

# Microorganisms

DH08 chapter 15

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# Microorganisms

aka microbe

- \* Small, living organisms that are not visible to the naked eye
- \* Found everywhere! Including ON and IN the human body
- \* They are part of the normal flora of the body
- \* Flora=plant life adapted for living in specific environment

# Nonpathogen vs Pathogen

- \* If they are **BENEFICIAL** to maintaining certain processes of the human body, then they are considered **nonpathogens**
- \* **Pathogens** are microorganisms that cause disease and infection
- \* We do not consider pathogens as beneficial

# GERMS!

- \* If they are pathogenic, we call them GERMS!
- \* Can be helpful in one part of the body but pathogenic when present in another part of the body
- \* FOR EXAMPLE- E. Coli is part of large intestine flora, but if it is in the urinary tract, it can cause an UTI

# Reproduction of Microorganisms

## What they need

1. Warm environment-body temp ideal
2. Darkness; can be killed by sunlight
3. Food and moisture
4. Oxygen to live-aerobic
5. No oxygen to live-anaerobic

# Classes of Microorganisms

## 6 classes of microorganisms

1. Bacteria
2. Protozoa
3. Fungi
4. Rickettsiae
5. Virus
6. Helminth

# Bacteria

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# The Basics

- \* One celled organisms
- \* Multiply rapidly
- \* Classified by shape & arrangement
- \* Killed by antibiotics
- \* Some have become antibiotic resistant

# Bacteria Classification

3 shapes with arrangements

1. Cocci=round or spherical
  - \* diplococci=cocci in pairs
  - \* streptococci=cocci in chains
  - \* staphylococci=cocci in clusters

# Bacteria

## 2. Bacilli=rod-shaped

- \* can occur singly, in pairs, or in chains
- \* can have flagella (thread-like projections similar to tails & allow for movement)
- \* can form spores (thick-walled capsules) which makes them hard to kill

# Bacteria

- 3. Spirilla=spiral or corkscrew, usually with tails
  - \* Includes the spirochete, usually without tails
  - \* Includes the vibrio (comma shaped)

# Types of Bacterial Infections

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- Diplococci caused diseases



# Gonorrhea

## What is Gonorrhea

### CAN GONORRHEA BE CURED?

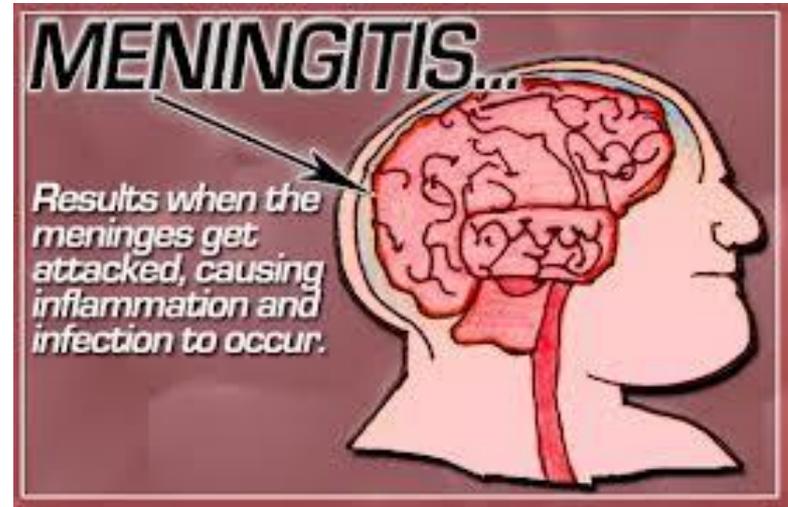
- It can be cured with the right treatment
- You have to take all of the antibiotics your doctor prescribes
- Antibiotics will stop the infection, but it will not undo any permanent damage



- Is a sexually transmitted disease (STD)
- A bacterium that can grow and multiply easily in the warm, moist areas of the reproductive tract, including the cervix, uterus, and fallopian tubes in women, and in the urethra in women and men.
- Is spread through contact with the penis, vagina, mouth, or anus.

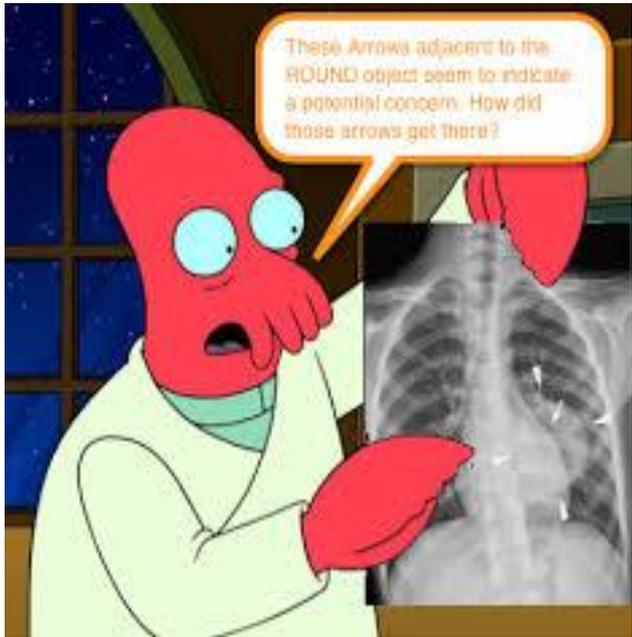
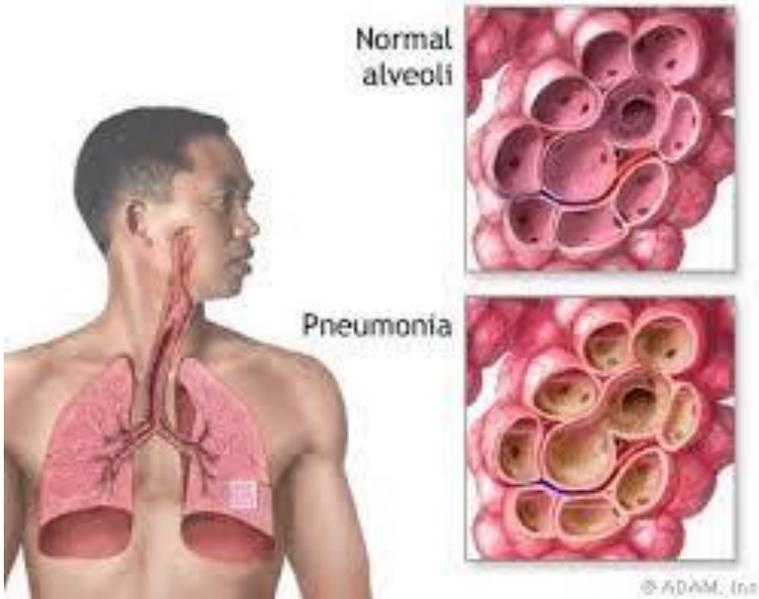


## Symptoms of Meningitis

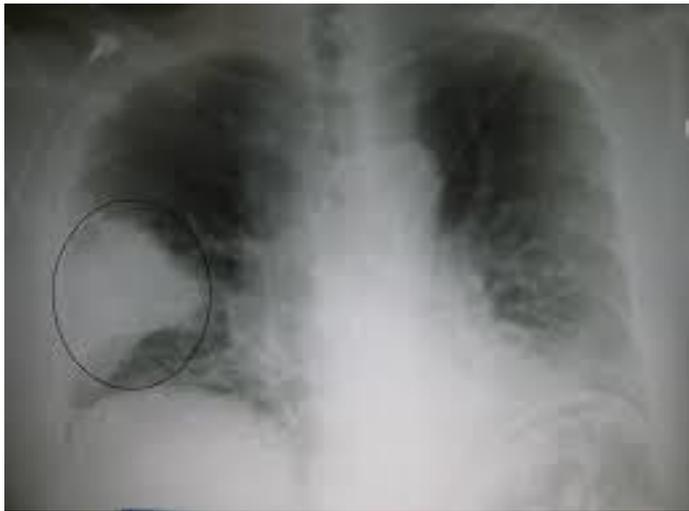
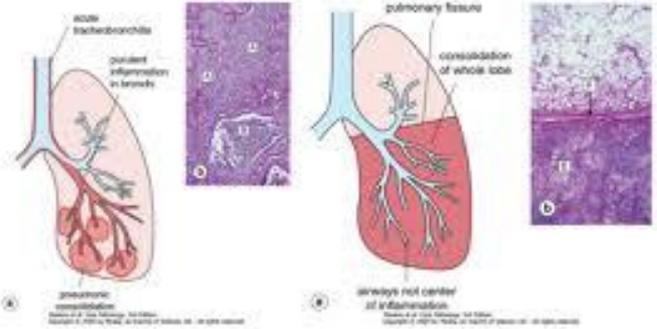


Spinal Tap - Meningitis Diagnosis

# Pneumonia



## Bacterial pneumonia



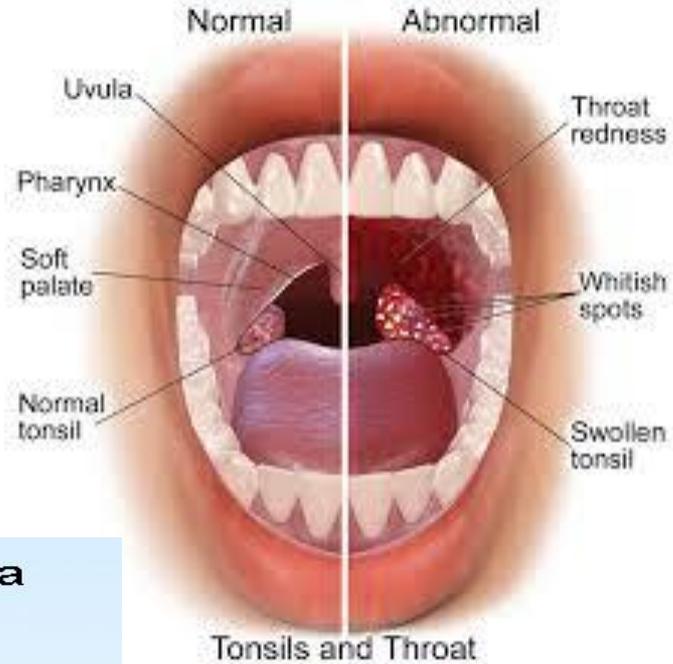
Streptococci caused  
diseases

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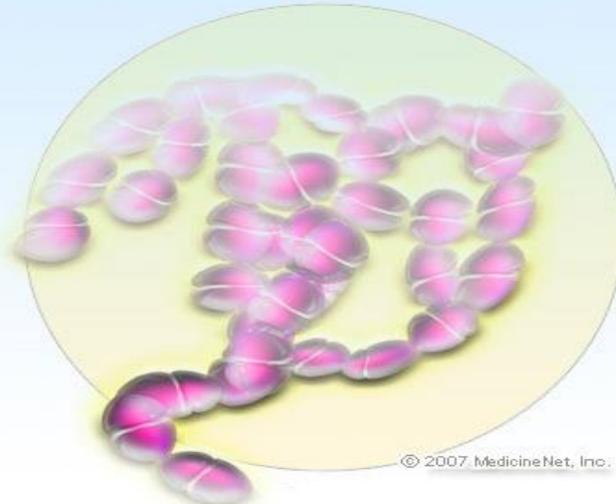


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# Strep throat



## Streptococcus bacteria



© 2007, MedicineNet, Inc.

