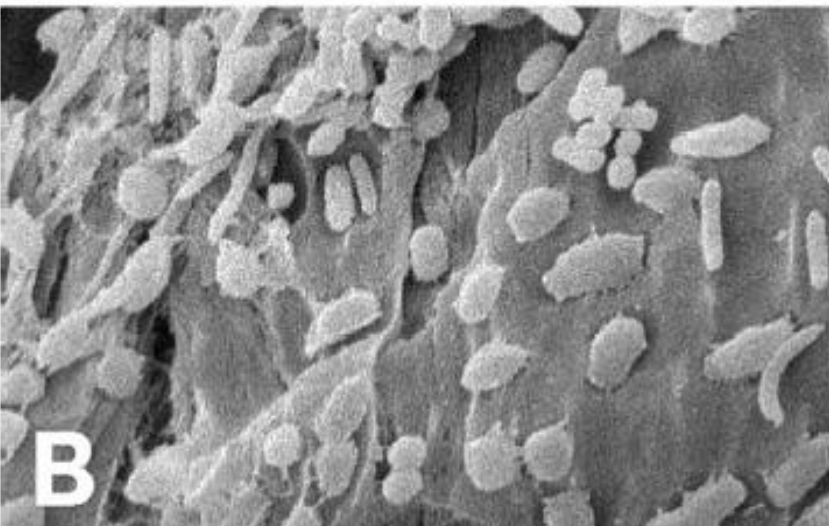
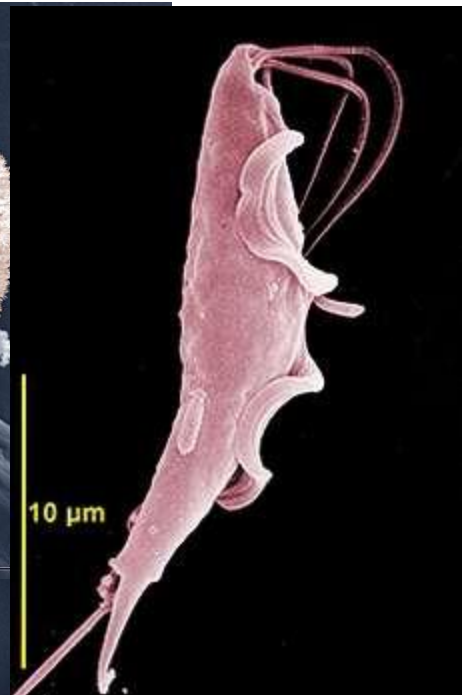
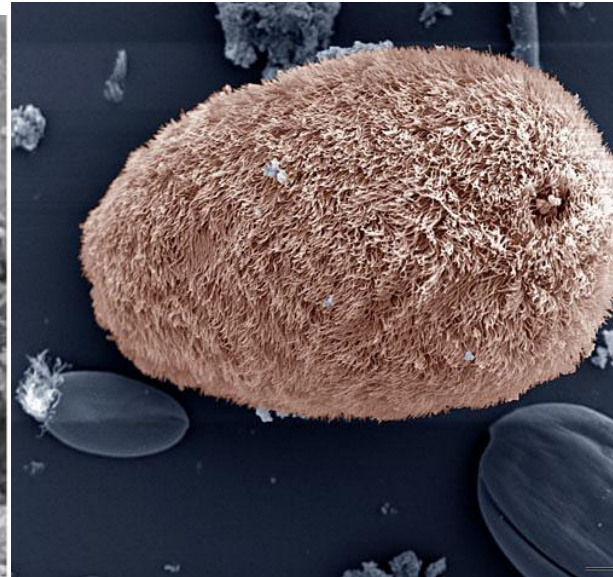
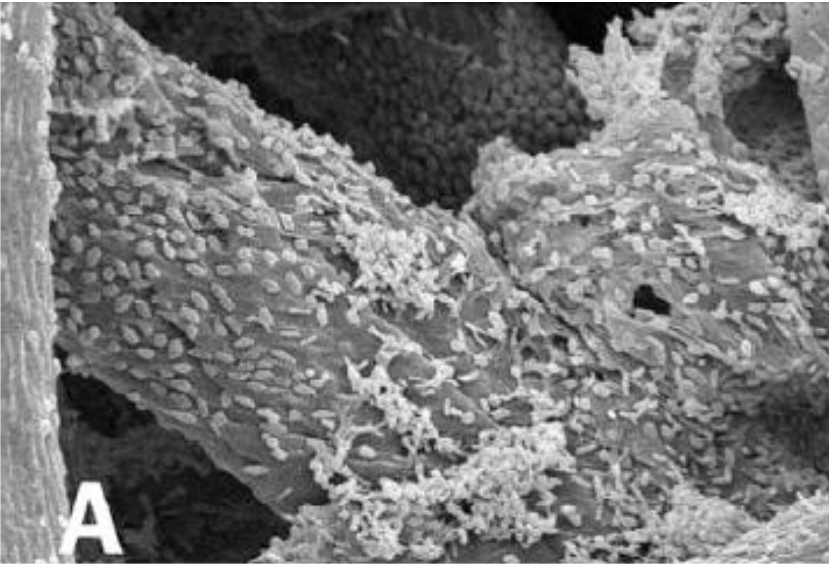


