2017 CADE Fall Epi Update Slides
Childhood diseases that are not individually reportable...

*but we get a lot of questions about them*
Disease List

- Hand Foot and Mouth
- Parvovirus B19
- Epstein Barr
- Cytomegalovirus
Hand, Foot, & Mouth Disease
Hand, Foot, & Mouth Disease

Caused by viruses in the genus Enterovirus: polioviruses, coxsackieviruses, echoviruses, and enteroviruses

- Coxsackievirus A16 most common cause is US
- Enterovirus 71 associated with cases and outbreaks, less often more severe disease such as encephalitis
- Several enteroviruses may be identified in outbreaks, usually 1 or 2

Common in children <5yrs

- Starts with: Fever, decreased appetite, sore throat, malaise
- 1-2 days later: Sores in mouth (herpangina)- small red spots that blister and ulcerate in back of mouth
- Skin rash with red spots, sometimes blisters on palms of hands/soles of feet, also on knees, elbows, buttocks or genital area

Complications:
More Common: dehydration due to mouth sores
Rare: Viral meningitis, encephalitis, fingernail / toenail loss
Hand, Foot, & Mouth Disease

Transmission:
- Nose and throat secretions (saliva, sputum, or nasal mucus)
- Blister fluid,
- Feces

Infectiousness:
- Most contagious during first week of illness
- Adults can be infected and be asymptomatic and still pass disease to others
- Stay home until symptoms resolve

Not transmitted to/from pets and other animals
Hand, Foot, & Mouth Disease

No vaccine against the viruses that cause hand, foot, and mouth disease

Lower risk of infection by:
• Wash your hands often with soap and water, especially after changing diapers and using the toilet.
• Clean and disinfect frequently touched surfaces and soiled items, including toys.
• Avoid close contact such as kissing, hugging, or sharing eating utensils or cups with people with hand, foot, and mouth disease.

There is no specific treatment:
• Take over-the-counter medications to relieve pain and fever (Caution: Aspirin should not be given to children.)
• Use mouthwashes or sprays that numb mouth pain
Parvovirus B19

TEXT HERE...
Parvovirus B19

Also called: Fifth disease and erythema infectiosum

- Fifth in a list of historical classifications of common skin rash illnesses in children.
- It is more common in children than adults.

A person usually gets sick with fifth disease within 4 to 14 days after getting infected with parvovirus B19.
Symptoms

First symptoms mild: fever, runny nose, headache
Rash develops on face and body
Several days, red rash on face “slapped cheek”
  • More common in kids
May get second rash (few days later) on chest, back, buttocks, or arms and legs
  • May be itchy with varying intensity, usually resolves after 7-10 days
  • Looks lacy as starts to go away
May have painful or swollen joints: 1-3 weeks
  Usually resolves without long-term problems
Complications

Usually mild for children and healthy adults

People with weakened immune systems caused by leukemia, cancer, organ transplants, or HIV infection are at risk for serious complications from fifth disease.

° It can cause chronic anemia that requires medical treatment.
Transmission

Respiratory secretions (saliva, sputum, nasal mucus)
◦ Coughs and sneezes
◦ Most contagious with cold symptoms (before rash)
◦ Not contagious once rash appears

Blood and blood products

In Utero

Once recovered become immune
Prevention & Treatment

No vaccine or medication
- Resolves on own
  - Symptom relief

Prevent with:
- Handwashing
- Covering coughs / sneezes
- Not touching eyes, nose, or mouth
- Staying home when sick

Pregnant healthcare providers know risks
Parvovirus B19 & Other Illnesses

Can cause painful or swollen joints (more common in adults)
- Can also cause the body to temporarily stop making new red blood cells
- Can lead to severe anemia and other complications

Usually affect people who have:
- Sickle cell disease or similar types long-lasting anemia or problems producing red blood cells
- Weakened immune systems caused by leukemia, cancer, organ transplants, or HIV infection
Parvovirus B19 & Pregnancy

Usually not a problem for pregnant women and their babies.

