

**Project:** Ghana Emergency Medicine Collaborative

**Document Title:** Infectious Diseases Overview

**Author(s):** Katherine A. Perry (University of Michigan), RN, BSN 2012

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# Communicable & Infectious Disease Emergencies

Katherine A. Perry  
RN, BSN

# Priorities & Major Goals

- To properly assess the patient with an infectious disease emergency
- To properly identify the infectious disease emergency
- To understand the specific emergency management

# Definitions

Communicable disease : an infectious disease transmissible by direct contact with an affected individual or the individual's discharges or by indirect means

Infectious Disease : a disease caused by the entrance into the body of organisms as bacteria, protozoans, fungi, or viruses

# Parasitic Infections

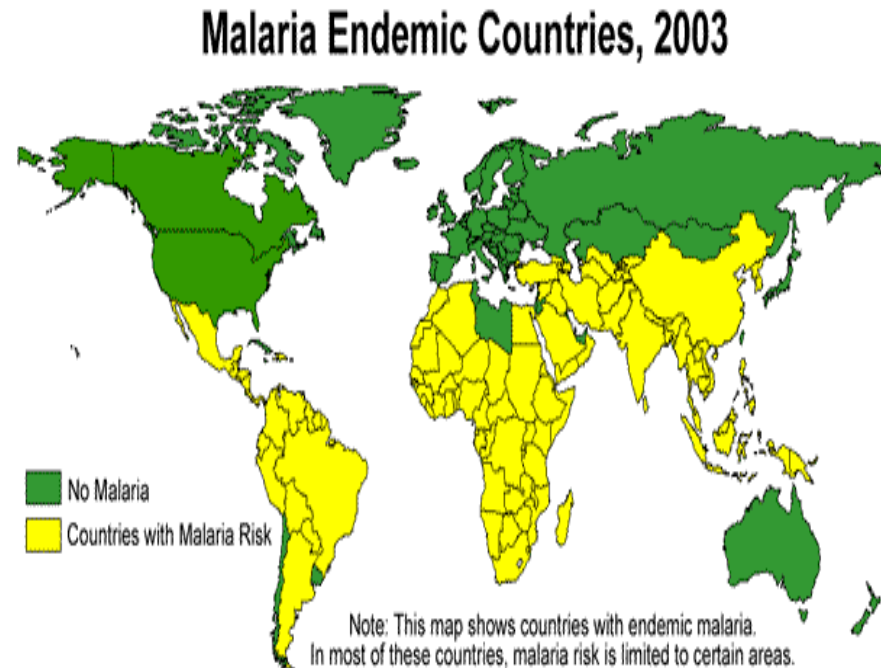
- Parasites enter through the mouth or skin
  - Mouth
    - Drinking
    - Eating
  - Skin
    - Burrowing
    - Bloodstream

# Most Common Parasitic Infections

- Malaria
- Helminths (parasitic worm)
- African Trypanosomiasis (“sleeping sickness”)
- Cryptosporidiosis

# Malaria

- Malaria is caused by a parasite called Plasmodium, which is transmitted via the bites of infected female mosquitoes
- Sub-Saharan Africa
  - 90% of all Malaria cases
  - 1.8 million die each year
  - 1 in 5 childhood deaths

