



Infection Control for First Responders

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Infectious Diseases

Infection Control

- Knowledge
 - Current outbreaks
 - Mode of transmission
- Prevention
 - Personal prevention
 - Vaccinations
- Therapy
 - After exposure

Case # 1

- A very worried mother calls you for help.
- She came back from disneyland about 10 days ago.
- They had a great time
- Now her son has a diffuse rash, and respiratory distress
- Differential Diagnosis?

Measles



Measles - Prodrome

- Onset of fever about 10-12 days after exposure
- Usually lasts 2-4 days:
 - Fevers 103-105
 - Conjunctivitis (red watery eyes)
 - Runny nose
 - Severe cough
 - Swollen lymph nodes : Occipital, post-auricular, cervical and angles of the jaw.



Rash : erythematous



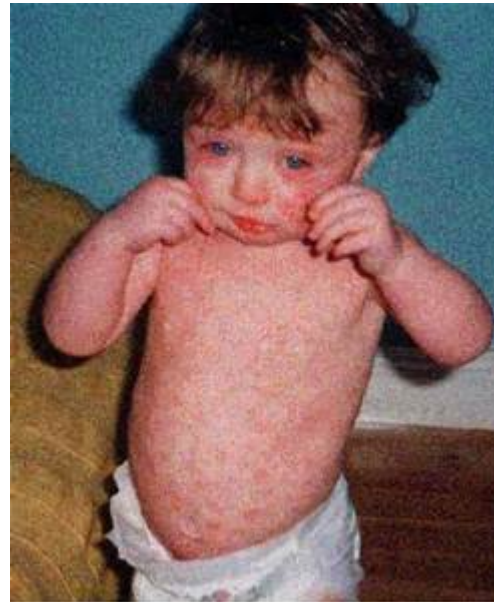
Measles : Koplik spots



- 2-3 days after symptoms begin, tiny white spots (Koplik spots) may appear inside of the mouth

Measles -Rash

- Rash appears 1-7 days after onset of prodromal symptoms
- Starts on the face and upper neck,
- Spreads down to back/ trunk
- Then arms , then legs
- "like a shower"
- It disappears the same way it started



Measles- Complications

- Anorexia, diarrhea, generalized lymphadenopathy
- Otitis media in 7% cases, mostly in children
- Pneumonia in 6% cases
- Acute encephalitis 0.1% cases
 - 15% case are fatal
 - 25% residual neurological damage
 - Death in adults
- Measles during pregnancy :
 - High risk premature labor
 - Spontaneous abortion
 - Low birth weight

Measles Cases and Outbreaks

January 1 to April 10, 2015*

159

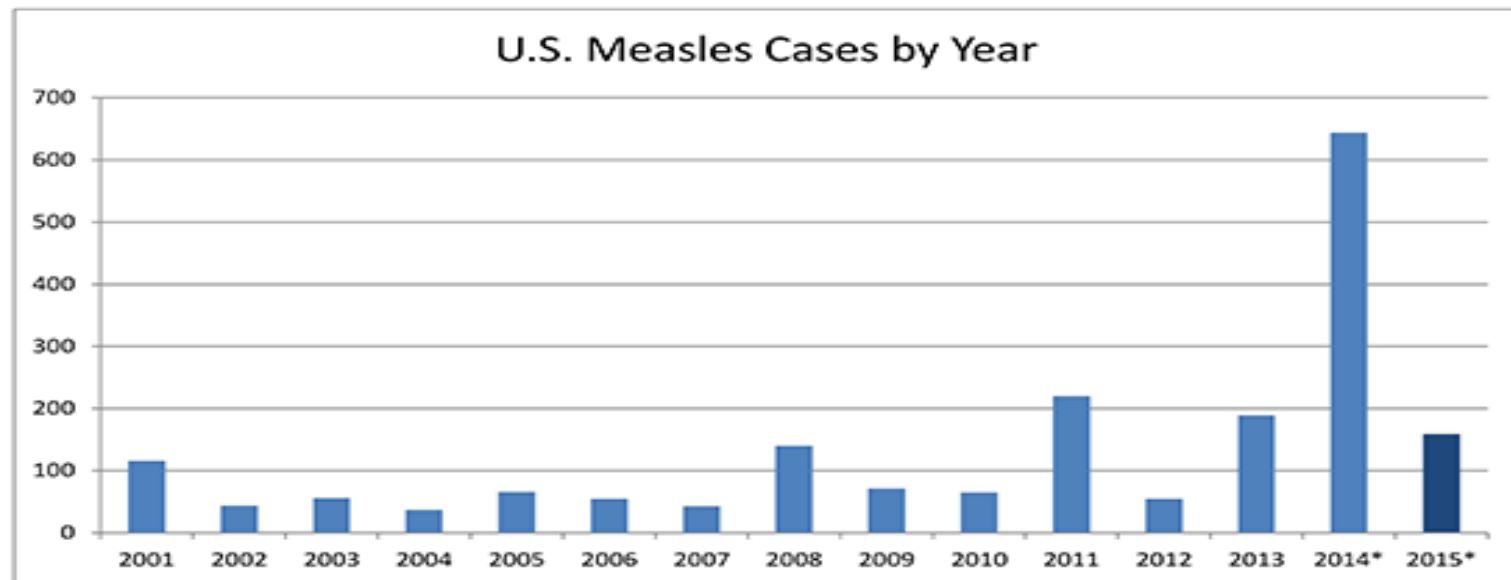
Cases

reported in 18 states and the District of Columbia: Arizona, California, Colorado, Delaware, Georgia, Illinois, Michigan, Minnesota, Nebraska, New Jersey, New York, Nevada, Oklahoma, Pennsylvania, South Dakota, Texas, Utah, Washington

4

Outbreaks

representing 91% of reported cases this year

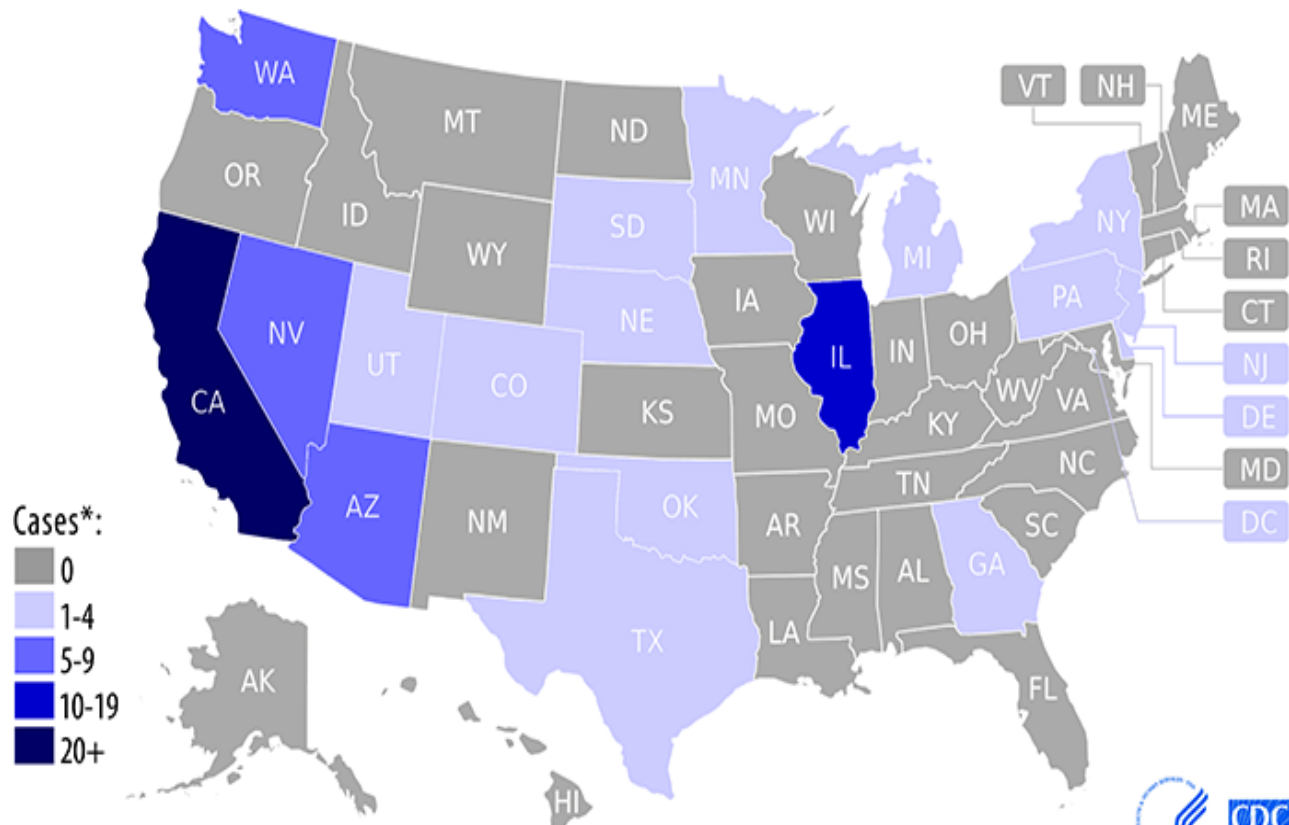


*Provisional data reported to CDC's National Center for Immunization and Respiratory Diseases