A group of bacteria, familiarly known as strep

# Rheumatic fever

**IS IT RHEUMATIC FEVER?**

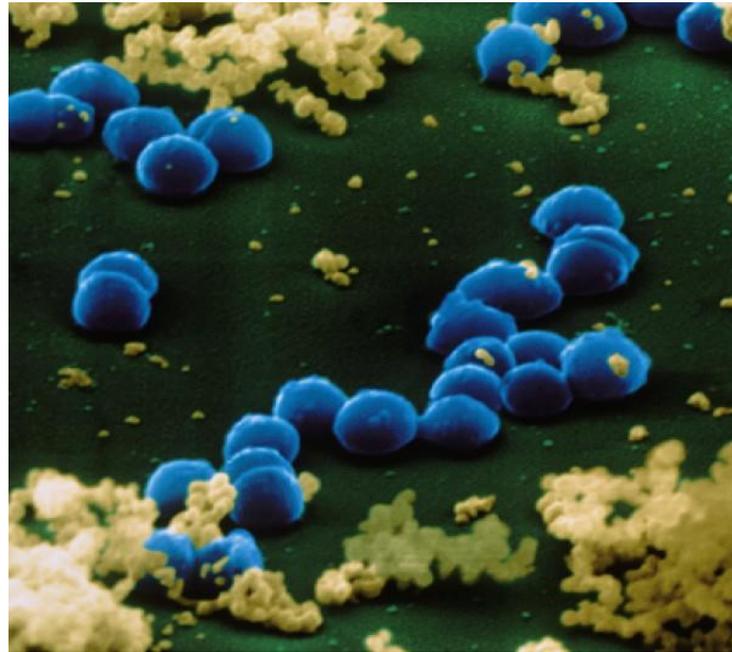
**SORE THROAT**

**SKIN SORES**

**SWOLLEN JOINTS**

If you experience any of these symptoms, **SEE YOUR DOCTOR!!**

WORLD HEART FEDERATION  
 WORLD HEALTH ORGANIZATION  
 VINDSTONE GROUP FOUNDATION



**RHEUMATIC FEVER**

INFLAMMATORY DISEASE INVOLVING THE JOINTS, HEART, SKIN, AND NERVOUS SYSTEM AFTER AN EPISODE OF UNTREATED GROUP A STREPTOCOCCAL PHARYNGITIS

**JONES**

CARDITIS  
 ERYTHEMA MARGINATUM  
 SYDENHAM CHOREA  
 NODULES

JOINTS (POLYARTHRITIS)  
 ARTHRALGIA  
 PROLONGED PR INTERVAL  
 FEVER  
 ELEVATED ESR/CRP

JONES CRITERIA FOR DIAGNOSIS: 2 MAJOR OR 1 MAJOR AND 2 MINOR WITH EVIDENCE OF RECENT GROUP A STREP INFECTION

■ MAJOR  
 ■ MINOR

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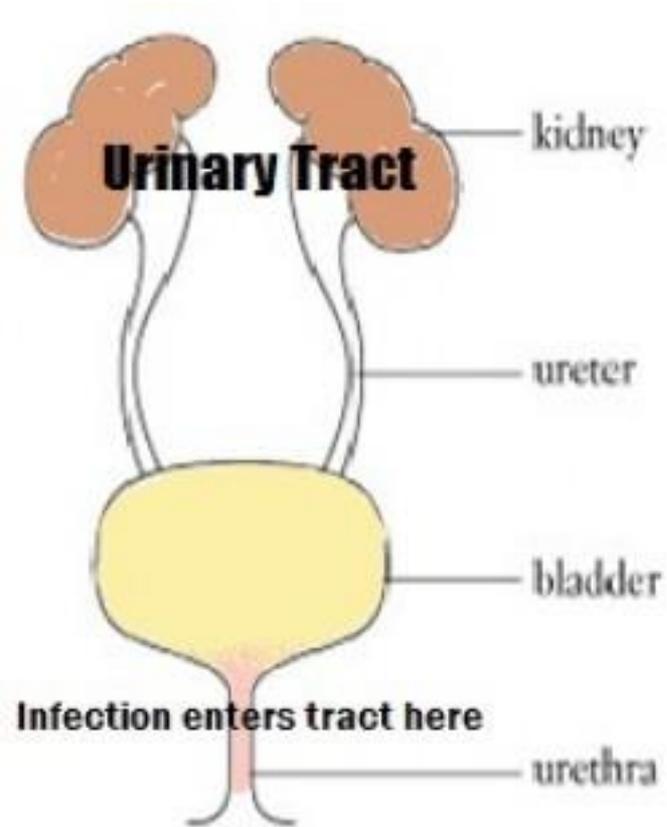
# Staphylococci diseases



Boils (Skin Abscess)



# Urinary tract infection



## Urinary Tract Infection Symptoms



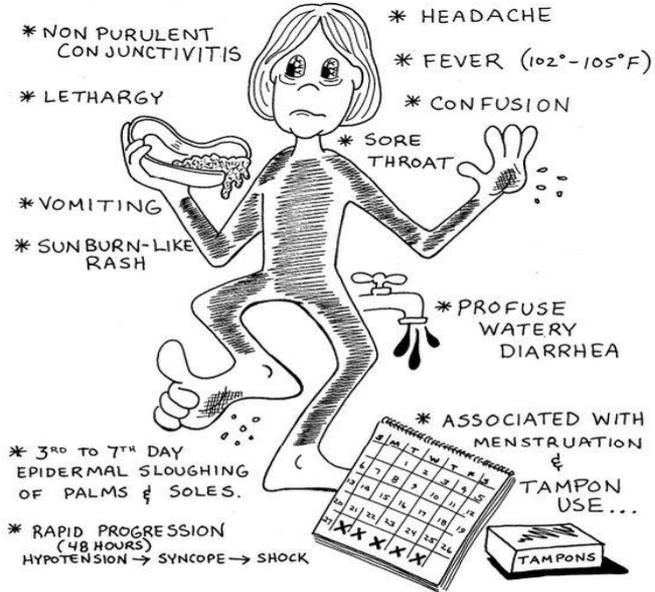
- Frequent urination, but very little urine may come out.
- Painful burning sensation before, during, and after urinating.
- Urinating blood.
- Urgent need to urinate, and in serious cases, unable to control bladder and leaks urine.
- Cloudy or foul smelling urine.
- Malaise or the general feeling of unwell.
- Severe pain in the lower abdomen region.
- Mild fever.

[Click Here to Cure Your UTI Naturally](#)

# Wound infections



## TOXIC SHOCK SYNDROME (TSS)



Reference: Memory Notebook of Nursing Vol. II, Page 79  
Author: JoAnn Zerwekh, EdD, RN, FNP, Jo Carol Claborn, MS, RN,  
C.J. Miller, BSN, RN



# Toxic Shock

**Table 5. Toxic Shock Syndrome: Case Definition**

1. Fever greater than 38.9°C
2. Diffuse macular erythroderma
3. Desquamation one to two weeks after onset of illness, especially on palms and soles
4. Hypotension (systolic blood pressure less than fifth percentile)



# Bacilli bacterial diseases

# Main symptoms of Pulmonary tuberculosis

## Central

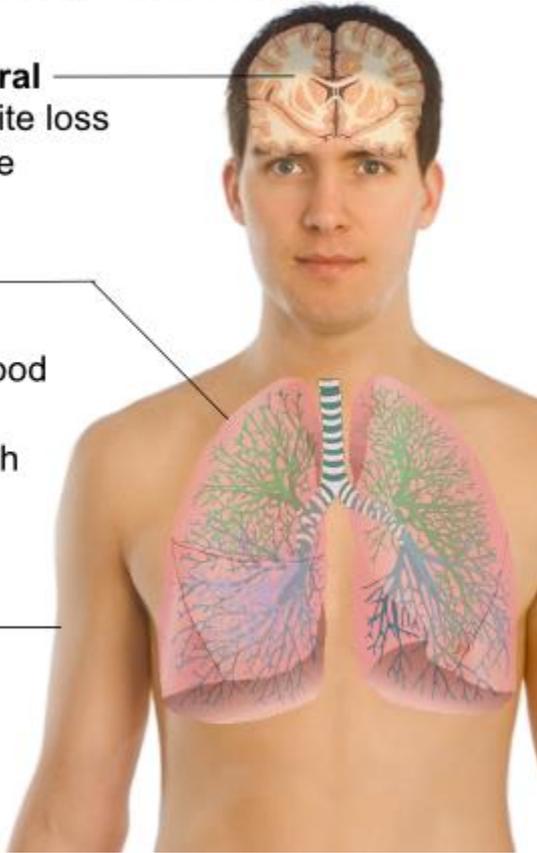
- appetite loss
- fatigue

## Lungs

- chest pain
- coughing up blood
- productive, prolonged cough

## Skin

- night sweats,
- pallor

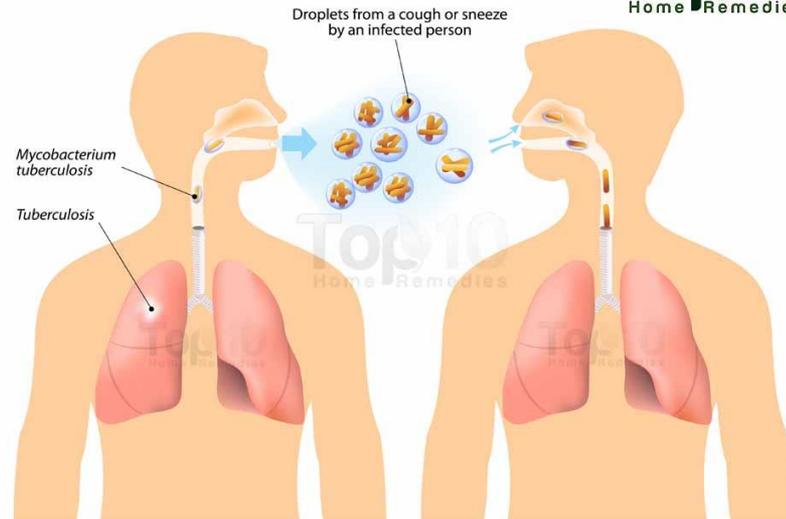


# Tuberculosis



## TUBERCULOSIS

Top10 Home Remedies





# Tetanus



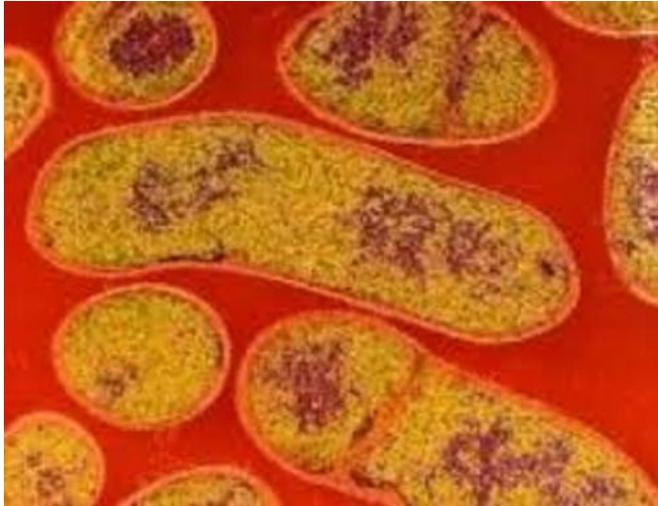
# What is Whooping Cough?



- Disease is characterized by inexorable spasms of coughing, with a protracted course
  - Contagious disease—can spread from coughs or sneezes
  - Begins with mild cold-like symptoms
  - After week or 2 can lead to more serious problems
  - Vaccine—preventable



# Botulism



## Botulism Symptoms

If you have recently developed the following symptoms, go to the hospital now:

- Double Vision
- Difficulty Swallowing
- Blurred Vision
- Dry Mouth
- Droopy Eyelids
- Muscle Weakness (Starts in shoulders and descends through body)
- Slurred Speech



# What is Diphtheria

- An infection of local tissue of Upper respiratory tract with production of toxin which causes systemic effects on Heart and Peripheral tissues,



Dr.T.V.Rao MD

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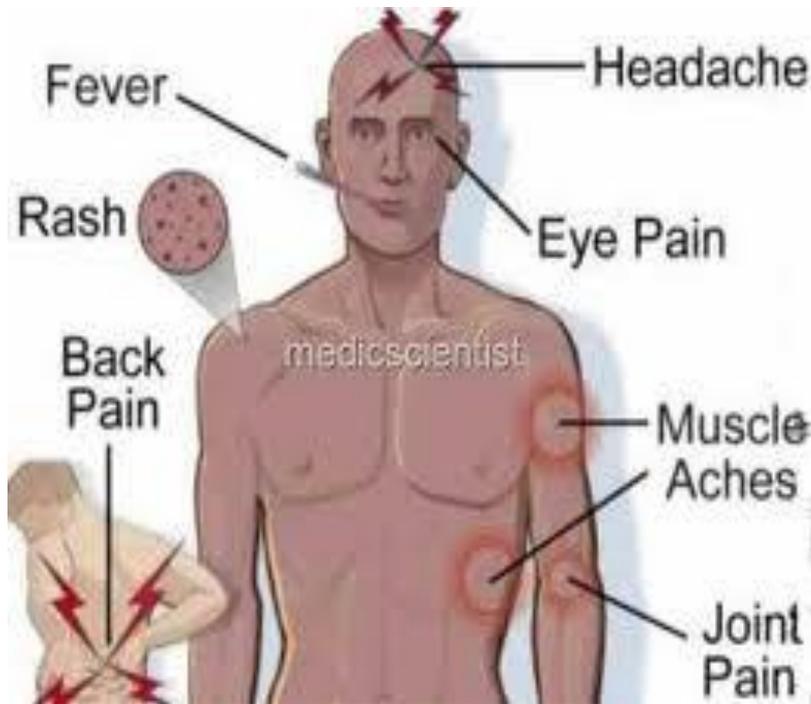
# Diphtheria

## Skin (cutaneous diphtheria)

- It is found in people with poor hygiene. Any break in the skin can become infected with diphtheria. The infected tissue develops an ulcerated area and a diphtheria membrane may form over the wound but is not always present. It is slow to heal and may be insensitive when touched.



