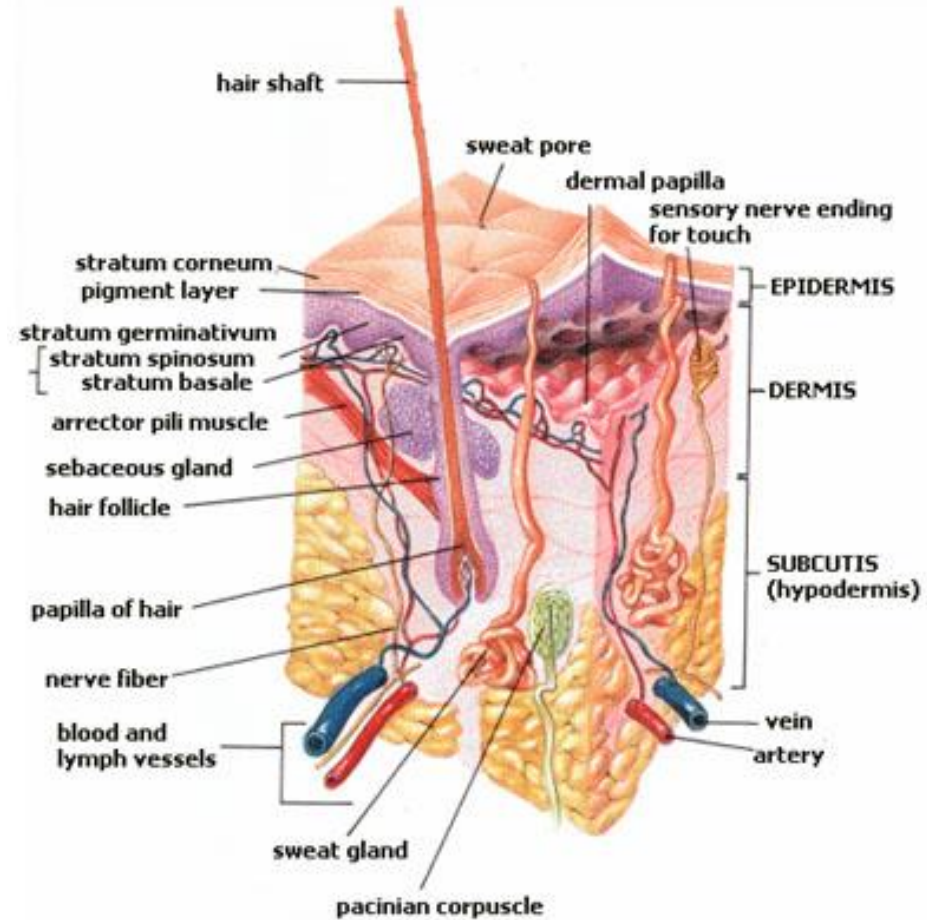


Body Systems Interactions:

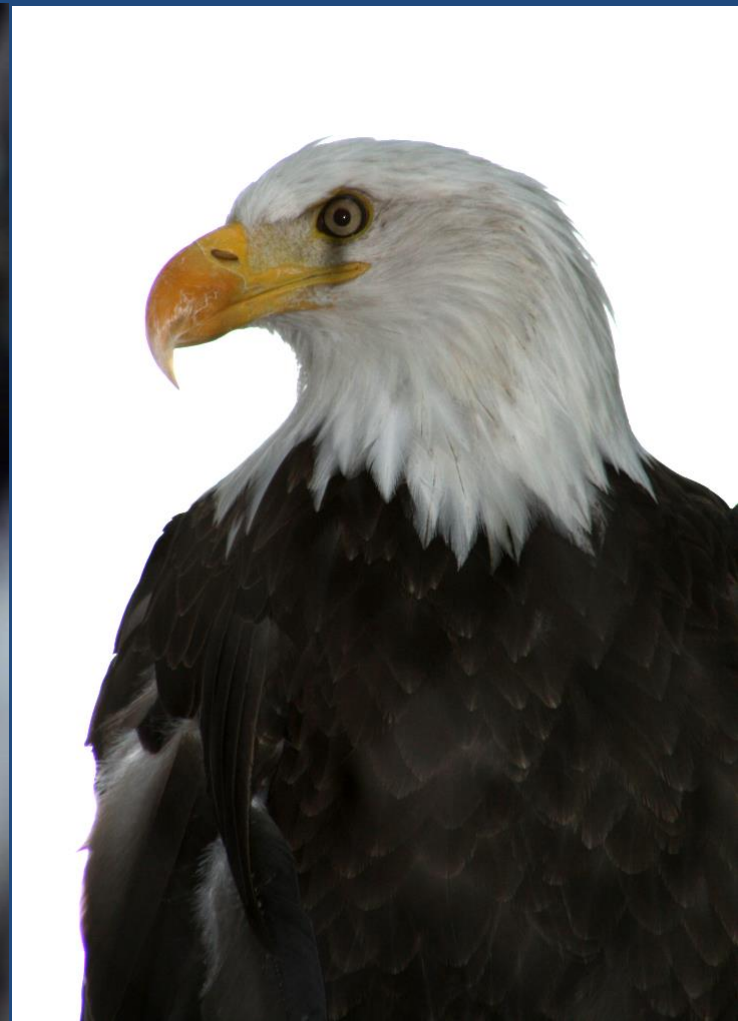
*Defense*

# Integumentary System

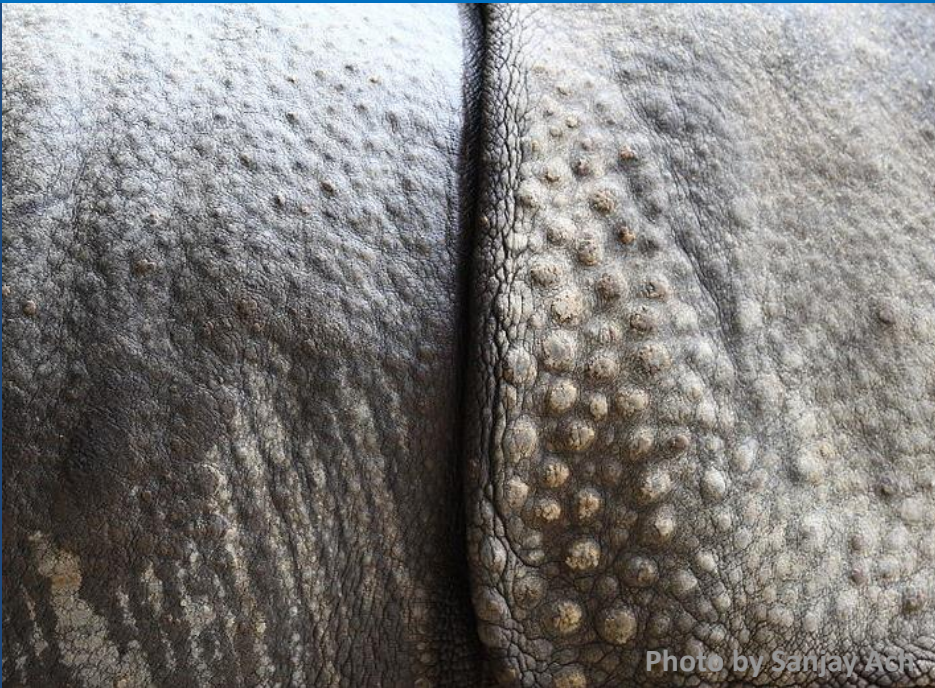
The main organ of the integumentary system is the **skin**. It also includes the *hair follicles* and *sweat glands*.



