

# Colostrum

"Don't be born without it!"

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## A Foundation for Health and Growth

**colostrum**

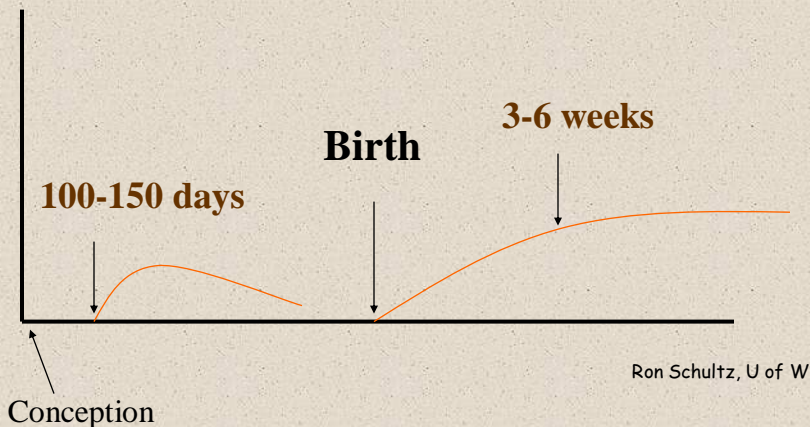
- Passive immunity
- Superior nutrition
- Growth and development factors

# Newborn Immunity

- No antibodies or immunoglobulins (Ig) at birth in the neonatal bovine
- No transplacental transfer occurs
- Active immune system although competent is naïve



# Immune Competence



## Colostrum Protection

- Antibodies from the dam
- IgG (88%), IgA(5%), IgM (7%)
- IgG1 = 80-85% of IgG
- Somatic cells (leukocytes) > 1 million/ml



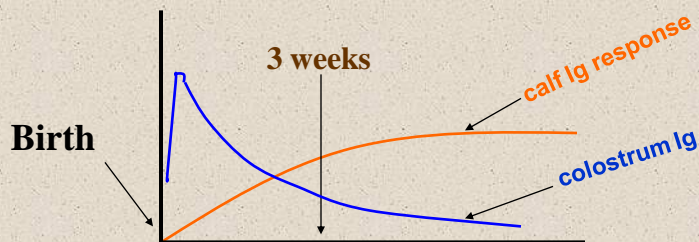
## Colostrum Formation

- From 3-4 weeks before term
- Ig enhanced by vaccination of dam
- Quality reduced by long dry period or ones shorter than 3-4 weeks
- May be affected by nutrition and stress



## Passive Immunity

- Immediate
- Short-lived Ig (11.5-16 day half-life)
- Antigen specific



## Failure of Passive Transfer of Immunity (FPT)

- Based on measuring the level of systemic immunity
- Calves with serum IgG levels of  $<10\text{g/L}$  at 24-36 hours of age are considered in the FPT category
- The equivalent serum total protein threshold is between 5.2-5.5 g/dL

## Colostrum Management

- Quantity
- Quality
- Quickly  
*and...*
- Cleanly



## Colostrum Feeding

- 3-4 quarts (8% of BW) within 4 hours of birth
- Won't drink it? Tube it!
- Feed 2 quarts again in 8-10 hours
- Sanitized and dry feeding articles!