2015 Measles Cases in the U.S.

January 1 to April 10, 2015






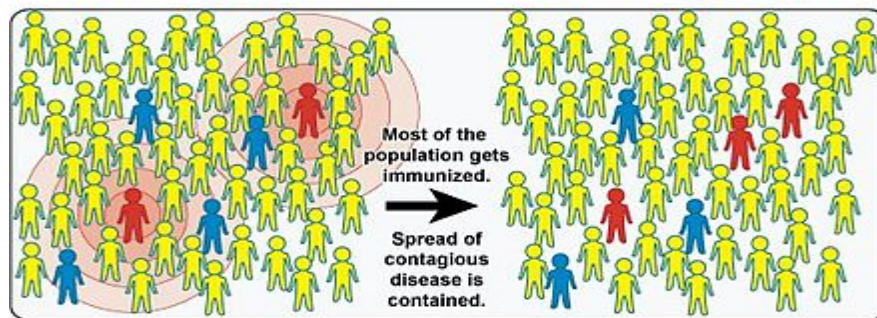
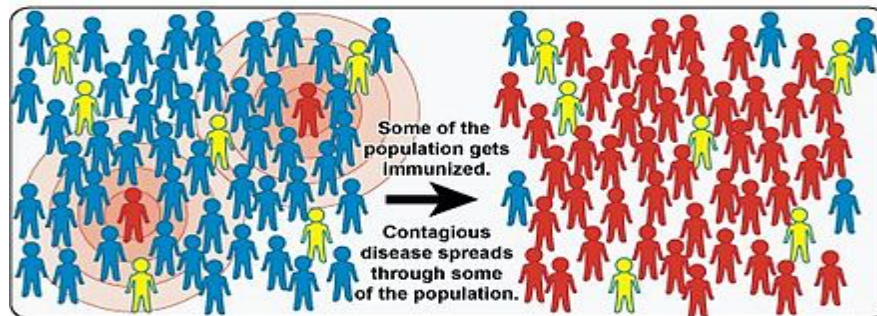
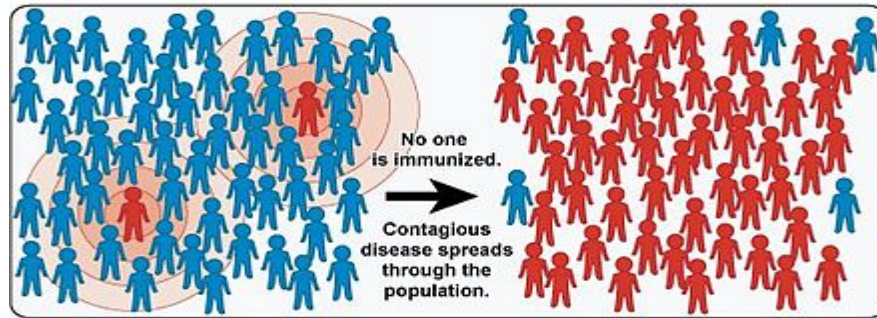
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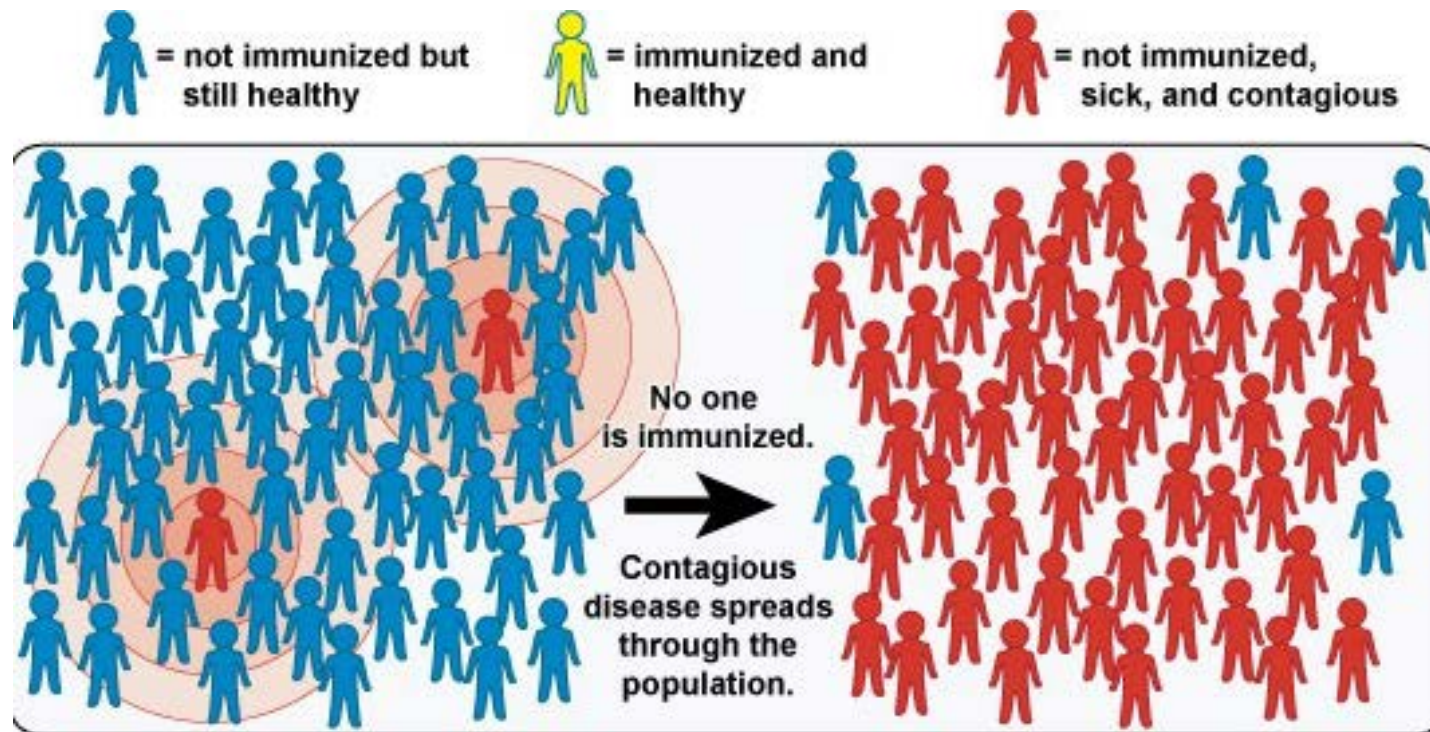
Knowledge

- Why Do Vaccine-Preventable Disease Outbreaks Occur in The United States?
- Despite available vaccination, we still see outbreaks:

 = not immunized but still healthy  = immunized and healthy  = not immunized, sick, and contagious



Why do we have outbreaks of Vaccine-Preventable diseases?



