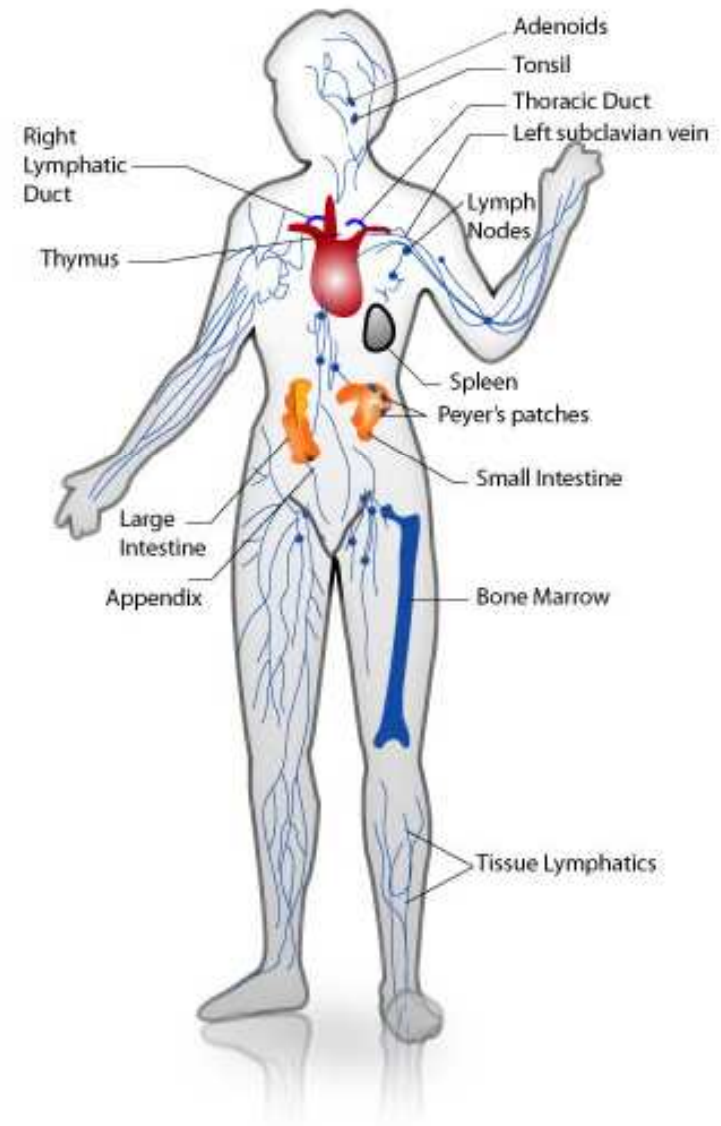


# Chapter 21

## The Immune System

# Function of the Immune System

- The immune system is a collection of mechanisms that protects against disease by identifying and killing **pathogens** and tumor cells.
- A **pathogen** is an organism or virus that causes a disease or disorder
- The Immune System detects a wide variety of agents, from viruses, bacteria, fungi & parasites
- Needs to distinguish them from our own healthy cells & tissue.

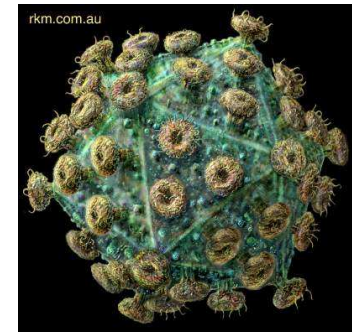


# Pathogen Types

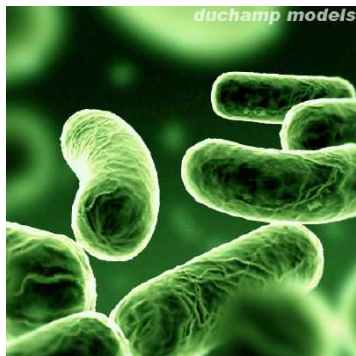
- **Infectious Diseases** are caused by a **pathogen** – an organism or virus
- Pathogens include various types of **Bacteria, Viruses, Fungi & Protists**
- Infectious diseases include: **measles, mumps, pneumonia, chicken pox, HIV & AIDS**, etc.



