Epidemiology of Communicable Diseases & Bloodborne Pathogens

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Definitions

• Epidemiology:
  – The study of the determinants and distribution of diseases and states of health and the factors which influence these distributions among human populations
Definitions

• Surveillance:
  – The ongoing systematic process that collects and reviews information regarding cases of a given disease
Communicable Diseases that Public Health Handles

- Common Food Borne Illnesses
  - Salmonella, campylobacter, giardia, norovirus
- Hepatitis A, B, C
- Meningitis
- Vaccine Preventables
Food Borne Illnesses

Spectrum of illness: Symptoms

- Mild: Loose stools, nausea, fatigue, malaise
- Moderate: Vomiting, diarrhea, fever, abdominal cramping
- Severe: Bloody diarrhea, dehydration, seizures, shock, death
Modes of Transmission

• Foodborne
  – Source contamination
    • Mishandling
    • Eating raw

• Waterborne

• Person-to-person
  • Direct- Diaper changes, sexual activity, other intimate contact (needle, drug-sharing)
  • Indirect- Through an object or substance capable of carrying an infectious organism
Mean Incubation Period (Hours)

- 72 hours: Campylobacteriosis
- 48 hours: Salmonella, Shigella, E. Coli
- 24 hours: Salmonella, Shigella, E. Coli
- 2-12 hours:
Characteristics of Bacterial Food Poisoning: Common Vehicles

- **Campylobacteriosis**
  - milk, chicken, pet animals, livestock

- **E. coli (0157:H7)**
  - salads, hamburger, salami, water (recreational), other

- **Salmonellosis**
  - eggs, meat, poultry, fruit (rare), reptile pets

- **Shigellosis**
  - milk, salads (potato, tuna, turkey)
Reservoir

- Domestic and wild animals
- Poultry, swine, cattle, dogs, and cats
- Iguanas, tortoises, turtles, terrapins
- Rodents
- Chicks (baby chickens)
Transmission

- Foodborne (Can be waterborne)
- Fecal-oral Route
  - Eating foods contaminated with animal feces
  - Contaminated foods usually look and smell normal
  - Foods include: raw and undercooked eggs & egg products, raw milk & raw milk products, poultry & poultry products
Transmission

• Contaminated foods often of animal origin
• Foods can be contaminated by unwashed hands of infected food handler
• Person-to-person fecal/oral transmission is important
• Reptiles, even if healthy, can harbor and transmit salmonella
Prevention

- Hand washing – at least 20 seconds, with warm, soapy water
- Refrigerate prepared foods
- Thoroughly cooking all foodstuffs derived from animal sources, particularly poultry, pork, egg products, and meat dishes
- Avoiding recontamination within the kitchen after cooking is completed
- Maintaining a sanitary kitchen, protecting prepared foods against rodent and insect contamination
- Exclude individuals with diarrhea from food handling and from care of hospitalized patients, the elderly and children
Treatment

- There is no vaccine to prevent GI illnesses
- HIV patients may require life-long therapy to prevent *Salmonella* Septicemia
- Most people recover on their own
- Antibiotics and anti-diarrhea drugs are not generally recommended for cases with intestinal infections
Hepatitis A
Hepatitis A

Transmission:

- Person to person - fecal / oral contact
  - putting something in the mouth that has been contaminated with infected feces
- Fecal contamination of food / water
  - fruits, vegetables, or other uncooked food that has been contaminated during handling
  - drinking water or using ice that has been contaminated
Hepatitis A

Symptoms:

- Children usually have no symptoms
- Adults / Children may experience
  - jaundice
  - fatigue
  - nausea & vomiting
  - abdominal pain
  - dark urine / light stools
  - fever
Hepatitis A

Treatment:
• No specific treatment
• Infection will clear up in a few weeks to months usually with no serious after effects
• Once recovered individual is immune and will never get HAV infection again

Prevention:
• Exclude patients from sensitive occupations or childcare until 10 days after onset of symptoms
• Immune globulin (IG) can provide temporary immunity if given prior to exposure or within 2 weeks after contact
Viral/Bacterial Meningitis
Meningitis

• Illnesses that refer to inflammation of the meninges - the lining that covers the brain
Causes:

Infectious Agents:

- Organisms transmitted from environment / people
  - bacteria
  - virus
  - fungi
  - other, non specified
Viral Meningitis

Transmission:

• Person to Person
  • specific transmission routes vary according to specific agent
  - Respiratory secretions
  - Airborne
  - Fomites
  - Fecal / Oral contamination
Viral Meningitis

• Symptoms
  - Fever
  - Headache
  - Stiff neck
  - Rash, similar in appearance to hives
  - Intestinal symptoms
Viral Meningitis

Treatment

• There is no specific medicines or antibiotics used to treat viral meningitis

• In most all cases, persons will completely recover with no lasting ill effects
Bacterial Meningitis

• Many different groups
  – Hib (Haemophilus influenzae)
  – Streptococcus pneumoniae
  – *Neisseria meningitidis*
Meningococcal Disease
Infections caused by the bacteria *N. meningitidis*

