

## Usefulness of milk urea nitrogen (MUN) to evaluate on-farm nutrition

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### Introduction

- On a gross scale, increasing crude protein content of diets:
  - Increases feed intake
  - Increases milk yield
  
- May increase milk protein content



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### Concerns

- Inefficiency of nitrogen use
  - Costly if excess protein is fed
  - Environmental issues
  - Cheese



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## CHEESE

- Processing yields affected by true protein content
- Increased value of protein



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## Protein Fractions of Milk

- Casein (~80%)
  - Whey (14-15%)
- } = True Protein
- NPN - nonprotein nitrogen (5-6%)
    - 25-30 mg/dl of milk
    - ~50% of NPN is urea N



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## Concerns (con't)

- Inefficiency of nitrogen use
  - Costly if excess protein is fed
  - Environmental issues
  - Cheese
  - Poor reproductive performance



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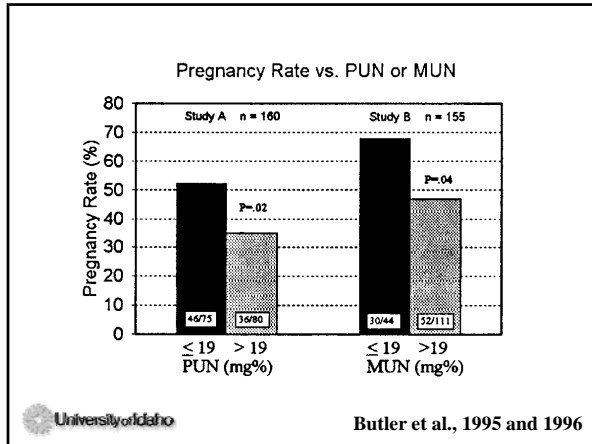
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**BUN and MUN suggested as a measure to evaluate efficiency of protein utilization**

University of Idaho

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**Urea**

$$\begin{array}{c}
 \text{NH}_2 \\
 \diagdown \\
 \text{O}=\text{C} \\
 \diagup \\
 \text{NH}_2
 \end{array}$$

- Excretory product of ammonia (NH<sub>3</sub>)
  - Rumen
  - AA catabolism
- Formed in liver: urea cycle

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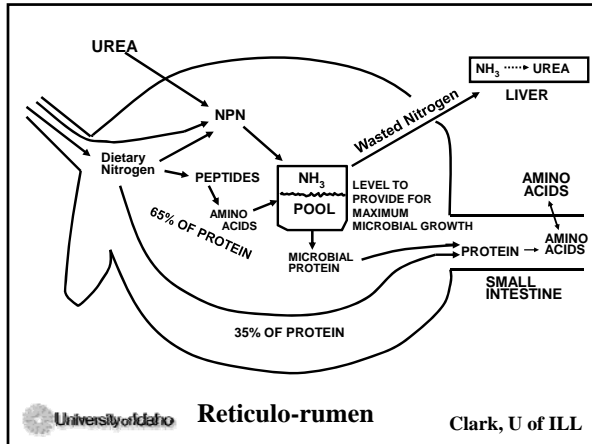
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- Released into blood for excretion by kidney
  - Blood urea nitrogen - BUN, PUN or SUN
  - Urea equilibrates with body water
  - BUN highly correlated with milk urea N (MUN)
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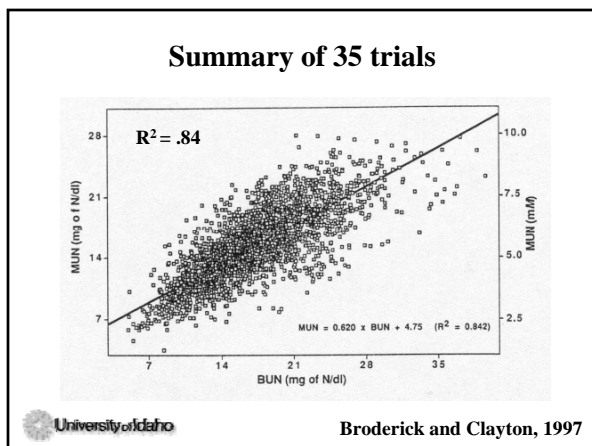
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## MUN

- Easier to sample
- Pre- and post-milking strip samples not different than typical milk sample



Gustafsson and Palmquist, 1993

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## Nutritional effects on MUN



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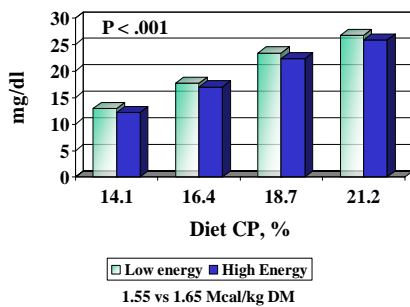
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## Milk urea N