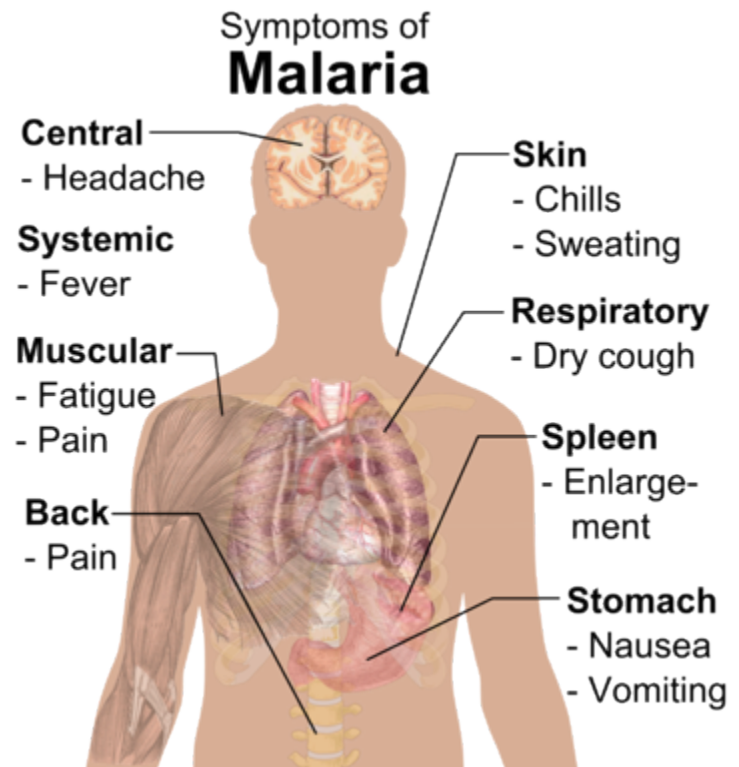


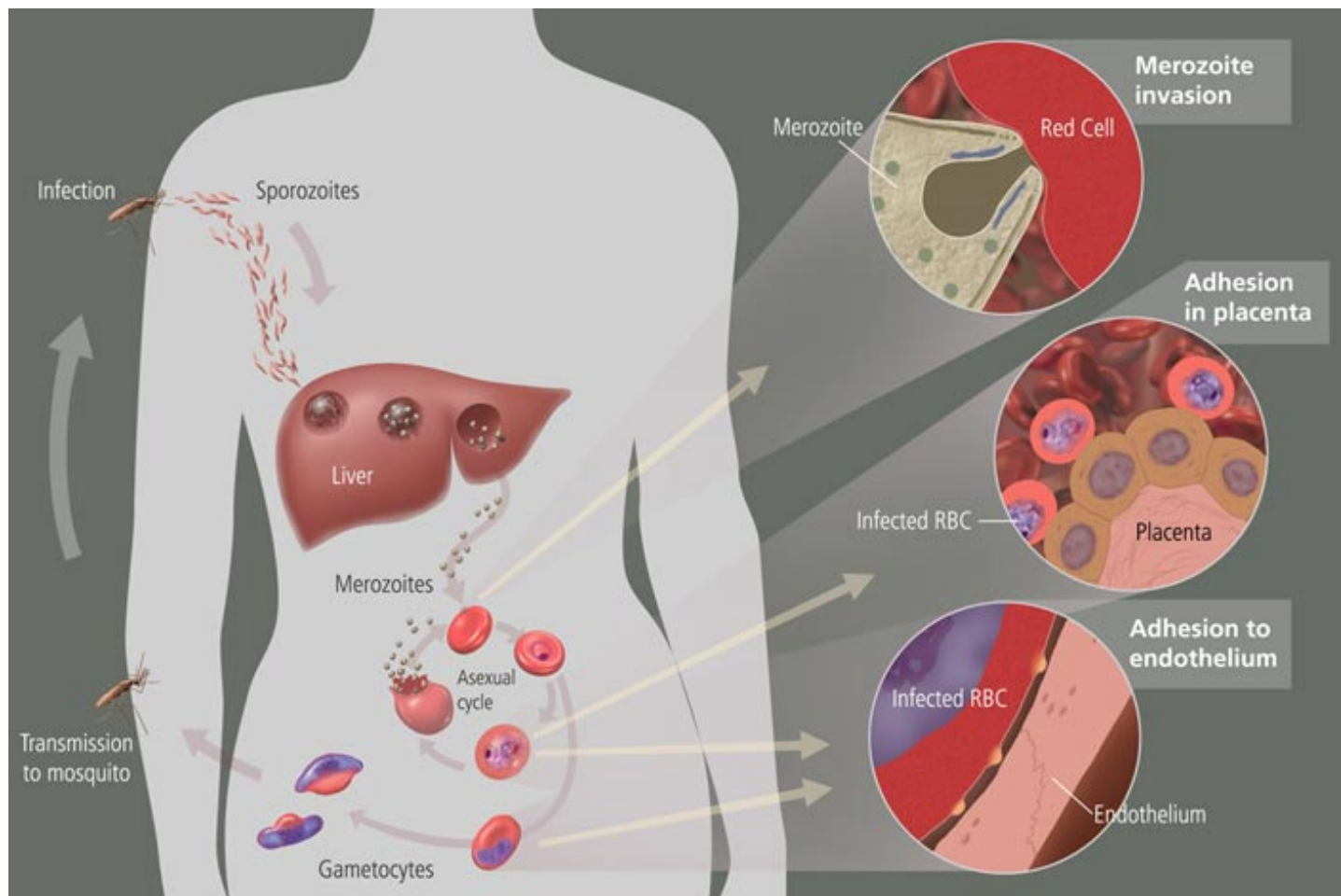


# Clinical Presentation

- In the early stages, malaria symptoms are sometimes similar to those of many other infections such as

- Fever
- Chills
- Headache
- Fatigue
- Nausea & vomiting
- Sweats
- Dry (nonproductive) cough.
- Muscle and/or back pain
- Enlarged spleen





# Cerebral Malaria

- Altered mental status
- Cognitive difficulties, language and behavior problems
- Possible seizure
- Fever, rigor and/or chills
- Signs of irritability, restlessness or psychotic behavior
- Risk Factors:
  - Young & Old
  - Pregnancy
  - Poor nutrition
  - HIV

