

# **Milk Components**

**What's in this Stuff**

# Milk Components

- **Water - 87.0 %**
- **Butterfat - 3.7 %**
- **Protein - 3.0 %**
- **Lactose - 5.0 %**
- **Minerals and Other Solids - 1.3%**

# Milk Components

- **Solids -not - fat (SNF) - includes everything but the water and fat**
- **Milk Urea Nitrogen (MUN) - a small part of the protein**
- **Somatic Cell Count (SCC) - not listed as component**

# Milk Components

- **Value of Components**
  - **Milk Prices Paid to Dairies**
    - **SCC/Quality Bonus \$**
    - **Fat %, SNF & Cheese Yield**
  - **Legal Limits on Milk Shipped**
  - **Metabolic Indicator of Cow's Health**

# Milk Components

- **Milk pricing includes differentials for:**
  - **Pounds (cwt) of Milk**
  - **% or pounds of butterfat**
  - **% or pounds of protein**
  - **Quality parameters (SCC, standard plate count, no antibiotics or added water)**

# Milk Components

- **Butterfat**
  - **It's the 2% in 2% Milk**
  - **Lipid Portion of the Milk**
  - **Measured by Babcock (centrifuge) method of ether extraction**
  - **Varies by breed (Holstein, Jersey, etc.)**

# Milk Components

- **Protein**
  - **Amount of Nitrogen (N) \* 6.38**
  - **Most important for cheese production**
  - **Primary nutritional value in milk**
  - **MUN implications**

# Milk Components

- **Lactose**
  - **Naturally occurring milk sugars**
  - **Allergenic reaction in people - lactose intolerant**



# Milk Components

- **Somatic Cell Counts**
  - **Indicates level of mastitis infection**
  - **High SCC Reduces milk production**
  - **Basis of quality bonus for milk payment**
  - **High SCC = lost money!**

# Milk Urea Nitrogen - MUN

- **Same as:**
  - **BUN (blood)**
  - **SUN (serum)**
  - **PUN (plasma)**

# Reasons to MUN Test

- **Nutrition**
- **Reproduction**
- **Environment**

# Nutrition Components

- **Dry Matter**
- **Energy**
- **Protein**
- **Minerals**
- **Vitamins**
- **Water**

# Nutrition


- **Overfeeding - Expensive**
- **Underfeeding – Affects Production & Repro**
- **Acceptable level means Energy & Protein in Balance**

# Reproduction

- **High MUN --> Lower Conception Rates**
- **Effects health and immunity**

# Environment

- **Excess MUN in Milk ->**
  - **Excess Excretion**
  - **Nitrate Pollution**
  - **Air & Water Quality Issues**



**Milk Component  
Variation  
During the  
Milking Process**



# Variation in Components

## Milk Components Change

- **Stage of Lactation**
- **Milking Practices**
- **Environmental Factors**
- **Breed & Genetics**
- **Season of the Year**

# Stage of Lactation

- **High very early**
- **Lower at peak**
- **Higher at end**
- **Inverse of Production Curve**

# Milking Practices

- **Frightened Cows**
- **Milking Schedule**
- **Maximum & Complete Letdown**
- **Vacuum Levels & Sampling Methods**

# Environmental Factors

- **Illness or Stress**
- **Heat Cycles**
- **Temperature/Season of Year**
- **Types of Feed**

# Breed & Genetics

	<u>% FAT</u>	<u>% PRO</u>
<b>Br.Swiss</b>	<b>3.92</b>	<b>3.43</b>
<b>Guernsey</b>	<b>4.41</b>	<b>3.37</b>
<b>Holstein</b>	<b>3.60</b>	<b>3.11</b>
<b>Jersey</b>	<b>4.54</b>	<b>3.59</b>

*(2007 CDHIA Statistics)*

# Season of the Year

<b>Season</b>	<b>Effect</b>	
	<u><b>Fat %</b></u>	<u><b>Pro %</b></u>
<b>Winter</b>	<b>Highest</b>	<b>Highest</b>
<b>Spring</b>	<b>Decreasing</b>	<b>Decreasing</b>
<b>Summer</b>	<b>Lowest</b>	<b>Lowest</b>
<b>Fall</b>	<b>Increasing</b>	<b>Increasing</b>