- Synergistic relationship between cow, rumen microorganisms

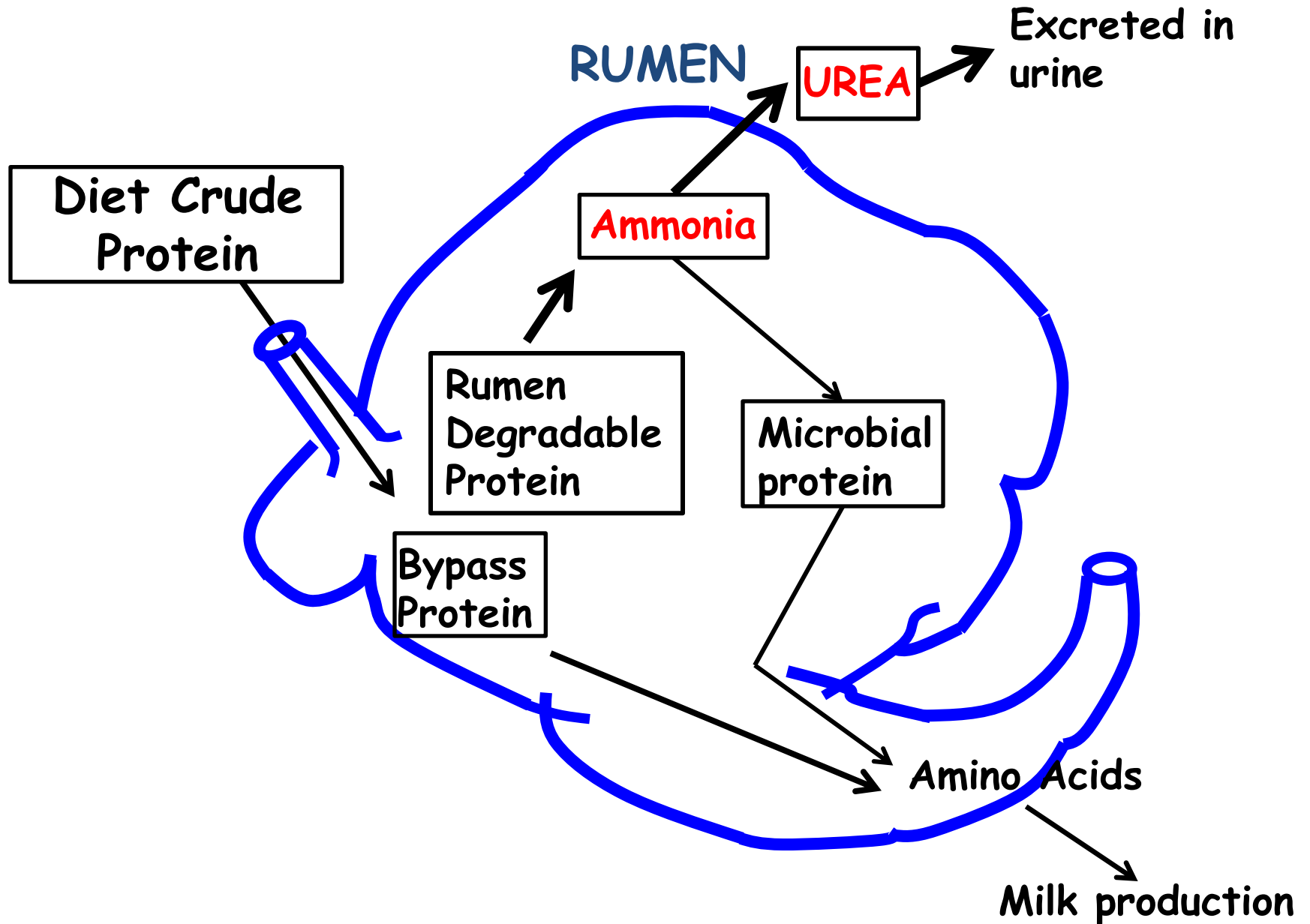
# Rumen Microorganisms

## BACTERIA

## PROTOZOA



# Substantial Losses of N from the Rumen as Ammonia



# Metabolizable Protein

- Post-rumen supply of protein
  - Microbial protein is 50-80% of metabolizable protein
  - Escape feed protein (bypass)