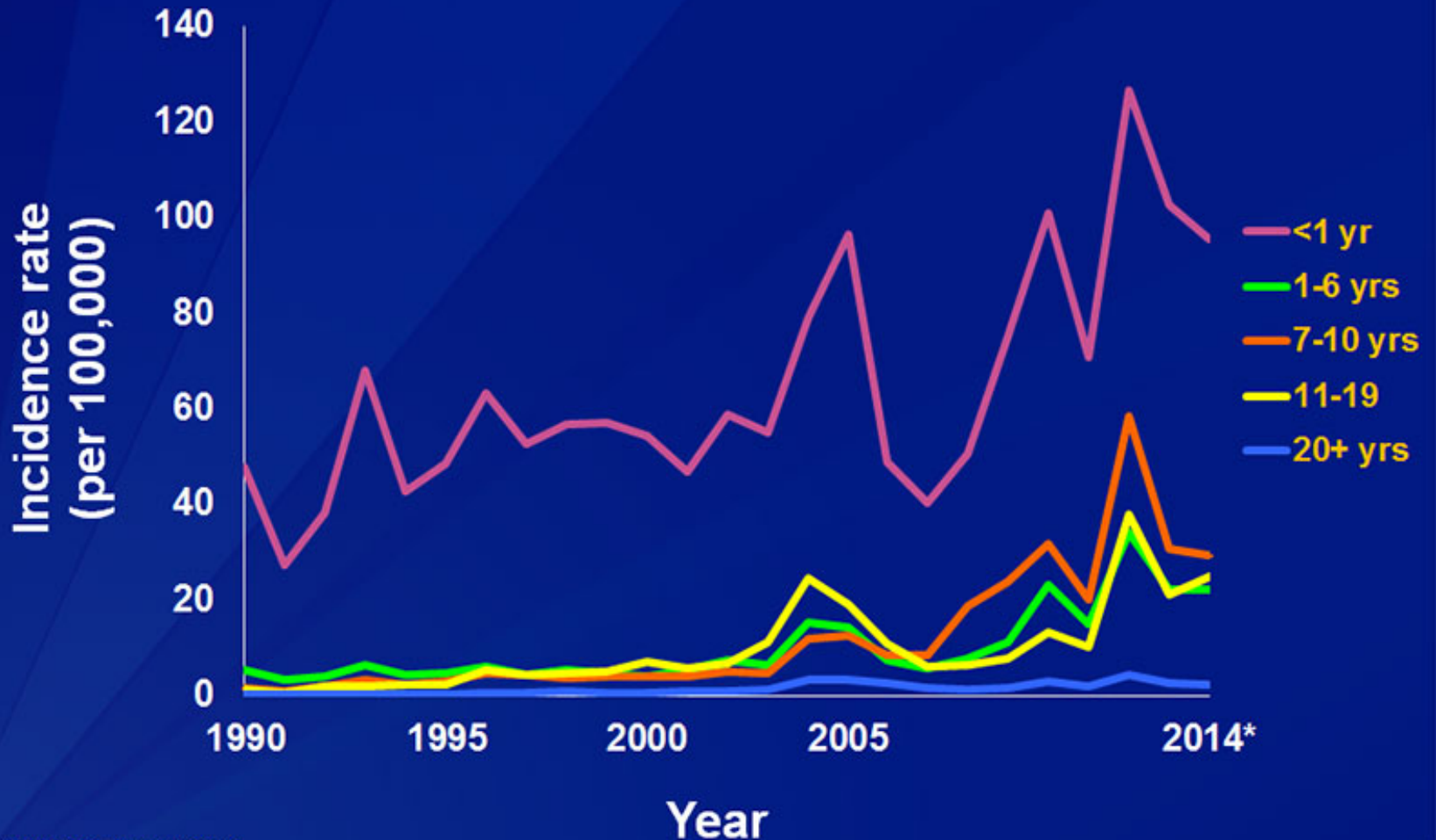
Case #2

- A worried mom calls you , her infant has the following symptoms:
 - Paroxysms of cough
 - Inspiratory "whoop"
 - Post-tussive vomiting
 - Apnea with cyanosis
- PCR test was (+) for ?

Increased whooping cough in Idaho



Reported pertussis incidence by age group: 1990-2014*



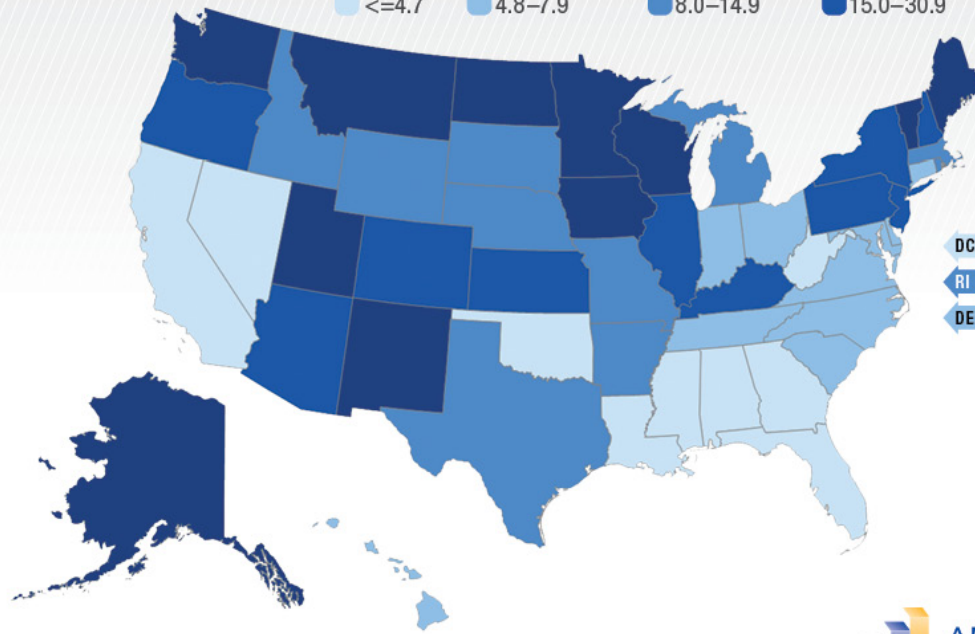
*2014 data are provisional.

SOURCE: CDC, National Notifiable Diseases Surveillance System and Supplemental Pertussis Surveillance System

Pertussis by State

Number of new cases of pertussis per 100,000 population

<=4.7 4.8-7.9 8.0-14.9 15.0-30.9 >=31.0



Whooping Cough Vaccinate To Protect

Who Needs Whooping Cough Vaccines?

- Pregnant women
- Infants and young children
- Preteens and teens
- Adults of all ages

Whooping cough is most deadly for infants.
Get vaccinated. Protect yourself. Protect babies.



Talk to your doctor and visit www.cdc.gov/whoopingcough

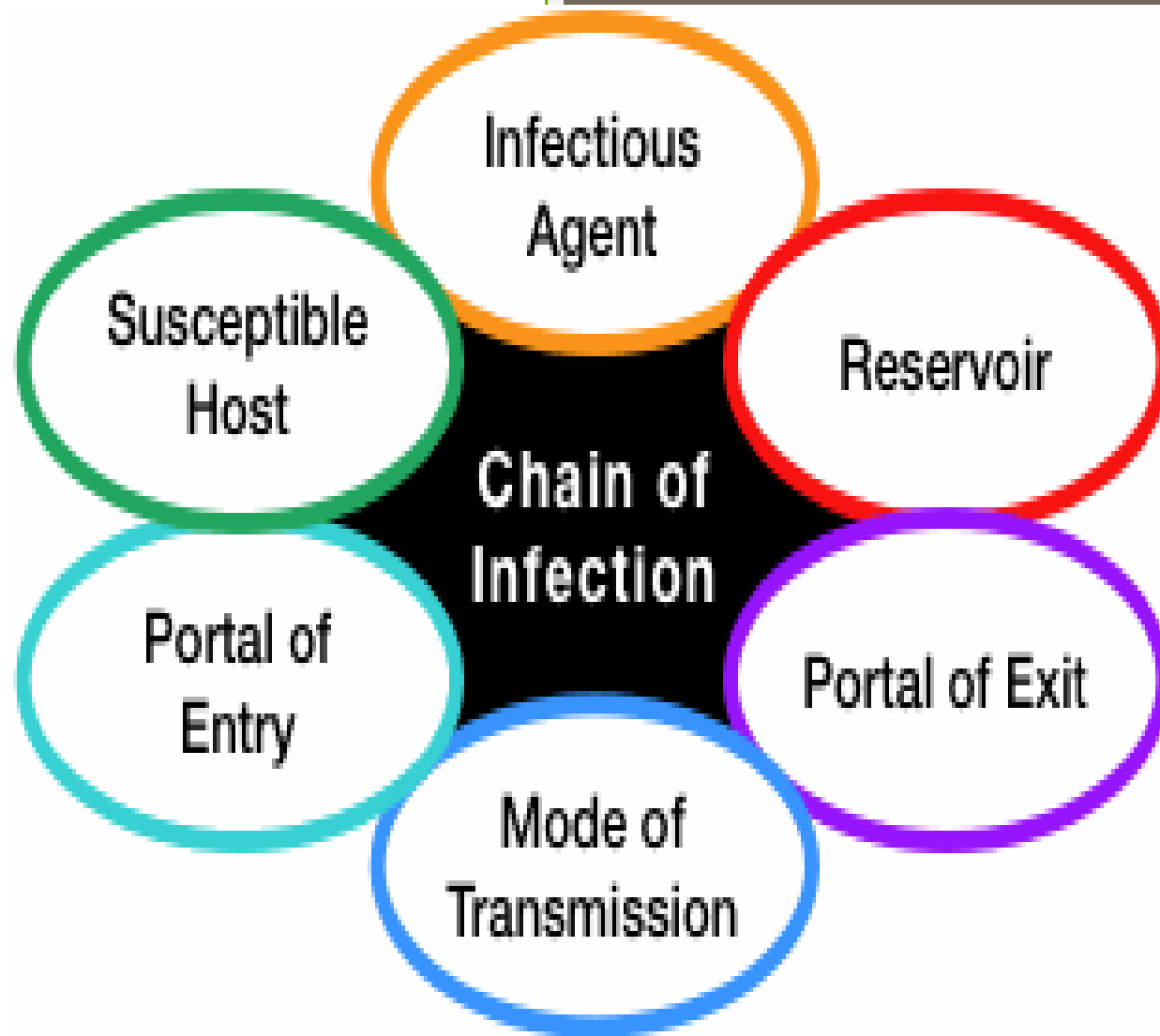


What can you do after pertussis exposure?