The **scales** of reptiles and the **feathers** of birds are also considered part of these animals' integumentary system.



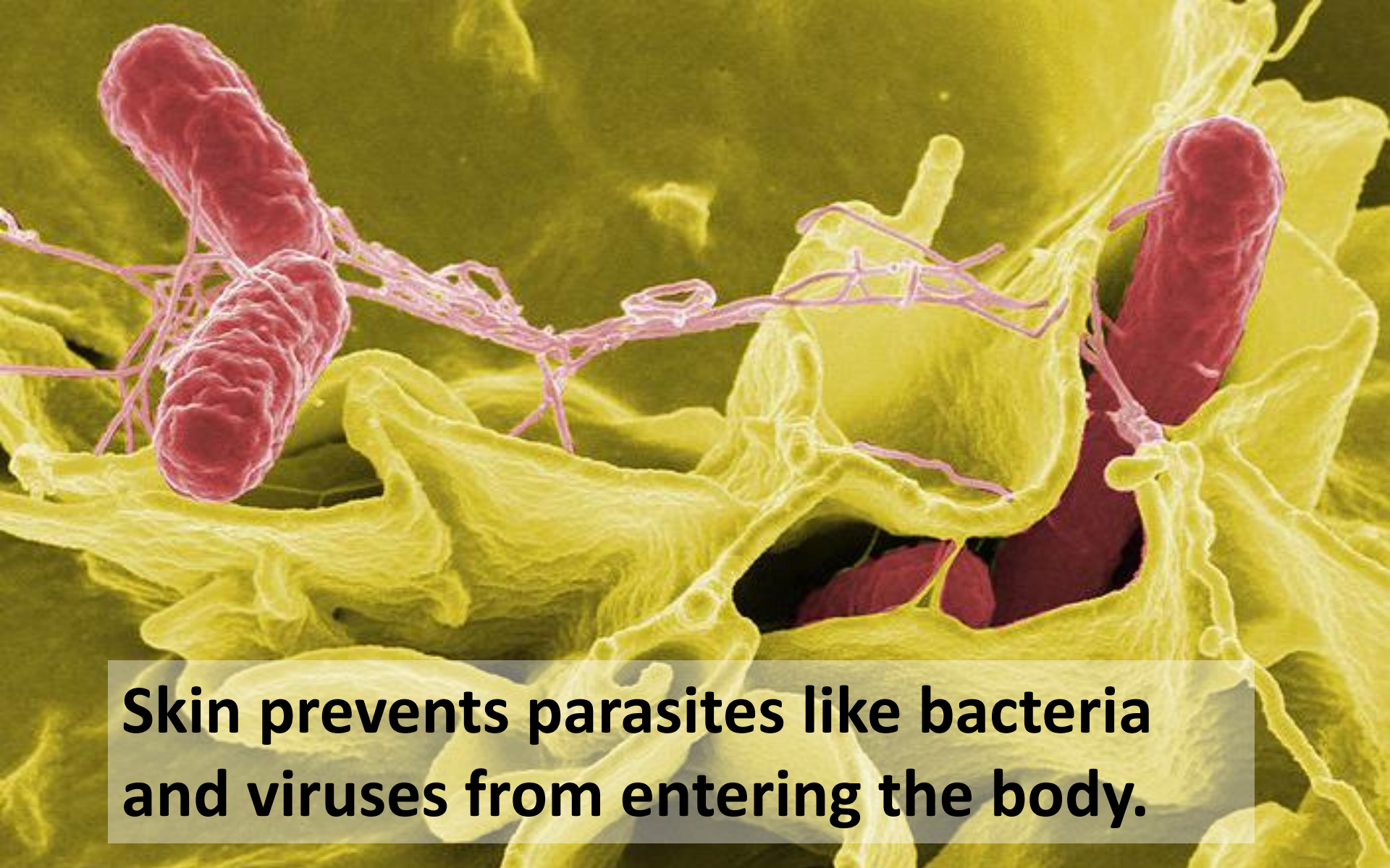
# Integumentary System



Skin is a **protective barrier** for your internal organs and tissues



Skin prevents the body from becoming **dehydrated** due to *excessive water loss.*



**Skin prevents parasites like bacteria and viruses from entering the body.**

**This shows the integumentary system interacting with the immune system to defend the body against germs.**

**Watch the  
short video  
about life on  
your skin.**

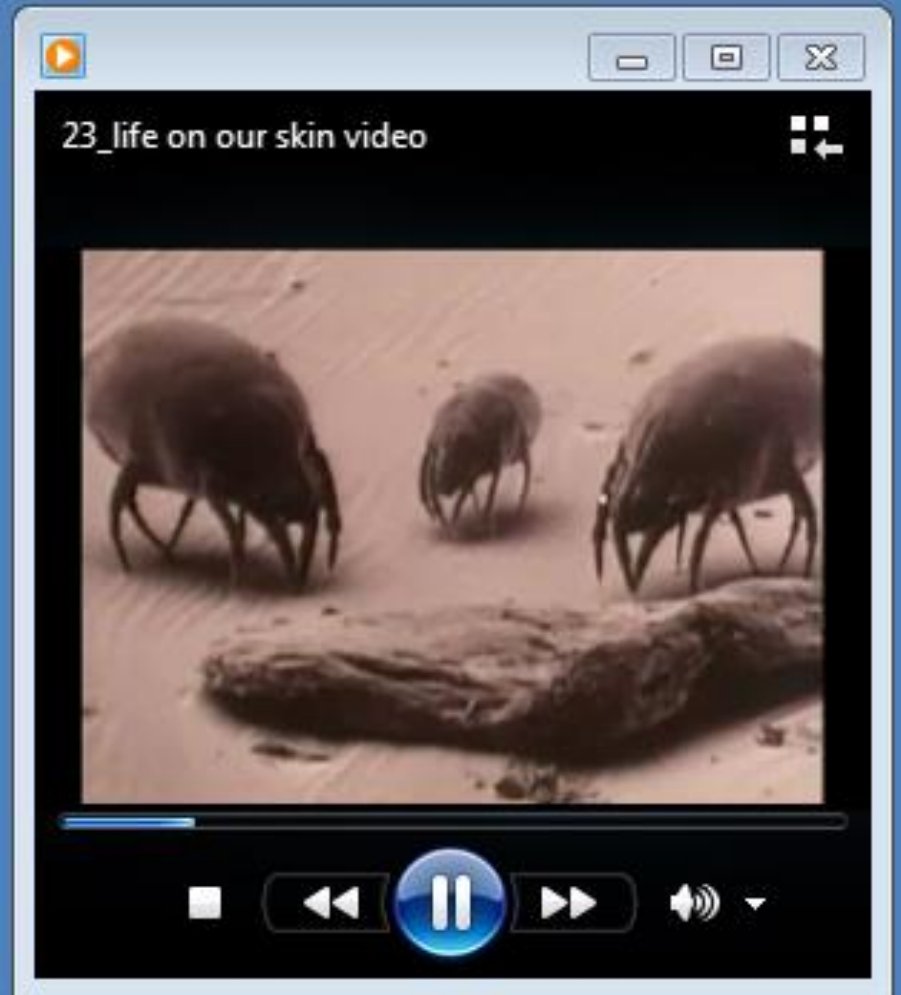
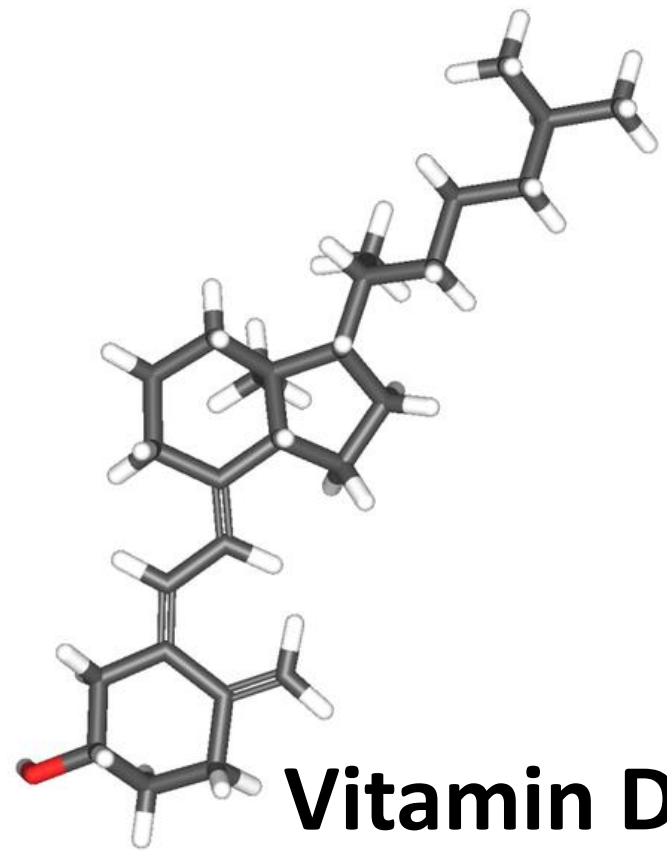