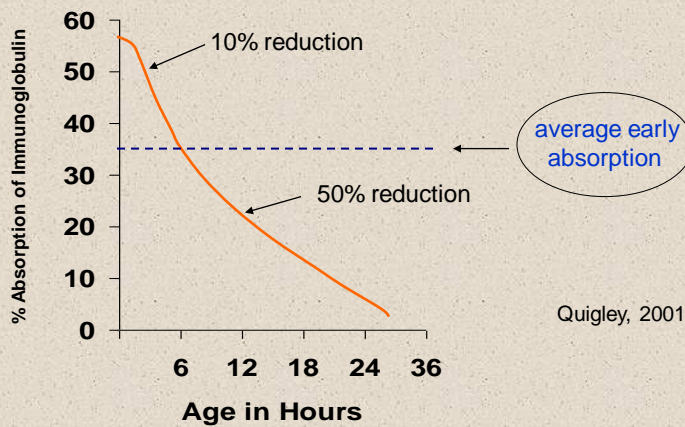


# Colostrum Absorption Factors

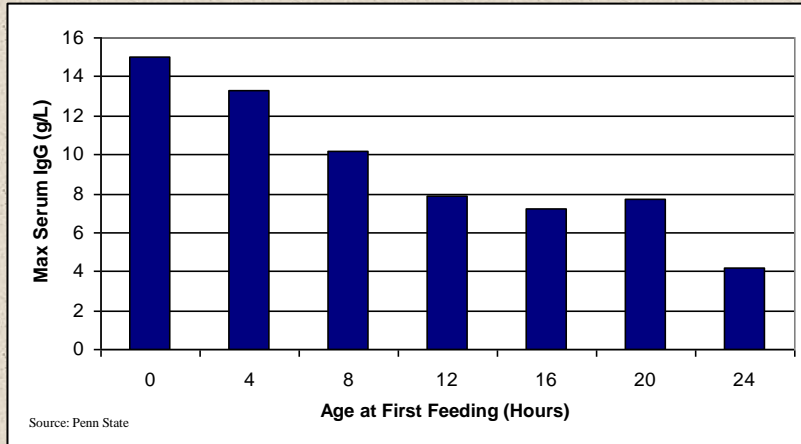
- Age of the calf
- Volume consumed
- Ig concentration
- Metabolic status of calf



## How soon is quick enough?



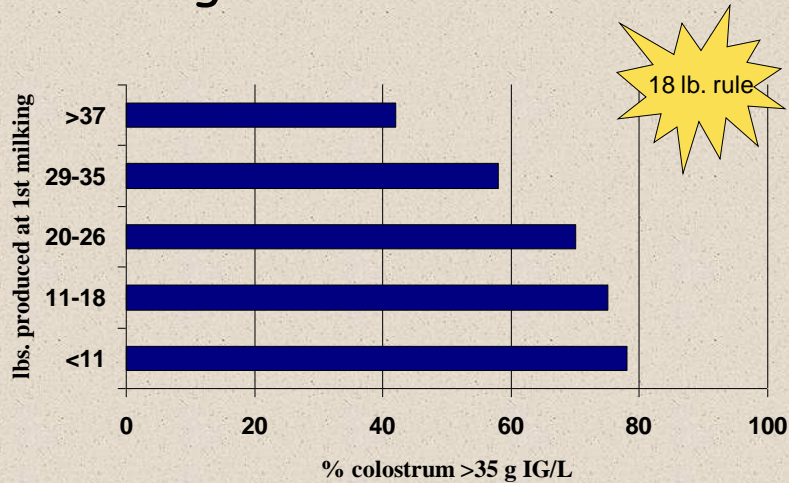
## Late action = poor protection



## Ig Concentration Factors

- Age of dam - *better with age to a point*
- Antigen exposure - *natural or vaccine*
- Time of milk out - *lose 40% by 6 hours*
- Volume of first milking - *18 lb. rule*
- Pre-milking or leaking - *milk replacing Ig*

## Effect of Milk Output at 1<sup>st</sup> Milking on IG Concentration



## Evaluation of IgG content

- Colostrometer
  - Calibrated for 68°-74°F
  - Fat and non-Ig protein variations skew results
  - Inexpensive
- Immunodiagnostic test
  - Measures IgG directly
  - Reports above or below 50mg/ml IgG level
  - Higher cost