Lysine 

Phenylalanine 

Histidine 

Isoleucine 

Methionine 

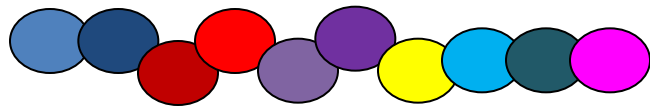
Valine 

Leucine 

Tryptophan 

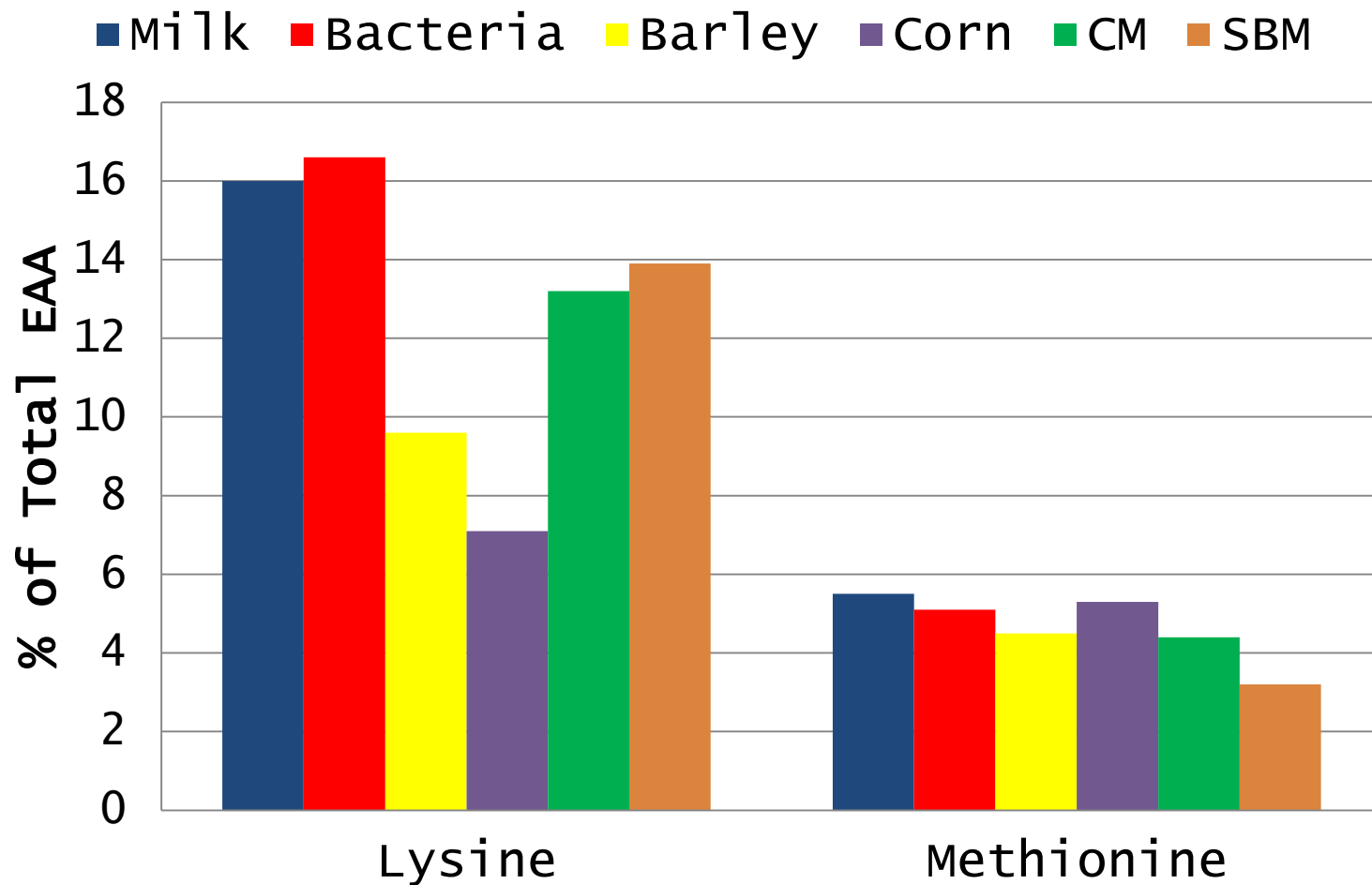
Threonine 

Arginine 



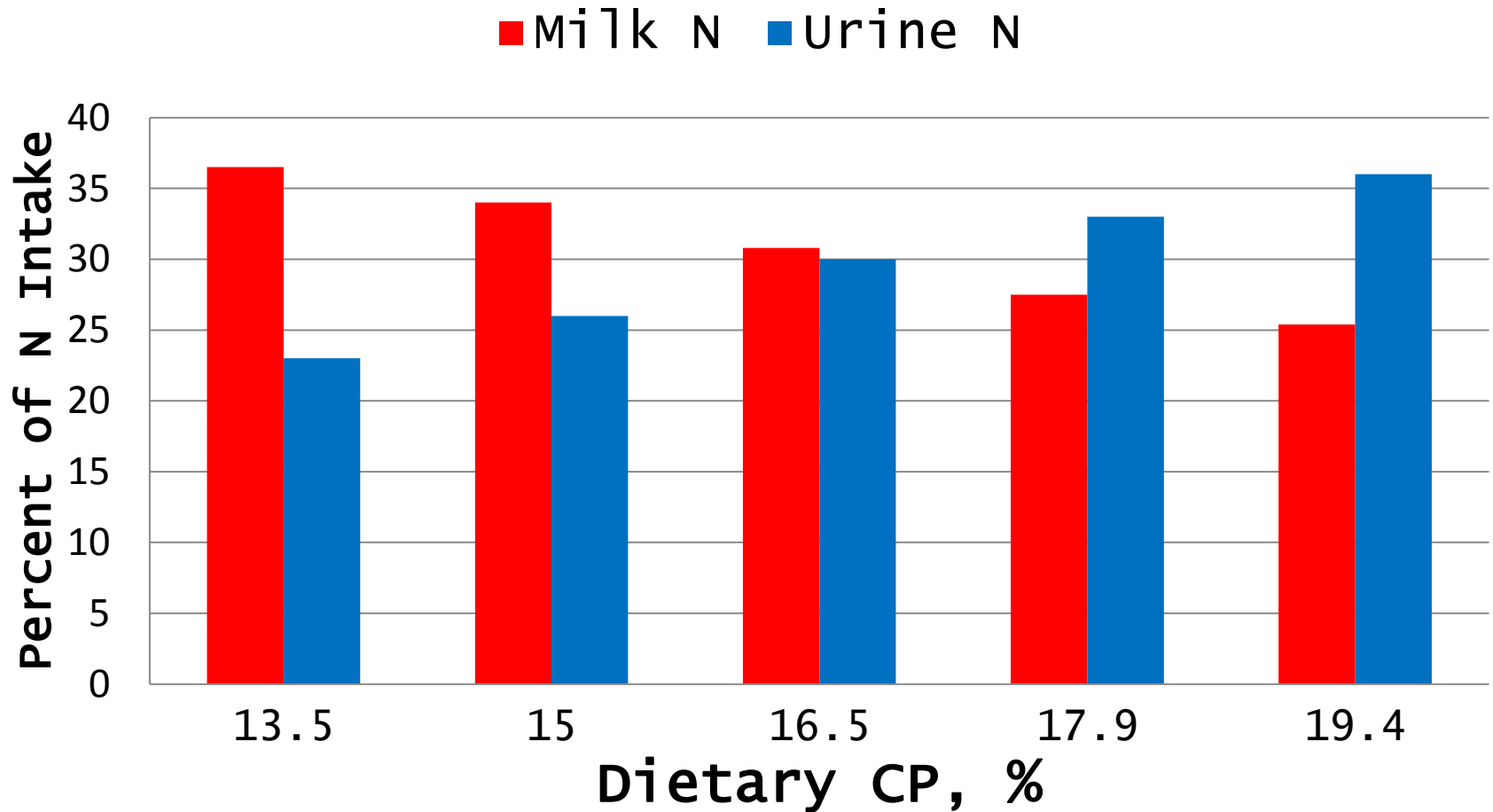
Milk, body proteins