# Different Types of Malaria

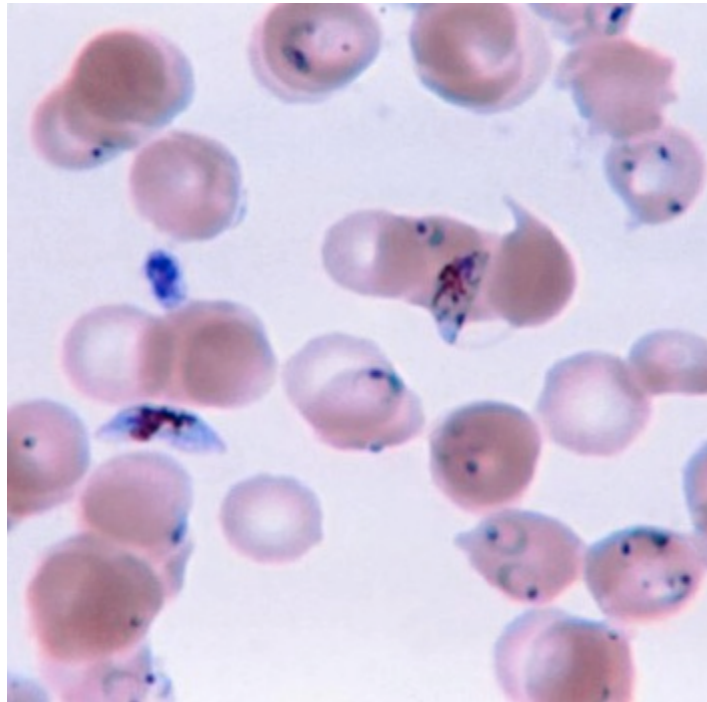
- *Plasmodium falciparum*- the most severe infections and is responsible for nearly 90% of malaria-related deaths in sub Saharan Africa
  - Obstruction to blood flow
  - Secondary organ dysfunction
  - Pregnancy- adhere to placenta, so maternal anemia & low birth weight
- *Plasmodium malaria*- cyclic paroxysms occur every 72 hours, not usually life-threatening

# Different Types of Malaria

- *Plasmodium ovale*- can rest in the liver for several months up to 4 years after a person is bitten by an infected mosquito
- *Plasmodium vivax*- widest geographic distribution throughout the world

# Cerebral Malaria

- Develops when infected red blood cells adhere to the cerebral microvasculature, causing blockage of the blood's pathway which stops blood flow, leading to a shortage of oxygen and nutrients to the brain, fatal if untreated

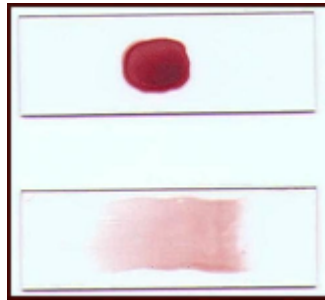


# Clinical Presentation

- Cyclic symptoms
  - Parasites develop, reproduce, and released from red blood cells and liver
- In severe cases malaria can lead to cerebral malaria, impaired function of the brain or spinal cord, seizures, and/or loss of consciousness

# Diagnosis

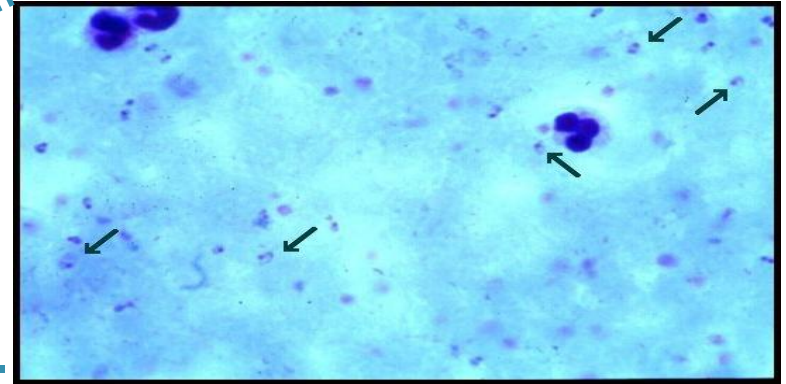
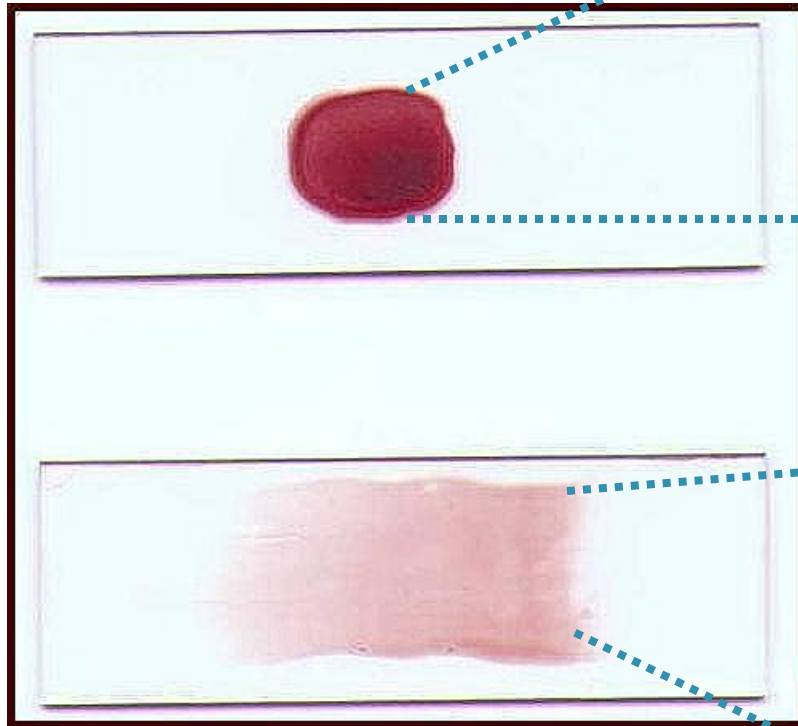
- Depends on the demonstration of parasites in the blood, usually by microscopy
- Peripheral smear examination
  - Gold-standard in confirming the diagnosis of malaria