Fungi - mold



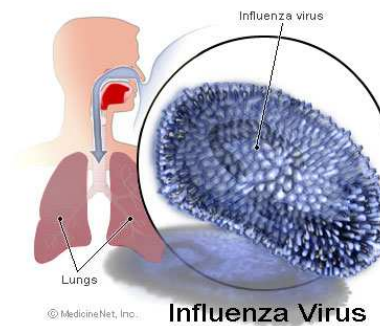
HIV Virus



Bacteria

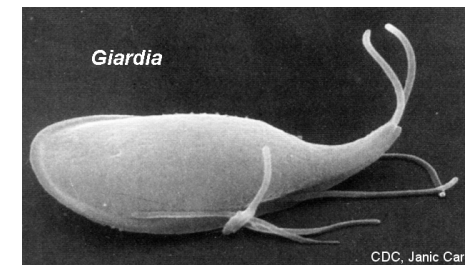


Malaria (a protist)



Flu Virus

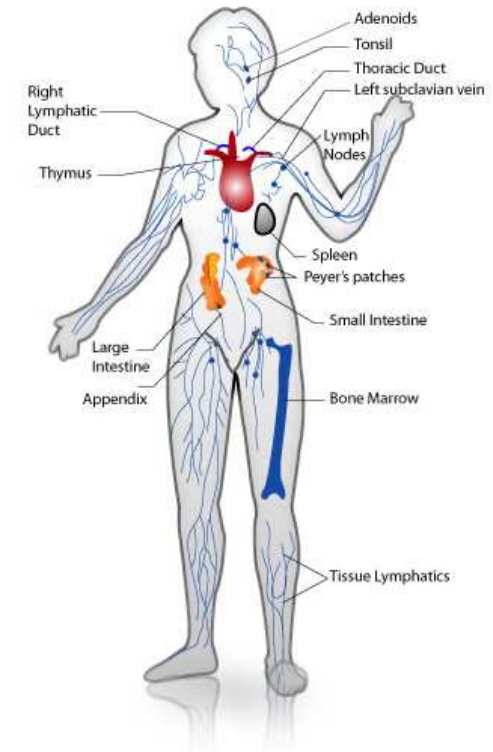
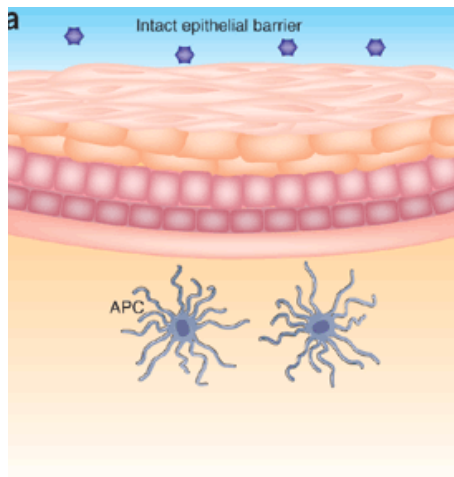
Giardia (a protist)