The most important meningococcal diseases are:
- Meningococcal meningitis
- Meningococcemia
Meningococcal Disease

- Rare form of bacterial meningitis

- Bacteria enters body through the nose and throat and infects the blood stream before reaching the brain
Meningococcal Meningitis
Meningococcal Meningitis

Symptoms

• Time between exposure to the bacterium and onset of illness is usually 3-4 days, but may be anywhere from 2-10 days.
• Sudden onset of high fever
• Intense headache
• Nausea / vomiting
• Stiff neck
• Body rash
Meningococcal Meningitis

Transmission

• Spread by direct contact with mucus or saliva from the nose and throat of an infected individual
  – Close contact with infected person
  – Exchange of saliva by kissing, mouth to mouth resuscitation, or sharing of utensils
**Meningococcal Meningitis**

**Treatment**

- **Early medical attention is important**
- Certain antibiotics are very effective in eliminating the germ from the nose and throat
- Effective prophylaxis treatment for contacts
  - Within 7 days (prior to the illness) from last exposure to a case (during infectious period)
    - Rifampin
    - Ciprofloxacin
  - Casual contact as might occur in a regular classroom, office or factory setting is not usually significant enough to cause concern
Meningococcemia
Meningococcemia

- *N. meningitidis* enters the body through the nose and throat and infects the bloodstream and the whole system.
- Meningococcemia spreads throughout the system, but does not necessarily cause meningitis.
- An acute bacterial infection affecting the entire body.
Meningococcemia

Symptoms

-Time between exposure to the bacterium and onset of illness is usually 3-4 days, but may be anywhere from 2-10 days.

• Sudden onset of fever
• Vomiting
• Weakness
• Irritability
• Usually a body rash w/in 24 hrs
• Person feels very ill and rapidly deteriorates
Meningococcemia

Transmission

• Spread by direct contact with mucus or saliva from the nose and throat of an infected individual
  – Close contact with infected person
  – Exchange of saliva by kissing, mouth to mouth resuscitation, or sharing of utensils
Meningococcemia

Treatment

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Meningococcal Disease

PREVENTION

• Good hand washing habits are among the best precautions against the spread of meningococcal diseases.

• Education
Vaccine Preventables
Varicella (Chicken Pox)

• Occurrence - winter spring season
• Clinical manifestation
  – Viral, fever, rash
• Transmission
  – Person-to-person direct contact, fomite transmission
• Reservoir
  – Humans
Measles

• Source: Humans
• Mode of Transmission
  – Droplet spread or direct contact with nasal or throat secretions of infected person. Tiny droplets can be suspended in the air for up to two hours or more.
  – Virus is highly communicable
• Incubation period – 12-17 days, usually 14 days, before the rash appears
• Symptoms – fever, nasal congestion, conjunctivitis, cough, rash
Mumps

• Source - Humans
• Mode of Transmission – direct contact with the saliva of an infected person & by droplet spread
• Period of Communicability- How long the patient is infectious
  – The patient may be infectious from six days prior to nine days after parotitis (swelling of salivary glands located close to the jaw)
• Incubation Period -16-18 days, may range from 12-25 days
• Symptoms – fever, headache, parotitis
Rubella

- **Source** - Humans

- **Mode of Transmission**
  - Person-to-person via droplets shed from the respiratory secretions of infected persons.

- **Incubation Period**
  - 12-23 days; usually 16-18 days.

- **Period of Communicability**
  - Highly communicable; the period of maximum communicability is from one week before, to one week after onset of the rash.
Symptoms of Rubella

- Rubella is a mild illness which may present few or no symptoms.
- Rash
- Slight fever
- Joint aches
- Headache
- Discomfort
- Runny nose and reddened eyes
- Lymph nodes just behind the ears and at the back of the neck may swell, causing some soreness and/or pain.
- Arthritis or arthralgia (aching joints) may occur in up to 70% of adults
Pertussis

- Reservoir – Humans
- Transmission – Respiratory droplets (coughing and sneezing)
- Incubation period – 5-10 days, but can be up to 24 days
  - Requires monitoring of contacts for symptoms for 24 days after last exposure
Clinical Features

- **Adolescents and adults**
  - Are primary carriers of pertussis enabling transmission to infants and children
  - Have milder illness with less severe complications than infants and young children
  - Airway generally large enough (anatomically) to accommodate the inflammation and secretions
  - Pertussis accounts for up to 7% of cough illnesses in these groups every year
Clinical Features

- **Infants and young children**
  - appear very ill and distressed
  - may turn blue and vomit
  - unable to swallow
  - have unforgettable stridor or ‘whoop’
  - airway too small to accommodate as adults do – easily obstruct and need airway and respiratory assistance to survive

- **Web sites where you can see and hear pertussis:**
  * [www.pertussis.com](http://www.pertussis.com)
  * [www.vaccineinformation.org/pertussis](http://www.vaccineinformation.org/pertussis)
Bloodborne Pathogens