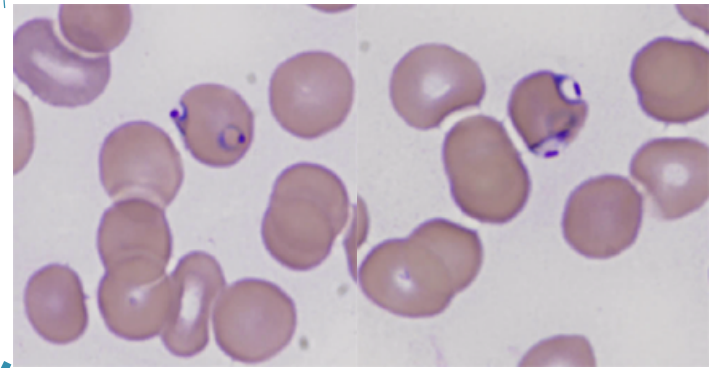
- Quantitative Buffy Coat (QBC) Test
  - fluorescence microscopy-based malaria diagnostic test
  - components of blood (including parasites) separate into distinct layers based on their differing densities



# Thin and Thick Blood Smears



Deep view of blood



Single-layer of RBCs

# Diagnosis

- A clinician who faces these symptoms would need answers to the following questions:
- Is it malaria?  
If yes;
- What is the species?
- Is it severe?
- Is it new/ recurrence?
- Is it active?

# Diagnosis

- Malaria may be described as simple or uncomplicated when the malaria infection is **NOT** life threatening and is easily treatable
- The definition of complicated Malaria is based on clinical presentation
  - A change in behavior, confusion or drowsiness;
  - Impaired consciousness or unarousable coma;
  - Multiple/recurrent convulsion
  - Deep breathing or respiratory distress
  - Pulmonary edema (x-ray)
  - Circulatory collapse or shock
  - Jaundice
  - Bleeding tendency or anemia
  - Prostration- generalized weakness so the patient cannot walk, or sit up without assistance

As a nurse, what nursing interventions do you expect?

- Blood tests
- Urine Analysis
- Your laboratory results would include:
  - Hyperparasitemia
  - Hypoglycemia
  - Metabolic acidosis
  - Severe anemia packed cell volume < 20%,  
Hgb < 6
  - Hemoglobinuria
  - Hyperlacticemia
  - Renal impairment, abnormal creatinine and  
urea levels

# Risk factors for Malaria infection

- Children between the age of 6 months and 5 years
- People from non malaria to malaria endemic areas
- Returnees to highly endemic areas
- Indigenous pregnant women
- People with sickle cell disease
- People of all ages, no matter their location, who have lowered immunity and have exposure to Malaria

# Treatment of Malaria

- The effectiveness of anti-malarial drugs differs with different species of the parasite and with different stages of the parasite's life cycle
- To alleviate symptoms: Chloroquine, quinine, artemisinin, artesunate, amodiaquine combinations (Blood schizonticidal drugs)
- To prevent relapses: Primaquine (tissue schizonticidal drugs)
- To prevent spread: Primaquine for *P. falciparum*, Chloroquine for all other

# Treatment

General principles:

- Administer antimalarial drug intravenously for at least 48 h; then administer orally as soon as patient can swallow
- Administer a loading dose
- Total duration of therapy depends on sensitivity of parasite, but usually 7 days

Type of Infection	Treatment
P. Vivax	Chloroquine 25 mg of salt/kg over 36-48 hours + Primaquine for 14 days.
P. Falciparum	Treatment depends on severity and sensitivity Artesunate+Pyrimethamine/sulphadoxine or other ACTs, OR Quinine plus tetracycline as suppressive therapy + Primaquine as gametocytocidal in single dose
Mixed (P. Vivax + P. falciparum)	ACT as for <i>P. falciparum</i> + Primaquine as for <i>P. vivax</i>



# Educate the patient

- Apply an insect repellent containing DEET (active ingredient) or any insect repellent to your skin and clothing. Insect repellent containing permethrin (active ingredient) may be applied to clothes, bed-nets, tents, blankets, and other equipment
- Infants, who are less than 2 months old, should use repellents with 30 percent DEET or less. **Do not** use DEET on the hands of young children or on infants who may rub their eyes or mouth.