CDC, Janic Car

# The Body Defenses

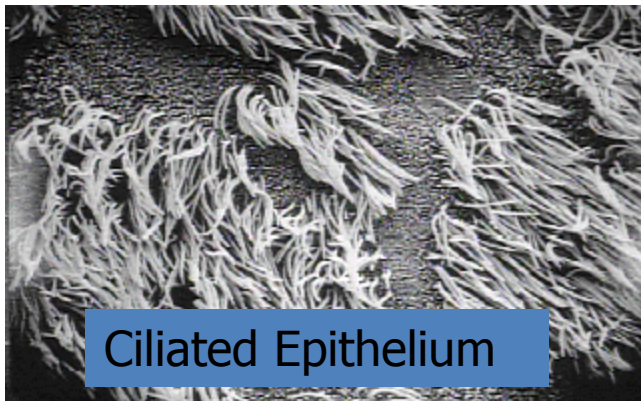
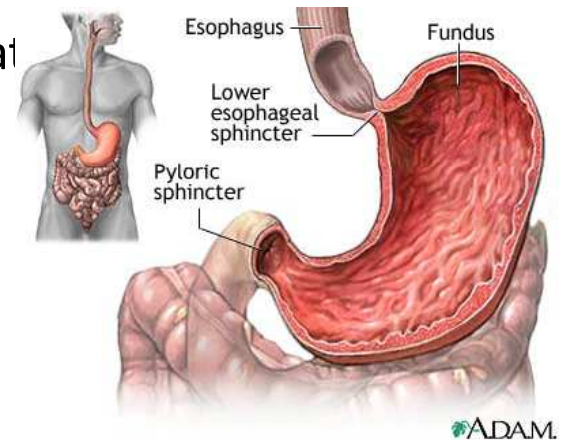
- 3 Lines of Defense:
  - 1<sup>st</sup> Line: Barriers keep pathogens away
  - 2<sup>nd</sup> Line: Inflammatory Response
  - 3<sup>rd</sup> Line: The Immune Response



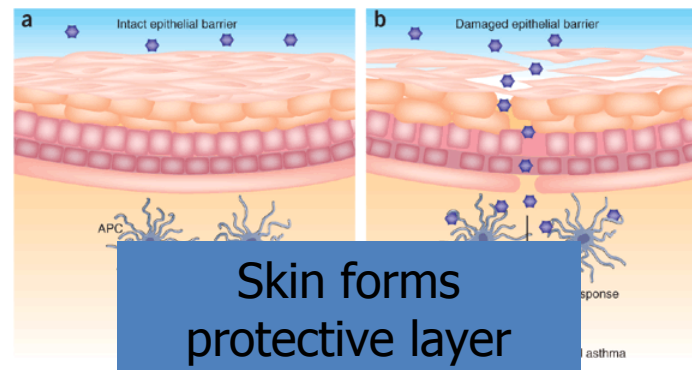
# The Body's Defenses: 1st Line of Defense:

- Barriers Keep Pathogens from successfully attacking the body:
  - **Skin** – waterproof barrier w/ destructive oils and sweat to help kill off pathogen
  - **Breathing Passages** – nasal passages, trachea, bronchi and lungs lined w/ ciliated epithelial cells that secrete mucus and move “captured” pathogens up & out of the respiratory tract to be expelled or swallowed!
  - **Mouth & Stomach** – Saliva and stomach acids aid in killing off pathogens