Microorganisms that are carried in the blood that can cause disease in humans
Common Bloodborne Pathogens Diseases

- Hepatitis B (HBV)
- Hepatitis C (HCV)
- Human Immunodeficiency Virus (HIV)
Transmission Potential

- Contact with another person’s blood or bodily fluids that may contain blood
- Mucous membranes: eyes, mouth, nose
- Non-intact skin- cuts or wounds
- Contaminated sharps/needles
Human Immunodeficiency Virus (HIV)

- HIV is the virus that causes AIDS
- HIV attacks the immune system – finds and destroys white blood cells that are needed to fight disease
- The CDC estimates that there are ~40,000 new HIV infections a year
- It is estimated that more than 1 million people are living with HIV or AIDS
HIV

• HIV does not survive well outside the body
• It is not transmitted through daily activities, such as shaking hands, hugging, or a casual kiss
• Primarily found in the blood, semen, or vaginal fluid of someone infected
• Transmitted 3 main ways:
  - Having sex with someone infected (vaginal, oral, anal)
  - Sharing needles and syringes with someone infected
  - Being exposed before or during birth (fetus or infant) or through breastfeeding
Hepatitis B (HBV)

- An estimated 3.2 million Americans are chronically infected
- May lead to chronic liver disease, liver cancer, and death
- HBV can survive for at least one week in dried blood
- Symptoms can occur 1-9 months after exposure
- HBV is transmitted through contact with body fluids infected with HBV
  - blood, semen, vaginal secretions
- Can be passed through exposure to sharp instruments contaminated with infected blood
  - tattooing, body piercing, needles, razors
Hepatitis B

• Virus can survive outside the body for at least 7 days on a dry surface
• 100 times more contagious than HIV
• People at risk include
  – injection drug users
  – sexually active homosexual & bisexual men
  – babies born to infected mothers
  – anyone with multiple sex partners
Hepatitis B

Symptoms

• Flu like symptoms
  – nausea, vomiting, fatigue, diarrhea, mild fever
• Jaundice
• A few patients have a more severe course of illness and may die of liver failure shortly after getting sick
• Many people with acute HBV have no symptoms
Hepatitis B

Treatment

• Only approved treatment is Interferon (what your body produces to fight against disease and infection)
  – other treatments are under investigation

• Approximately 90-95% of adults will recover within 6 months and not contract HBV again.

• If exposed to HBV
  – should receive hepatitis B immune globulin (HBIG) w/in 14 days of exposure
  – vaccine series should be started
Hepatitis B

Chronic Carriers

- If unable to clear virus within six months patient is considered chronically infected and a carrier of HBV
- Usually shows no signs or symptoms of infection
- Can unknowingly pass HBV to others
- Patients with HBV should consider being vaccinated for hepatitis A
Hepatitis B Vaccination

- Vaccination available since 1982
- Available for all age groups
- Given as 3-4 shots over a 6 month period
- Strongly endorsed by medical communities
- After receiving 3 doses, vaccine provides greater than a 90% protection
Hepatitis C (HCV)

- Hepatitis C is the most common chronic bloodborne infection in the United States
- Symptoms include: jaundice, fatigue, abdominal pain, loss of appetite, intermittent nausea, vomiting; some may have no symptoms
- May lead to chronic liver disease and death
Hepatitis C

Transmission
• HCV is transmitted through contact with blood infected with HCV.
• Those at risk include:
  – IV drug users
  – anyone who had a blood transfusion prior to 1992
  – those with multiple sex partners
• Transmission through sexual contact and saliva appears to be low
Hepatitis C

Treatment

• Antiviral therapy is recommended for patients with chronic HCV who are at greatest risk for progression to cirrhosis

• There is no effective post-exposure prophylaxis

• Unlike HAV and HBV, previous infection of HCV does not mean immunity
Chronic Carriers

- If unable to clear virus within six months patient is considered chronically infected and a carrier of HCV
- Disease may progress over a period of 10 - 40 years
- 20% will develop cirrhosis of the liver (liver slowly deteriorates)
  - 25% of these will develop liver failure
- Can unknowingly pass HCV to others
- Patients with HCV should consider being vaccinated for Hepatitis A & B
Universal Precautions

- Use of proper PPE
  - Latex gloves
  - CPR mouth barriers
  - Aprons
- Treat all blood and bodily fluids as if they are contaminated
- Proper cleanup and decontamination
- Disposal of all contaminated material in the proper manner
- Proper handwashing
  - Wash hands for at least 20 seconds
  - Use warm, soapy water
What you Can Do?

- Report all communicable diseases and outbreaks to Public Health for follow-up.

- Educate staff, clients, family/friends on the importance of proper hand washing, immunizations, and covering your cough.
References

- **MMWR Surveillance for Foodborne-Disease Outbreaks --- United States, 1998—2002**

- **Communicable Disease Manual, APHA**

- **Infectious Disease Control Manual**

- **Vaccine information**
Questions??

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Questions??
THANK YOU!!!!!