Cannas et al., 1998

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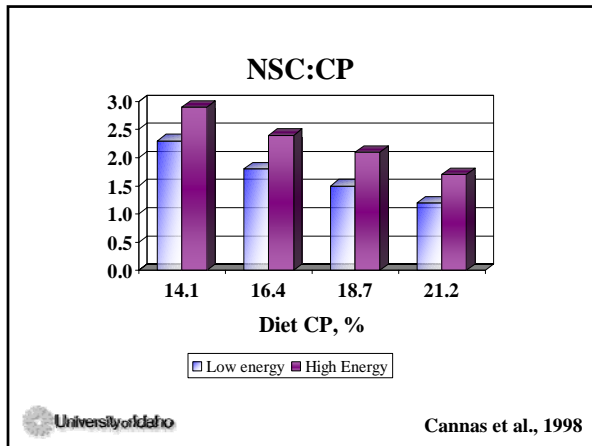
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### Quick summary

- MUN increased with increasing dietary protein
- Response confounded with carbohydrate availability
- RDP as a % of crude protein increased with increasing dietary CP

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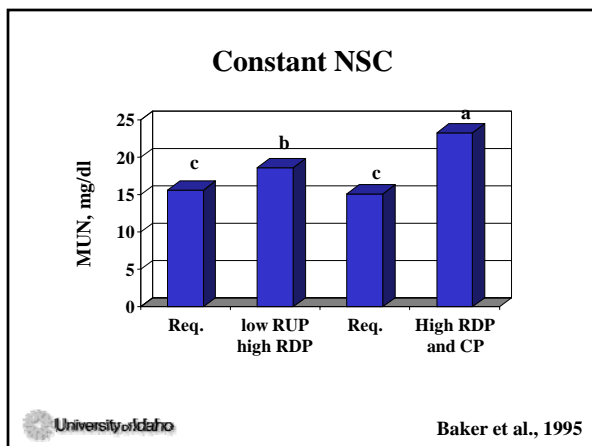
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### Quick summary

- Excess RDP increases MUN
- Imbalance in protein supply contributes to increased MUN



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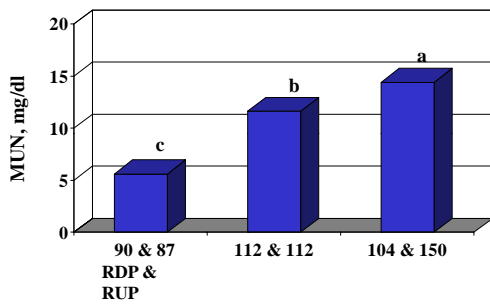
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### Effect of RUP on MUN



Roseler et al., 1993

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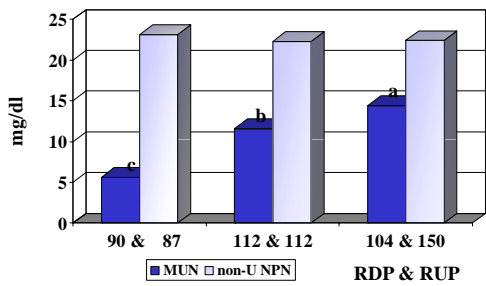
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### Milk NPN



Roseler et al., 1993

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### Quick summary

- MUN is affected by level of dietary RUP
- Non-urea NPN is stable



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### MUN may be a useful tool, BUT...

- Problem could be from a variety of nutritional issues
  - Dietary protein source
    - RDP
    - RUP
  - Dietary carbohydrate
  - Rumen fermentation (i.e., energy)



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### Milk Urea Nitrogen (MUN)

- What does it tell you?
  - Low MUN (<12 mg/dl) suggests a very efficient use of amino acids
    - possibly limiting



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### Milk Urea Nitrogen (MUN)

- What does it tell you?
  - High MUN (>18 mg/dl) suggests a significant rate of amino acid oxidation
    - overfeeding of protein
    - imbalanced amino acid pattern
    - excess urea fed
    - low energy
    - inadequate carbon for the bacteria to capture the N as microbial protein



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### How to Use MUN

- Sampling
  - with normal herd testing (individual animals)
  - more repeated in a subset of each ration fed or pen of cows (10-15% of cows sampled)
  - Time of day
    - little variation unless significant slug feeding or significant sorting occurring



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### How to Use MUN

- Results only can suggest that protein nutrition is improper (could be either protein or energy effect)
- Only provides a clue; does not give the full answer
- You must investigate to determine if there is a problem



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