- About half of pregnant women are immune, so they and their babies are usually protected

Pregnant women who are not immune usually have mild illness

- Their babies usually do not have any problems
- In less than 5%, baby will develop severe anemia caused by its mother’s infection and the woman may miscarry
- More common with infections in the first half of pregnancy
Epstein Barr Virus
EBV

Member of herpes family
- Also known as human herpesvirus 4
- One of the most common human viruses
- Virus is found all over the world
- Occurs only in humans

Most people will be infected at some point in their lives
- 9 of 10 adults have antibodies indicating current or past infection

Can cause infectious mononucleosis and other illnesses
Mononucleosis – “Mono”

Epstein-Barr virus is most common cause, others include:
- Cytomegalovirus
- Toxoplasmosis
- HIV
- Rubella
- Hepatitis A, B, C
- Adenovirus

Symptoms usually appear four to six weeks after you get infected and may include—
- extreme fatigue, fever, sore throat, head and body aches, swollen lymph nodes in the neck and armpits, swollen liver or spleen or both, and rash

Enlarged spleen and a swollen liver are less common symptoms
Most get better in two to four weeks, but some are fatigued for several more weeks
EBV-Symptoms

Most infected during childhood
- Children usually do not have symptoms or they are not distinguishable from other mild illnesses
- Teens and adults usually get symptoms, resolve in 2-4 weeks

Symptoms:
- fatigue
- fever
- inflamed throat
- swollen lymph nodes in the neck
- enlarged spleen
- swollen liver
- rash

Virus goes latent and can reactivate
- Persons with weakened immune systems are more likely to develop symptoms if EBV reactivates
Other severe complications of EBV

Nervous System
- **Viral meningitis** (swelling of the tissues that cover the brain and spinal cord)
- **Encephalitis** (swelling of the brain)
- **Optic neuritis** (swelling of the eye nerve)
- **Transverse myelitis** (swelling of the spinal cord)
- Facial nerve palsies (paralysis of facial muscles)
- **Guillain-Barré syndrome** (an immune system disease)
- **Acute cerebellar ataxia** (sudden uncoordinated muscle movement)
- **Hemiplegia** (paralysis on one side of the body)
- **Sleep disorders**
- **Psychoses**

Hematological System
- EBV infection can affect a person’s blood and bone marrow. The virus can cause the body to produce an excessive number of white blood cells called lymphocytes (lymphocytosis).
- EBV can also weaken the immune system, making it more difficult for the body to fight infection.
- Examples of some of these conditions include—
  - Neutropenia with secondary infections
  - Hemophagocytic syndrome
  - Acquired hypogammaglobulinemia
  - X-linked lymphoproliferative disease

Other Conditions
- **Pneumonia** (injury of the lungs)
- **Interstitial lung disease** (a large group of disorders, most of which cause scarring of lung tissue)
- **Pancreatitis** (swelling of the pancreas)
- **Myocarditis** (swelling of the heart muscle)
- **Oral cavity-oral hairy leukoplakia** (raised, white patches on the tongue), which is usually seen in people infected with HIV
- Cancers associated with EBV infection include—
  - **Burkitt’s lymphoma** (cancer of the lymphatic system)
  - **Nasopharyngeal carcinoma** (cancer of the upper throat)
  - **Hodgkin’s disease** and **non-Hodgkin’s lymphoma** (cancers of the lymphatic system)
  - Post-transplant lymphoproliferative disorder (white blood cells are produced in excess)
  - Other tumors including leiomyosarcomas (cancer in the soft tissue) and T-cell lymphomas
- Complications of EBV infection include—
  - **Peritonsillar abscesses** (pus-filled tissue near the tonsils)
  - **Acute bacterial sinusitis** (bacterial infection of the sinus cavities)
  - Suppurative lymph nodes (swelling of lymph nodes)
  - **Mastoiditis** (bacterial infection of the mastoid bone of the skull)
  - **Sialadenitis** (swelling and injury of salivary glands)
  - Blockage of the air passages in the nose and throat
Transmission

Spread through bodily fluids, especially saliva
  ◦ Also via blood and semen
  ◦ Blood transfusions and organ transplants

Objects: toothbrush or drinking glasses
  ◦ Virus survives as long as the object remains moist

First infection- can spread for weeks (even before symptoms)
  ◦ Stays in latent state and infectious again with reactivation
EBV Diagnosis

Viral capsid antigen (VCA)
- Anti-VCA IgM appears early in EBV infection and usually disappears within 4 to 6 weeks
- Anti-VCA IgG appears in the acute phase of EBV infection, peaks at 2 to 4 weeks after onset, declines slightly then persists for the rest of a person's life

Early antigen (EA)
- Anti-EA IgG appears in the acute phase of illness and generally falls to undetectable levels after 3 to 6 months
- Detection of antibody to EA can be a sign of active infection, however, 20% of healthy people may have antibodies against EA for years

EBV nuclear antigen (EBNA)
- Antibody to EBNA, determined by the standard immunofluorescent test, is not seen in the acute phase of EBV infection but slowly appears 2 to 4 months after onset of symptoms and persist for life
- Other EBNA enzyme immunoassays may report false positive results

Monospot test
- Not recommended for general use
- Cross reacts with other viruses
- Studies have shown that the Monospot produces both false positive and false negative results
Cytomegalovirus
Cytomegalovirus- About the Virus

Herpesvirus: the same group as herpes simplex virus types 1 and 2, varicella-zoster virus, and Epstein-Barr virus.