# Education Continued

- Sleep under mosquito net, check your bed-net for holes before using it



Insecticide-treated mosquito net

# Education Continued

- Do not go outside, especially at night or between dawn (sunrise) and dusk (sunset). Mosquitoes feed most actively during these times. Avoid activities in places where mosquitoes are usually present
- Wear long-sleeved shirts and long pants to keep your skin covered. Choose clothes that are light-colored because mosquitoes are attracted to dark clothing.

# Discharge Information

- Keep a current list of your medicines: amounts, and when, how, and why you take them. Take the list or the pill bottles to follow-up visits
- Carry your medicine list with you in case of an emergency. Use vitamins, herbs, or food supplements only as directed
- Take your medicine as directed: Contact a healthcare provider if you think your medicine is not working as expected. Tell him about any medicine allergies, and if you want to quit taking or change your medicine

# Discharge Information

## CONTACT A CAREGIVER IF:

- You have a fever.
- Your skin is itchy, swollen, or has a rash
- If your symptoms do not improve with treatment
- You have any questions or concerns about your illness medicine, care, or recovery

## SEEK CARE IMMEDIATELY IF:

- You become confused, act differently than normal, or it is harder than normal to wake you up
- You have a bad headache or trouble thinking clearly
- You have seizures (convulsions)
- You have trouble breathing all of a sudden
- Your symptoms are getting worse or coming back

# Summary

You have now come to the end of this lecture on severe and complicated Malaria. You have learned that severe and complicated Malaria is a medical emergency and it requires early diagnosis and prompt treatment

# Case Study #2

Akpene Agbo is 30 years old. She is approximately 24 weeks pregnant with her second baby. She comes to the antenatal clinic for her ANC visit complaining of severe headache, fever and dizziness. Akpene and her family moved to the area 6 months ago. She has never suffered from malaria

- Basic Assessment:

- 1) What will you include in your initial assessment of Akpene and why?

# Case Study #2

- Gather information - onset, duration, and severity of headache, fever, and dizziness, and any medications taken
- Ask about previous history of headache, dizziness, recent illness, signs of other infection (pain when passing urine, chest pain, painful cough, abdominal pain/tenderness), history of any other danger signs, signs of uncomplicated and severe malaria, and history of the pregnancy (e.g., last menstrual period, symptoms of pregnancy, quickening, presence of contractions, leaking of fluid) This is because every pregnant woman living in malaria-endemic areas who presents with a fever should be suspected of having malaria (other causes of fever in pregnancy should still be considered)
- Check Akpene's VS: temperature, pulse, blood pressure, and respiratory rate to identify and treat life-threatening illnesses as rapidly as possible



# Case Study #2

What screening procedures and laboratory tests will you include (if available) in your assessment of Akpene and why?

# Case Study #2

- Check CBC, metabolic panel, urine analysis for kidney function & protein, X-ray and vital signs
- Carry out a laboratory test to confirm whether she has malaria or not
  - Blood Smear
  - QBC

# Case Study #2

1. Akpene states she has felt well during this pregnancy, and began having fever and headache yesterday morning. She states that she does not have other symptoms such as cough, difficulty urinating, abdominal pain, or leaking of fluid from the vagina. She has not had convulsions or loss of consciousness. She has not taken any medication
2. Akpene is 60 kg and her temperature is 38.7 C. Her blood pressure is 122/68, pulse rate is 92 bpm, RR 18. Akpene is pale, not jaundiced and well hydrated. Her fundal height is 23 cm (which is compatible with the dates of her last menstrual period) and fetal heart tones are 140 bpm
3. Her Hgb is 10.5 g/dl; the blood film for malaria is positive.

# Case Study #2

Based on these findings, what is Akpene's evaluation, and why?

# Case Study #2

- Akpene is 24 weeks pregnant (determined by last menstrual period and uterine size)
- She has uncomplicated malaria (based on her positive blood film, symptoms, and vital signs)

# Case Study #2

Based on your evaluation, what is your plan of care for Akpene and why?

# Case Study #2

- Instruct her to Artesunate 200mg-Amodiaquine 600 mg taken in two divided doses after meals
- Pt should also take Tylenol (two tablets every 6 hours until her temperature returns to normal)
- Tell her and her relatives to return to the clinic in 48 hours if she is not feeling better, or immediately if she has signs and symptoms of severe malaria (e.g., convulsions, loss of consciousness)
- Tell her that she must take all of her medication, and describe the side effects it may cause (tinnitus, skin rashes, stomach upsets, low blood sugar, if she is on quinine)

