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The Body's Natural Immune System

INNATE IMMUNITY

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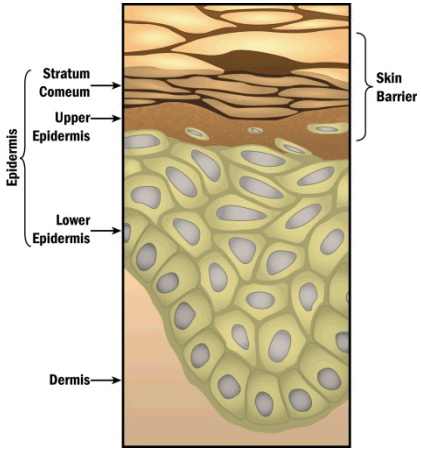
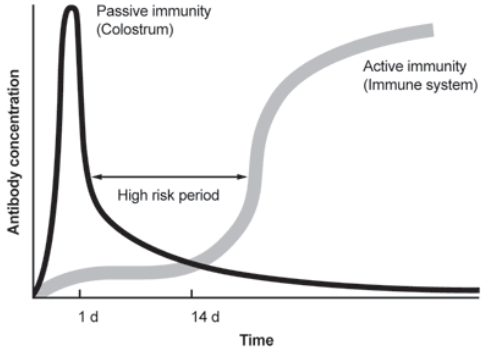
The Innate Immune Response

- **Infectious microorganisms have the potential to multiply rapidly in the body and can produce about 500 million offspring in one day**
  - Requires a rapid response that can rid the body of infectious microorganisms before they overwhelm the body's defenses
  - Must be easily activated at anytime
- **The innate immune response is the branch of the immune system responsible for rapid response to invading pathogens**
- **The innate response has many different subsystems**
  - Inflammation

Innate Immune Response

- **Undifferentiated system of cells, organs and macromolecules that guard the body for any material different from "self"**
- **Primary barriers also play a role in innate immunity**
  - Skin and mucosal membranes
- **Ingestion of colostrum provides innate immunity to neonates until their immune system becomes more mature**
  - First immunity consisting of immunoglobulin G and some maternal cells
  - Immune competence begins approximately three weeks after birth





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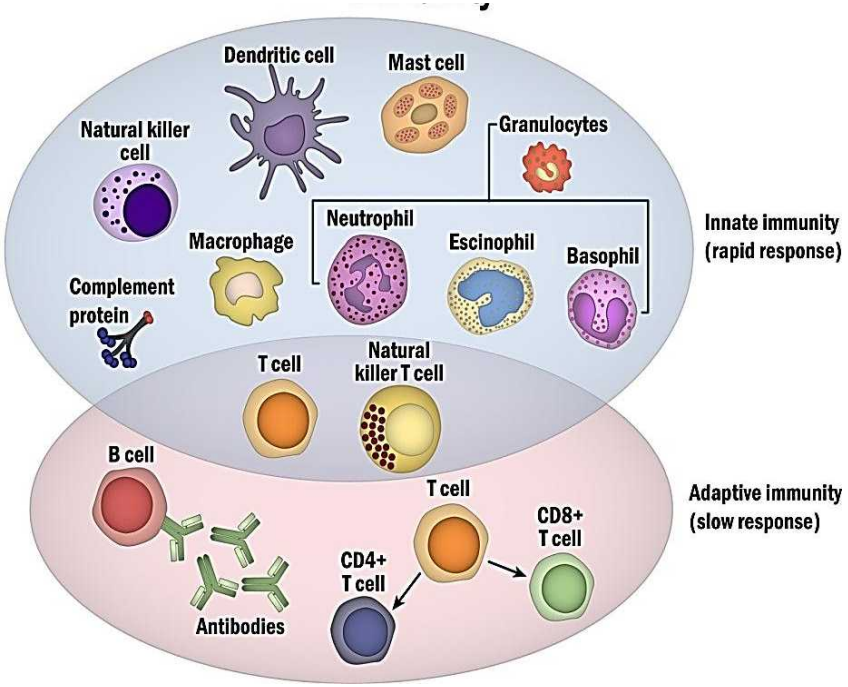
Innate Immune Response