# Typhoid

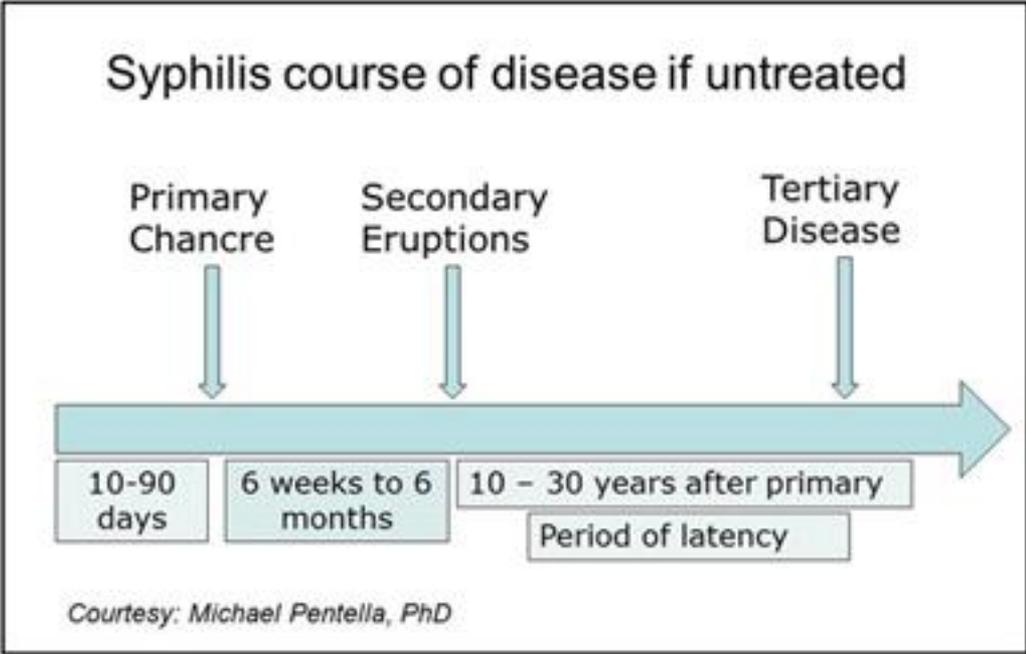
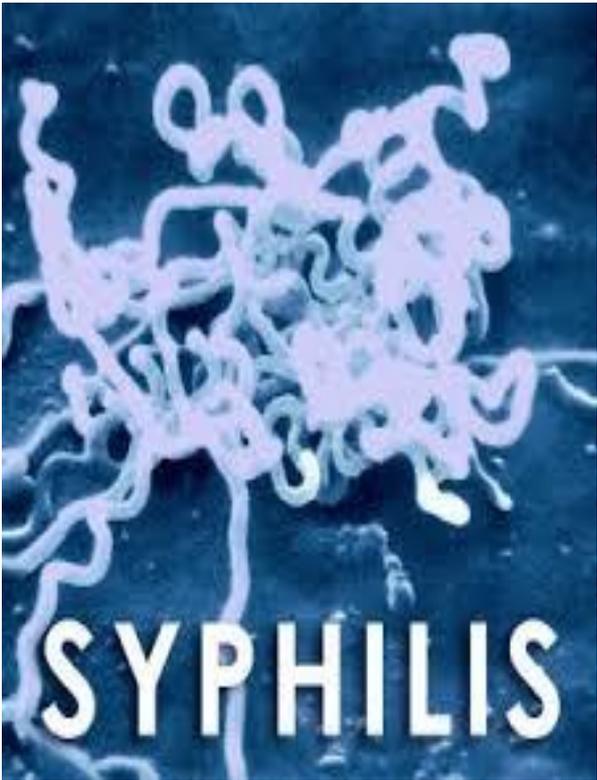


## Typhoid fever

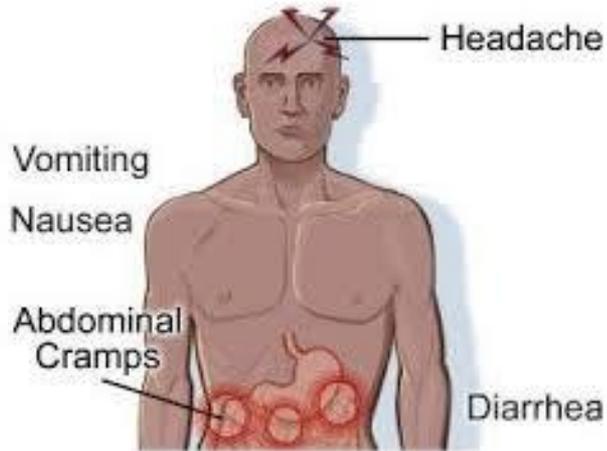
- ◆ 400 cases are diagnosed and treated in the U.S. each year
  - 75% are acquired from traveling internationally
- ◆ The disease is common in Latin America, Africa and Asia, where 21.5 million people are affected each year
- ◆ It is treated effectively with antibiotics
- ◆ The incubation period is 1 to 3 weeks
  - diagnosis is made by blood and/or stool cultures
- ◆ Major symptoms:
  - sustained high fever (103°-104° F)
  - weakness
  - stomach pains
  - headache
  - muscle aches
  - loss of appetite
  - constipation is more common than diarrhea, and vomiting is not severe
- ◆ For more information, go to: [www.cdc.gov/ncidod/dbmd/disease/typhoidfever\\_g.htm](http://www.cdc.gov/ncidod/dbmd/disease/typhoidfever_g.htm)

Spirilla caused diseases

# Syphilis



# Cholera



## Cholera Transmission



1. *Vibrio Cholerae* are found in the faeces of an infected individual.
2. Leakages in the sewerage system may contaminate the clean and potable water making it unfit for drinking and use.
3. Dirty hands may transfer these bacteria onto the food.
4. Contaminated food or water serves as a medium for transmitting the disease from one person to another.

<http://papahealth.com/>



Antibiotic  
resistant bacteria

# Methicillin-resistant staphylococcus



# The Basics of Protozoans, Fungi, & Rickettsia and Infections

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# Basic Information: What are Protozoa?

- One-cell animal like organisms
- May have flagella which allows them to move freely
- Can be pathogenic



# Where are Protozoa?

- Found in decayed materials
- and animal or bird feces
- Insect bites
- Contaminated water



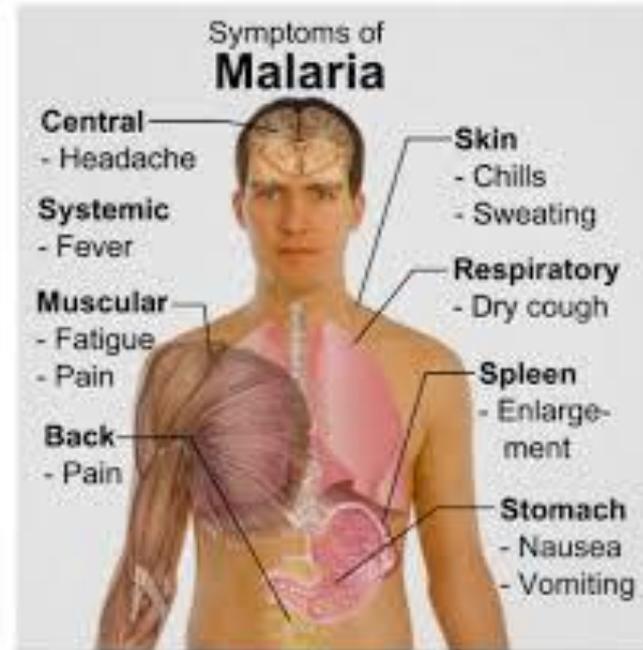
# How We Get Infected with Protozoa



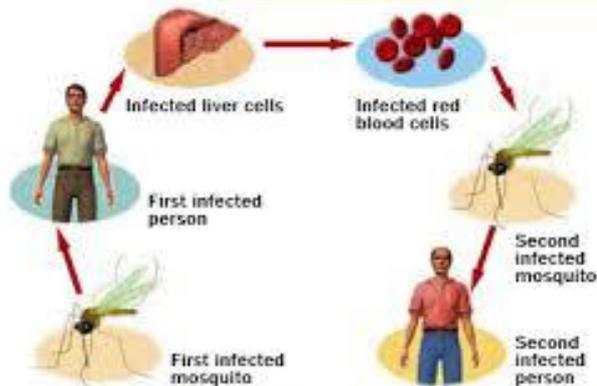
- Can be found in contaminated water
- Can be transmitted in bug bite



# Malaria



**Malaria transmission cycle**



# Amebic dysentery

## Intestinal infection

**Amebiasis or amebic dysentery is caused by the protozoan *Entamoeba histolytica*. Improved sanitation and clean water supply decrease the incidence of amebiasis. The amount of chlorine normally used to control pathogens is *inadequate* in killing the cysts. Drinking water can be rendered safe by boiling or iodination with tetraglycine hydroperiodide. Nevertheless, drinking water is usually not much of the problem.**

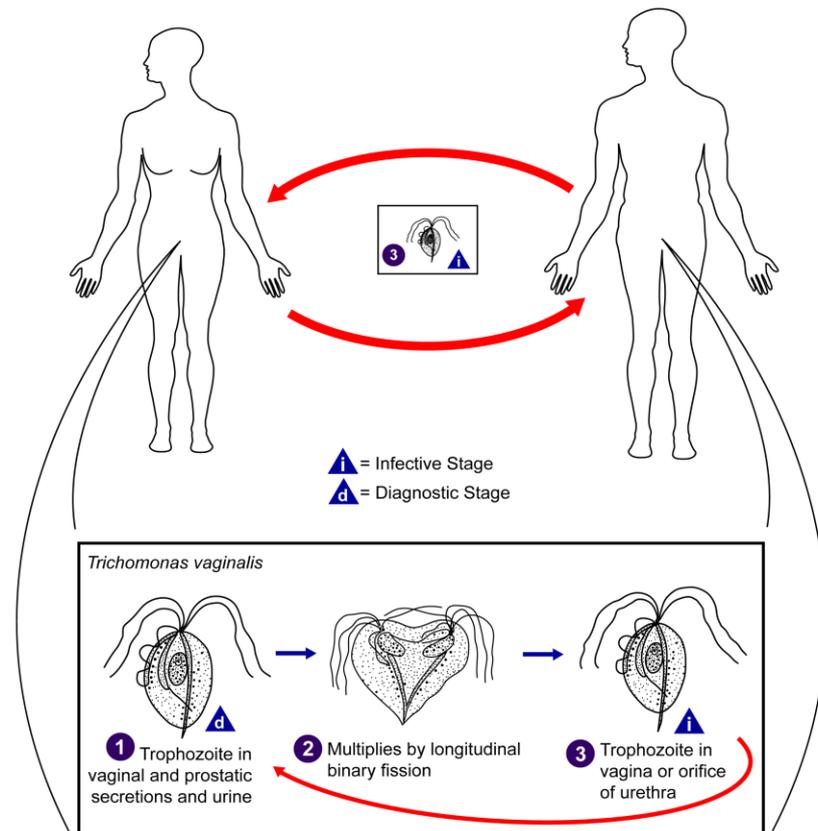


# Trichomonas

## STD aka Trich



### Trichomoniasis (*Trichomonas vaginalis*)



# African sleeping sickness



*African Sleeping Sickness (Trypanosoma brucei)*



## Late Stage (Encephalitic Stage)

- Finally, the late stage leads the host to death.
- The host enters a terminal coma, or "sleep," giving the disease its name: "sleeping sickness."



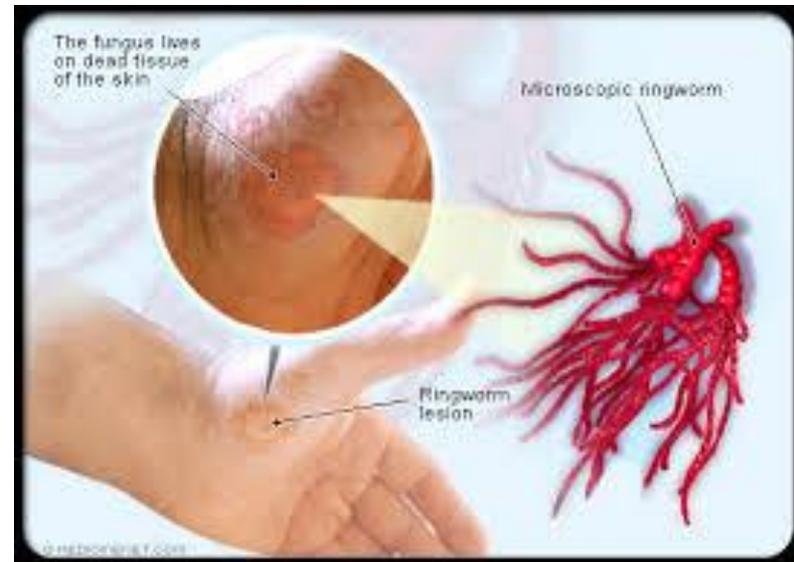
# Fungi and It's Diseases

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# Basic Information of Fungi

- Simple, plant-like organisms that live on dead organic matter
- Antibiotics do **NOT** kill fungi
- **ANTIFUNGAL** medications kill fungi
  - Expensive
  - Must be taken internally (swallow pill)
  - May cause liver damage
- Yeasts and mold most common and CAN be pathogenic. They can cause:

# Ring Worm



# Athlete's Foot



## What Is Athlete's Foot?

Athlete's foot is a common condition of fungal infected foot. Apart from, fungus there are other causes of athlete's foot but a group of fungi called **dermatophytes** are main cause of this infection.