Saliva & Stomach Acid destroy most pathogens



Ciliated Epithelium

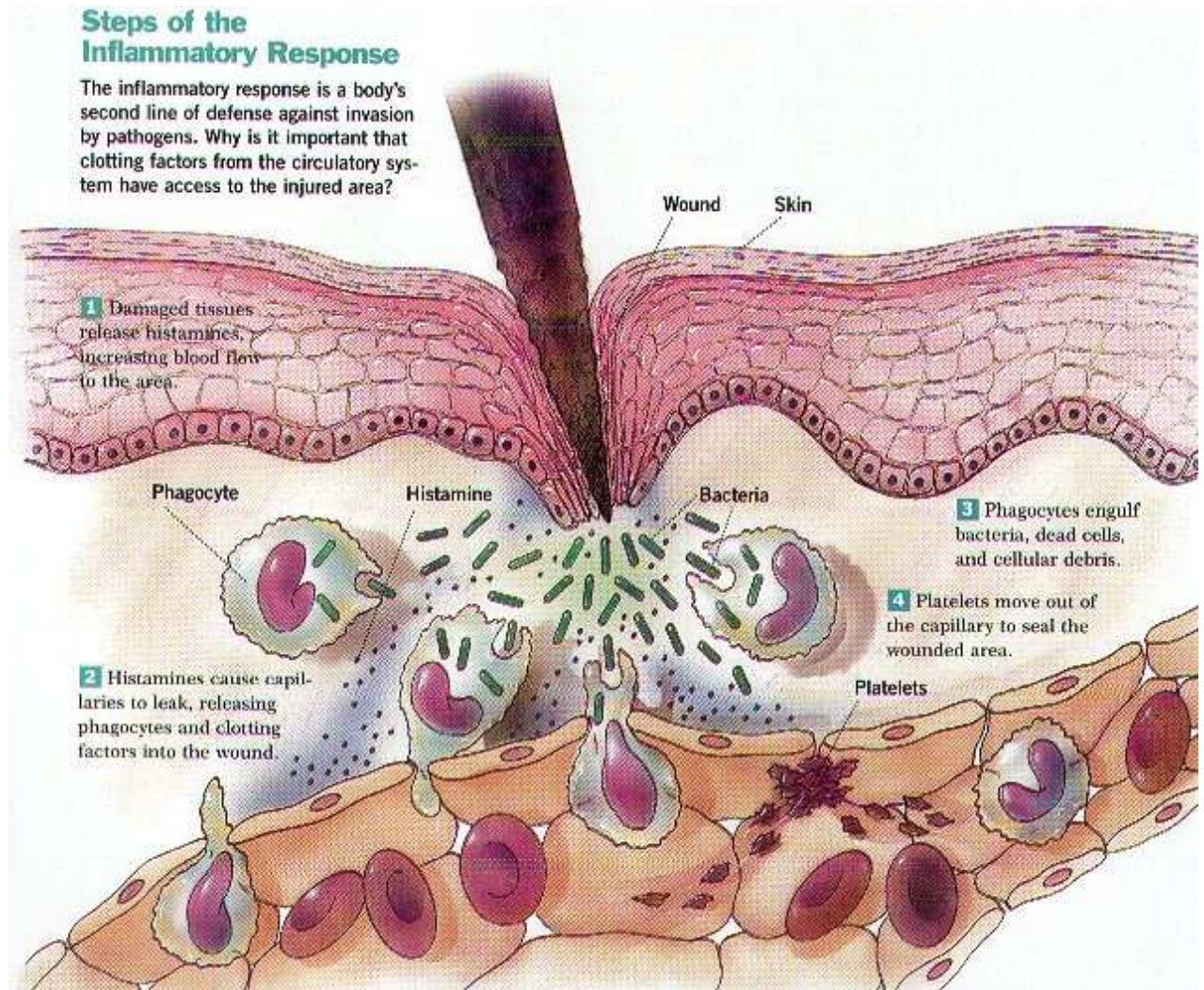


Skin forms protective layer



# The Body's Defenses: 2nd Line of Defense:

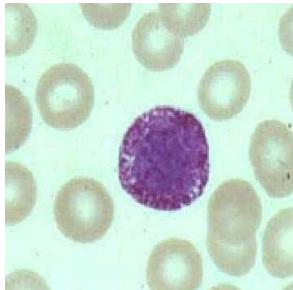
- Damaged cells trigger the release of **histamines**:
- Blood vessels dilate (widen & enlarge) causing increased blood flow
- They leak plasma and white blood cells into the area
- causes swelling, redness, tenderness and fever.



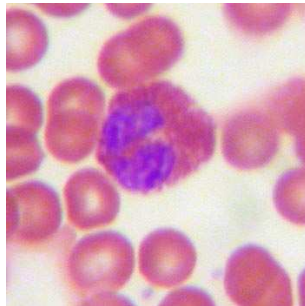
# The Body's Defenses: 3rd Line of Defense:

## The Immune Response

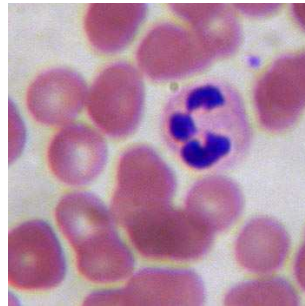
- **White Blood Cells – WBC** (phagocytes & lymphocytes)
  - **Phagocytes (AKA Macrophage)**– Attack, engulf & eats pathogens and destroys them. 3 main types
    - (“-phils” – latin suffix meaning “love”)
    - **Basophils** – least abundant WBC “loves” base type stains –
    - **Eosinophils** – “loves” eosin type stains
    - **Neutrophil** – Most abundant WBC – “loves” neutral stains



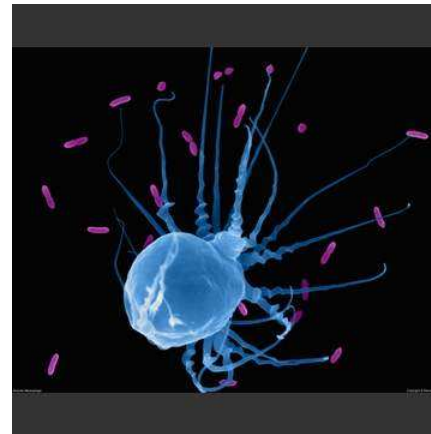
Basophil



Eosinophil



Neutrophil

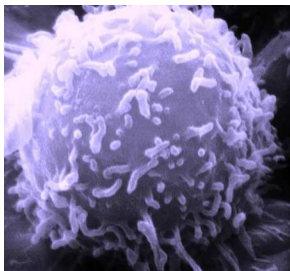


Phagocytes

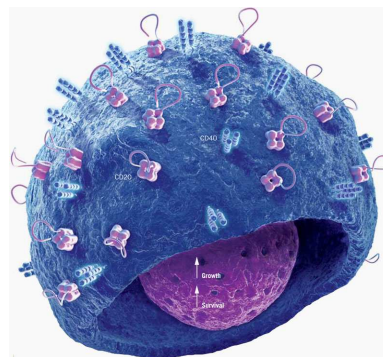
# The Body's Defenses: 3rd Line of Defense:

## The Immune Response

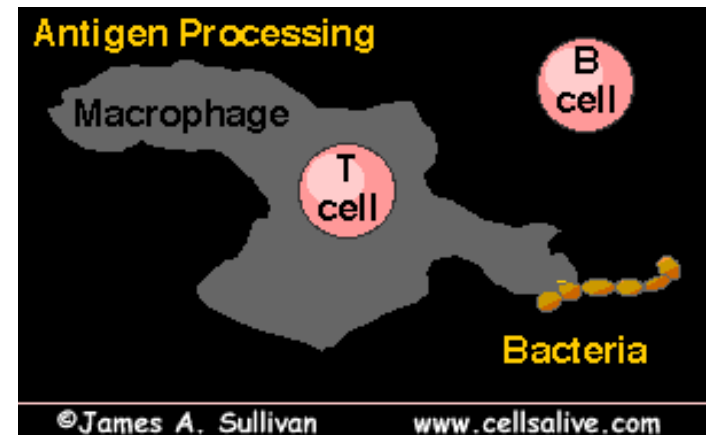
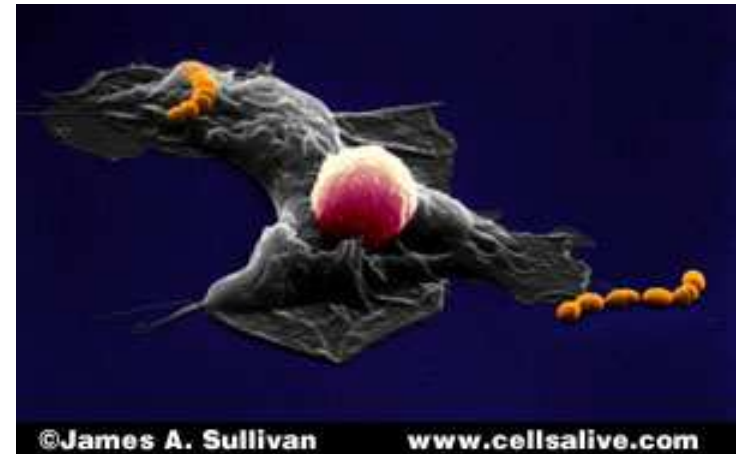
- **New Terms:**
  - **Antigen:** usually a protein found on the cell membrane of the pathogen that has attacked the body
  - **Antibody:** protein (nonliving) that reacts w/ antigen to mark the pathogen allowing it to be recognized & then eaten by a **phagocyte**