- Share a characteristic ability to establish lifelong latency.
- After initial infection, which may cause few symptoms, CMV becomes latent, residing in cells without causing detectable damage or clinical illness.

People who are infected with CMV sometimes shed the virus in body fluids, such as urine, saliva, blood, tears, semen, and breast milk.

- The shedding of virus may occur intermittently, without any detectable signs, and without causing symptoms.
- However, in people who are severely immunocompromised by medication or disease, viral reactivation may lead to symptomatic disease.
Cytomegalovirus - Epidemiology

Commonly infects people of all ages
- 1 in 3 children are infected by age 5
- Over ½ of adults infected by age 40
Most healthy people infected with CMV after birth will have few symptoms and no long-term health consequences

- Some experience a mononucleosis-like syndrome—prolonged fever and hepatitis
- Once infected, establish lifelong latency and may reactive intermittently
- Reactivation rarely occurs in immune suppressed due to therapeutic drugs or disease

For most, not a serious health problem. Certain groups are high risk:

- Infants infected in utero
- Low birth weight and premature infants
- Immune compromised (i.e., organ and bone transplants, HIV)
Symptoms

Most infected people have no symptoms
Mild symptoms include:
- Fever,
- Sore throat,
- Fatigue, and
- Swollen glands

Occasionally causes mononucleosis or hepatitis

People with weakened immune systems
- Symptoms affecting eyes, lungs, liver, esophagus, stomach and intestines
Transmission & Prevention

Virus shed in body fluids: urine, saliva, blood, tears, semen and breast milk
- Direct contact with urine or saliva (babies and young children)
- Sexual contact
- Breast milk
- Transplanted organs and blood transfusions
- Mother to child during pregnancy

Handwashing, especially after diaper changes
Standard precautions in healthcare
Treatment

• Healthy people who are infected with CMV usually do not require medical treatment

• Antiviral medications are available to treat CMV infection in people who have weakened immune systems and babies who show symptoms of congenital infection
Congenital CMV

First infection, reinfection with a different CMV strain, or reactivation of previous infection occurs during pregnancy

- One in every 200 babies are born with congenital CMV

Nearly ½ women already infected before 1st pregnancy
  - Of those who are not infected, 1-4% will have primary infection during pregnancy
Congenital CMV

Most common congenital viral infection

- 20% of congenitally infected babies will be sick and have long-term health problems
- Leading nongenetic cause of deafness in children
- Roughly 400 children die from it annually

Some health problems are apparent at birth:

- Premature birth,
- Liver, lung and spleen problems,
- Small size at birth,
- Small head size, and
- Seizures.
Congenital CMV

Some develop health problems later during infancy or childhood:

- Hearing loss
- May develop later in babies who passed their newborn hearing test.
- Vision loss,
- Intellectual disability,
- Small head size,
- Lack of coordination,
- Weakness or problems using muscles, and
- Seizures.

Not fully understood, but infection can result in pregnancy loss
Congenital CMV

Diagnosis

- Testing a newborn baby’s saliva, urine, or blood
- Specimens collected within two to three weeks after the baby is born
Antiviral may decrease the risk of health problems and hearing loss in some infected babies who show signs of congenital CMV infection at birth.

- Use of antivirals for treating babies with congenital CMV infection who have no signs at birth is not currently recommended.

Babies with congenital CMV infection, with or without signs at birth, should have regular hearing checks.
Daycare Providers

- Greater risk of CMV infection
- 1 of 3 children infected by age 5
- Young children generally have no symptoms
- Present in body fluids for months after first infection
- Regular handwashing
Questions...
Common and not-so-common causes of rash illness
Why is public health so concerned about rashes? MEASLES
Differential Diagnosis of Typical Measles

1. Kawasaki disease (agent unknown)
2. Roseola Infantum (Human herpes virus type 6)
3. Rubella (Togavirus)
4. Scarlet Fever (beta-hemolytic streptococci)
5. Fifth Disease (Parvovirus B19)
6. Enterovirus (Echovirus, coxsackie viruses)
7. Dengue virus (Dengue virus types 1-4)
8. Drug rash (Penicillins, sulfonamide, etc.)
9. Infectious mononucleosis (Epstein-Barr virus)
10. Measles (Paramyxovirus Measles virus)
“If I send you a picture of the rash can you tell me if it is measles?”