# Histoplasmosis



Histoplasma spores



Risk factor:  
exposure to  
bird or bat  
droppings

ADAM

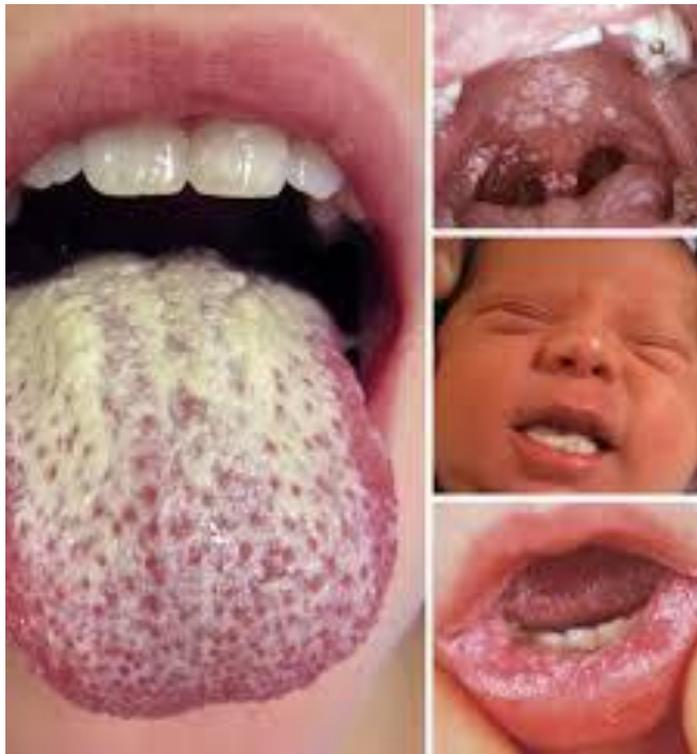


# Yeast Vaginitis



	Bacterial vaginosis	Yeast infection	Trichomoniasis
<b>Cause</b>	Bacteria	Yeast/fungus	Parasite
<b>Discharge</b>	Thin, gray, usually increased in volume	Thick, curdy, and white, like cottage cheese	Yellow-greenish or gray foamy
<b>Odor</b>	Fishy, unpleasant, or foul	None	Fishy
<b>Discomfort</b>	Itching sometimes present	Vaginal itching/burning usually present, painful urination sometimes present	Itching, burning, painful urination sometimes present

# Thrush



## Oral Thrush In Children

Oral Thrush  
Close-up



Thrush is a yeast infection caused by forms of a fungus called *Candida* that appears as whitish, velvety lesions in the mouth and on the tongue. Thrush is common in infants; the doctor will likely prescribe a mild antifungal medication.



# The Basics of Rickettsiae & the Diseases

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# Basic Info on Rickettsiae

- ▣ It is a parasitic microorganism which means it CANNOT live outside the cells of another living organism
- ▣ Found in fleas, lice, ticks, and mites
- ▣ Transmitted to humans by insect bites
- ▣ Antibiotics ARE effective against rickettsiae

# The Parasite



Attachment of rickettsiae to the surface of an endothelial cell is followed by their entry into the cell via rickettsia-induced phagocytosis. Following phagocytosis, the phagosome membrane (arrow) is lost and the rickettsiae escape into the host cell cytoplasm. Bar = 0.5  $\mu$ m

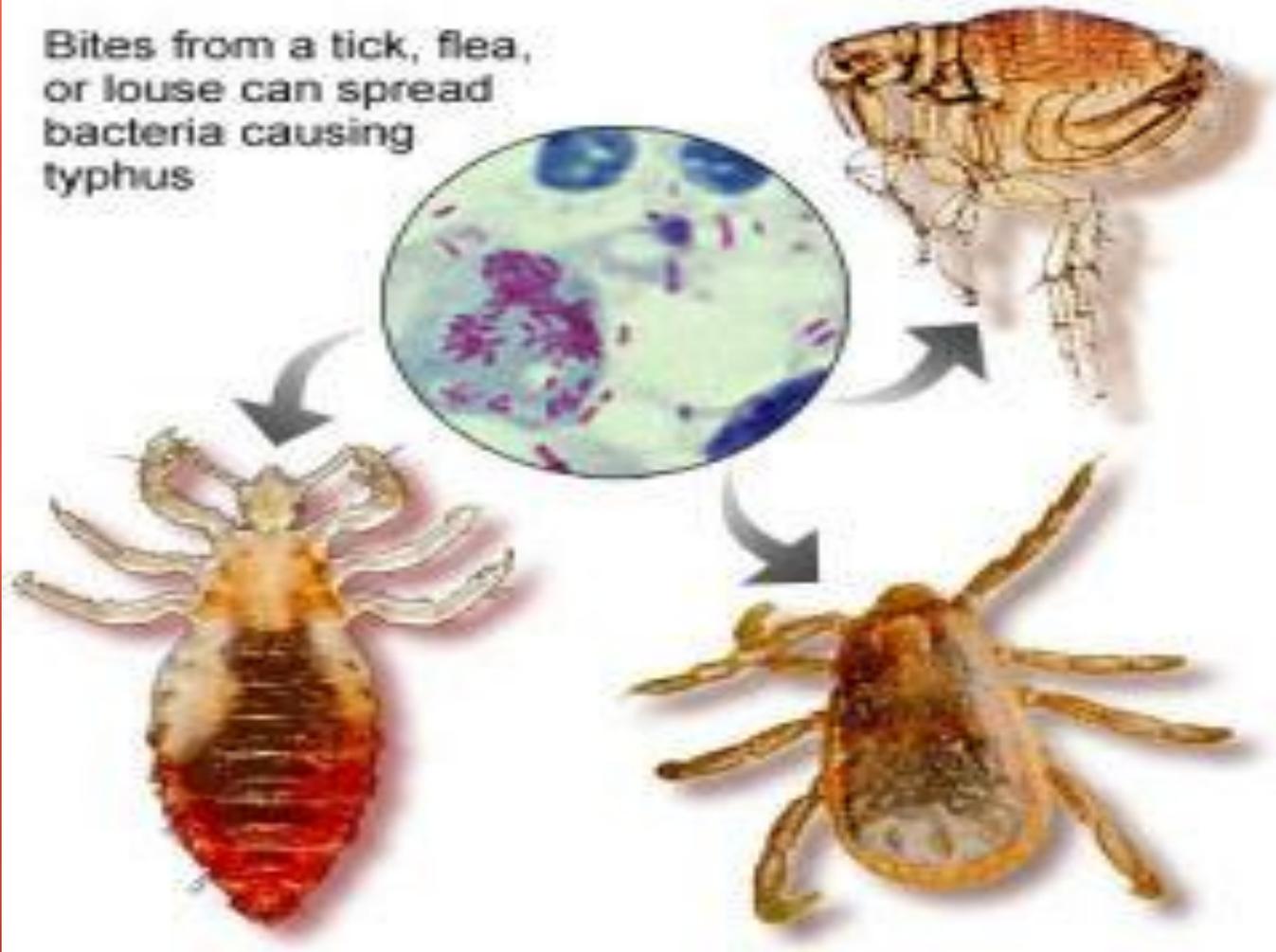
# Where It Is Found

- ▣ Fleas, lice, ticks, and mites

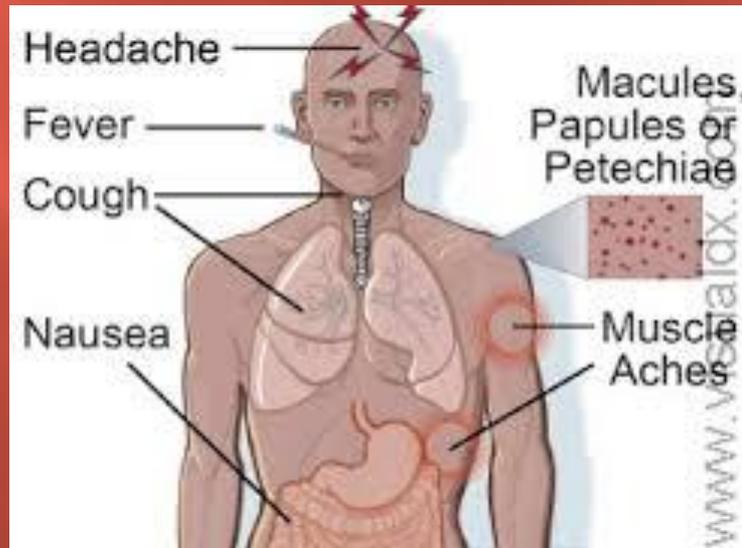
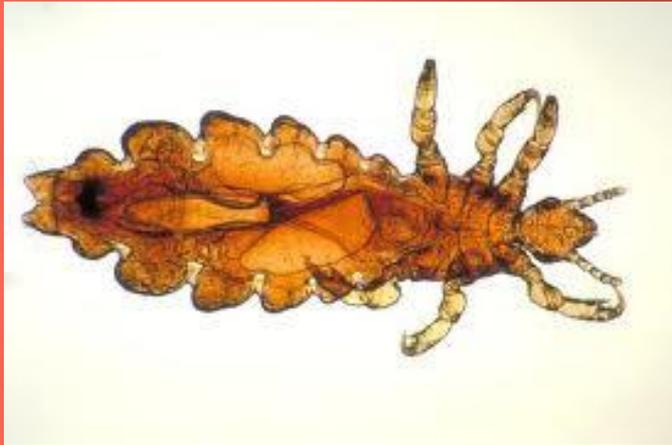