## Grams IgG absorbed = volume x concentration

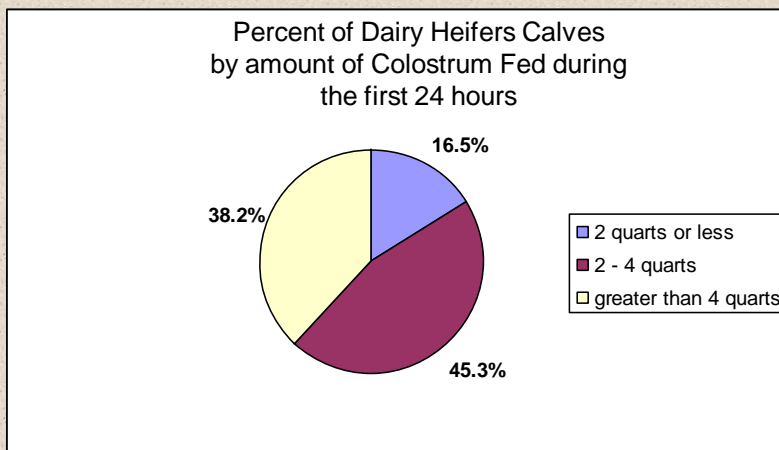
90 lb calf needs 36 grams IgG  
Average absorption rate = 35%

Good colostrum = 50g/L  
 $50\text{g/L} \times 0.35 \times \boxed{2\text{ L}} = 35\text{ grams}$

Fair colostrum = 25g/L  
 $25\text{g/L} \times 0.35 \times \boxed{4\text{ L}} = 35\text{ grams}$



## The Volume Status Quo



NAHMS 2002

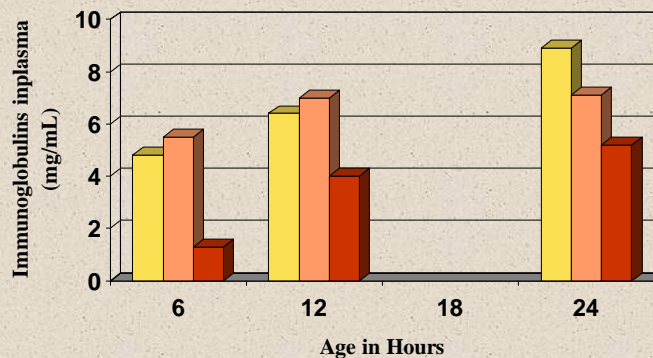
## Metabolic Impact of Dystocia

- Physical trauma, inactivity and congestion
- Low blood oxygen levels
- Hypothermia ( $<101^{\circ}\text{F}$ )
- Respiratory acidosis
- Transient hypoglycemia



## Dystocia Affects Absorption of IgG

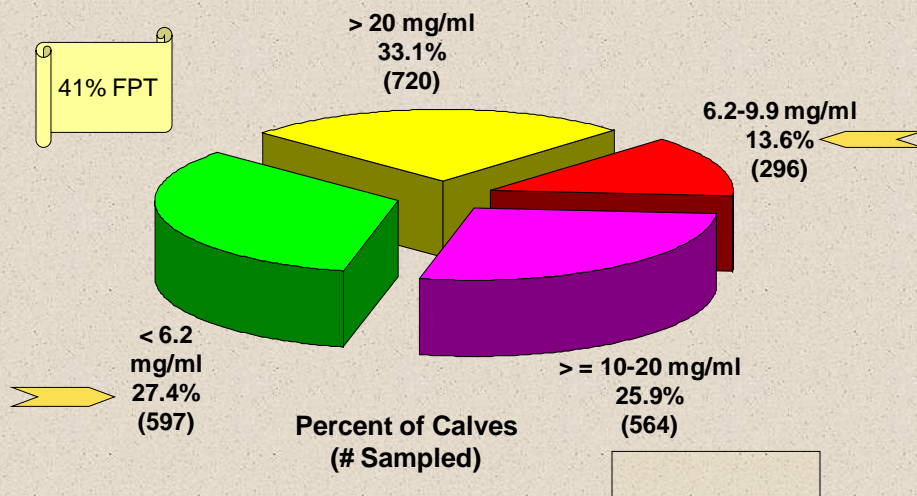
■ Births without dystocia    ■ Moderate dystocia births  
■ Severe dystocia births



Source: M Energy Metabolism and Thermoregulation in the newborn Calf: Effective of Calving Conditions, Vermorel et A. "1989 Canadian Journal of Animal Science, Volume 69.