Image of UV light being emitted by the sun.



**Vitamin D**

Skin uses UV light from the sun to make **vitamin D** which is important for bone development.

This shows the integumentary system interacting with the **skeletal system** to maintain healthy bones.

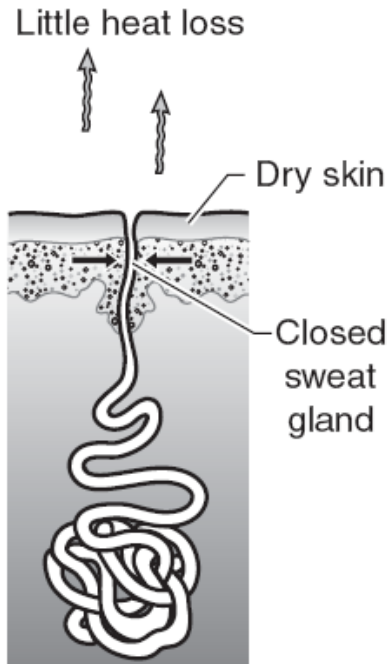


Photo by Ildar Sagdejev

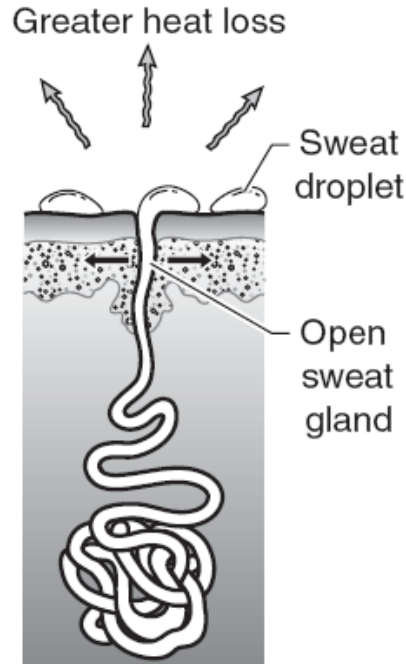
Skin and hair help to **regulate the body's** temperature by **sweating** or forming "goose bumps".



## Normal Body Temperature



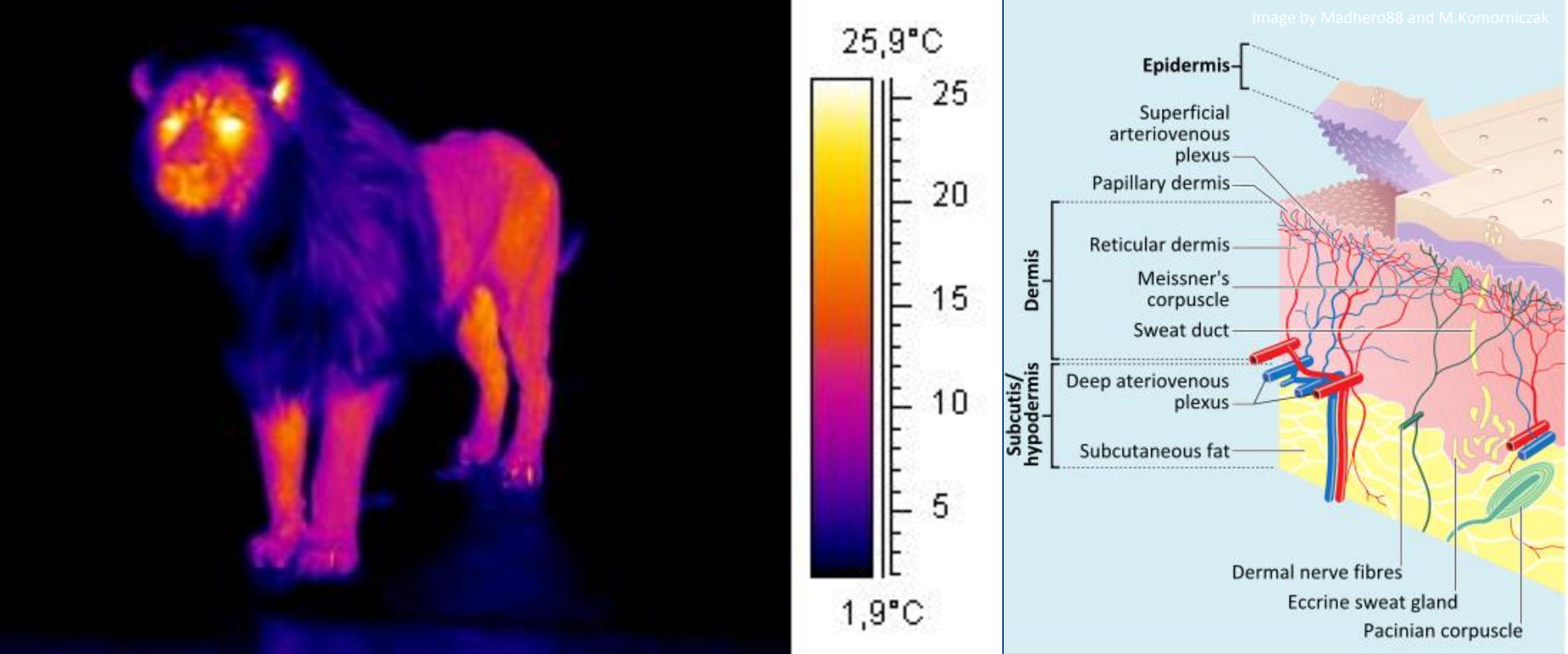
## High Body Temperature



Sweat contains **water** and **salts** which *absorb heat* from the body and carry the heat away when the **water evaporates**.

Skin begins to sweat when the **brain** detects an increase in body's temperature.