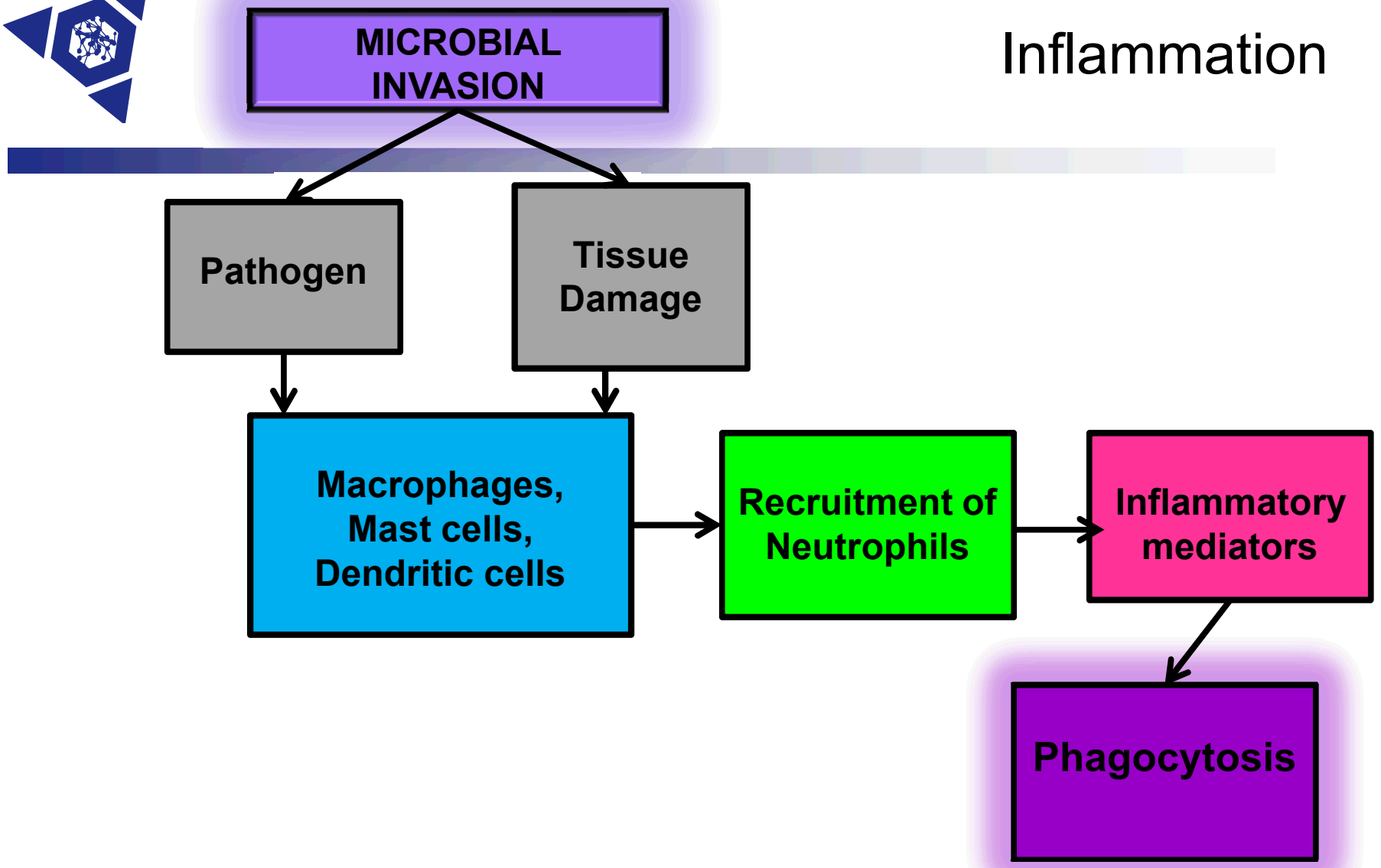
- Components of the innate immune system have the ability to differentiate ‘self’ from foreign antigens
- Non-specific response
- Activated by damaged tissues
- Initiates induction of the acquired response
- Comprised of phagocytic cells
  - Neutrophils
  - Macrophages
  - Natural killer cells
- Inflammatory mediators