# TUBERCULOSIS



# Tuberculosis

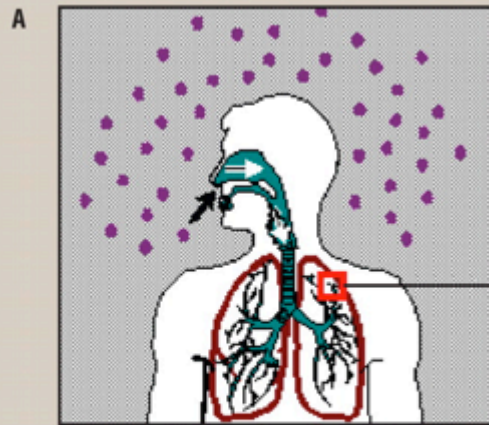
- Mycobacterium Tuberculosis (TB) = #1 Cause of Death Worldwide from a Single Infectious Agent
- TB most common in lungs (85%), but can occur in other parts of the body (extrapulmonary)

# Transmission

- Infection = Person to Person via Airborne Infectious Aerosol:
  - Coughing
  - Sneezing
  - Talking

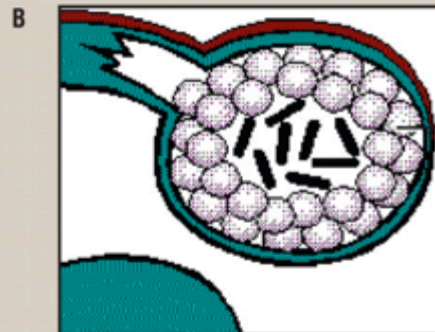
# Clinical Presentation

- Prolonged cough
- Chest pain
- Hemoptysis
- Fever
- Chills
- Night sweats
- Fatigue
- Loss of appetite
- Weight loss/failure to gain weight



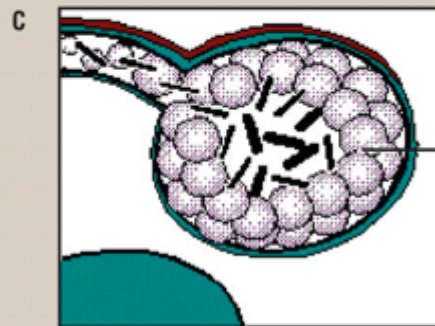
Droplet nuclei with bacilli are inhaled, enter the lung, and deposit in alveoli.

Droplet nuclei are inhaled



Macrophages and T lymphocytes act together to try to contain the infection by forming granulomas.

Macrophages and T lymphocytes try to contain the infection



In weaker immune systems, the wall loses integrity and the bacilli are able to escape and spread to other alveoli or other organs.

In weaker immune systems, the wall loses integrity and the infection spreads to other alveoli/other organs

Images courtesy of Centers for Disease Control and Prevention.<sup>17</sup>

# Children with TB

- Children have few tubercle bacilli in lungs, therefore, are rarely infectious
- Children less than 12 years of age usually lack the pulmonary force to produce airborne bacilli
- For a case of childhood TB infection, it is likely that an adolescent or adult transmitted TB bacilli to the child

# Types of TB

- Active Tuberculosis:
  - When the immune system of a patient with dormant TB is weakened, the TB can become active (reactivate) and cause infection in the lungs or other parts of the body
- Latent Tuberculosis:
  - do not feel sick and do not have any symptoms
  - They are infected with *M. tuberculosis*, but do not have TB disease
  - Only sign of TB infection is a positive reaction to the tuberculin skin test or TB blood test
  - Are NOT infectious and cannot spread TB

# Types of TB

- Multi drug resistant (MDR TB) is TB that is resistant to at least two of the best anti-TB drugs, isoniazid and rifampicin
- This can result from poor patient compliance, inappropriate dosing or prescribing of medication, poorly formulated medications, and/or an inadequate supply of medication

# Diagnosis of TB

- PPD
- Sputum Culture
- Chest X-Ray



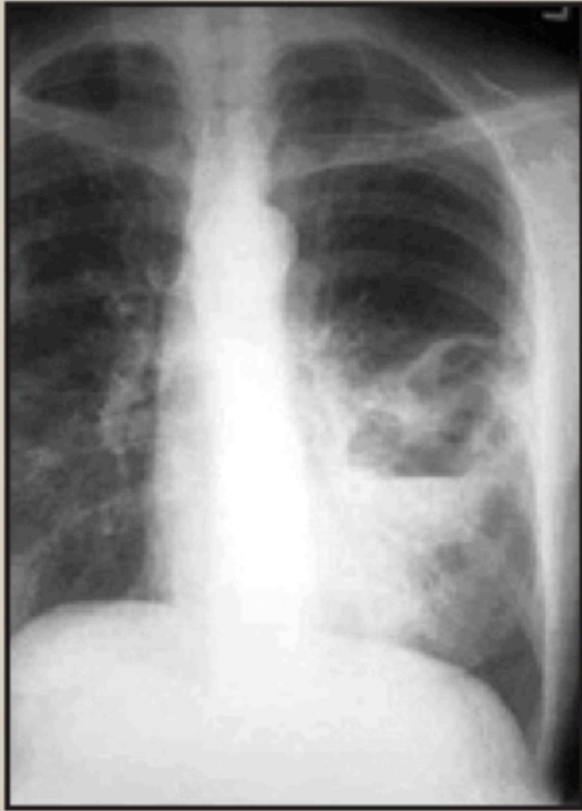
# Diagnosis

- PPD – Purified Protein Derivative
  - The Tuberculin Skin Test Identifies Individuals infected with *Mycobacterium Tuberculosis*
  - Injection Site = Intradermally Dorsal Side of Forearm
  - Inflammatory Reaction = 24-72 Hours
  - Result Test in 48-72 Hours (If Positive at 6 Days = true Positive)