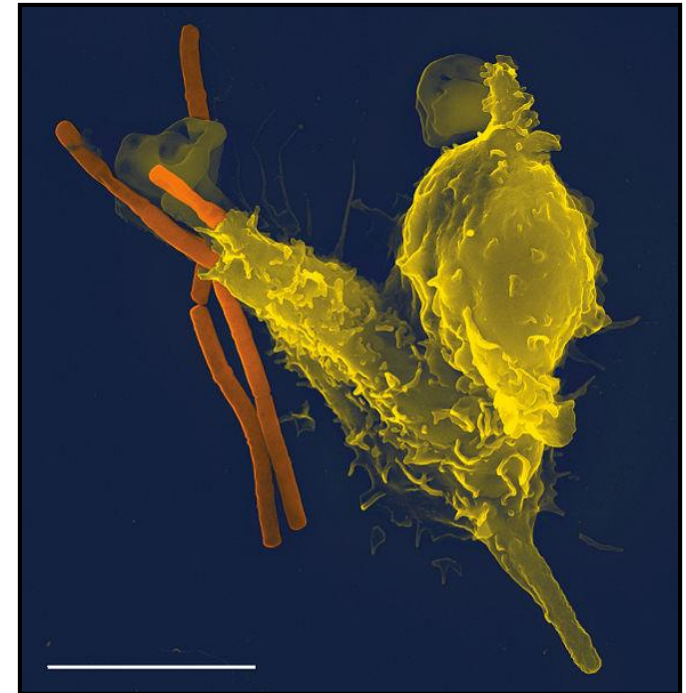
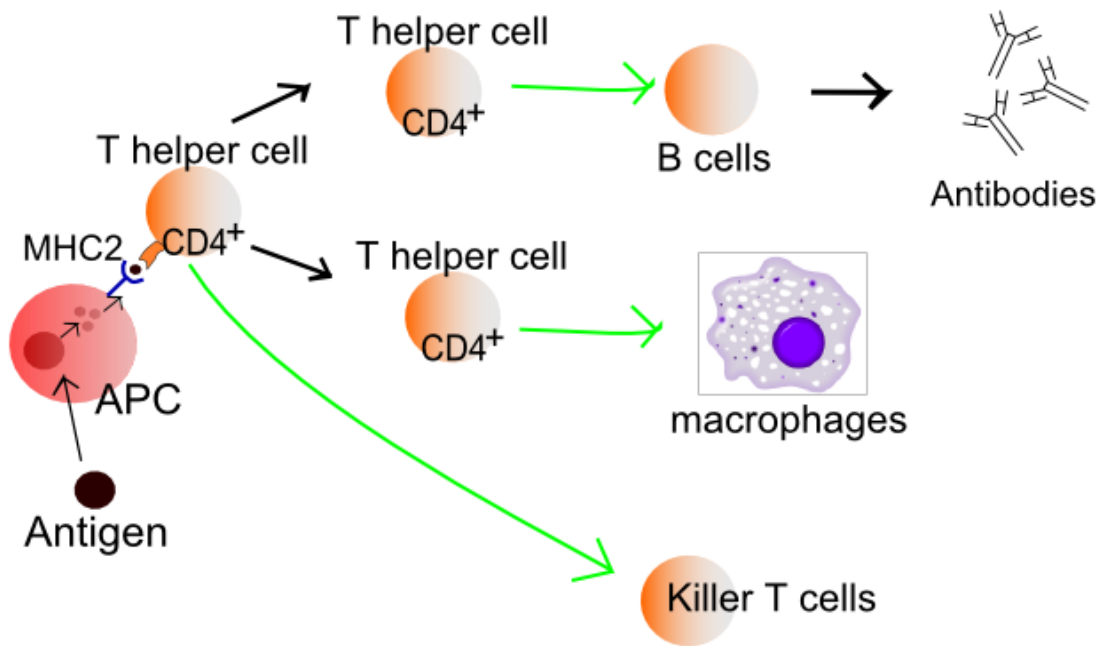
This shows the integumentary system interacting with the nervous system to maintain homeostasis.



Skin and hair also help the body *retain heat* when it is cold. Retaining heat is also aided by a layer of subcutaneous **fat**. The **lipids** in the fat cells *prevent heat loss* and *store energy* for the animal.

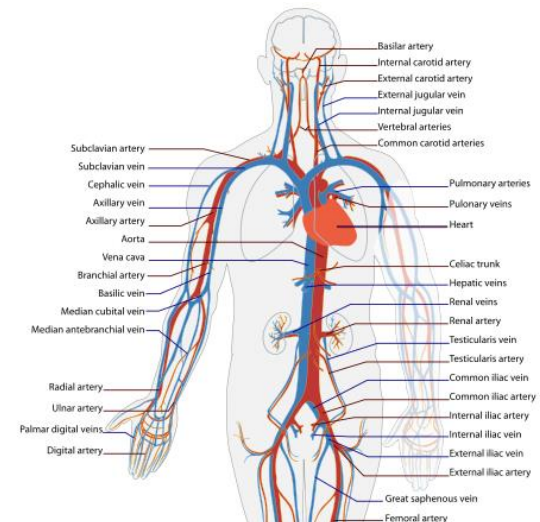
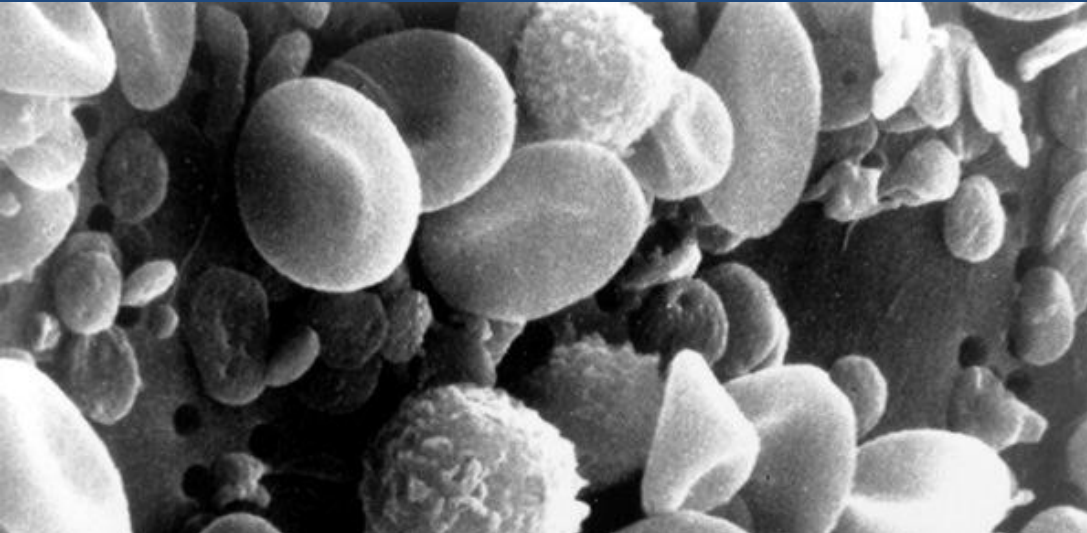
# Immune System

The main function of the immune system is to *fight infections*. This is the job of the **white blood cells** and the **antibodies** they create.

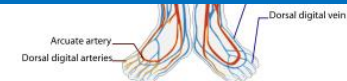


# Immune System

The immune system travels throughout the body through the **blood**. This allows white blood cells to be distributed all over the body.