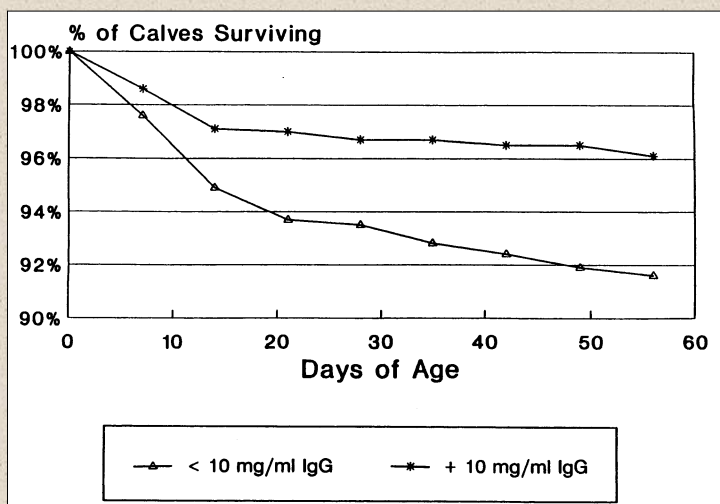
## Distribution of Immunoglobulin (IgG) Levels in Dairy Calves

National Dairy Heifer Evaluation Project



## Comparison of Calf Survival Rates by Level of Immunoglobulin (IgG) Concentration

National Dairy Heifer Evaluation Project



# First one there is the winner!

The delivery of pathogenic bacteria to the gut whether from environmental exposure or through the feeding system can alter the outcome expected by the passive transfer indicated.

| Feeding  | Results   |
|--|---|
| <i>E. coli</i> fed alone   | High level of bacteria attachment to intestine and high level of <i>E. coli</i> in lymph (circulation)              |
| Colostrum and <i>E. coli</i> fed together                        | No bacteria attachment to intestine   |
| Colostrum feeding followed in one hour by <i>E. coli</i> feeding | No bacteria attachment to intestine. High level of circulating antibodies. No <i>E. coli</i> in lymph (circulation) |

Source: Corley et al., 1977

## 1<sup>st</sup> day nutritional needs

- Calves are only 3% fat by body weight compared to 18% for human infants
- Only 180 grams of glycogen stores
- Only 18 hours of energy reserve in thermo-neutral environment (>60°F)
- Acute need for absorbable and available energy and protein

# Mother Nature's Best

The average Holstein "first milking" colostrum compares to normal milk as follows:

|                     |    |                            |        |
|---------------------|----|----------------------------|--------|
| Colostrum contains: | 2  | times the <b>solids</b>    | (24%)  |
|                     | 4  | times the <b>protein</b>   | (14%)  |
|                     | 2  | times the <b>fat</b>       | (7%)   |
|                     | 65 | times the <b>IgG</b>       | (3.2%) |
|                     | 2  | times the <b>calcium</b>   | (.26%) |
|                     | 10 | times the <b>Vitamin A</b> |        |
|                     | 3  | times the <b>Vitamin D</b> |        |
|                     | 10 | times the <b>iron</b>      |        |

## Other Properties

- Growth factors
- Hormones
- Immunomodulators
- Leukocytes (WBC)
- Antimicrobial protective factors
- Enzyme inhibitors



## What about replacements and supplements?

- Invaluable in Johnes, BLV, etc situations
- Variations in IgG content and ratios
- No cellular component
- Presence of growth factors
- Nutritional content

## Food for thought....

*If you could be given the "perfect" product to lay the foundation for superior calf health and growth at no out of pocket cost just by adhering to best management practices, what would you say?*

She's counting on you!



*Thank you*