Which ones prompt public health action?
• All of them, there is no way to visually differentiate
  • Need to perform testing to rule-in or rule-out
What is causing this rash?

Photo sources: CDC and WebMD
Measles (Rubeola, Hard Measles, Red Measles)

Extremely contagious
- Infectious Period: 4 day before through 4 days after rash onset
- 90% of non-immune after exposed infectious person will get ill
- Virus hangs in air for as long as 2 hours

Progression of symptoms:
- Incubation period: up 7-21 days (average 14 days)
- Begins with: high fever and the 3-C’s (cough, coryza & conjunctivitis)
- 2-3 days later: tiny white spots (Koplik spots) in the mouth
- 3-5 days later: rash (flat red spots) usually starts on the face (at hairline) and spread down to neck, trunk, arms, legs and feet
  - When rash appears fever may spike to more than 104 F
  - Rash may become confluent as it spreads across body
What is causing this rash?

Photo sources: American Heart Association
Kawasaki Disease

- Acute febrile illness
- Unknown cause
- Primarily impacts children <5yrs, in Asia
- Clinical signs: fever, rash, swelling of the hands and feet, irritation and redness of the whites of the eyes, swollen lymph glands in the neck, and irritation and inflammation of the mouth, lips, and throat
- Leading cause of acquired heart disease in the US. Serious complications include coronary artery dilatations and aneurysms.
- The standard treatment, intravenous immunoglobulin and aspirin, substantially decreases the development of these coronary artery abnormalities.

Photo sources: American Heart Association
What is causing this rash?

Photo sources: https://www.skinsight.com/skin-conditions/infant/roseola-sixth-disease
Roseola infantum

- Caused by two common strains of herpes virus
- Extremely common:
  - Most children infected by kindergarten
  - Most common between 6 and 15 months of age (maternal antibodies protective until about 6 months of age)
  - 95% of cases in children <3 years

- Mild illness, typically resolves on own
  - 3-5 days of high fever (on average 103F), when fever breaks the rash begins all over body
  - Small slightly raised pink bumps – begin on chest and spread to face, arms, legs
What is causing this rash?

Photo sources: CDC
Rubella  
(German Measles, 3-day measles)

Eliminated from US in 2014, but frequently imported cases  
◦ Vaccination started in 1969  
◦ Today, less than 10 imported cases each year

25-50% of infected people are asymptomatic, in others other usually mild  
◦ Red rash typically first sign: face and then spreads- usually lasts 3 days. Other symptoms:  
   a low-grade fever, headache, mild pink eye (redness or swelling of the white of the eye),  
   general discomfort, swollen and enlarged lymph nodes, cough, runny nose

Unvaccinated pregnant women infected during pregnancy may miscarry, fetal or perinatal death, or have serious birth defects (more common if infected in 1st trimester): heart problems, loss of hearing and eyesight, intellectual disability, and liver or spleen damage.

Because MMR vaccine is an attenuated (weakened) live virus vaccine, pregnant women who are not vaccinated should wait to get MMR vaccine until after they have given birth.
What is causing this rash?

Photo Source: https://www.atsu.edu/faculty/chamberlain/scarletfever.htm
Scarlet Fever

Symptoms: very red, sore throat; fever (101° F or above); red rash with a sandpaper feel; Bright red skin in underarm, elbow, and groin creases; whitish coating on the tongue; "strawberry" (red and bumpy) tongue; Headache or body aches; Nausea, vomiting, or abdominal pain; Swollen glands

Complications:
- Rheumatic fever (an inflammatory disease affecting heart, joints, skin, and brain)
- Kidney disease (inflammation = post-streptococcal glomerulonephritis)
- Otitis media (ear infections)
- Skin infections
- Abscesses (pockets of pus) of the throat
- Pneumonia (lung infection)
- Arthritis (joint inflammation)
What is causing this rash?