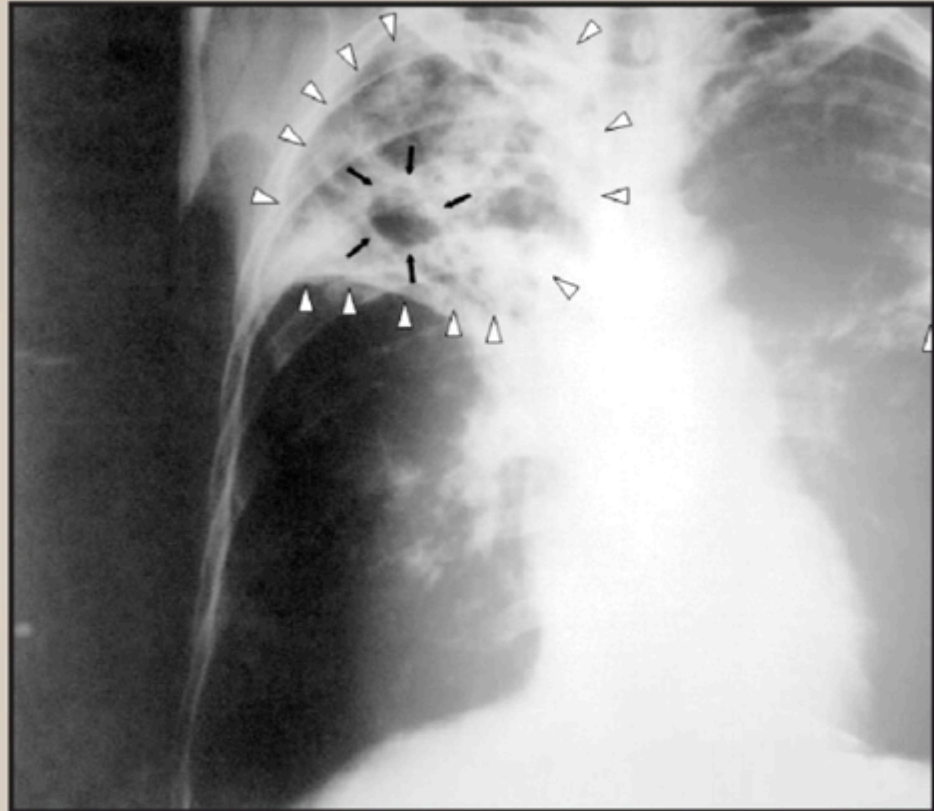


# Chest X-ray

- The chest X-ray examination is done and if there are any changes in the lung, a sputum sample will be sent for microscopic examination & culture



**A**



**B**

Images courtesy of Centers for Disease Control and Prevention.<sup>26</sup>

A. Infiltrates in left lung

B. Bilateral advanced pulmonary tuberculosis

# Sputum Culture

- Definitive diagnosis of tuberculosis requires the identification of *M. tuberculosis* in a culture of a diagnostic specimen
  - The most frequent sample used from a patient with a persistent and productive cough is sputum
  - Mycobacteria grow slowly, 3 to 6 weeks may be required for detectable growth on solid media.

# Treatment

- First-line anti-TB agents:
  - isoniazid (INH)
  - rifampin (RIF)
  - ethambutol (EMB)
  - pyrazinamide (PZA)

<b>Diagnosis</b>	<b>Treatment</b>
TB Infection	INH – 9 Months
TB Disease       3 or 4 drugs	First 2 months – INH, RIF, PZA, EMB (add EMB if drug resistance is suspected)  Next 4 months – 2 most effective sensitive drugs (INH & RIF in pan-sensitive cases)
Multidrug resistant TB disease (resistance to at least INH & RIF)	Treat with sensitive drugs for at least 18 months

# Prevention

- BCG (Bacille Calmette Guerin) is a vaccine made from a live weakened bacterium related to tuberculosis (TB) bacteria (*Mycobacterium tuberculosis*). The BCG vaccine prevents the bacteria from spreading within the body, thus preventing TB from developing
- If patients plan to travel, they should talk to their health care providers and make sure they have enough medicine to last while away.

# Discharge Instructions

- Take your medicine as directed
- Call your primary healthcare provider if you think your medicine is not working
- Carry your medicine list with you in case of an emergency
- You must complete your treatment until you are cured of TB, even if you do not feel sick.
- It is very important that you take your TB medicines exactly as your caregiver tells you. If you skip or stop your pills, TB germs will **not** be killed. You will always have TB germs in your body unless you correctly take all your medicines.