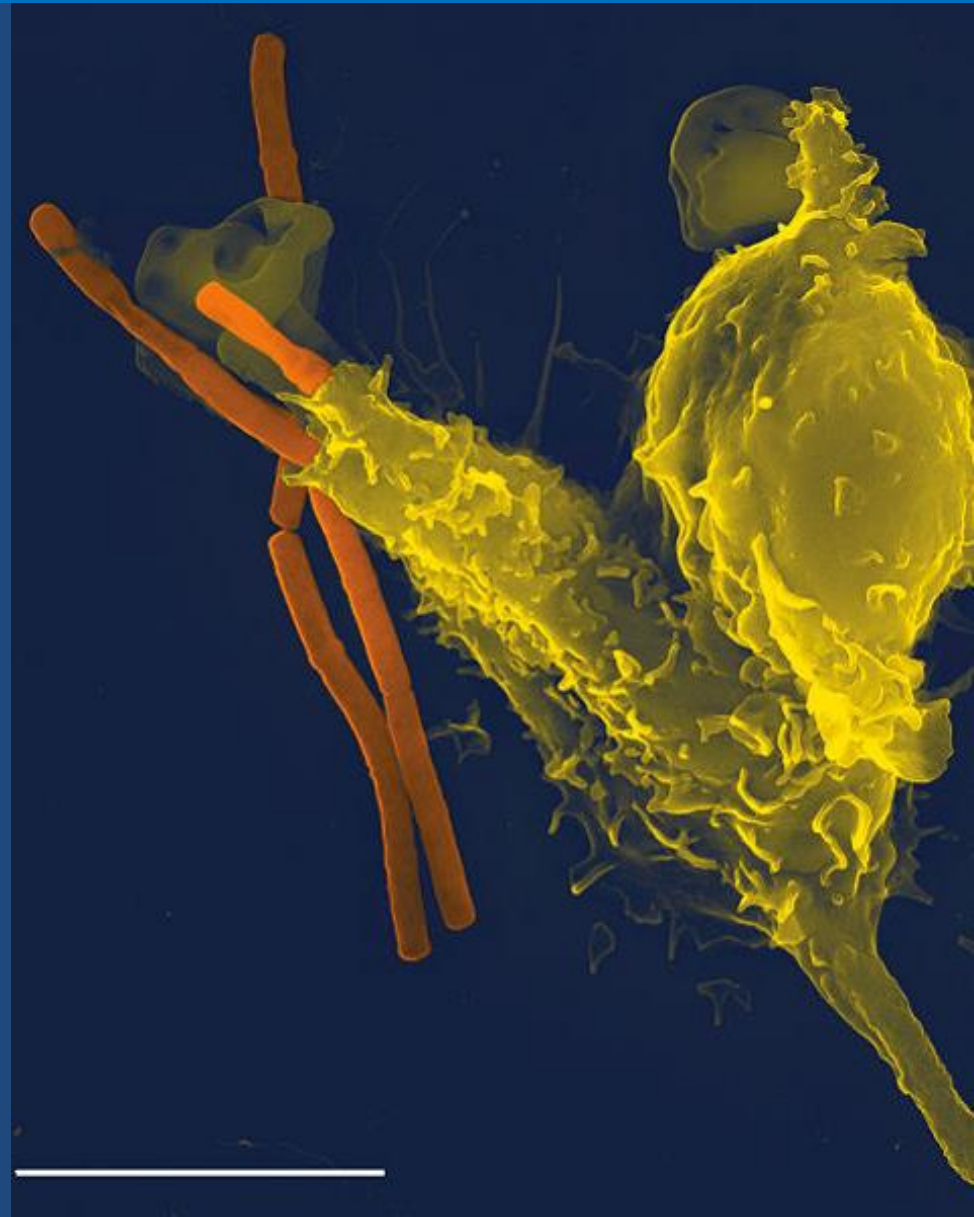


This shows the immune system interacting with the **circulatory system** to fight infections in the body.



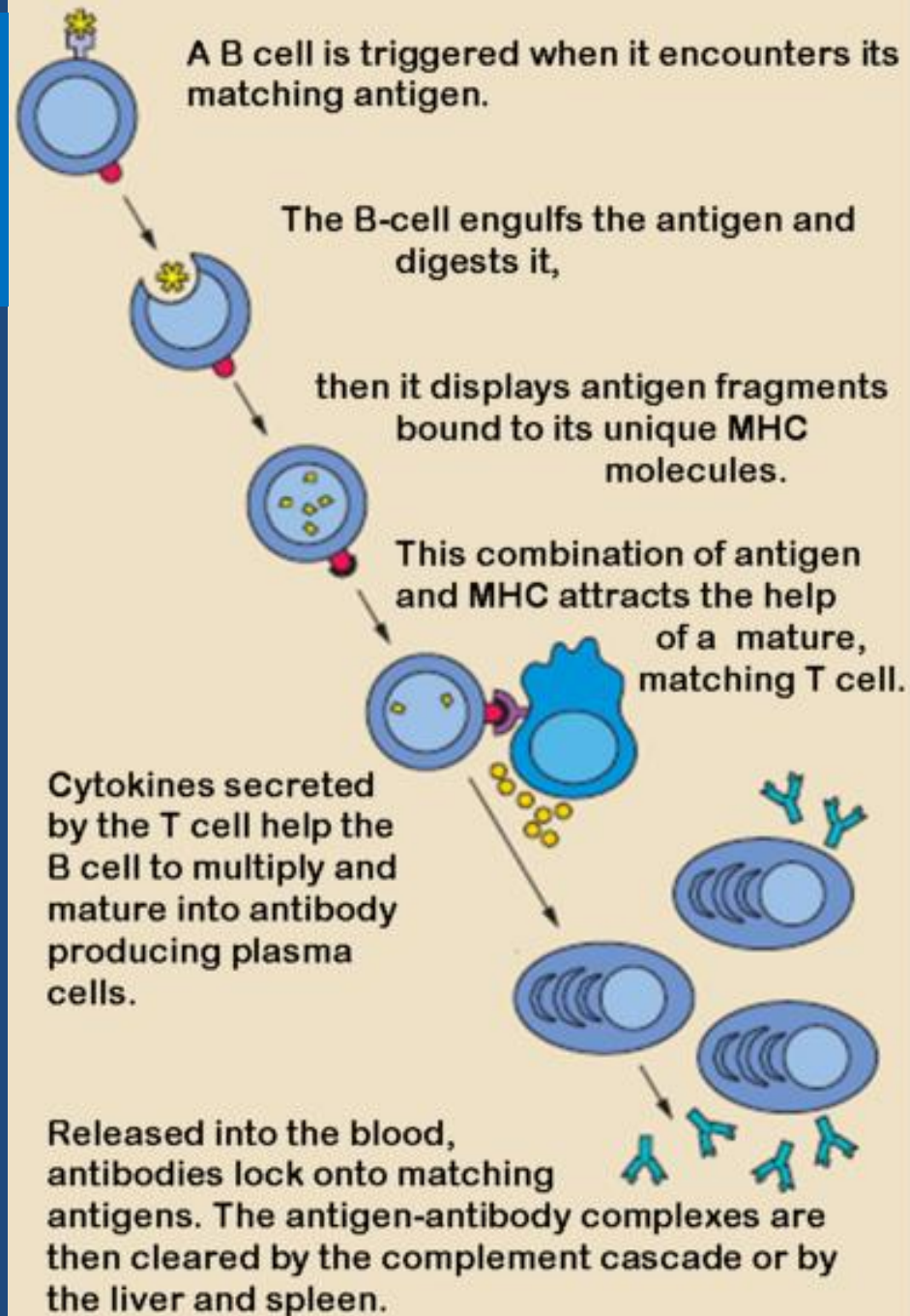
# Immune System: White Blood Cells

**Neutrophils** are a type of white blood cell that kill bacteria by *engulfing* them. They pull the bacteria inside of themselves where **lysosomes** full of *digestive enzymes* tear apart the harmful bacteria.