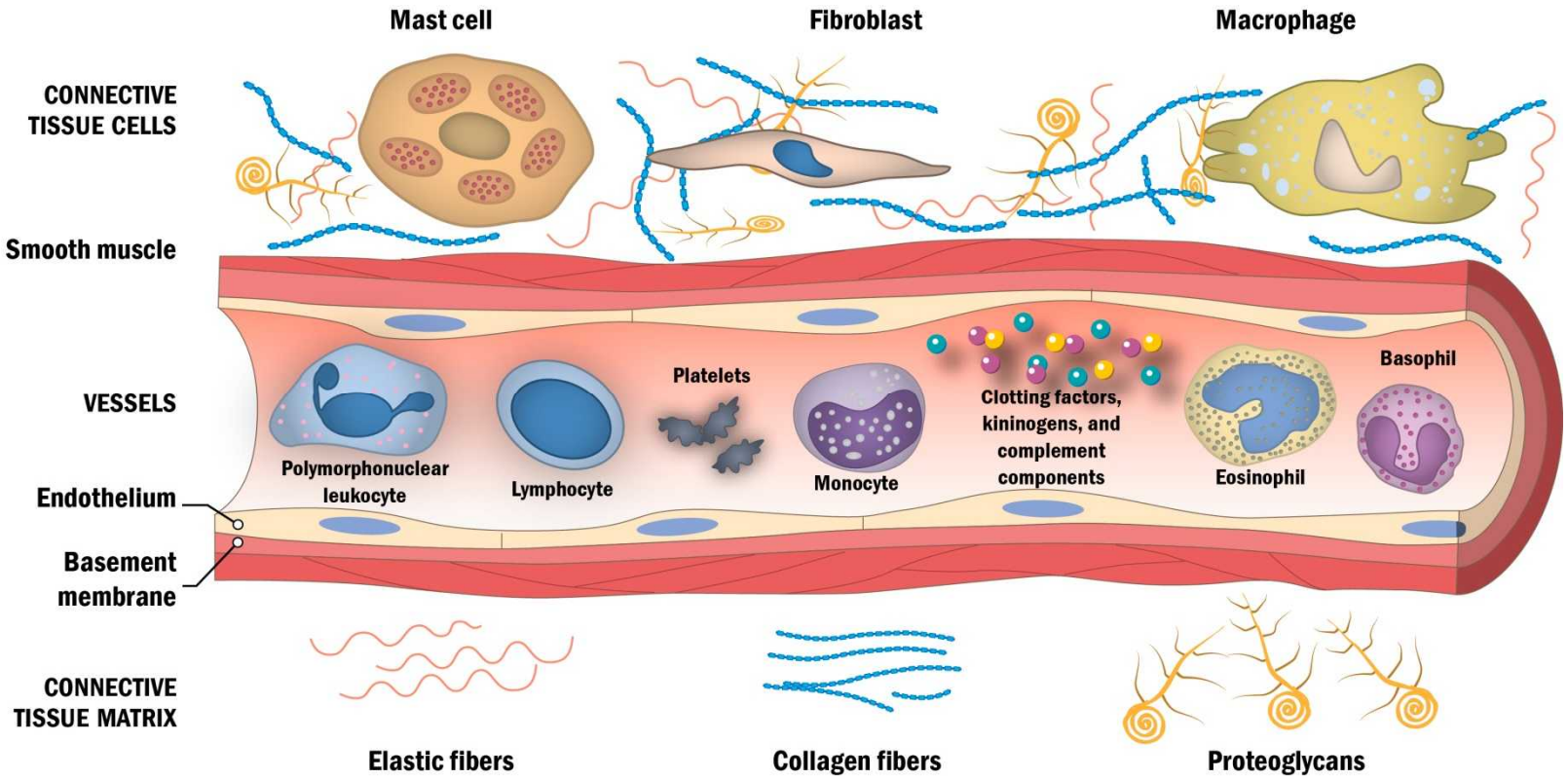
Activation of the Innate Immune System

- **Two types of signals activate the innate response**
  - Cells sense proteins on cell wall or genetic material of microorganisms
    - **Pathogen associated molecular pattern**
  - Cells sense molecules detected from damaged tissue and broken cells
    - **Damage associated molecular pattern**
- **Signal proteins bind to pattern recognition receptors on macrophages, dendritic cells, and mast cells**
    - **Major group are toll like receptors**
- **Damaged cell or the microorganisms interact with the macrophages, dendritic cells, and/or mast cells**
  - Inflammatory mediators are released to turn on the inflammatory process
    - **Increased blood flow**
    - **Vessel wall permeability**
    - **Attract neutrophils to remove damaged tissue or kill microorganisms**