- Make sure you have updated Tdap vaccine
- Medication prophylaxis

Prevention First





Infectious Agents

Susceptible Host



Reservoir

Chain of Infection

Portals of Exit



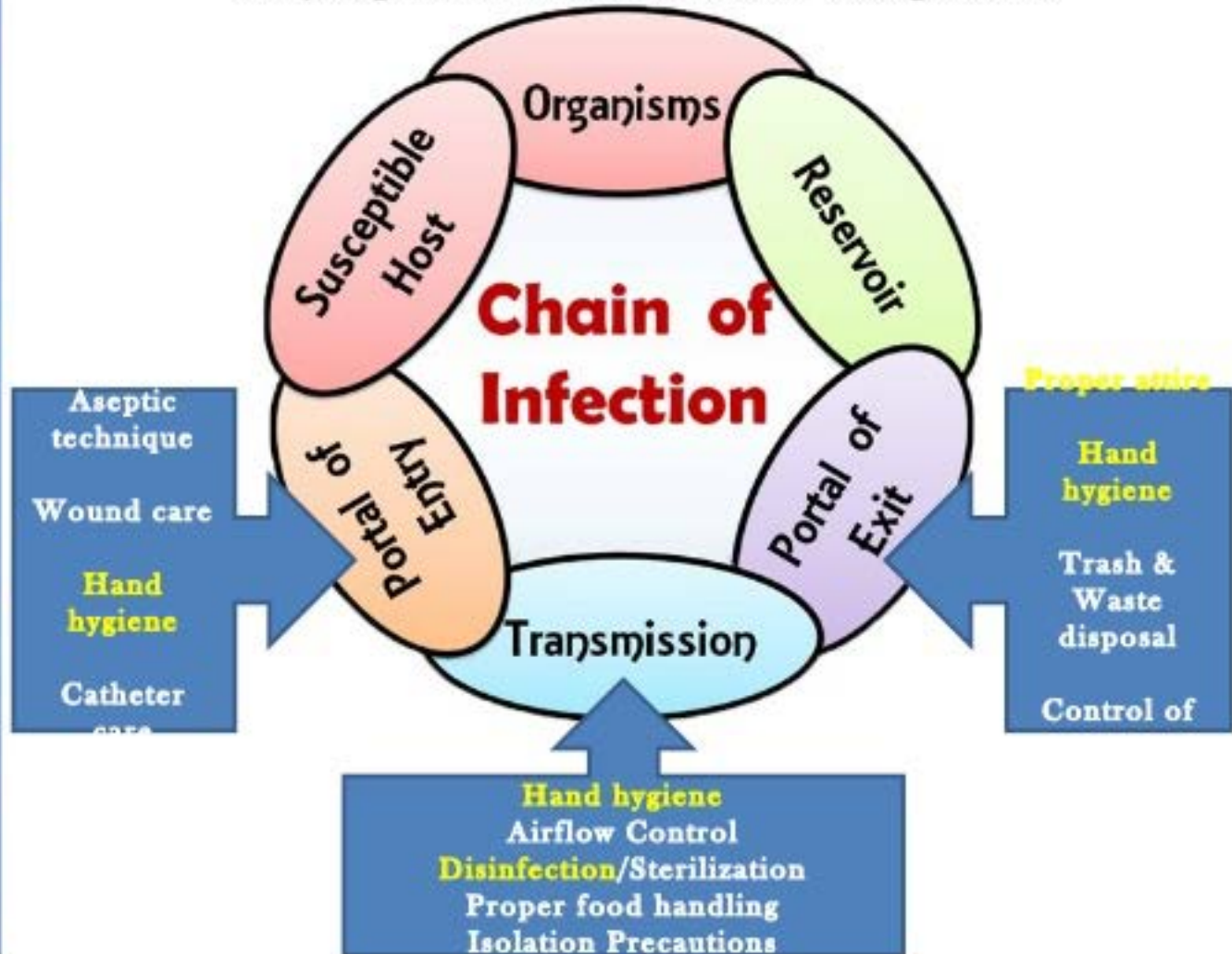
Portals of Entry

Modes of Transmission



Actions that break these links are the most significant for us.

They represent our interaction with patients



Human pathogen transmission

Infection caused by
airborne transmission



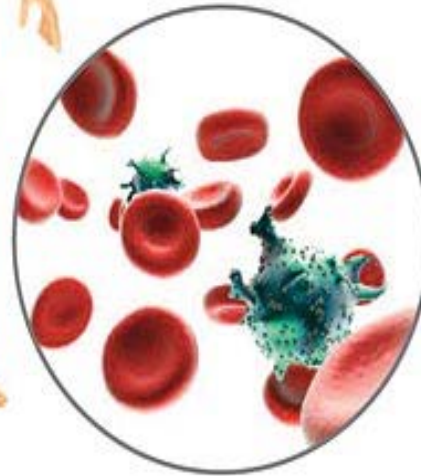
Infection caused by
contact and faeces



Infection caused by
contaminated water



Infection caused by
pathogens in blood-
stream and tissues



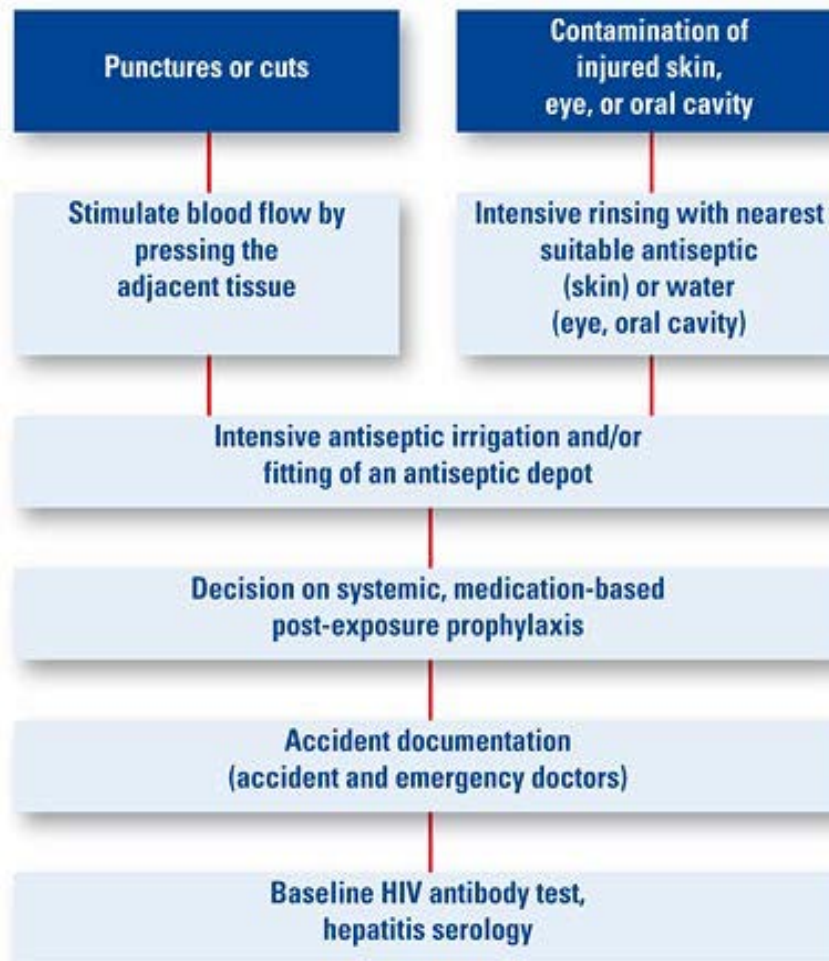


Case # 3

- EMS worker trying to start IV on a 19 year old male, he is being evaluated for drug overdose.
- Worker gets stuck with the needle. He was wearing gloves.
- Which pathogens do we worry about?

Case # 3

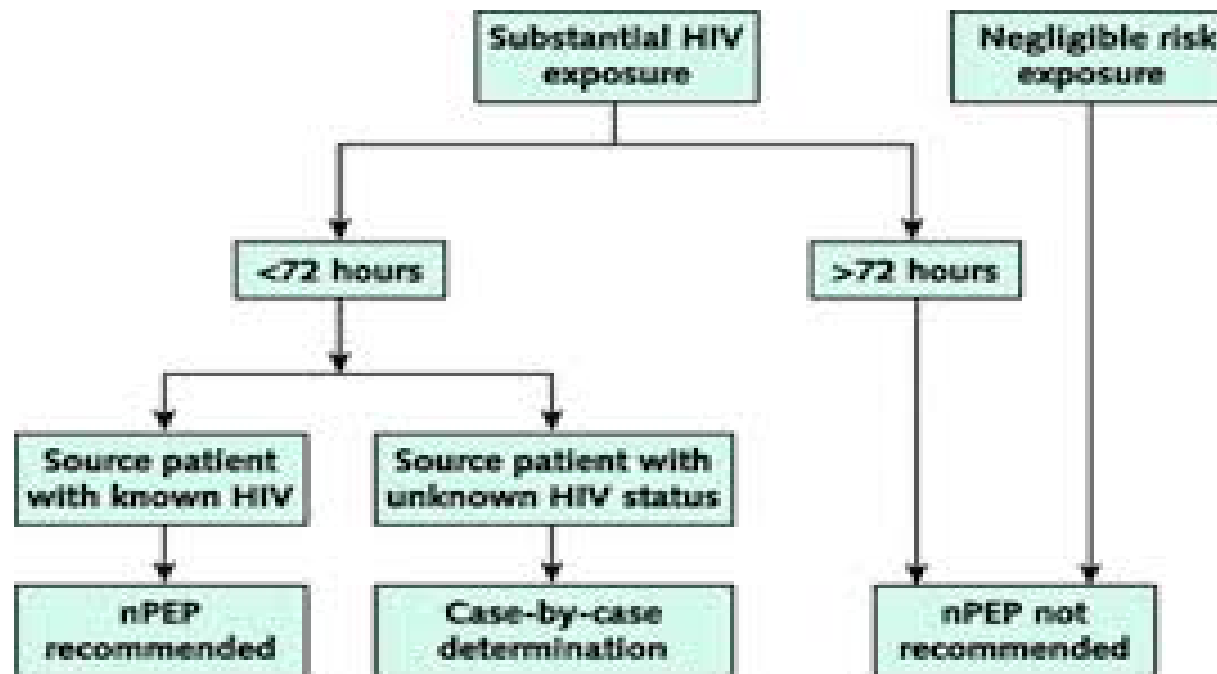
- Source patient has blood test done.
- Results :
 - Rapid HIV test is positive
 - Hepatitis B surface antibody positive
- What is the next step?