# The Insects

Bites from a tick, flea, or louse can spread bacteria causing typhus



# Typhus Fever

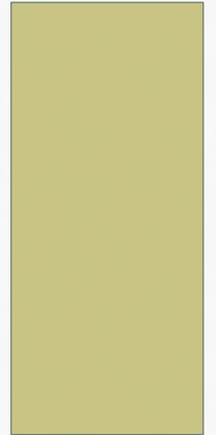


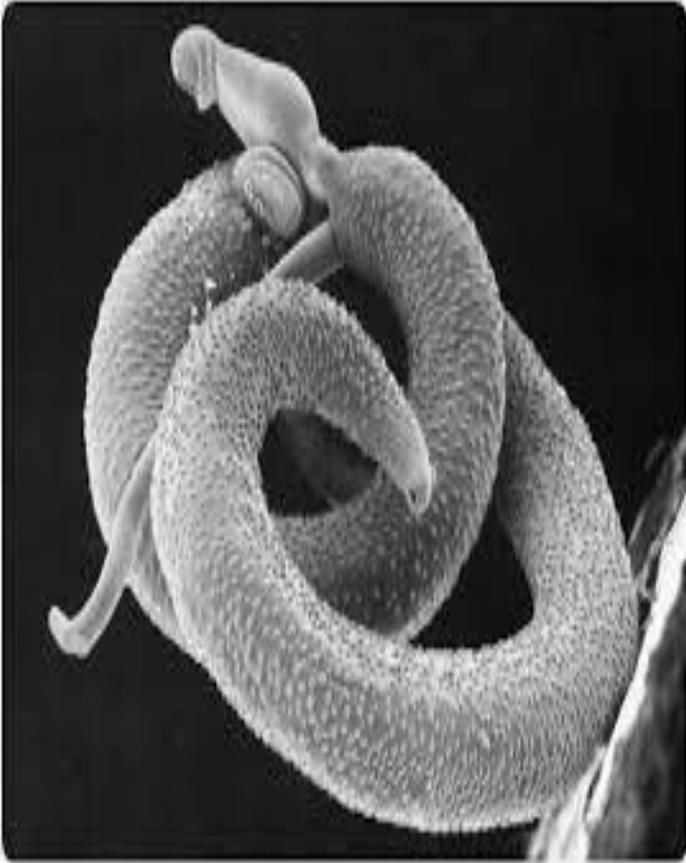
# Rocky Mountain spotted fever



# INFECTIONS FROM HELMINTHS

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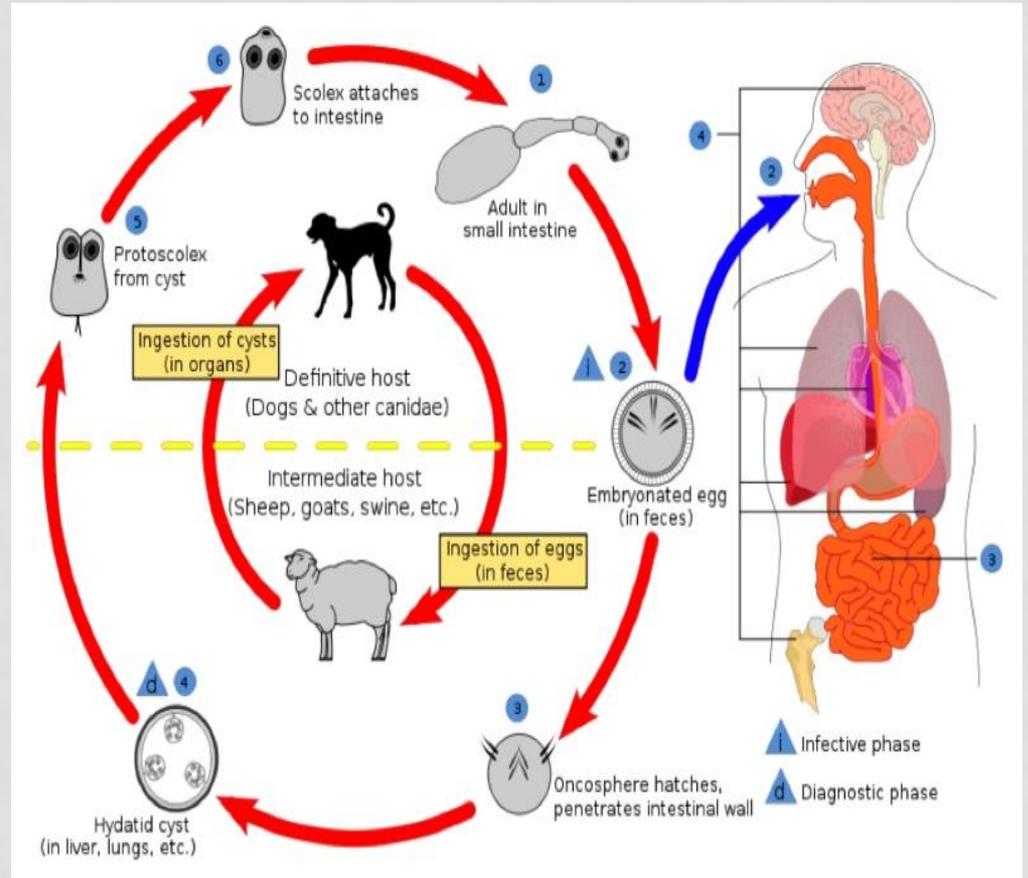
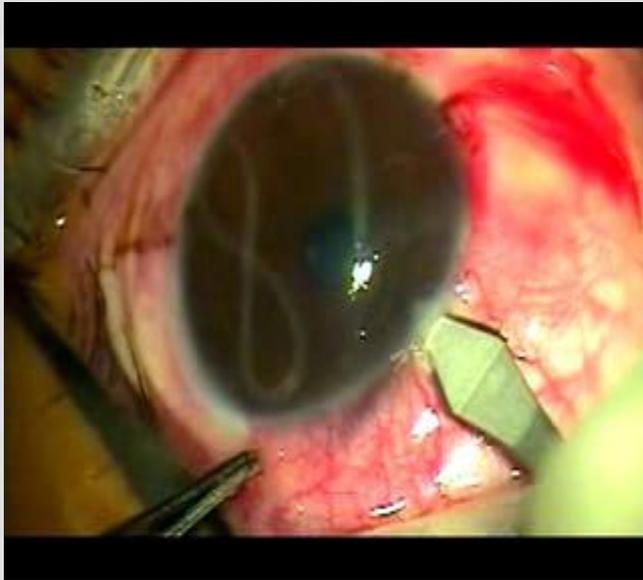
## BASIC INFO

- Multi-cellular parasitic organisms
- We call them “worms” or “flukes”

## HOW DO WE GET THEM?

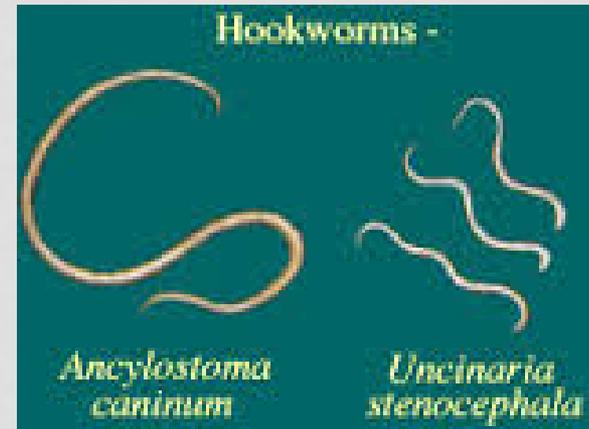
- We eat the eggs or larvae in contaminated food
- When we are bitten by insects
- Some can go thru your skins





# HOOK WORM

THEY ATTACH TO SMALL INTESTINES & CAN INFECT HEART & LUNGS



Adult Hookworm,  
note teeth



Hookworms living  
inside the intestines



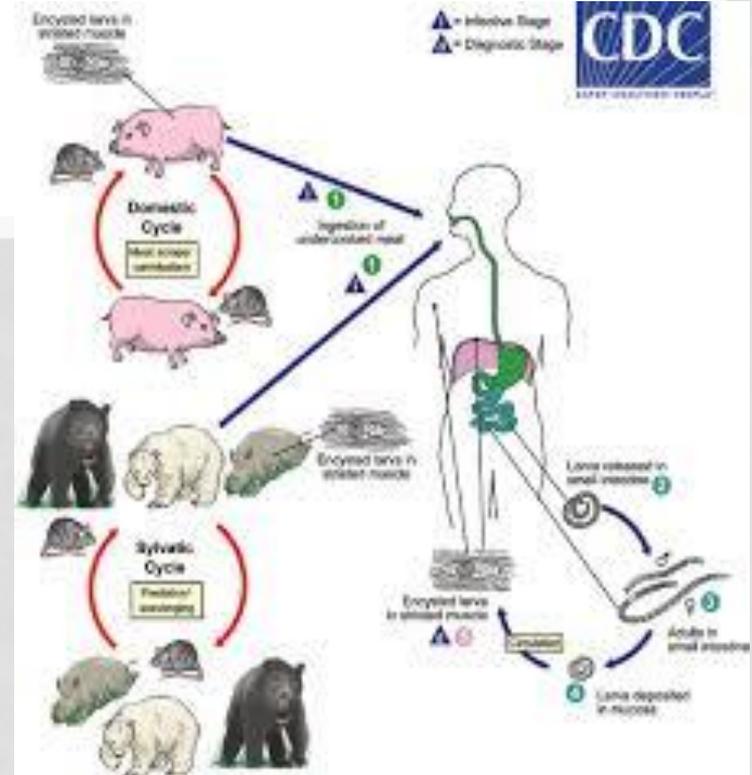
# ASCARIASIS

THEY LIVE IN SMALL INTESTINES & CAN CAUSE OBSTRUCTION



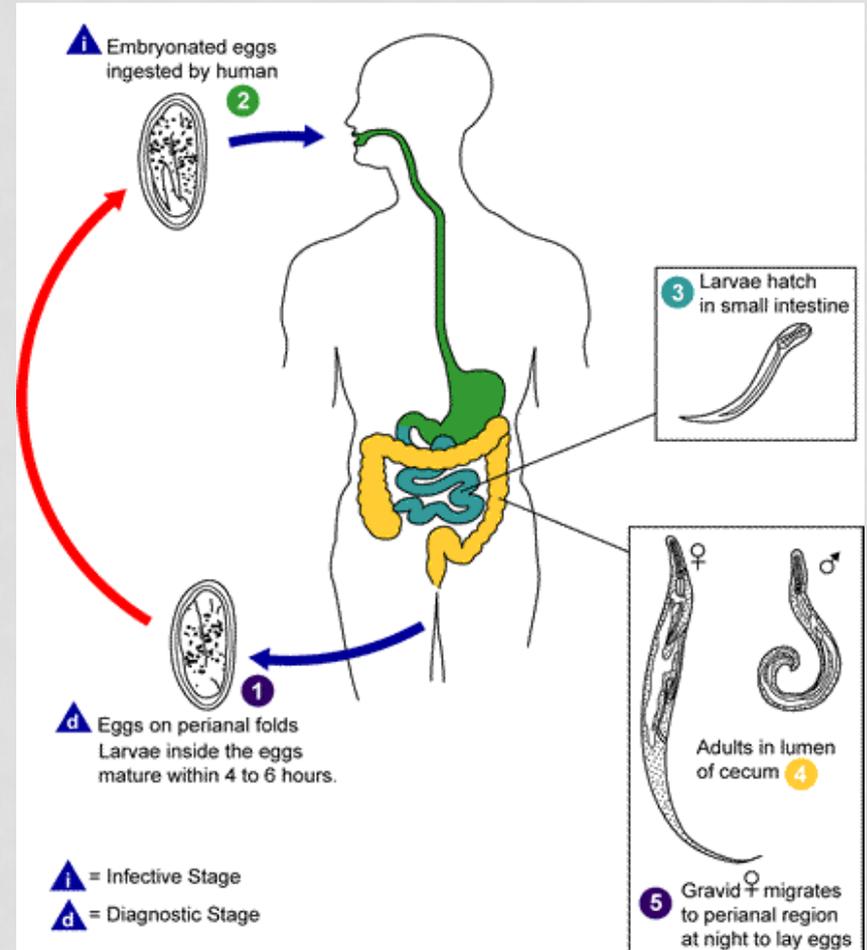
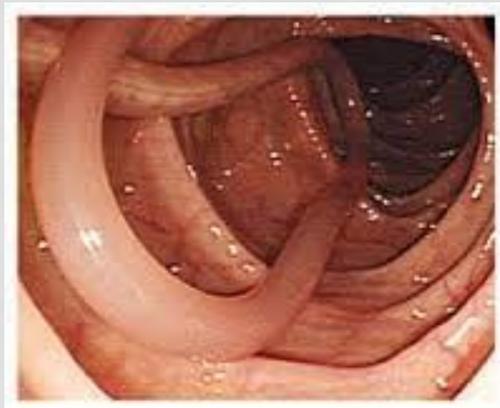
# TRICHINELLA SPIRALIS

AKA TRICHINOSIS; FROM RAW/  
UNDERCOOKED PORK



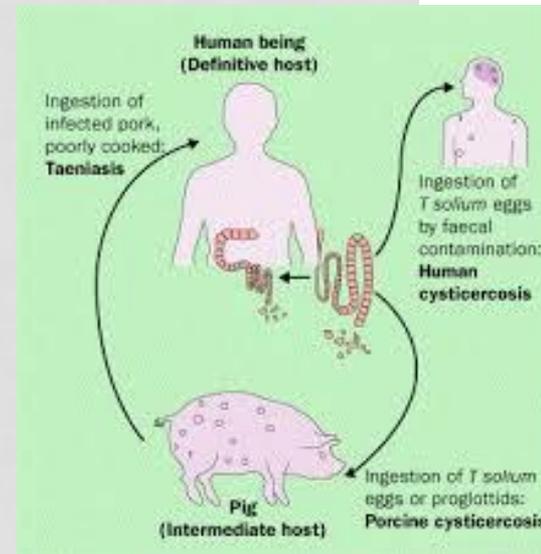
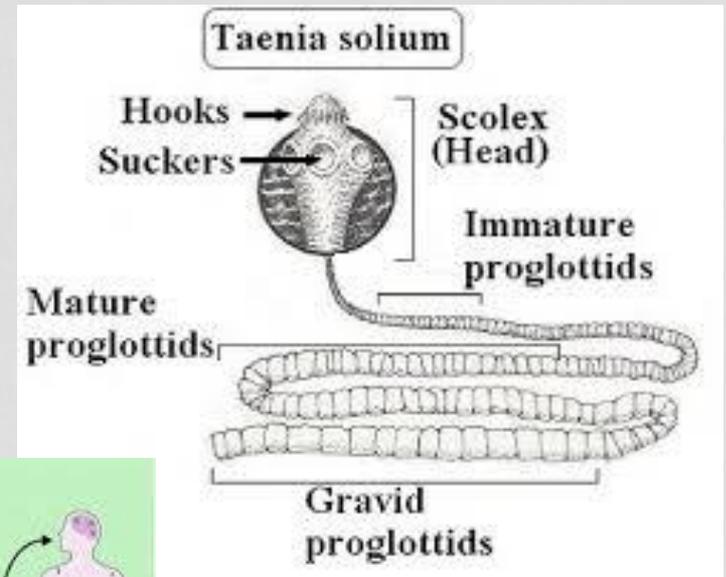
# ENTEROBIASIS

AKA PINWORM; COMMON IN YOUNG KIDS



# TAENIA SOLIUM

AKA TAPEWORM; FROM RAW, UNDERCOOKED PORK





# Viruses and Viral Infections

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# Viruses



- ▶ Smallest microorganism
- ▶ Visible only with electron microscope
- ▶ Cannot reproduce unless inside another living cell
- ▶ Spread from human to human by blood and other body secretions