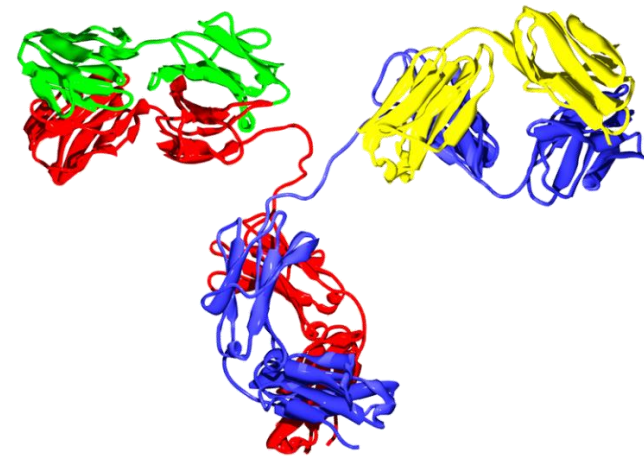
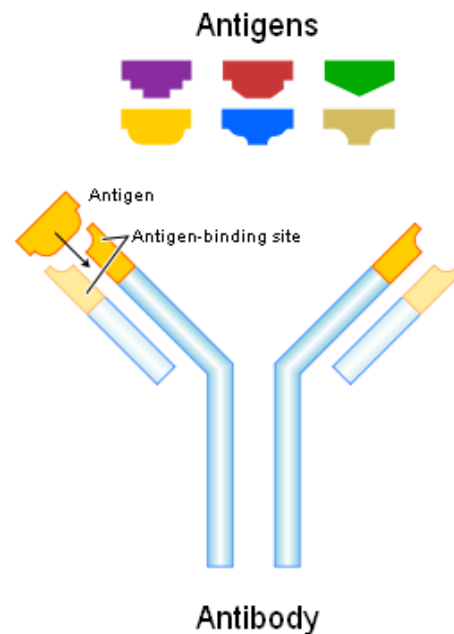
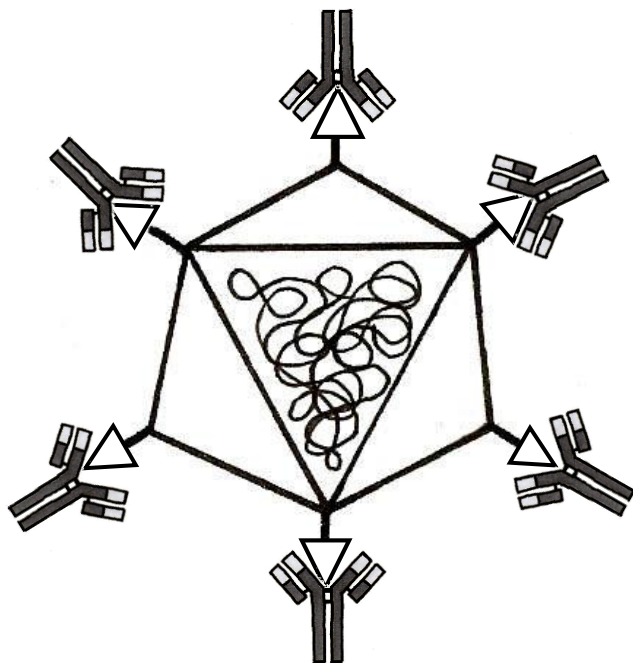
# Immune System: White Blood Cells

**B cells** make *antibodies*. Memory B cells are stored in the blood and respond quickly when a germ attacks the body a second time. These cells are critical in building *immunity* to diseases.



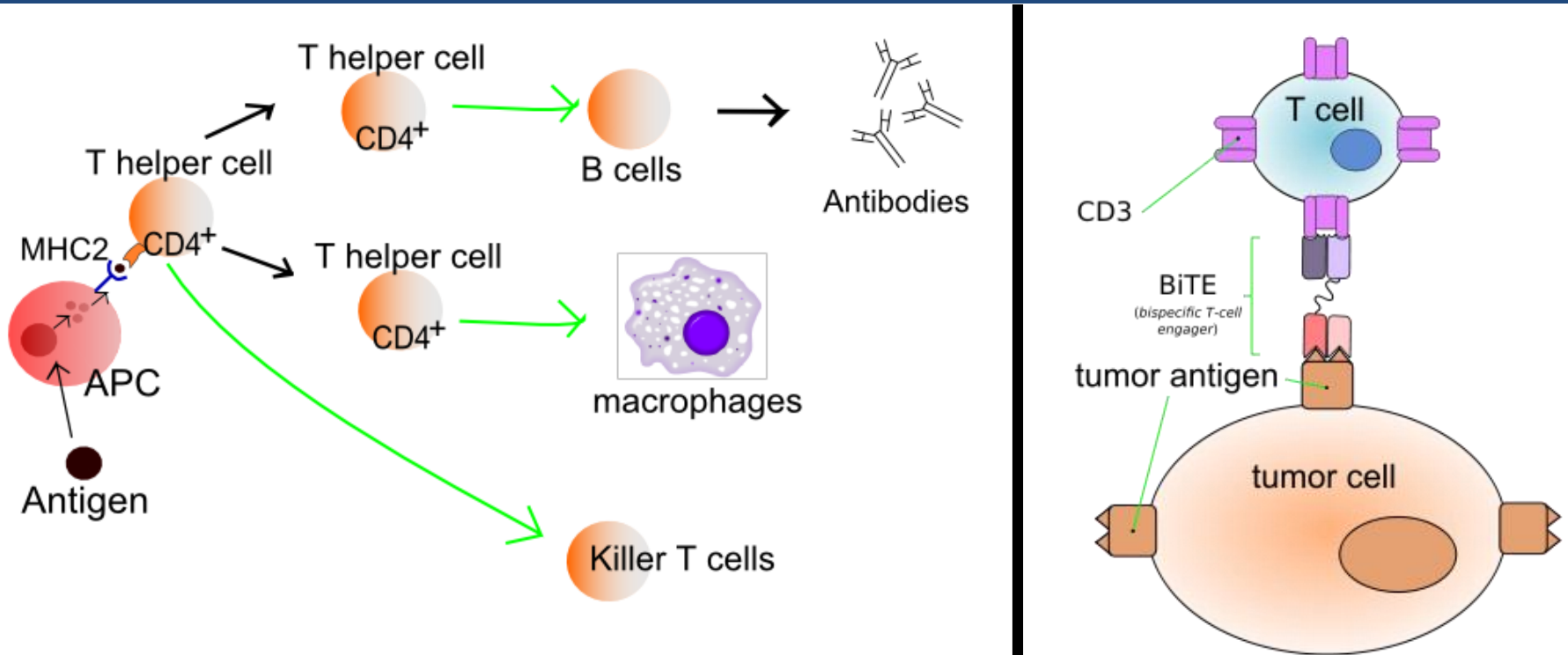
# Immune System

**Antibodies** are a huge part of the immune system. Once they attach to an **antigen**, they can prevent further infection and signal the *liver* and *spleen* to destroy the invading germs.



# Immune System: White Blood Cells

**T Cells** are white blood cells that actually attack the body's cells which are infected with *bacteria* or *viruses*. They also target and destroy **tumor** cells which are the root of all cancers.