# Comparison of Profiles of Essential Amino Acids



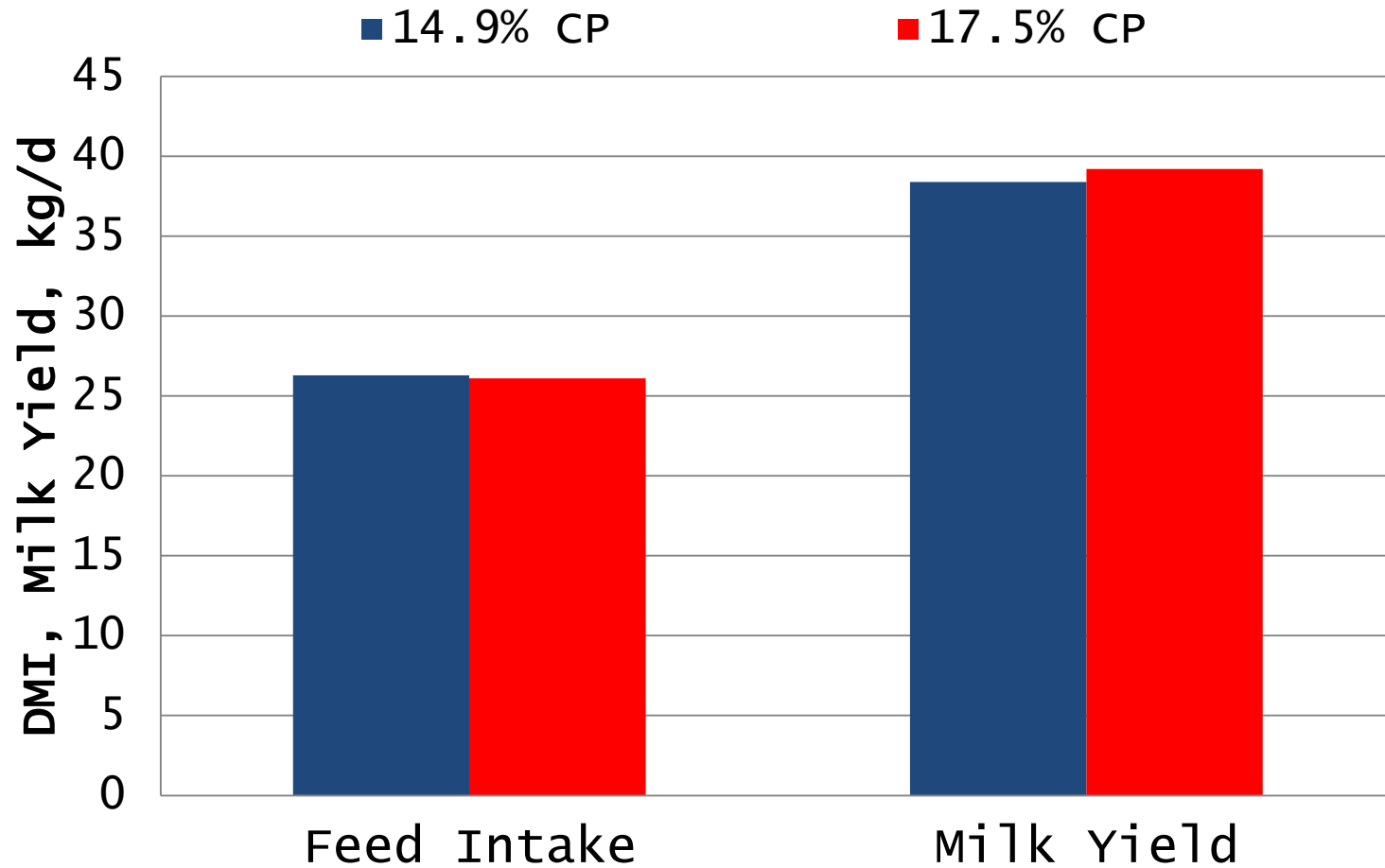
- lys & met in common feedstuffs inferior to microbial protein