# How We Deal with Viruses

- ▶ Difficult to kill=resistant to many disinfectants
- ▶ **Not** killed by antibiotics



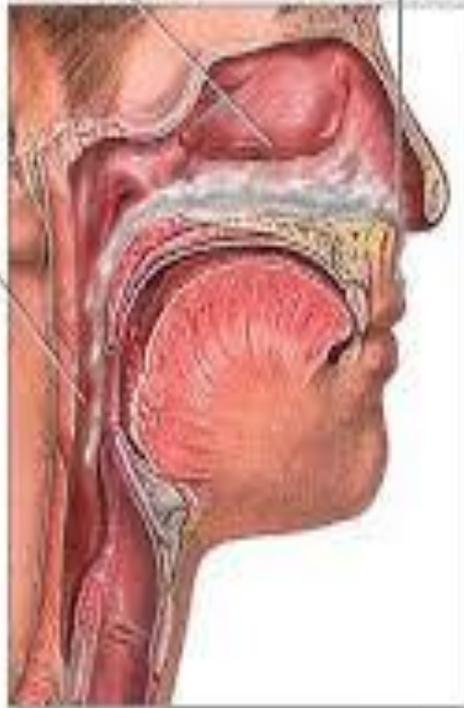
# Common cold

Symptoms of a cold:

Nasal congestion      Runny nose

Sore throat

Headache



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# Measles

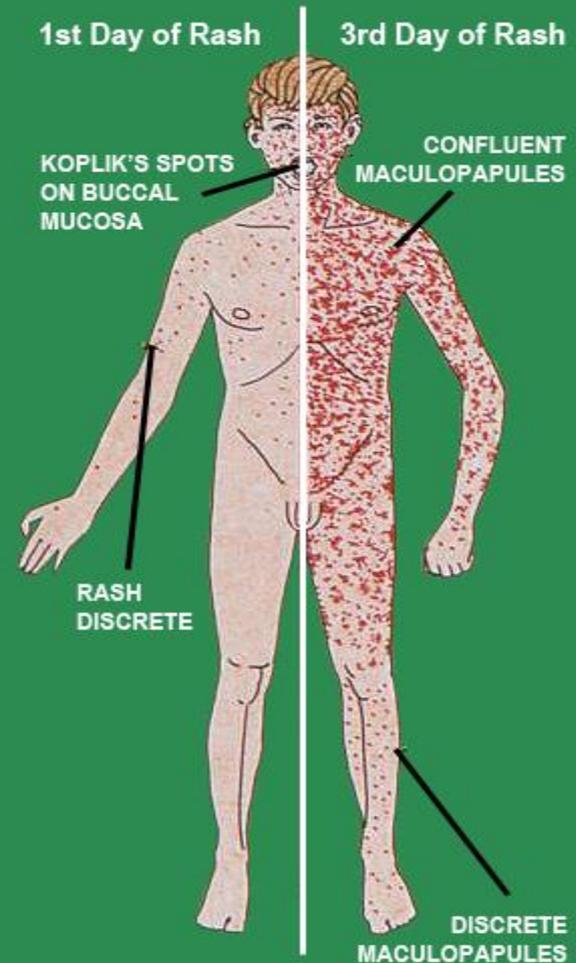
## Symptoms of Measles

Symptoms usually begin 8 - 12 days after exposure

- Bloodshot eyes
- Cough
- Fever
- Light sensitivity
- Muscle pain
- Rash – may appear as flat, discolored areas
- Runny nose
- Sore throat
- Tiny white spots inside the mouth (Koplik's spots)



## Schematic Distribution of Measles Ruboela Rash



# Mumps



## Pathogenesis - Mumps

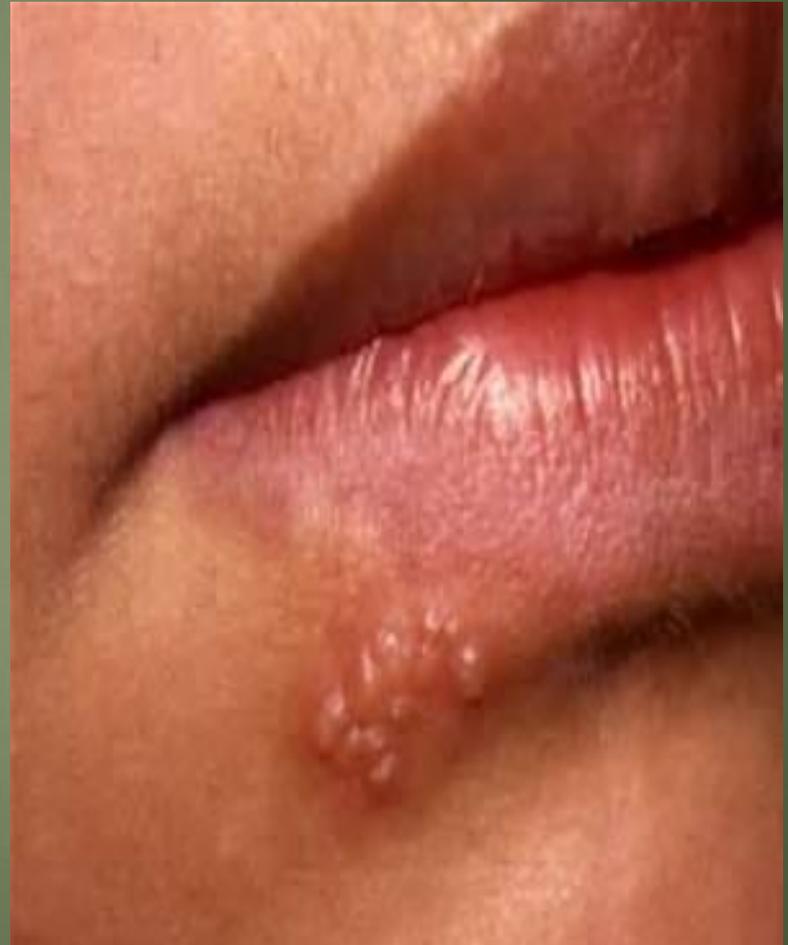


- ▶ Respiratory transmission of virus
- ▶ Replication in nasopharynx and regional lymph nodes
- ▶ Viremia 12-25 days after exposure with spread to tissues
- ▶ Multiple tissues infected during viremia

# Chicken pox



# Herpes



# Warts



Plantar

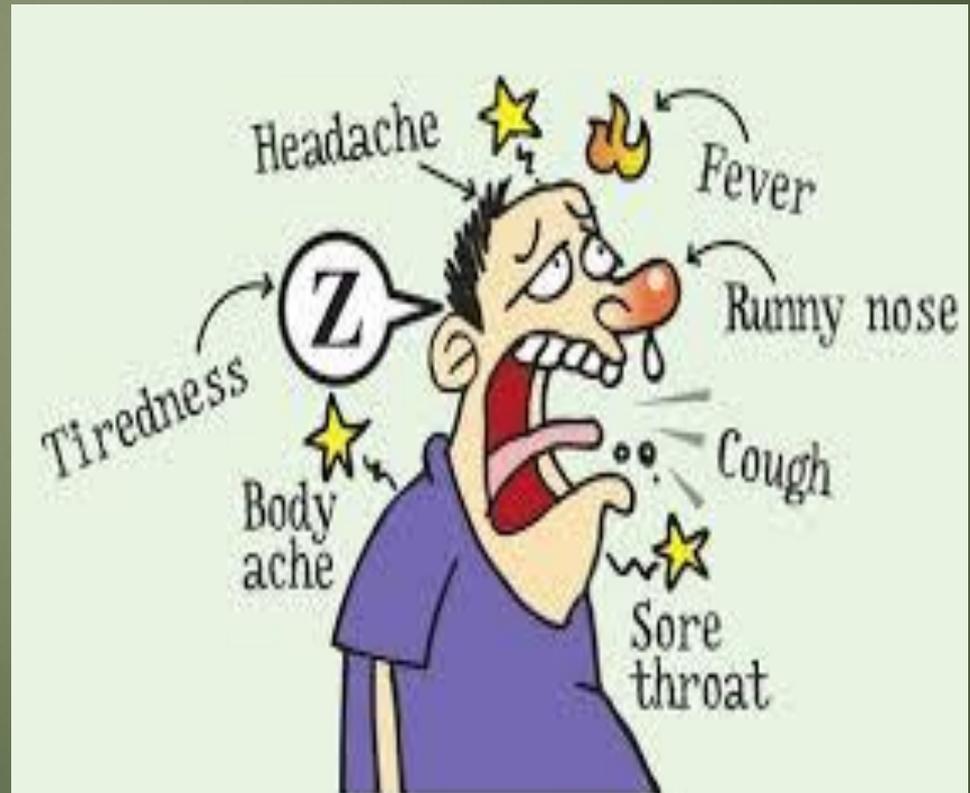
Periungual

Common

Flat

# Influenza

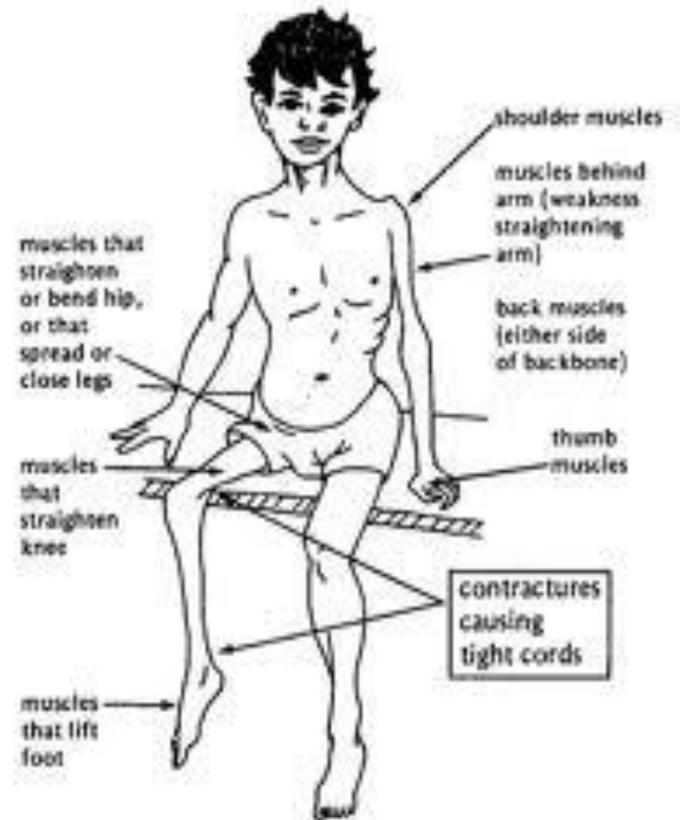
“The flu”



# Polio



MUSCLES COMMONLY WEAKENED BY POLIO



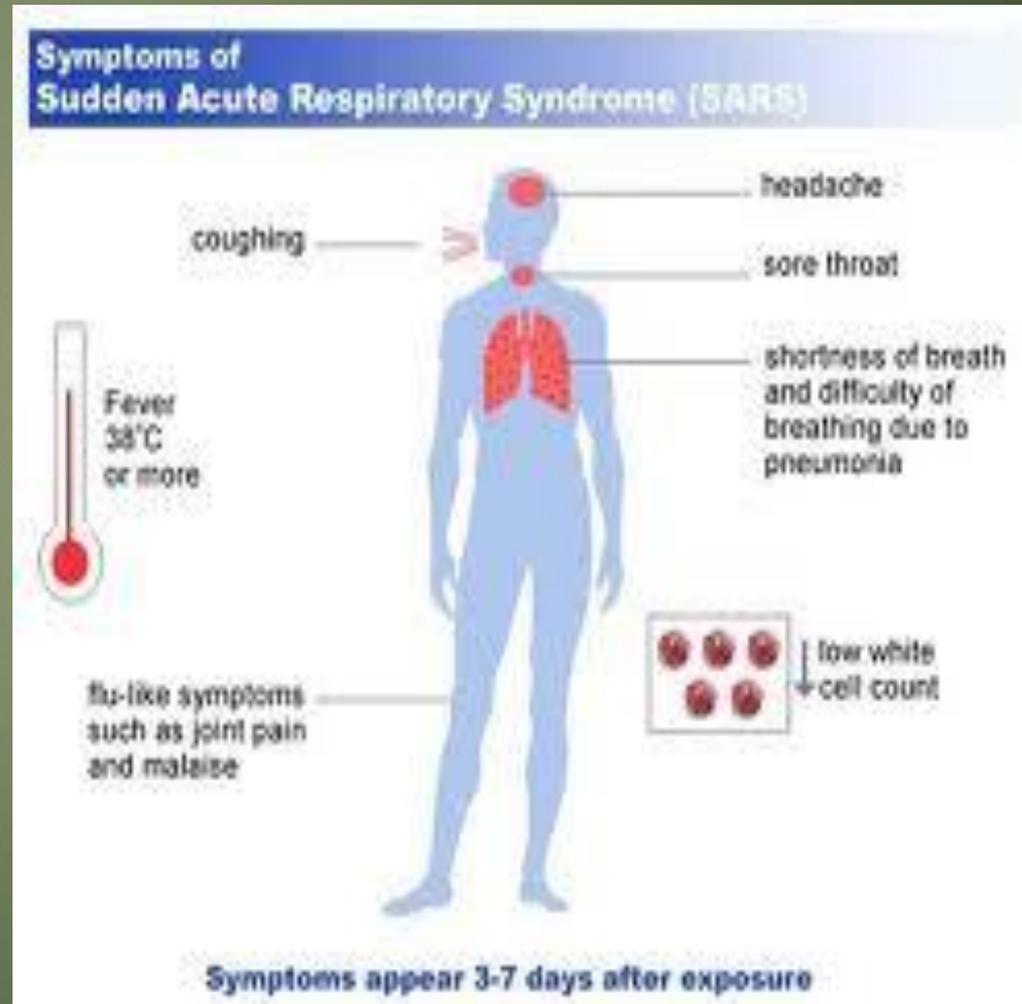
# Mutations and Changes

- ▶ Mutate and change genetic information so new and different viruses emerge constantly
- ▶ Viruses that infect animals can mutate to infect humans with lethal results (SARS, WNV, monkeypox, ebola, Marburg)