Bloodborne pathogens

Pathogen	Infection Risk after needlestick	Post exposure Prophylaxis (PEP)	
		What to Do?	When to act?
HIV	0.3	Four weeks of medication, case by case basis	As fast as possible
Hepatitis B	0% with vaccination/PEP 30% without PEP	Unvaccinated: Immunoglobulin/ vaccine	Within 24 hours
Hepatitis C	1.8%	No recommendation	N/A

Exposure to HIV



24 hours

48 – 72 hours

5 days

Regional lymph node

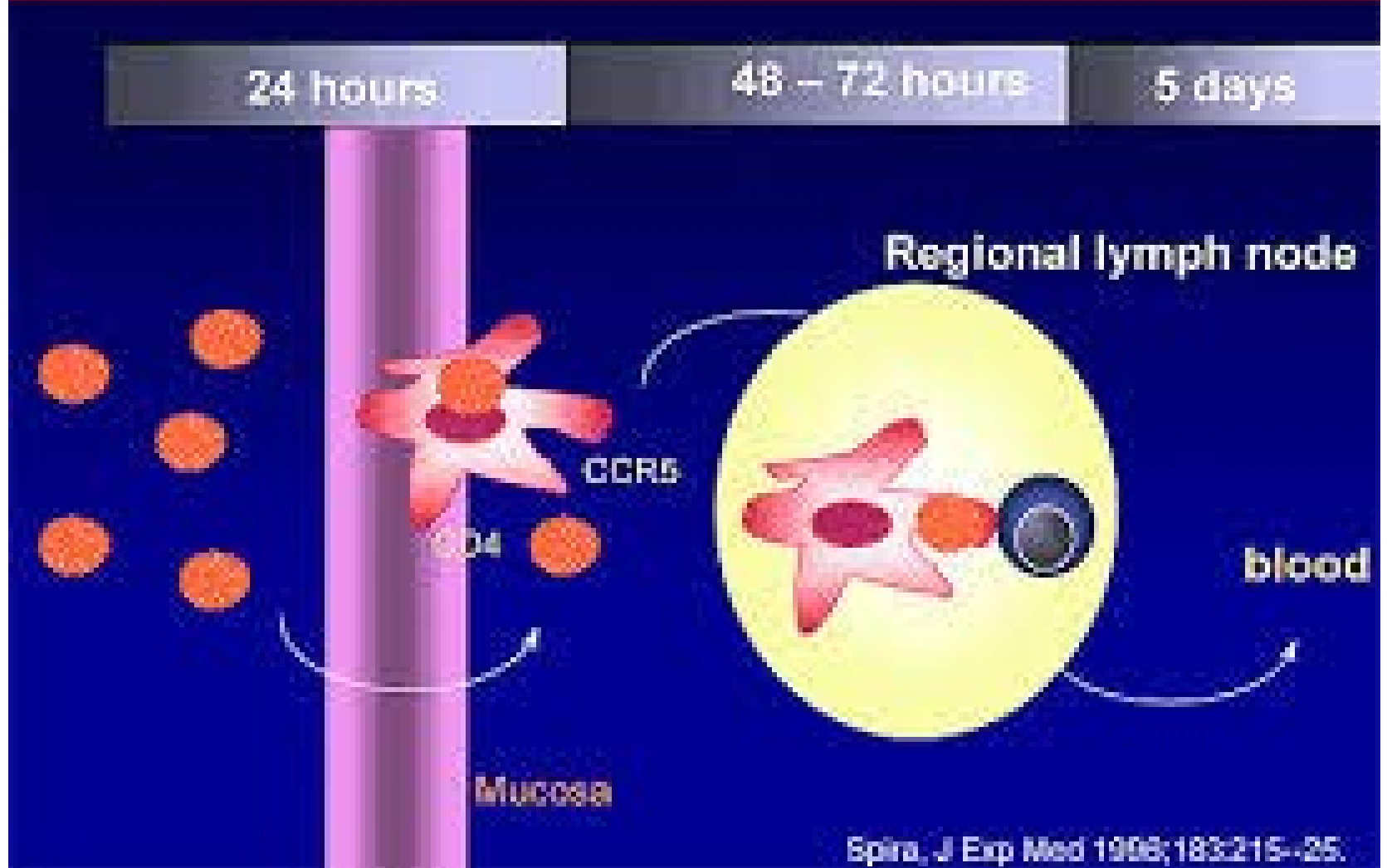
CCR5

CD4

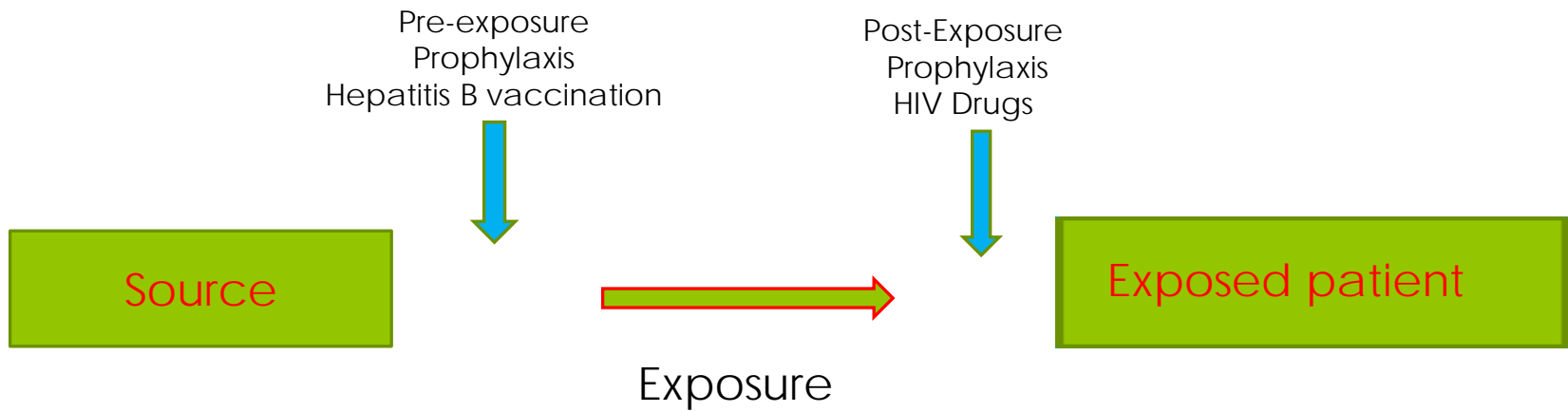
blood

Mucosa

Epira, J Exp Med 1998;183:215-25.



Hepatitis B and HIV



HCW Status	Recommended Treatment		
	Source HBsAg Positive	Source HBsAg Negative	Source Unknown or Unavailable
Unvaccinated	HBIG x1 and HBV vaccine*	HBV vaccine*	HBV vaccine*
Previously Vaccinated			
Responder Anti-HBs >10 mIU/ml	No treatment	No treatment	No treatment
Non-Responder Anti-HBs <10 mIU/ml	1. HBIG x1 and HBV vaccine* <i>or</i> 2. HBIG now and in one month [†]	No treatment	If Source High Risk 1. HBIG x1 and HBV vaccine* <i>or</i> 2. HBIG now and in one month [†]
Response Unknown	Test HCW ant-HBs 1. If titer >10 mIU/ml, No Treatment 2. If titer <10 mIU/ml, HBIG and booster	No treatment	Test HCW ant-HBs 1. If titer >10 mIU/ml, No Treatment 2. If titer <10 mIU/ml, Vaccine booster and recheck titer in 1-2 months

*Initiate and complete HBV vaccine series (3 doses).

[†]Two doses of HBIG preferred for individuals who failed to respond to two completed HBV vaccine series.
HBIG= hepatitis B immune globulin (0.06 ml/kg IM)

Post- Exposure Prophylaxis (PEP)



New York State Department of
Health AIDS Institute

PEPline

HIV Post-Exposure
Prophylaxis

Resource for
Current Regimens, Medication
Dosing, Timing of PEP and
all other questions

