

# THE BOVINE COLOSTRUM:

## IMPORTANCE IN CALF GROWTH AND POTENTIAL USE IN THE TREATMENT OF GASTROINTESTINAL DISEASES

PART 1

### The Colostral Components

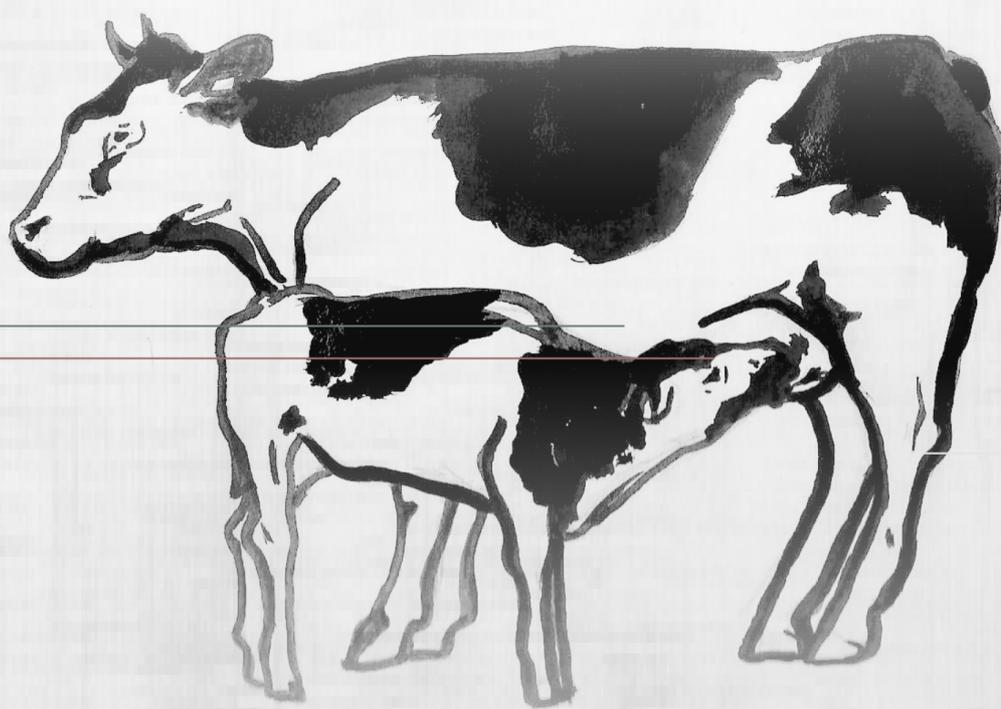
#### WHAT IS THE COLOSTRUM

- We have referred to the colostrum while citing colostrum immunity during the lectures in the chapter of Immunophysiology as well as that of Digestion.

The colostrum is the first milk produced 5–7 days after parturition and it is the first food taken by the newborn calf.

Regarding its composition it is more similar to the blood rather than the milk. It consists of nutrients and a great variety of biologically active substances including immune components and growth factors. The constitution of the colostrum means that it is essential for the newborn and has great potential as a product in the human nutrition and pharmacy markets [Penchev Georgiev 2008].

The exact composition of the colostrum may vary according to the stage of lactation, or due to pathological conditions (e.g. mastitis might be responsible for the presence of maternal epithelial cells (MEC) originating from the mammary gland). [K. Stelwagen et al 2008]



#### NUTRIENTS\*

##### CARBOHYDRATES [Leonardo Murgiano 2009]

1. Lactose

##### PROTEINS [Penchev Georgiev 2008]

1. Caseins
2.  $\beta$ 2-microglobulins  
(prevent excess Fe in the body by acting on liver cells and erythrocytes)
3. Enzyme inhibitors
4. Acute phase proteins
  - a. **Haptoglobin:**  
(binds hemoglobin to protect the kidneys)
  - b. **Glycoproteins**
  - c. **Prealbumin**
5. Enzymes
  - a. **Plasmin**  
(fibrinolysis => dissolves blood clots)
  - b. **Glucuronyl transferase**  
(neutralizes the toxic compounds in the liver, some of which may be carcinogenic)
  - c. **Glucose-6-phosphate isomerase**
  - d. **Phosphodiesterase**
  - e.  **$\alpha$ -mannosidase**
  - f. **Galactosyltransferase**
  - g. **Alkaline phosphatase**
  - h. **N-acetyl- $\beta$ -glucosaminidase**
  - i. **Membrane-bound enzyme  $\gamma$ -glutamyl transferase**
  - j. **Cathepsin D**  
(breaks down caseins)
6. Hormones
  - a. **Insulin**
  - b. **Glucagon**
  - c. **Thyroid hormones (thyroxin T3)**
  - d. **Cortisol**
  - e. **Somatotropin**
  - f. **Prolactin**
  - g. **Oestrogens**

##### LIPIDS [Leonardo Murgiano 2009]

1. Prostaglandins
2. Cholesterol
3. Triglycerides
4. Phospholipids

##### VITAMINS [Penchev Georgiev 2008]

1.  $\beta$ -carotene,
2. Vitamins -A, -B, -D, -E

##### MINERALS [Penchev Georgiev 2008]

1. Iron
2. Magnesium
3. Sodium salts

\*AND BIOLOGICALLY ACTIVE SUBSTANCES



#### IMMUNAL

##### COLOSTRAL IMMUNOGLOBULINS [K. Stelwagen et al 2008]

1. IgG1 81%
2. IgG2 5%
3. IgA 7%
4. IgM 7%

##### OTHER IMMUNOLOGICAL FACTORS

[K. Stelwagen et al 2008]

- A. Major milk proteins
  - a.  **$\alpha$ - $\beta$ -lactoglobulin**
  - b. **Lactalbumin**
  - c. **Caseins**
- B. Other Proteins and Peptides
  - a. **lactoferrin : antibacterial/antifungal**
  - b. **Lactoperoxidase**
  - c. **Lysozyme**
  - d. **Angiotensin (antimicrobial function)**
  - e. **Complements such as C3**
  - f. **The highly glycosylated polypeptide SC**  
(enhances the adaptive and innate immunity)
  - g. **Ribonucleases**
  - h.  **$\beta$ -defensin**
  - i. **Lipopolysaccharide-binding protein**
  - j. **Glycoproteins**
  - k. **Cathelicidins**
  - l. **Properdin**
  - m. **Antimicrobial cationic peptides and proteins**

##### IMMUNE CELLS ( $\gamma$ T AND B LYMPHOCYTES, NEUTROPHILS, MACROPHAGES)

[K. Stelwagen et al 2008]

- ◆ Phagocytosis
- ◆ Cytokines production
- ◆ Inflammation initiation



#### GROWTH

##### COLOSTRAL GROWTH FACTORS [Sylvie F. et al 2006]

Growth factors, together with the hormones present in the colostrum play a significant role in the ontogenesis of the gastrointestinal tract as well as the functional maturation of the newborn calf. [Penchev Georgiev 2008]

1. Insulin-like growth factors family mostly (IGF)  
(They are found free or bound to IGF-binding protein)  
IGF-1 (the most abundant), IGF-2
2. Colostric basic growth factor
3. Prolin rich polypeptide
4. Transforming growth factors (TGF)  
TGF- $\alpha$ , TGF- $\beta$