*(Source: Ng-Kwai-Hang, Hayes, Moxley, and Monardes, 1984)*

# **Fresno State Study**

- **Completed April 2000**
- **18 Cows**
- **12 Holstein**
- **6 Jersey**

# Fresno State Study

- **4 Quartiles of the Letdown**
  - Meaning  $\frac{1}{4}$  of the cows production
- **All Components Analyzed**
  - **Fat**
  - **Protein**
  - **Lactose**
  - **Somatic Cells (SCC)**



# Fresno State Study

## Variation by:

- **Breed**
- **Lactation/Age**
- **Days in Milk**

<b>All Cows</b>						
<b>All Cows - 18 cows</b>						
quartile	% fat	% pro	% lactose	% snf	ave. scc	
1	1.91	3.49	4.77	9.24	169	
2	3.24	3.54	4.79	9.23	233	
3	4.47	3.53	4.69	9.08	177	
4	5.97	3.49	4.54	8.81	321	
<b>By Breed</b>						
<b>Holsteins - 12 cows</b>						
quartile	% fat	% pro	% lactose	% snf	ave. scc	
1	1.81	3.25	4.75	8.93	208	
2	2.77	3.29	4.78	8.95	300	
3	3.97	3.29	4.68	8.80	228	
4	5.24	3.25	4.53	8.55	425	
<b>Jersey - 6 cows</b>						
quartile	% fat	% pro	% lactose	% snf	ave. scc	
1	2.10	3.98	4.82	9.85	89	
2	4.20	4.03	4.82	9.80	99	
3	5.47	4.02	4.73	9.65	76	
4	7.42	3.97	4.57	9.33	113	

# By Lactation

## 1st lactation - 5 cows (4 - H/1 - J)

quartile	% fat	% pro	% lactose	% snf	ave. scc
1	2.14	3.40	4.70	9.10	124
2	2.90	3.48	4.82	9.20	49
3	4.16	3.48	4.70	9.02	84
4	6.04	3.42	4.56	8.78	173

## 2nd lactation - 7 cows (5 - H/2 - J)

quartile	% fat	% pro	% lactose	% snf	ave. scc
1	1.94	3.49	4.86	9.29	171
2	3.00	3.53	4.83	9.27	315
3	4.31	3.51	4.73	9.11	225
4	5.81	3.47	4.57	8.81	378

## 3rd lactation and above - 6 cows (3 - H/3 - J)

quartile	% fat	% pro	% lactose	% snf	ave. scc
1	1.67	3.58	4.73	9.30	203
2	3.82	3.60	4.72	9.22	290
3	4.90	3.60	4.65	9.10	200
4	6.08	3.57	4.48	8.83	377

# Days in Milk

## Less than 150 days in milk - 8 cows (5 Ho/3 Jer)

quartile	% fat	% pro	% lactose	% snf	ave. scc
1	1.73	3.40	4.88	9.24	133
2	3.25	3.41	4.83	9.14	186
3	4.33	3.40	4.75	9.00	148
4	6.05	3.39	4.61	8.76	153

## More than 150 days in milk - 10 cows (7 Ho/3 Jer)

quartile	% fat	% pro	% lactose	% snf	ave. scc
1	2.05	3.57	4.69	9.24	197
2	3.24	3.64	4.76	9.31	270
3	4.58	3.64	4.65	9.15	201
4	5.90	3.57	4.48	8.85	455

# Changes in Components

## Separate Study Verification

	<u>% Fat</u>	<u>% Pro</u>	<u>% SNF</u>
<b>1st Minute</b>	<b>2.46</b>	<b>3.49</b>	<b>8.97</b>
<b>2nd Minute</b>	<b>3.62</b>	<b>3.46</b>	<b>9.07</b>
<b>3rd Minute</b>	<b>4.90</b>	<b>3.40</b>	<b>8.98</b>
<b>After 3 min.</b>	<b>6.30</b>	<b>3.34</b>	<b>8.89</b>

*(Data from 10 Ayrshire, Guernsey, Holstein and Jersey breeds - Gilmore & Gaunt, 1962)*

# Fresno State Study

- **Major Variations in**
  - **%Butterfat**
  - **Somatic Cell Counts**

# Fresno State Study

- **Minor Variations in**
  - **%Protein**
  - **Lactose**
  - **SNF**

# Implications for DHIA

- **Requires Accurate Sampling**
- **Incorrect Sampling Big Problem for Fat/SCC**
- **Testers Responsible for the Samples Each Month**