1-888-448-4911

24 Hours/
7 Days Per Week

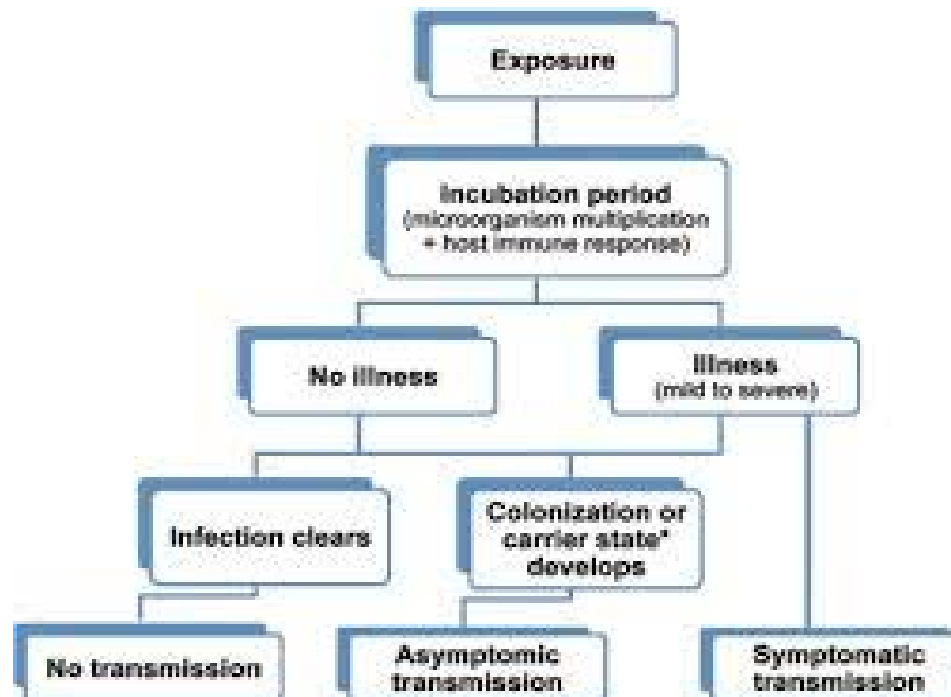
This service is provided by the NY State AIDS Institute's
HIV Clinical Education Institute

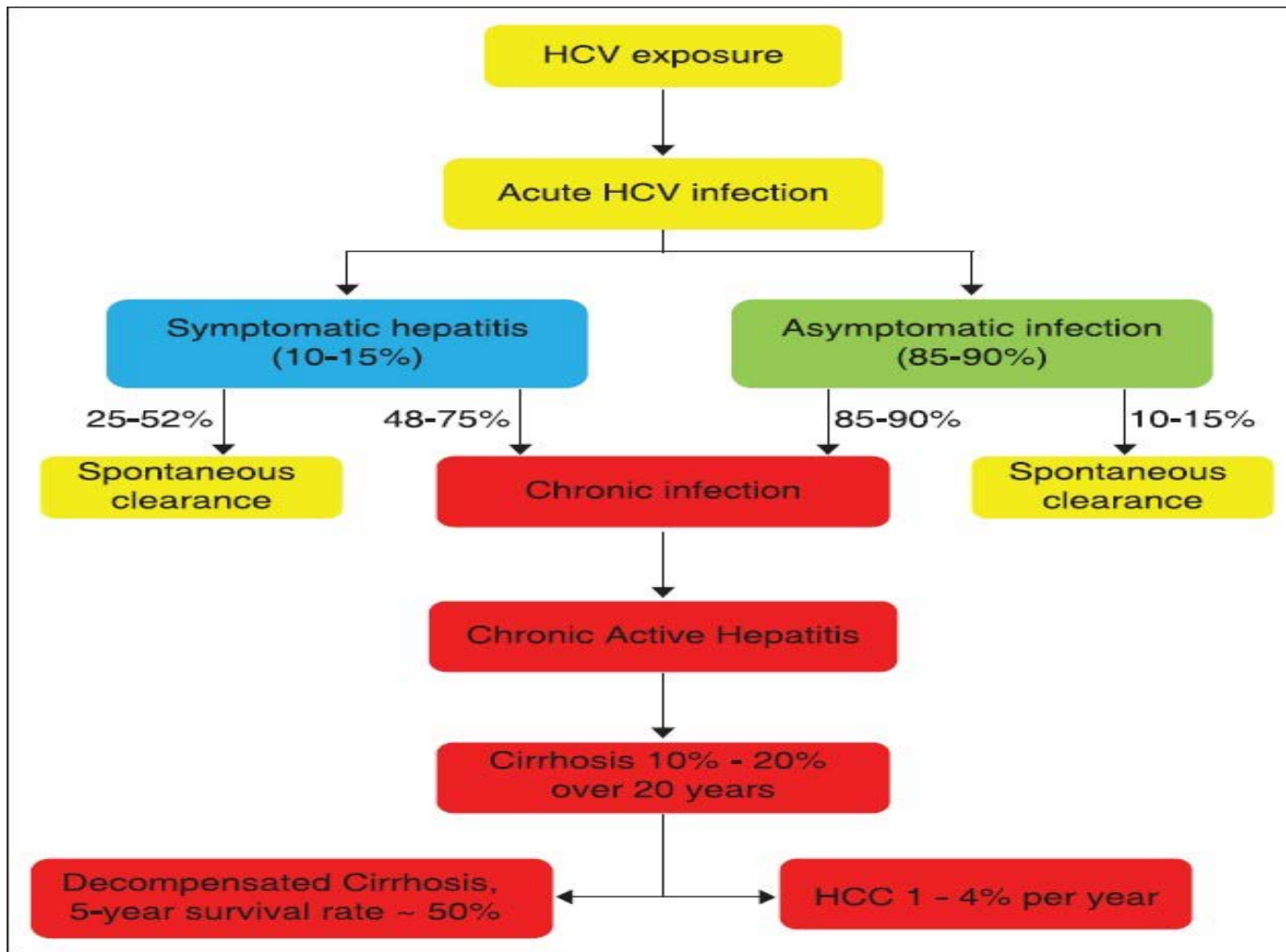


Case # 4

- After you treat a 40 year old male involved in a car accident, you find out that he is positive for Hepatitis C.
- What is your next step?

Exposure to pathogens





Blood-borne pathogens

Pathogen	Infection Risk after needle-stick	Post exposure Prophylaxis (PEP)	
		What to Do?	When to act?
HIV	0.3	Four weeks of medication, case by case basis	As fast as possible
Hepatitis B	0% with vaccination/PEP 30% without PEP	Unvaccinated: Immunoglobulin/ vaccine	Within 24 hours
Hepatitis C	1.8%	No recommendation	N/A

Case # 5

- You are called to evaluate a 30 year old healthy female who just “passed out” at basketball practice.
- She is transported by ambulance to the ER.
- After she arrives to the ER, you noticed that she had a ‘boil’ on her leg, looks like a spider bite that got infected.
- What is your differential diagnosis for the infected leg?



Methicillin Resistant *Staphylococcus aureus* (MRSA)

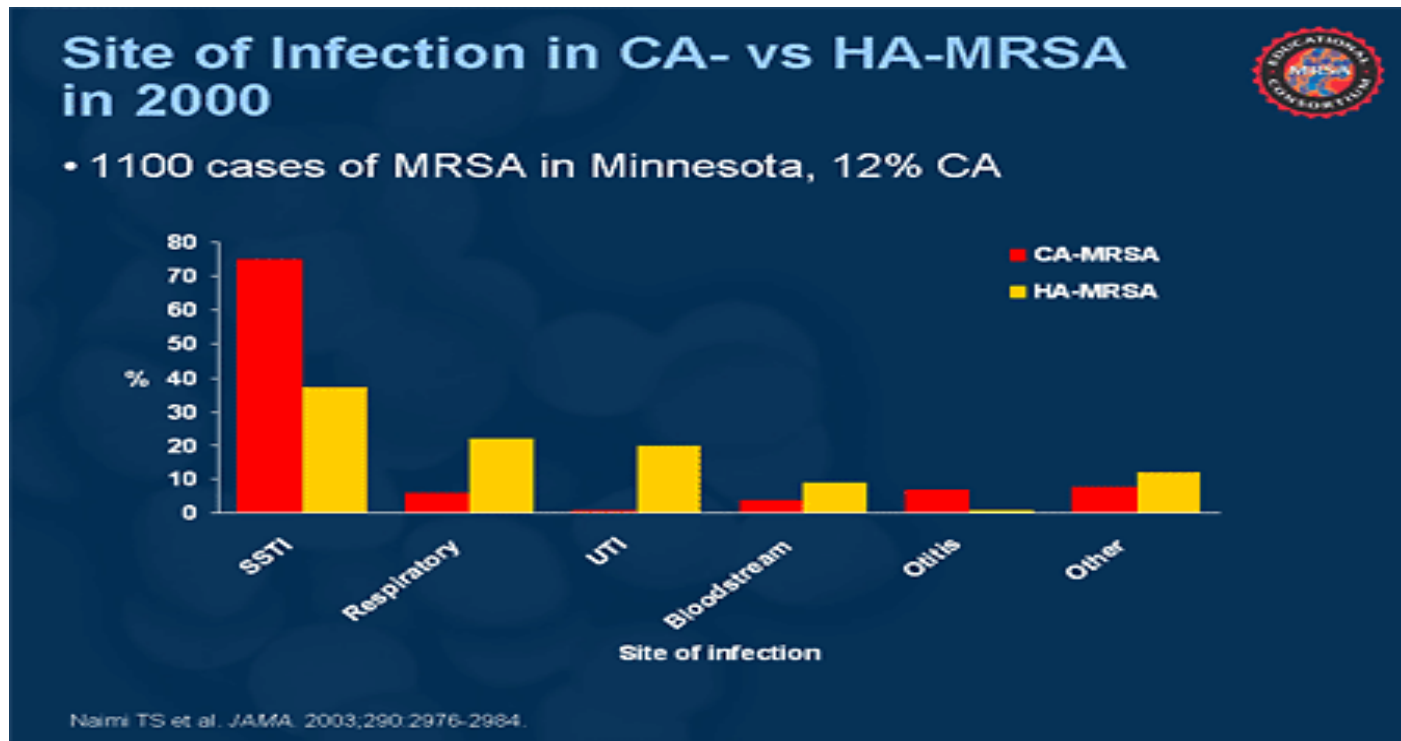


Infected :
induration,
purulence



Colonized :
clean borders, no
drainage, no induration

Community Acquired (CA) vs. Healthcare associated MRSA (HA-MRSA)