**H.I.V.**

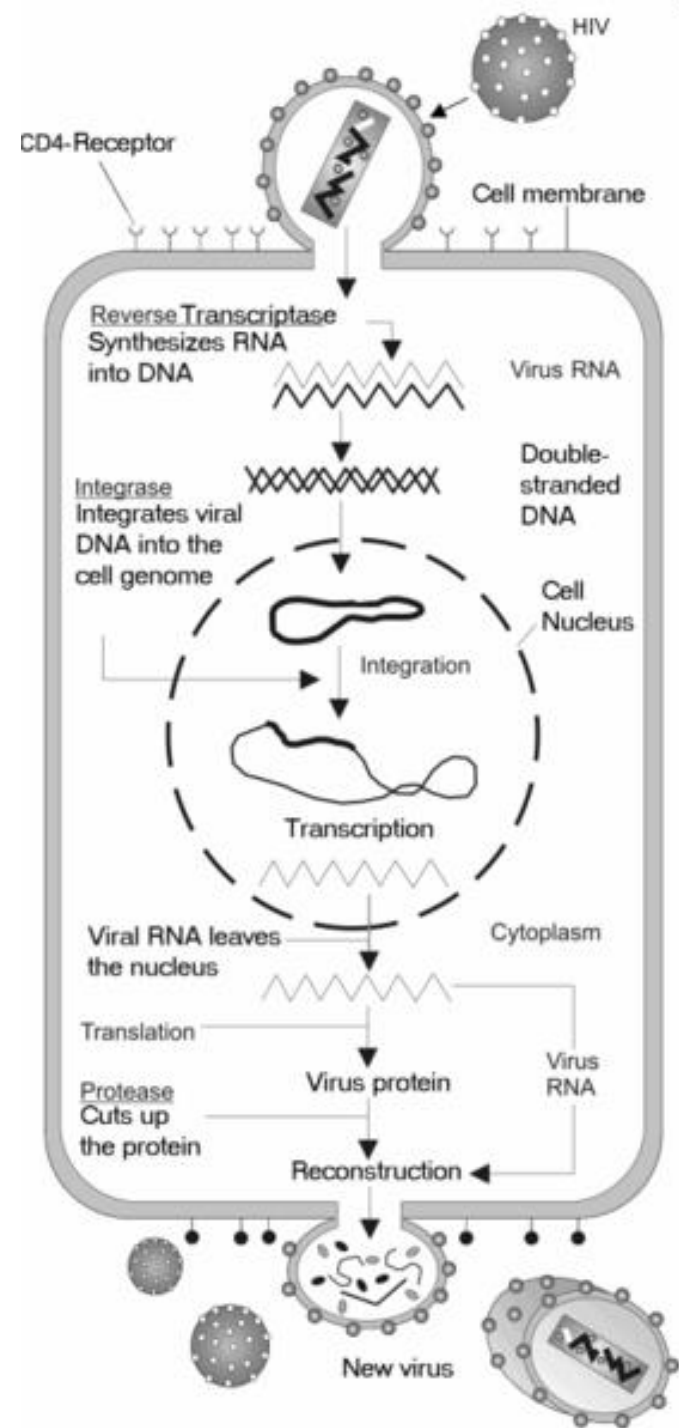
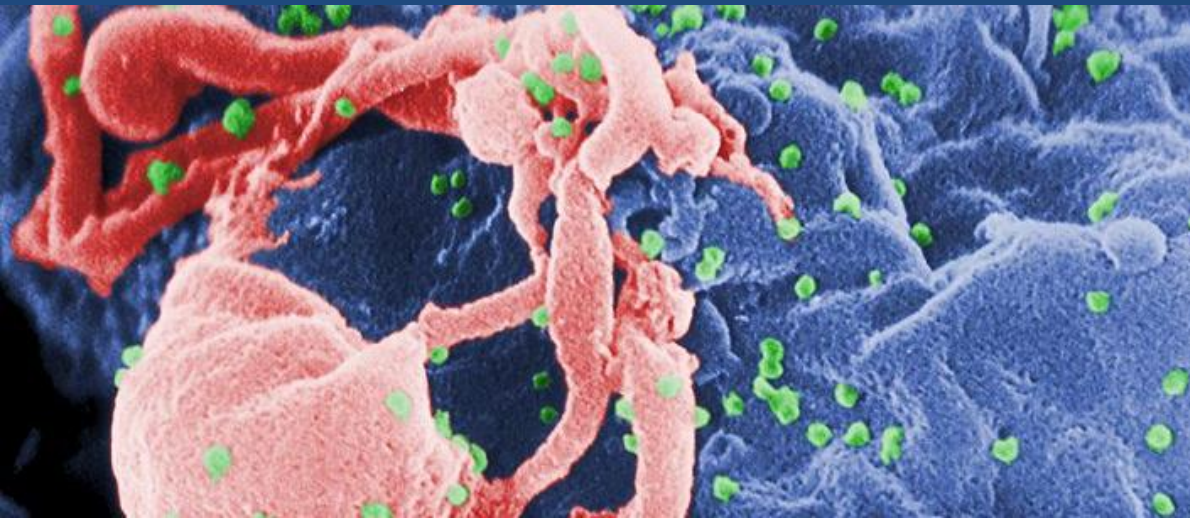
*Human Immunodeficiency Virus*

H.I.V. is the virus that causes **A.I.D.S.**, or *acquired immune deficiency syndrome*. It attacks a special T cell known as a **Helper T cell**.

# HIV

## Human Immunodeficiency Virus

When **Helper T** cells are destroyed, the immune system can no longer fight infections correctly. This causes the patient to be very susceptible to *secondary infection*.



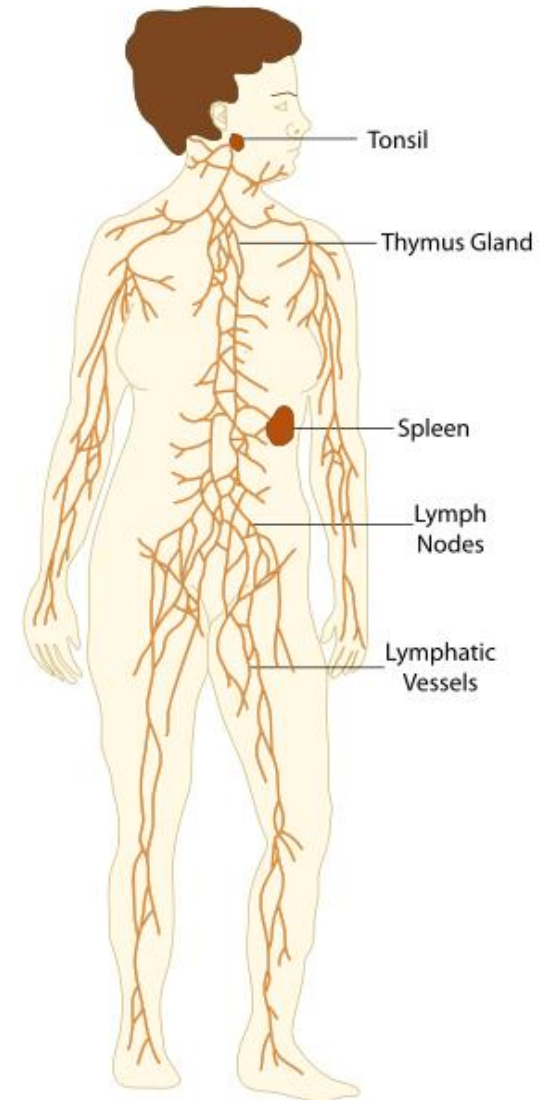
# Immune System

**Antibiotics** can also be used to help the immune system fight infection. It is important that you understand that antibiotics *kill bacteria*, but they *do NOT kill viruses*.