# Severe Acute Respiratory Syndrome (SARS)

Flu-like symptoms



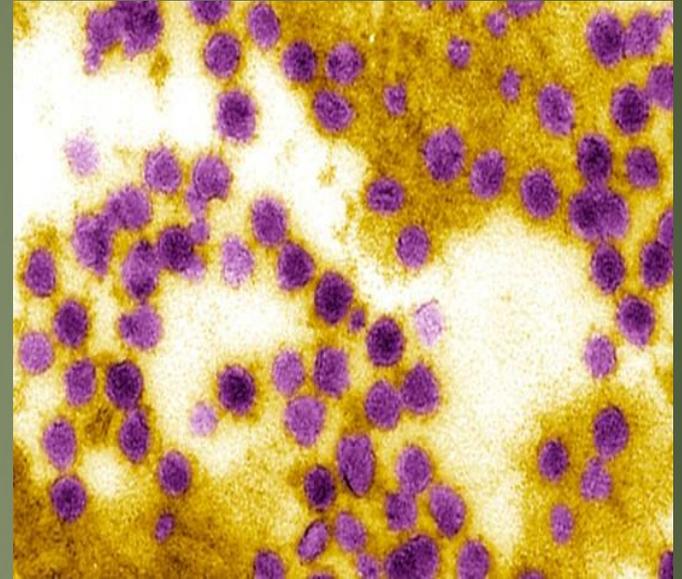
# West Nile Virus

Transmitted thru mosquitoes; 1<sup>st</sup> to birds and now to humans

1 A mosquito bites a bird infected with the West Nile virus. The mosquito now carries the virus.

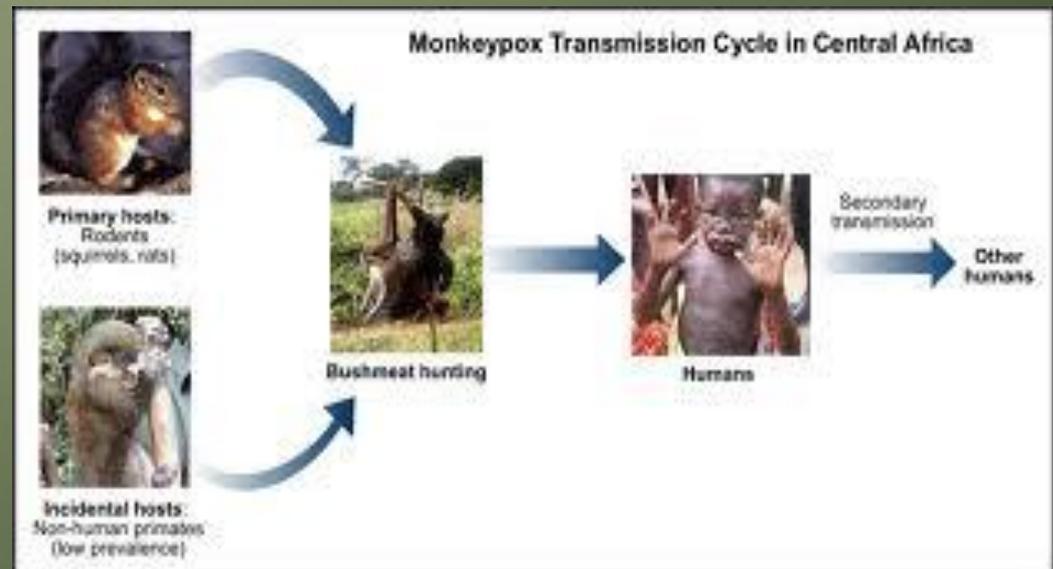
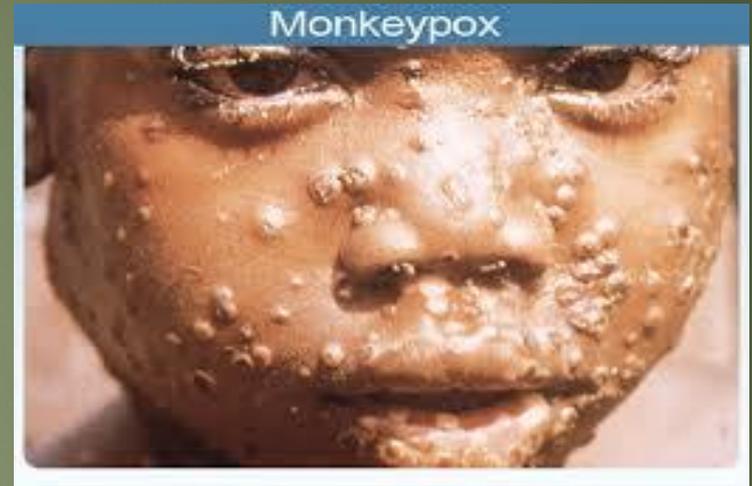


2 If the infected mosquito then bites a human or another bird, it may pass on the virus.



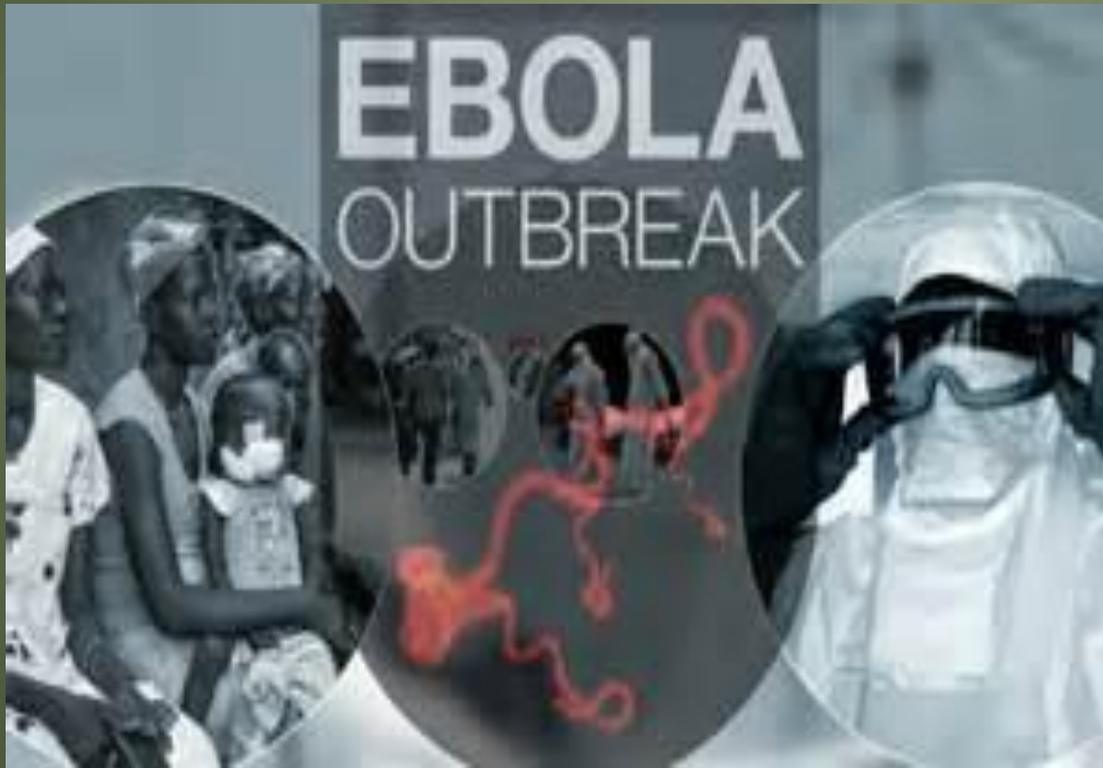
# Monkey pox

First with primates & rodents; similar to small pox and can use smallpox vaccine

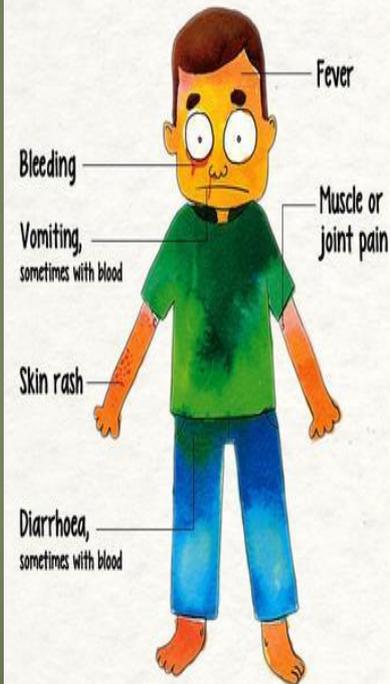


# Ebola

Started with primates and causes hemorrhagic fever



## EBOLA SYMPTOMS



50-90%  
Of people infected with Ebola die.

But people who  
**SEEK TREATMENT EARLY**  
have a better chance of survival.

2 - 21  
Number of days from exposure to virus to onset of symptoms.

Patients become  
**CONTAGIOUS**  
once they begin to show symptoms.

If someone has been in an area known to have Ebola or in contact with someone suspected to have Ebola and they begin to have symptoms, they should seek medical care **IMMEDIATELY**

# Marburg

Evolved like Ebola

## The Marburg virus

The Marburg virus, a haemorrhagic fever was discovered in 1967

Transmission: bodily fluids from a contaminated person are highly infectious

### Symptoms

The virus attacks the body's ability to coagulate blood and frequently affects the digestive tract and the lungs

Signs: diarrhoea, abdominal pain, nausea, headache, irritated throat, bleeding

Incubation: 3 to 9 days

Mortality: Most deaths occur within 3 to 7 days of symptoms

### Precautions

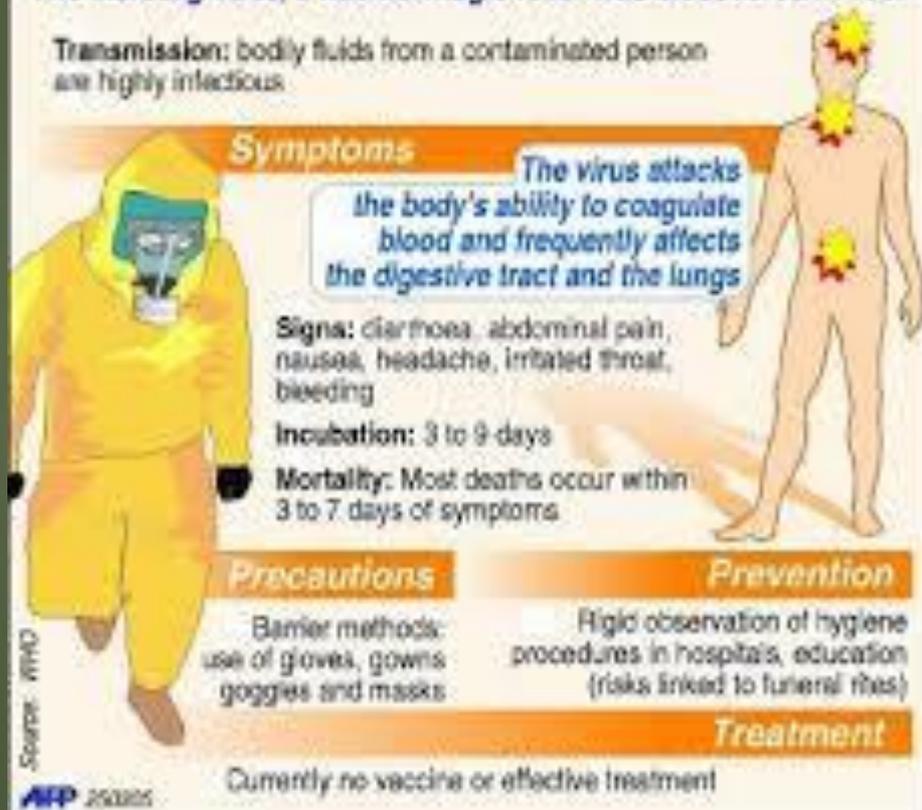
Barrier methods: use of gloves, gowns, goggles and masks