Nasal decolonization



How to Prevent Serious Skin Infection from MRSA: The Do's and Don'ts

- Methicillin-resistant *Staphylococcus aureus* (MRSA) can lead to serious infections that can take you off the playing field and put you in the hospital
- MRSA can be spread from player-to-player and from family member-to-player
- Follow these simple steps to reduce your chances of developing a skin infection and spreading it to your teammates

Do:

- Wash your hands regularly
- Seek medical attention from the training staff if you or your family members have skin lesions that look like:



- Keep all skin lesions, abrasions, or turf burns clean and covered

Do Not:

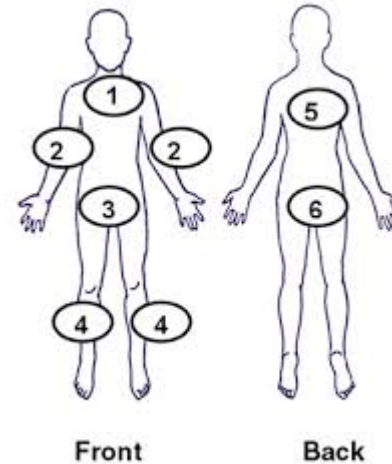
- Share personal equipment
 - ➔ Razors, towels, clothes
- Shave your body (below the neck) with a razor
 - ➔ If hair removal is necessary, use disposable clippers
- Ignore any skin infection

Decolonization

- Chlorxhedine



- Areas of colonization



How to avoid MRSA?

- Cover patient's draining wounds.
- Use Contact Precautions.
- Wash hands , especially after contact with a contaminated wound.
- Launder clothing after contact with a contaminated area on the skin. Dry clothes at least 30 minutes on high.
- Avoid sharing items (e.g., towels, bedding, clothing, razors, or athletic equipment) that may become contaminated by contact with wounds or skin flora.
- Disinfect/clean medical and sports equipment, kitchen counters, and other surfaces with an approved disinfectant or diluted bleach.
- Do not bring contaminated items into station

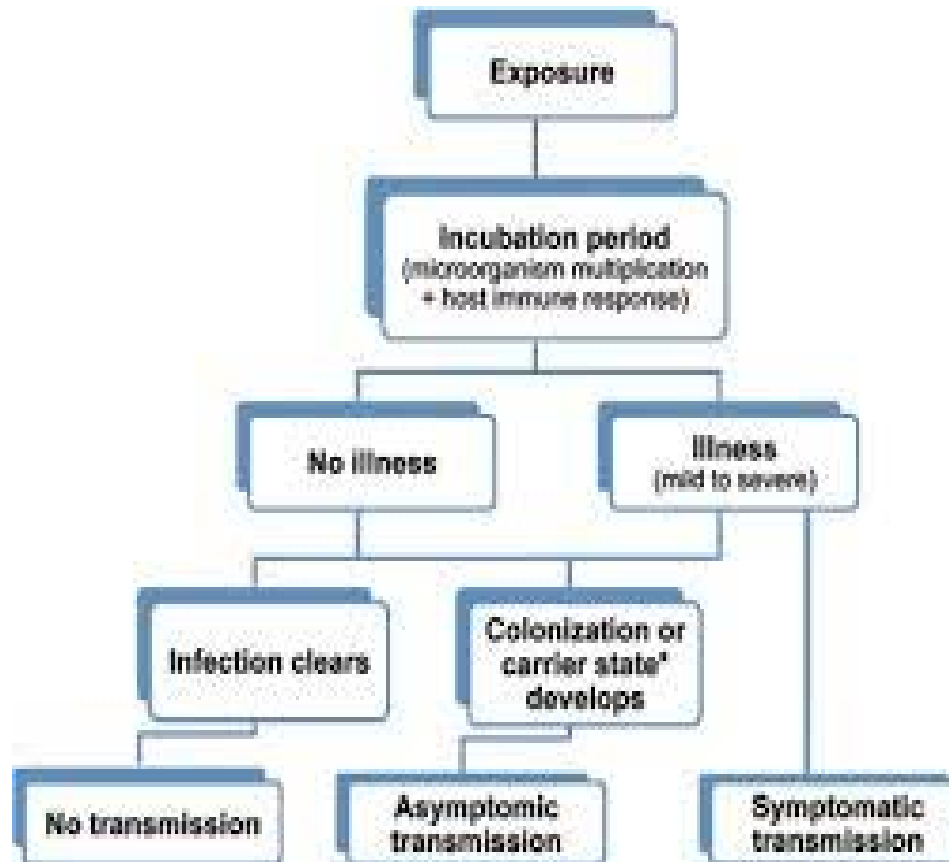


STOP Contact Precautions

		
Wear gown when entering room	Wear gloves when entering room	Wash hands before leaving room

All visitors report to Nursing Station before entering room

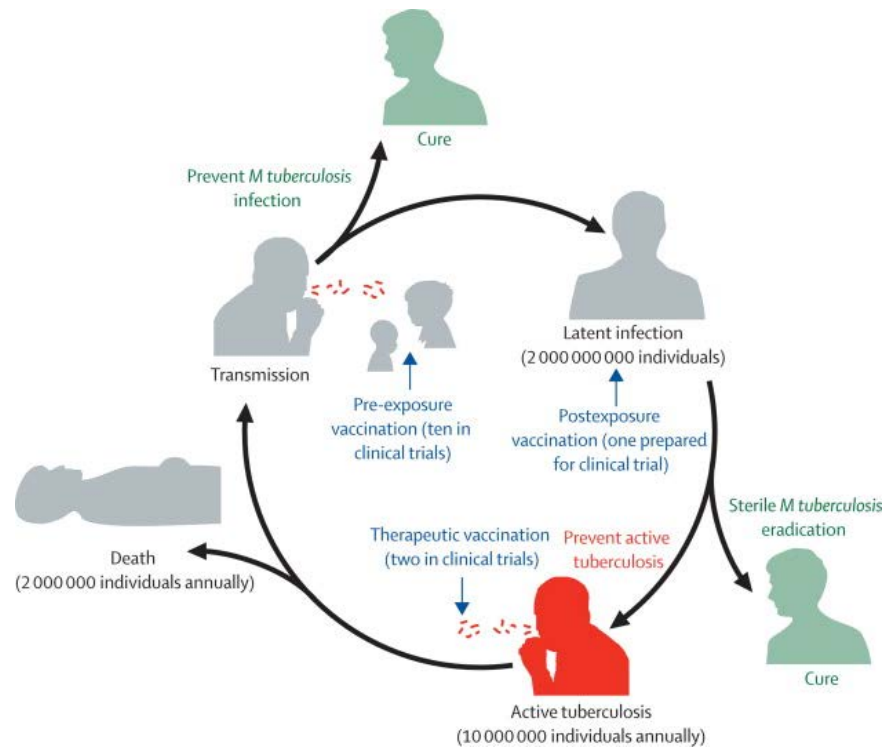
Exposure to pathogens



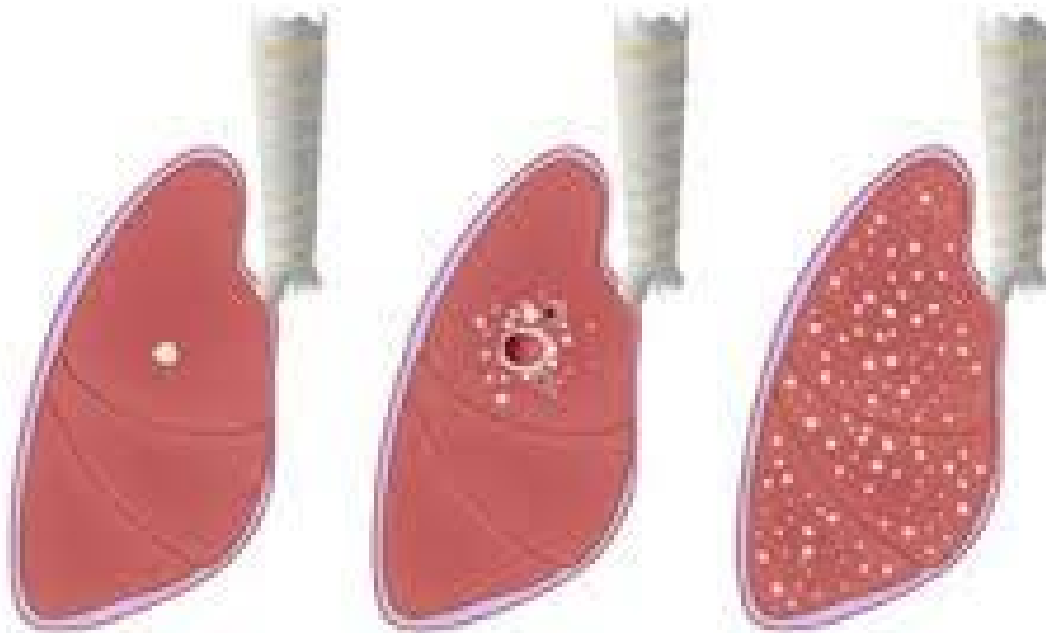
Case # 6

- You were attending a call to a local homeless shelter.
- A 64 year old male has productive cough with abundant sputum.
- You are informed that he was admitted to the hospital with diagnosis of active tuberculosis