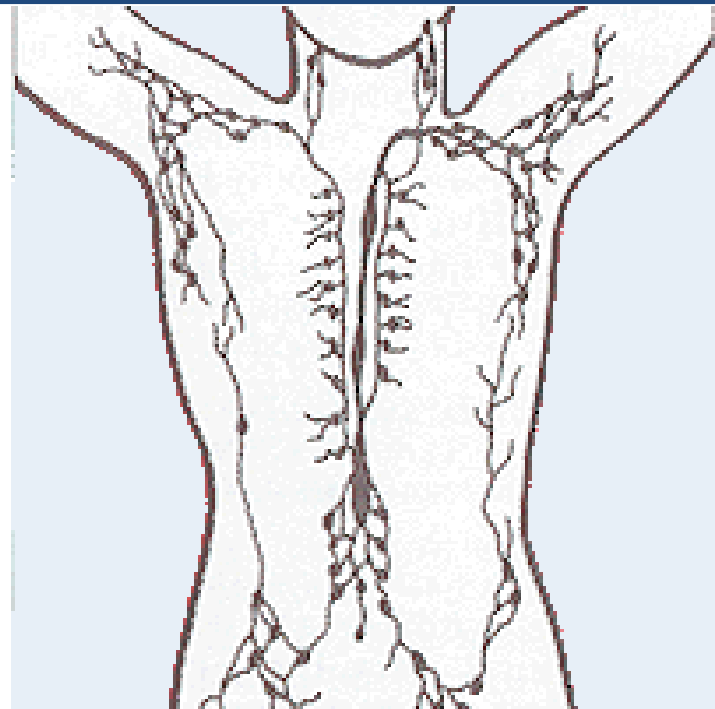
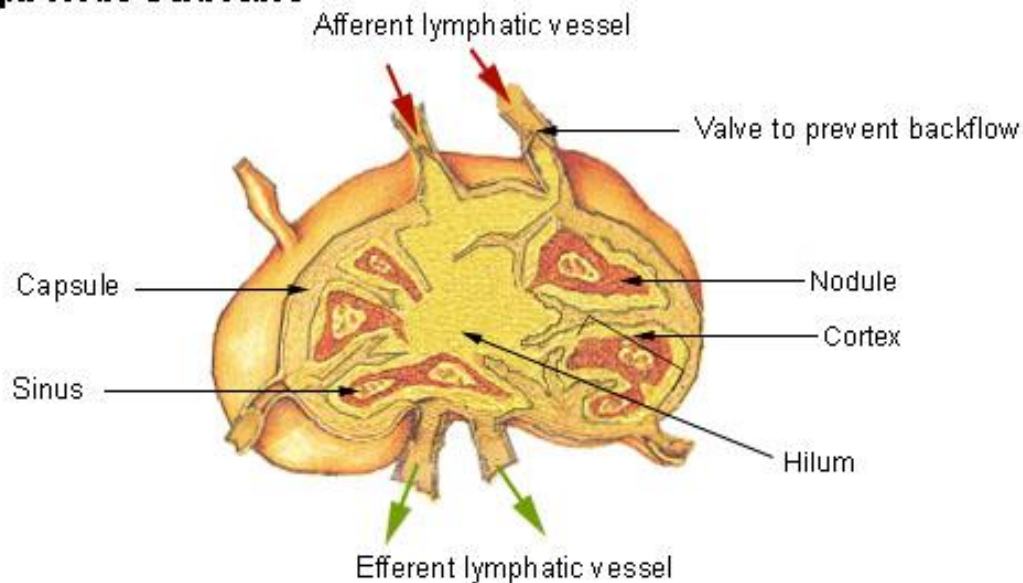
# Lymphatic System

The *lymphatic system* removes the fluid from around cells, called **lymph**, and filters out and kills parasites. This fluid is then returned to the *blood stream*.



When this fluid passes through the **lymph nodes**, **white blood cells** attack and kill any germs. This causes the lymph nodes to swell which is why doctors check lymph nodes for signs of infection.

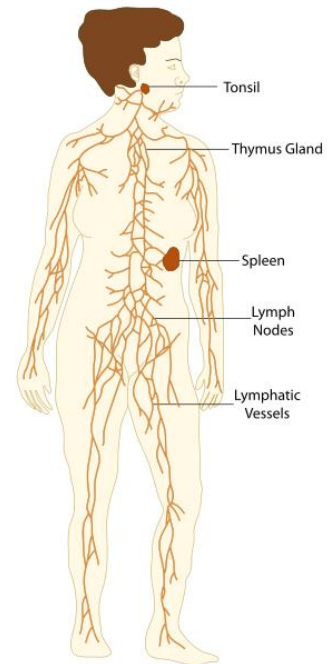
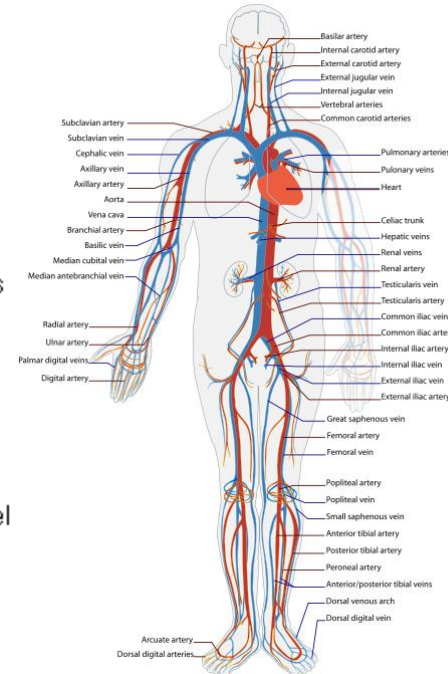
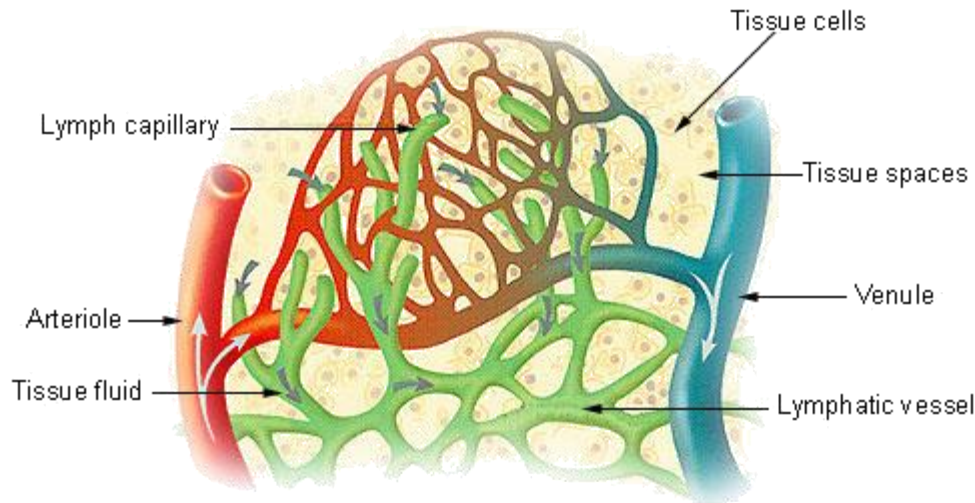
### Lymph Node Structure



This shows that the lymphatic system is a key component of the body's **immune** response.

The lymphatic system returns fluid to the blood, and it is a subsystem of the *circulatory system*.

### Lymph Capillaries in the Tissue Spaces



Because of this, we often say the most important systems for **fighting infection** are the **immune** and **circulatory systems**!

Watch the short video about the lymphatic system.

