Nutrition

- Feed costs make up approximately 50% of the total cost of producing milk
- As milk yield increases fixed costs per cwt decline
- Cow must be fed everyday
- Career opportunities
  - B.S., M.S., Ph.D.
  - private consultants - $1/cow/month

Nutrient Requirements

- Cows
  - milk
  - growth
  - pregnancy
  - maintenance
- Heifers
  - growth
  - pregnancy
  - maintenance

Nutrient Consumption

- 17,000 lbs of dry matter
- 70% CHO (11,900 lbs)
- 17% Protein (2,890 lbs)
- 5% Fat (850 lbs)
- 8% Minerals (1,360 lbs)

World Record Milk Production

- LA-Foster Blackstar Lucy 607 (NC)
  - 6-3 365d 3X 75,275 milk
  - 1738 (2.3%) fat
  - 2164 (2.9%) protein
- City-Edge Commotion Excel (WI)
  - 4-2 365d 3X 70,612 milk
  - 2963 (4.2%) fat
  - 2163 (3.1%) protein

Factors that Influence Production

1. Genetics
2. Management
3. Environment
4. Feeding Program
### Ruminants

- What are the advantages of Ruminants?
- Convert products unusable to humans to:
  - milk
  - meat
  - wool
- Natures perfect recycle bin
- Do not compete with human food sources

### Rumen Function

- Provide an environment for the microbial fermentation of complex carbohydrates:
  - VFA - energy
  - microbes - protein
  - B vitamins

### Ruminant Anatomy

- Reticulum
- Rumen - capacity 60 - 100 L
  - average 40 L of liquid in rumen
- Omasum
- Abomasum

### Rumen Papillae

- Increase surface area
- absorptive capacity is 2x VFA production
- Remove products of digestion
- Buildup of VFA
  - inhibit fermentation
  - decrease passage rate
  - decrease intake

### Products of Fermentation

- VFA
  - Acetate
  - Propionate
  - Butyrate
- Microbial protein
- B vitamins
- Carbon dioxide and Methane
- Ammonia and Nitrate

### Rumen Motility

- Primary Contraction - Mixing cycle
  - functions to move - turnover digesta
  - Timing
    - Rest - 28 sec
    - Rumination - 26 sec
    - Eating - 23 sec
- Secondary Contraction - Eructation cycle
  - 1:1 ratio for primary to secondary
Factors Effecting Contractions

- Physical form of diet
  - High forage - 70/hour (primary)
  - Low forage - 55/hour
  - No forage - 45/hour
- Rumen pH - 6.5 to 7.0 optimal for #
  - pH <5.5 contractions and motility decline
  - pH <4.5 motility ceases

Benefits of Rumination

- Increases feed intake
- Reduction of particle size
- Addition of saliva
- Prevent rumination
  - Slower fermentation rate
  - Decrease passage
  - Decrease intake

Saliva

- Cattle consuming a forage diet - 180 L/day
- Functions
  - Aids in mastication and swallowing of feed
  - Buffering
- An excellent buffer between pH 5.5 - 7.5
- Small particle size reduces saliva during eating and rumination