# Discharge Instructions

- The most important way to keep from spreading TB is to take all your medicines exactly as your caregivers told you
- Keep all of your follow-up appointments. Your caregivers need to see how you are doing
- Avoid close contact with others, especially babies and elderly people
- ALWAYS cover your mouth and nose with a paper tissue when you cough or sneeze. Throw the used tissue away. If possible, flush used tissues down a toilet
- ALWAYS wash your hands with soap and water after you cough or sneeze.
- Family members, close friends, and co-workers should have a TB skin test. They may have gotten the TB germ without being sick. To keep from getting TB, these contacts may need to take medicines

# Discharge Instructions

## CONTACT A CAREGIVER IF:

- You have any problems that may be caused by the medicines you are taking. Tell your caregiver if you have a skin rash, nausea, vomiting, or your eyes or skin are yellow. Call your caregiver if your urine looks like dark tea or coffee
- Your TB symptoms do not go away or get worse, even if you are taking your TB medicines.
- Anyone who spent time near you gets symptoms of TB:
  - Fever, not wanting to eat, losing weight, night sweats, or cough. These people will need to be tested for TB.

# Discharge Instructions...

- You have a cough that does not go away after 3 or 4 weeks following a cold.
- You have a fever.
- You have questions about your condition and your medicines

## SEEK CARE IMMEDIATELY IF:

- You have chest pain or cough up blood
- You have trouble breathing
- You have a fever, headache, and a stiff neck

# Isolation Precautions

# Standard Precautions

- Protection of all patients regardless of their diagnosis or presumed infection status
- Apply to blood (including dried blood), all body fluids, secretions, and excretions (except sweat)
- Include the following /Hand hygiene /Personal Protective Equipment /Respiratory hygiene/cough etiquette
- Personal Protective Equipment: Barrier between micro-organisms and the wearer

# Standard Precautions

- Gloves should be worn when touching or handling: blood, body fluids, secretions, excretions, contaminated items or surfaces



- Hand hygiene must be performed after removal of gloves.

# Airborne Precautions

- By dissemination in the air of droplet nuclei containing the infectious agent
- Diseases include active pulmonary tuberculosis (TB), measles, chicken pox, pneumonic (pulmonary) plague and hemorrhagic fever with pneumonia

# AIRBORNE PRECAUTIONS

- Private room with door closed at all times.
- Surgical mask upon room entry and surgical mask on patient before transportation and visitors before entering room.
- Wear eye protection when performing procedures that may generate aerosols.
- Hand hygiene before and after contact with patient and/or anything in room.

\*\* Visitors please check at desk before entering room.



# Droplet Precautions

- Droplets containing micro-organisms come in contact with mucus membranes
- Droplet distribution is limited by the force of expulsion and gravity
- Diseases include influenza, pertussis, mumps and pneumonias

## DROPLET PRECAUTIONS

- Private room. Door may remain open.
- Surgical mask upon room entry and surgical mask on patient before transportation and visitors before entering room.
- Wear eye protection when performing procedures that may generate aerosols.
- Hand hygiene before and after contact with patient and/or anything in room.
- Wear a gown and gloves when anticipating secretions – remove gown and gloves before leaving room.

**\*\* Visitors please check at desk before entering room.**

# Contact Precautions

- Direct contact transmission: Direct physical transfer of microorganisms from an infected person to a susceptible host
- Indirect contact transmission: Contact with a contaminated object such as contaminated equipment or instruments
- Diseases include multi-resistant organism (MRO) infection, enteric and skin infections

## CONTACT PRECAUTIONS

- Private room. Door may remain open.
- Put gloves on when you enter the room.  
Remove gloves before leaving the room and place in trash. Clean your hands.
- Put gown on before entering room.  
Remove gown in ROOM and place in trash.
- Hand hygiene before and after contact with patient and/or anything in room.
- Dedicated equipment such as stethoscope and blood pressure cuff.

**\*\* Visitors please check at desk before entering room.**

As a nurse, what is your  
nursing role?

# Nurses Role

- Patients with TB should be monitored regularly to ensure that:
  - No interruptions occur in treatment;
  - Serious side-effects from the treatment are quickly identified;
  - There is improvement in the patient's condition, although this is often very gradual
- The nurse's role is vital in the control of TB and for the successful completion of the patient's therapy

# Case Study #1

Physical Exam:

BP 130/70 HR 90 RR18 T-38.6

Lung: Crackles in the Right Upper lung (RUL) There is Dullness to Percussion in the RUL

Heart: Regular Rate Rhythm No Murmurs

Pt is having difficulty breathing

What nursing interventions do you expect?

- Administer oxygen if ordered and as ordered by a physician
- Give the TB patients fluids to loosen up secretions for easier expulsion from the lungs
- Position the patient in a high fowlers position to reduce the work needed to breathe
- Encourage and provide rest periods so the tuberculosis patient can have energy to breathe.