### Prevention

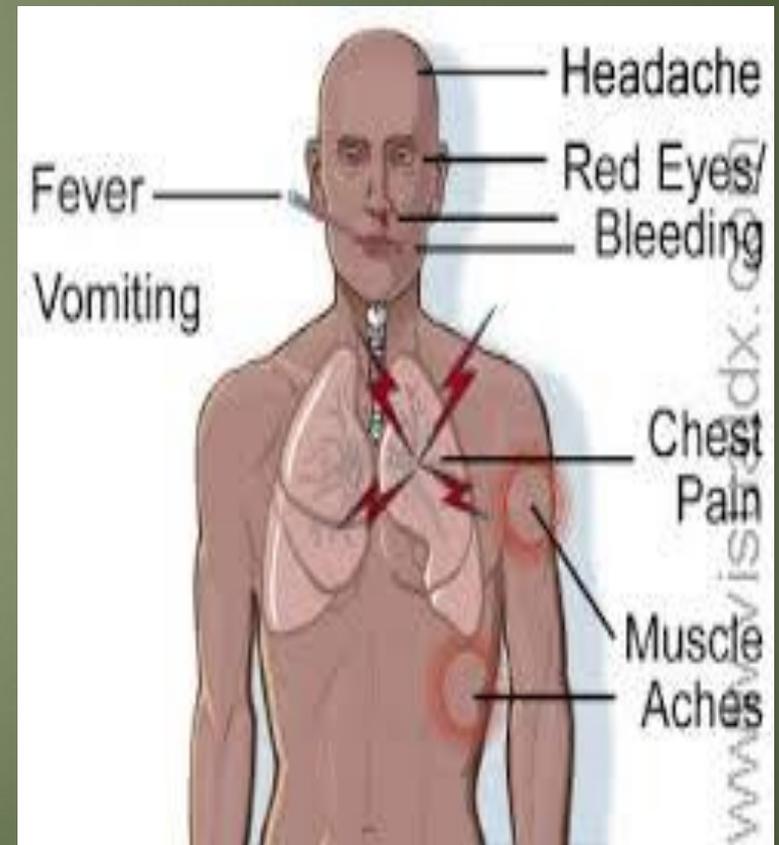
Rigid observation of hygiene procedures in hospitals, education (risks linked to funeral rites)

### Treatment

Currently no vaccine or effective treatment



Source: WHO  
AFP 250205



# H5N1 bird flu



# Viruses in Healthcare

- ▶ 3 viral diseases of concern for HCW: **HCV, HBV, HIV**
- ▶ 3 shot vaccine is available for HBV
- ▶ Federal law requires Employers to provide HBV vaccine at no cost to any at risk HCW



# Hepatitis B aka HBV



Body Piercing



Tattooing

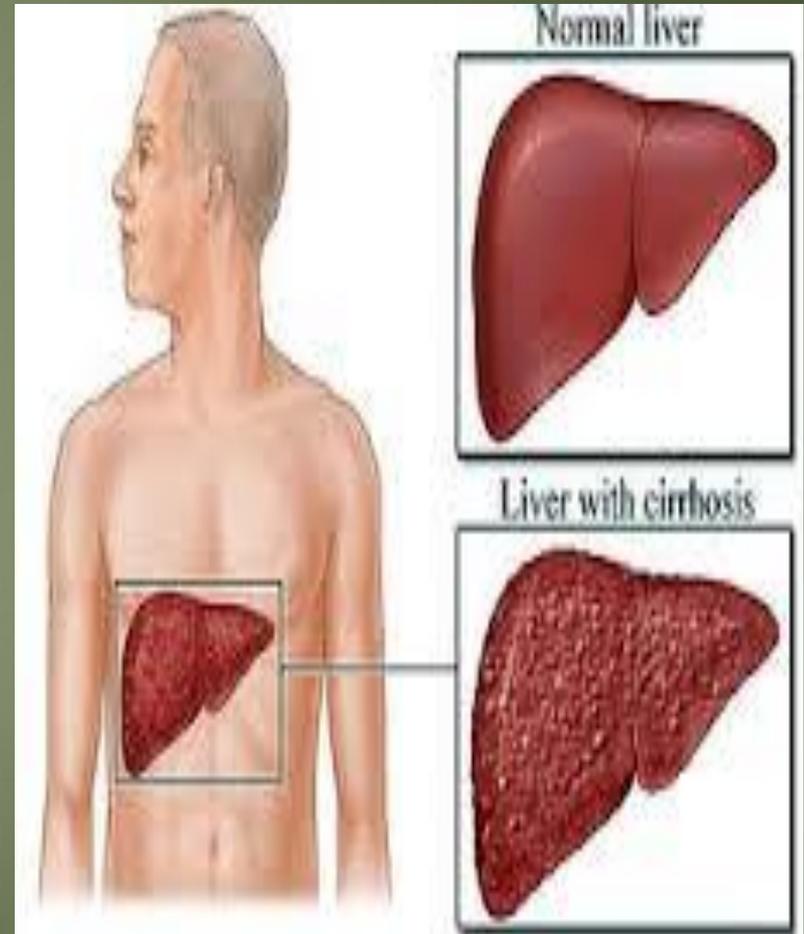
## Causes of Hepatitis B



Vertical Transmission



Blood Transfusion



# Hepatitis C

aka HCV

## WARNING

Hepatitis C virus can live on an exposed surface like a spoon for days, and inside a used syringe for weeks!

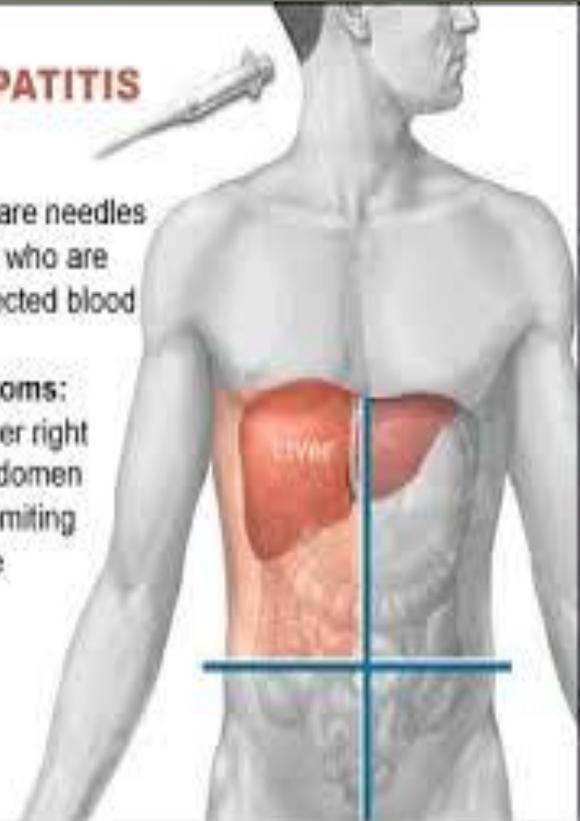
## ACUTE HEPATITIS

### Risk factors:

- people who share needles
- health workers who are exposed to infected blood

### Possible Symptoms:

- pain in the upper right quadrant of abdomen
- nausea and vomiting
- loss of appetite
- jaundice
- fatigue
- itching



# Hepatitis

Difficult to destroy and can live in dried blood for several days

## Hep B (HBV)

- ▶ Thru blood, serum, and other body secretions
- ▶ Can cause destruction and scarring of liver cells and
- ▶ There is a VACCINE

## Hep C (HCV)

- ▶ Thru blood and blood containing body fluids
- ▶ Causes liver damage also
- ▶ There is NO vaccine

# Famous People with Hep C

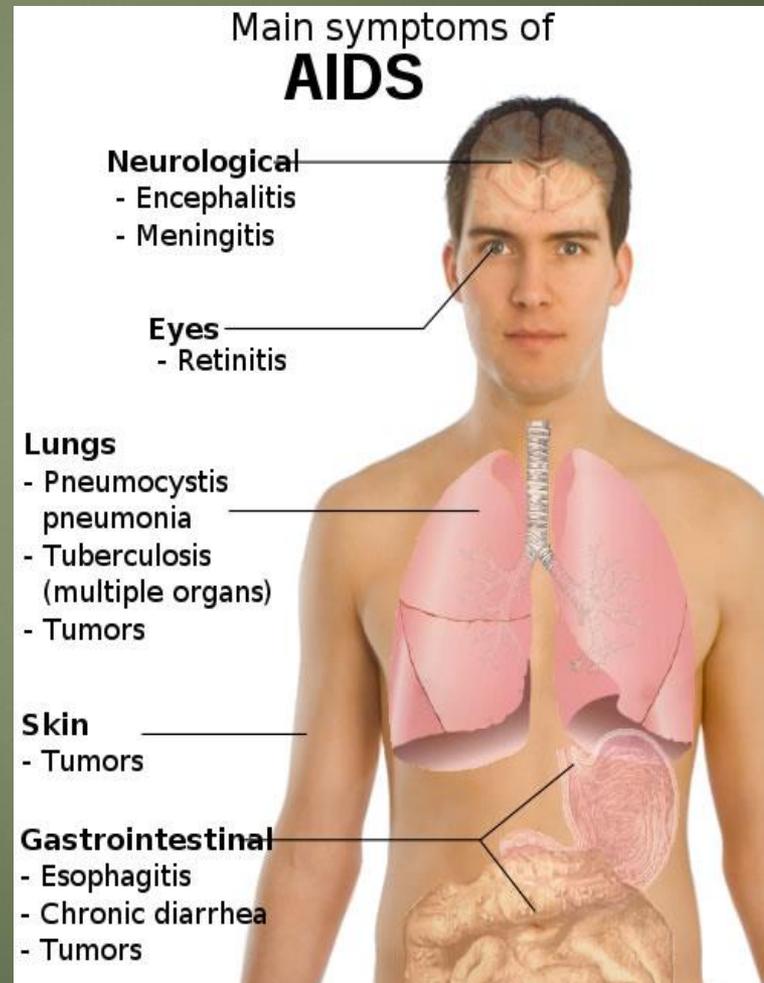
Pamela Anderson, Judd, Steven Tyler, Keith Richards, ?



# AIDS

## Acquired Immune Deficiency Syndrome

- ▶ Suppresses the immune system
- ▶ Person cannot fight off cancers and infections that would normally NOT affect a healthy person
- ▶ NO cure NO vaccine



# HIV and AIDS

The most common methods of transmission of HIV are:



Unprotected sex with an infected partner



Sharing needles with infected person

Almost eliminated as risk factors for HIV transmission are:



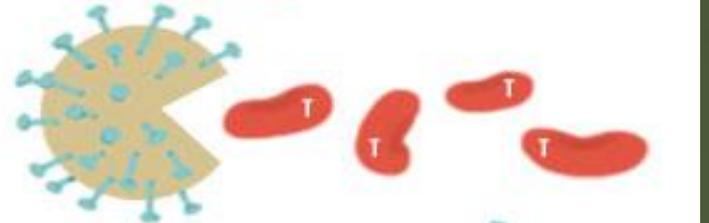
Transmission from infected mother to fetus



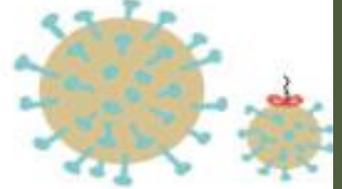
Infection from blood products

ADAM.

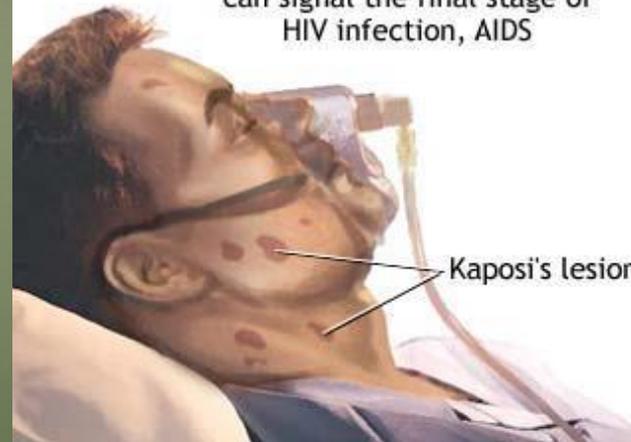
## HIV ATTACKS YOUR T-CELLS



AND USES THEM TO  
**MAKE COPIES**  
OF ITSELF



Opportunistic infections such as pneumocystosis or malignancies such as Kaposi's sarcoma can signal the final stage of HIV infection, AIDS



Kaposi's lesions

ADAM.