Tuberculosis



Tuberculosis



Latent
infection

Cavitary
tuberculosis

Miliary
tuberculosis

TUBERCULOSIS (TB)

- fatigue
- malaise
- anorexia
- wt. loss



chronic cough
(productive)

night sweats

hemoptysis
(advanced state)

low grade temp.
(late afternoon)

Treatment:

TB medications 6 to 12 months
bedrest until symptoms
resp isolation until
negative sputum
frequently out-pt basis

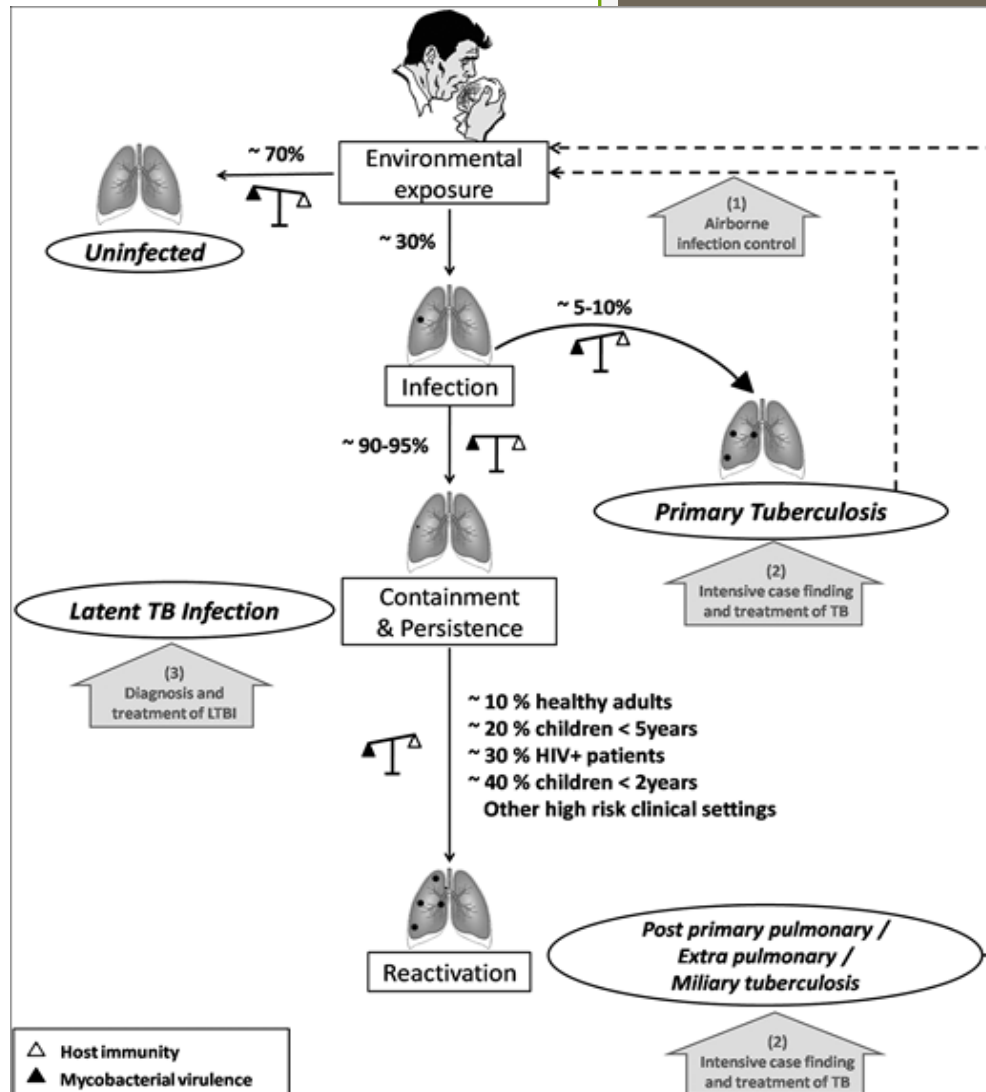
Diagnostic:

TB skin test
chest x-ray
bacteriologic
sputum studies

TB Pathogenesis

Latent TB infection (LTBI)

- Once inhaled, bacteria travel to the lung alveoli and establish infection.
- 2-12 weeks after infection, immune response limits activity; infection is detectable.
- Some bacteria survive and remain dormant but viable for years (latent TB infection LTBI)

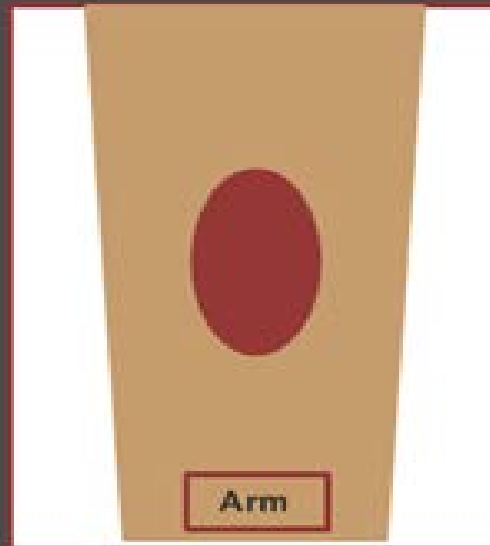


Testing for Latent Tuberculosis

Scroll on the two images on the right side of this screen...



There are two ways to test for latent tuberculosis...

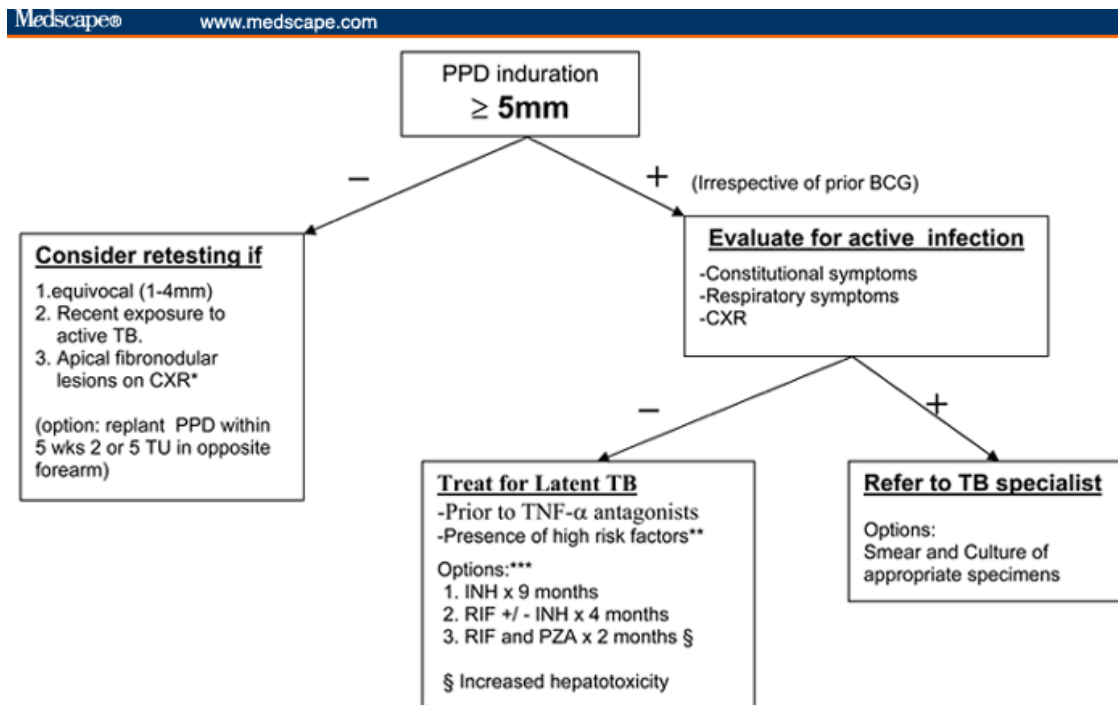


Skin Test

Blood Test



Treatment of Latent TB



Case # 7

- You are called to evaluate a 77 year old male who just had a syncopal episode.
- Turns out, he has been having at least 10 liquid bowel movements a day.
- He had fevers last week, but he did better with oral Augmentin for sinusitis.
- Other nursing home residents are having similar symptoms, some of them also have vomiting.
- What is your differential diagnosis?

Diarrheal illness



Salmonella

Diarrheal illness :



- Nothing replaces hand-washing with soap and water.

Conclusions :

Ways of Transmission

- Airborne:
 - Influenza
 - Tuberculosis
 - Viral illness
- Body secretions:
 - Enteroviruses
- Blood borne:
 - HIV
 - Hepatitis B
 - Hepatitis C

Conclusions:

Ways to Prevent infection

- Good nutrition
- Good control of your own illness :
diabetes, blood pressure, etc.
- Vaccinations:
 - Tetanus (Tdap)
 - Pertussis
 - Influenza
 - Mumps, measles, rubella
 - Hepatitis B