# Milk N Efficiency and Dietary CP%



- Urine N mostly in the form of urea

# Feeding Low Crude Protein Diets

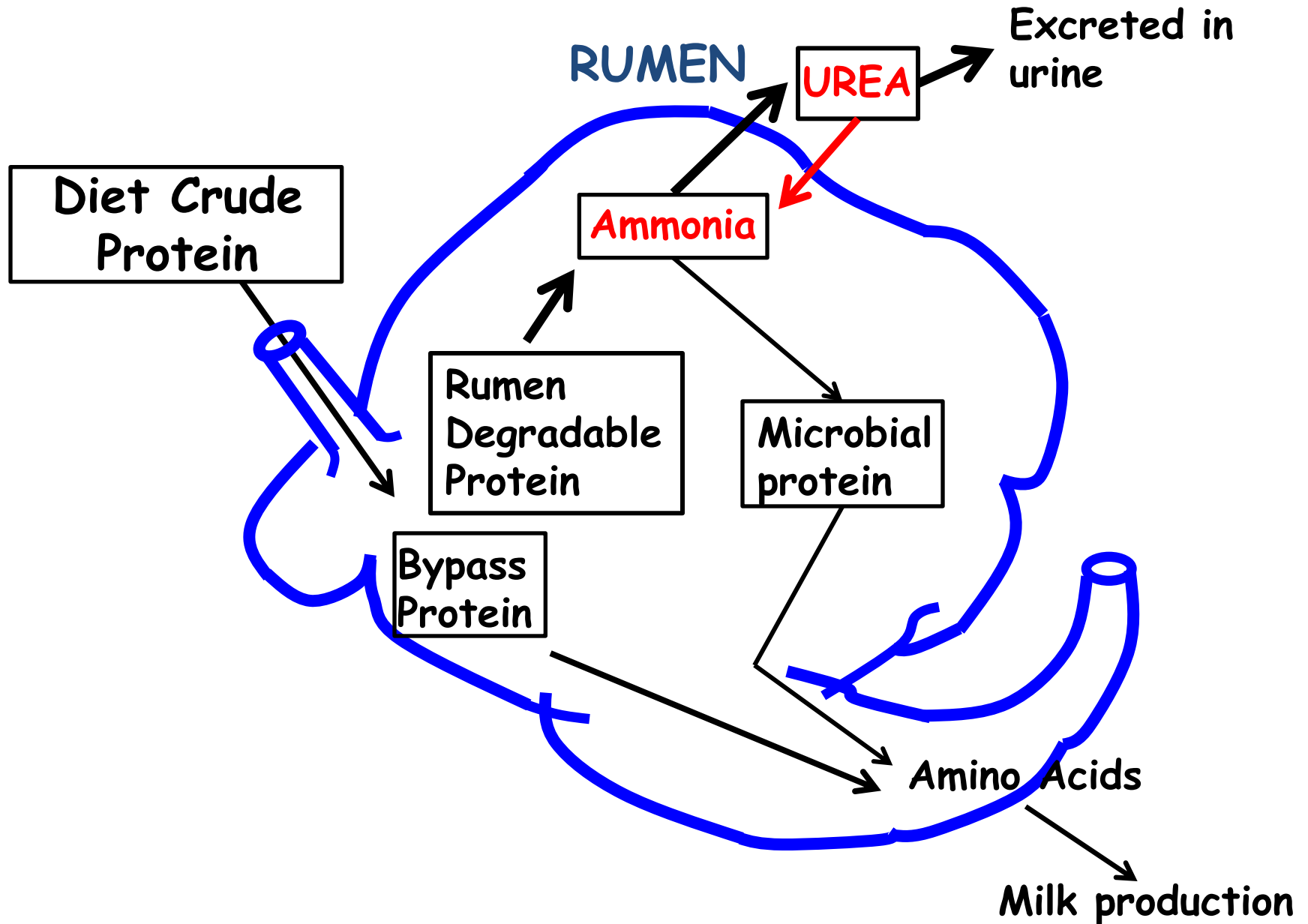


- Milk composition not affected

*Davies et al. (unpublished)*

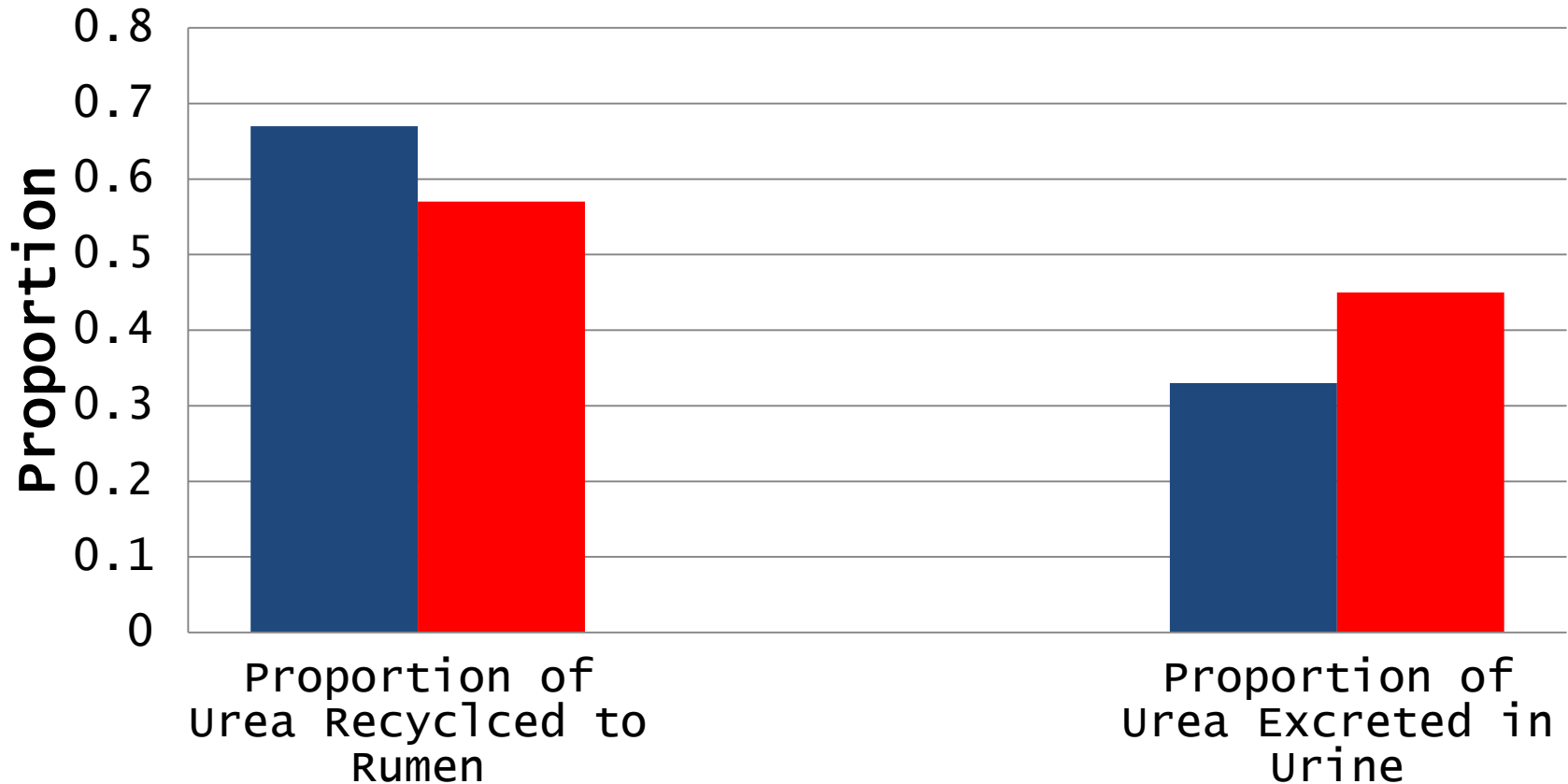


# Substantial Losses of N from the Rumen as Ammonia



# Effects of Diet Crude Protein on Urea-N Fractional Transfers in Dairy Cows

■ 14.9% CP ■ 17.5% CP



*Davies et al. (unpublished)*

# Feeding Low Crude Protein in Dairy Cows

- Can maintain high levels of milk production
- Enhance ability of the cow to recycle urea to the rumen
- Benefits
  - Reduced feeding costs
  - Improved fertility
  - Minimize nitrogen excretion into environment

# Milk Urea Nitrogen (MUN)

- MUN and Blood urea nitrogen are tightly correlated
- MUN measured in mg/dL
- What is normal?
  - 12-18 mg/dL for western Canada?
  - Determine baseline values for each herd

## So why worry About MUN?

- Overfeeding protein is expensive
- Energy cost of urea excretion
  - Up to 2 Mcal/d
- Impaired reproductive efficiency
  - MUN >19 mg/dL reduces pregnancy rates by 3-5%
- Poor environmental stewardship
- Underfeeding protein can reduce milk income

# Trouble-Shooting MUN

- If MUN too high
  - Excessive soluble and/or rumen degradable protein results in excess ammonia
  - Shortage of rumen fermentable carbohydrate limits microbial ability to capture the available ammonia
  - Low rumen pH limits microbial growth
- Don't use MUN values by themselves
  - Feed management
  - Production records
  - Nutrition program

# Conclusions

- Opportunities exist
- Lower CP intake by up to 2-2.5% units
- Enhance urea recycling, microbial protein supply
- If used cautiously, MUN can be a valuable tool to monitor protein status of dairy herd