Inflammation



Inflammation

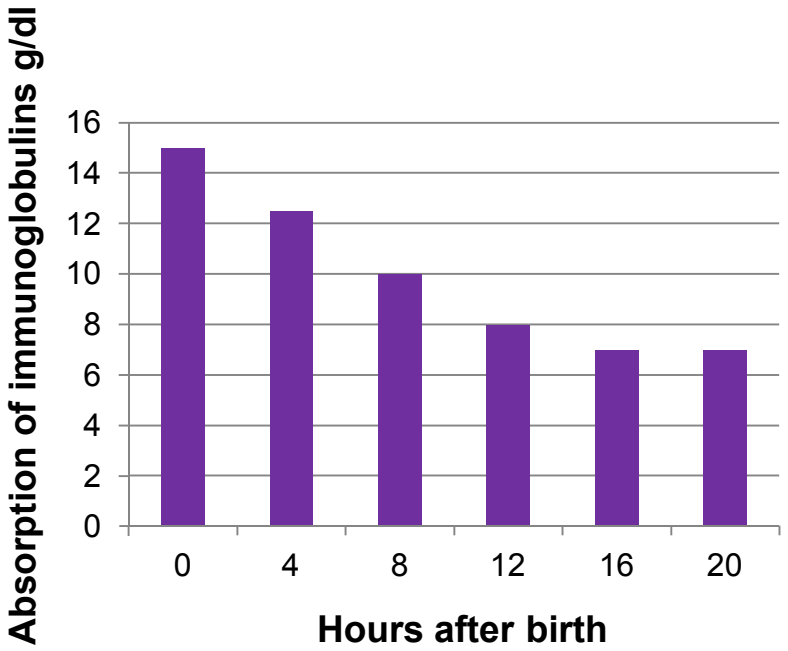


Innate Immune System: Colostrum

- **Natural immunity**
- **Cattle, sheep and goats**
  - Colostrum provides first immunity
  - Significant first 30 days of life of calf, lamb, kid, and foal
- **Colostrum**
  - Critical first 12-15 hours
  - Immunoglobulins
  - Maternal cells

Colostrum

- **Quality – Ideally 100 grams of immunoglobulin G per liter**
  - Good maternal nutrition increases immunoglobulin levels
  - Vaccinations increase immunoglobulin levels
- **Volume**
  - Calves need 2 to 4 liters
  - Lambs need 0.8-1.2 liters
  - Kid need 1 liter several feedings
- **Must be fed within 12 to 24 hours**
  - Ideally should be fed within 12 hours
  - Absorption declines after



Colostrum

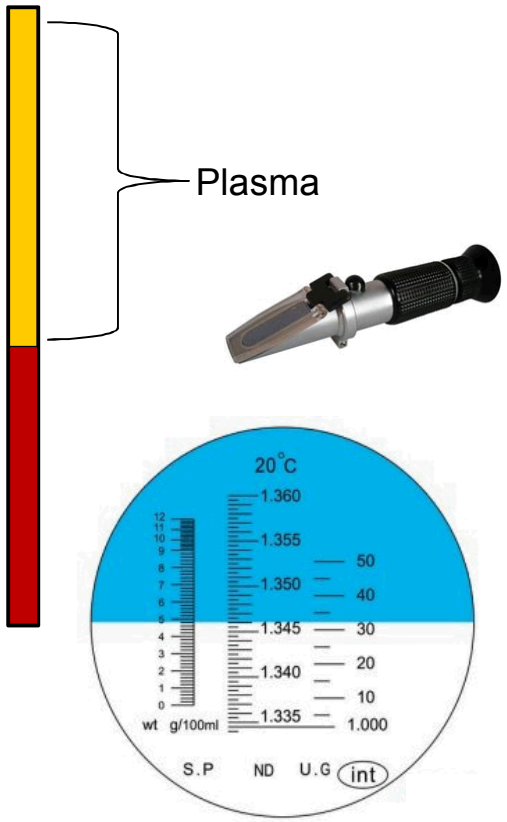
- **Maternal immunity is critical for first 30 days of life of calves, kids, lambs, and foals**
- **Young that receive colostrum perform better throughout whole life**
- **Improved growth**
- **Better immune system and respond better to vaccines**
- **Less disease**
  - Reduces transmission to other animals
  - Important for overall herd health
- **Protection declines after 3 to 4 weeks**

Colostrum Feeding

- **Studies have demonstrated that calves that do not ingest adequate good quality colostrum are 3 times more likely to get sick and 5 times more likely to die later in life than calves fed colostrum**
- **Colostrum must be administered within 12 hours after parturition to ensure adequate absorption**
  - Immunoglobulin absorption begins to decline four hours after birth
- **Calves should be given 2 to 4 liters depending on the size of the calf**
  - The colostrum can be divided into to 2 to 3 feedings 2 – 4 hours apart but within the first 12 hours of life
  - The colostrum can be fed by bottle or given via stomach tube or esophageal feeder
    - **Risks associated with the use of esophageal feeders**

Assess for Failure of Passive Transfer

- **Weak, sick, high risk, and/or maladjusted calves should be evaluated for FPT**
  - Passive transfer can be assessed using serum total proteins
  - ***Total protein concentration >5.2 gm/dl indicate that the calf ingested adequate good quality colostrum***
  - Total protein concentration can be falsely elevated if the calve is dehydrated
    - **If a calf is dehydrated, rehydrate and reassess**
  - Total protein concentration can be utilized during the first seven days of age to assess passive transfer
- **Total protein concentration can be measured using a refractometer after the plasma and RBC have been separated**



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