T Cell



B Cell

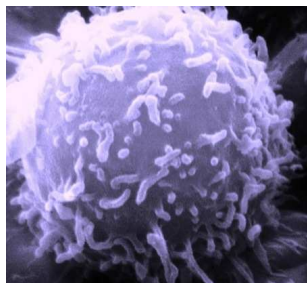




# The Body's Defenses: 3rd Line of Defense:

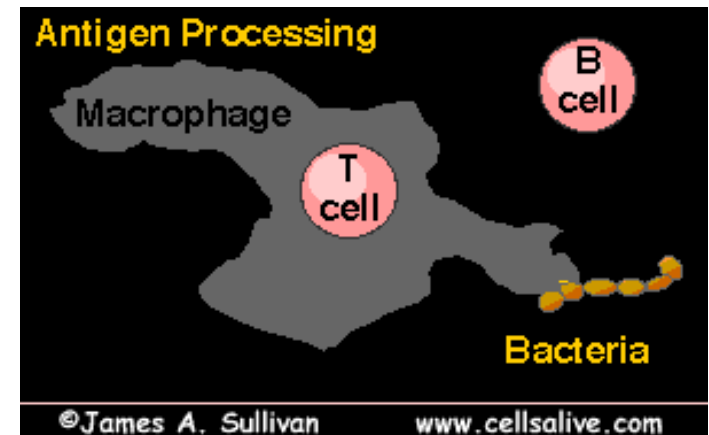
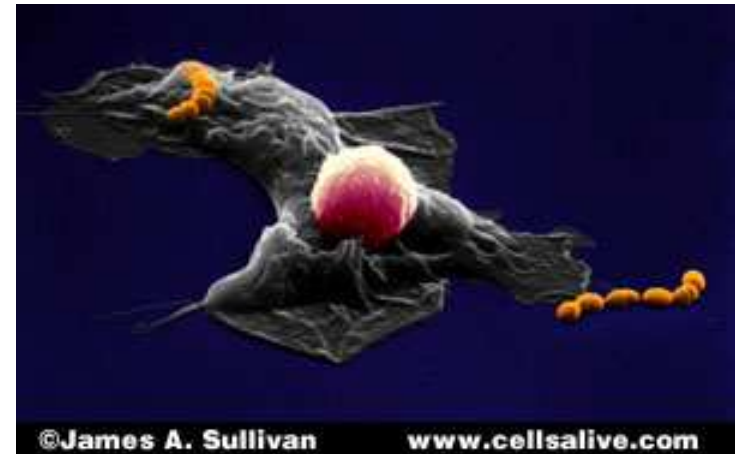
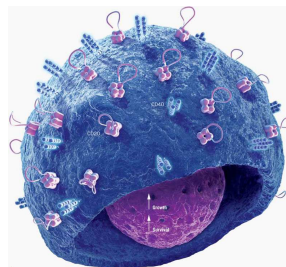
## The Immune Response

- **White Blood Cells – WBC**
  - **Lymphocytes** produce antibodies
    - **T cells** : (made in the **Thymus Gland**)  
Over 10 million in your body each able to recognize specific antigens.
      - Some attack & kill invading pathogen.
      - Some stimulate B Cells to activate
    - **B cells**: (made in the **Bone marrow**)  
Once activated, they produce thousands of antibodies that attack the pathogen



T Cell

B Cell



No Mas...

Immune system

over and out!!