Photo Sources: http://www.healthtipsandguides.net/itchy-rash.htm
Fifth Disease - Parvovirus B19

More common in children than adults
First symptoms mild: fever, runny nose, headache
Rash develops on face and body
Several days, red rash on face “slapped cheek”
May get second rash (few days later) on chest, back, buttocks, or arms and legs
  ▪ May be itchy with varying intensity, usually resolves after 7-10 days
  ▪ Looks lacy as starts to go away
May have painful or swollen joints: 1-3 weeks (usually resolves)
Pregnant women who are not immune usually have mild illness
  ▪ Their babies usually do not have any problems
  ▪ In less than 5%, baby will develop severe anemia
  ▪ Miscarriage
  ▪ More common with infections in the first half of pregnancy
What is causing this rash?

Photo Source: https://painepodcast.com/2016/04/24/12-approach-to-sore-throat-in-children/
Drug Reaction Rash

The type of rash depends on the medicine and the body’s response. Medicines have been linked to every type of rash, ranging from mild to life-threatening reactions.

The timing of rash onset of a drug reaction rash can also vary from an immediate reaction up to many weeks after taking the medicine.
What is causing this rash?
Enterovirus
(Coxsackievirus, Hand Food & Mouth)

Enterovirus group includes, polioviruses, coxsackieviruses, echoviruses and enteroviruses; viruses can be found in nose and throat secretions, blister fluid, stool.

Generally, infants and children under five years old are affected.

Spread through close personal contact, coughing or sneezing, contact with stool and contact with contaminated objects and surfaces.

Common symptoms of hand, foot and mouth disease include: fever, sore throat, malaise, painful rash with blisters and ulcers in the mouth or on the skin (one to two days after fever onset)

An infected person is most contagious during the first week of illness, but people can be contagious for days or weeks after symptoms resolve. Some infected people don’t develop symptoms but are still infectious.
What is causing this rash?

Dengue Virus

Dengue fever is a disease caused by one of four related viruses.

Transmitted by mosquitoes.

Symptoms begin 4-7 days (3-14 days) after exposure, last 3-10 days, and include:
  ◦ High fever
  ◦ Severe headache and pain behind eyes
  ◦ Joint, muscle, and bone pain
  ◦ Rash
  ◦ Mild bleeding (nose or gum bleeds, easy bruising)

A mosquito must feed on an infected person during a five day period when large amounts of the virus are in their bloodstream (usually before the person is symptomatic). An additional 8-12 days incubation in mosquito before it can transmit to another human.
What is causing this rash?
Infectious mononucleosis
(Epstein-Barr virus)

9 of 10 adults have antibodies indicating current or past infection
- Children usually do not have symptoms or they are not distinguishable from other mild illnesses
- Teens and adults usually get symptoms, resolve in 2-4 weeks

Symptoms: Fatigue, fever, inflamed throat, swollen lymph nodes in the neck, enlarged spleen, swollen liver, rash

Virus goes latent and can re activate
- Persons with weakened immune systems are more likely to develop symptoms if EBV reactivates
6 Historical Causes of Childhood Rash

First disease: Rubella
Second disease: Measles
Third disease: Scarlet fever
Fourth disease: Chickenpox
Fifth disease: Erythema Infectiosum (Parvovirus B19)
Sixth disease: Roseola infantum
Questions...
Shingles and Chickenpox

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Protecting and Improving the Health of Iowans
The chick (enpox) comes first...

Varicella (Chickenpox) is an acute infectious disease caused by varicella-zoster virus

- Herpesvirus group
- After acute infection, the virus stays in the sensory nerve ganglia as a latent infection

Primary infection = varicella (chickenpox)
Reactivation of a latent infection = herpes zoster (shingles)

Incubation period: 14-16 days
Course of illness in unvaccinated:
- Mild prodrome of fever and malaise
- 1-2 days later itchy rash that progresses from macules to papules to vesicles to crusts
- Appears first on head, chest, and back then spreads to rest of body
- Fever of up to 102F for 2-3 days

Infants, adults and immunocompromised higher incidence of for severe disease/complications
Recovery usually provides immunity for life (second occurrence in immunocompromised very rare)
Chickenpox Illness

Varicella in vaccinated persons (breakthrough):
- Wild-type virus infection more than 42 days after vaccination
- Usually mild, typically afebrile and fewer than 50 lesions (maculopapular rather than vesicular)
- 25%-30% of vaccinated (1 dose) have full course of disease

Complications:
- Bacterial infections of skin and soft tissue most common in kids
- Pneumonia most common in adults
- More severe: cerebellar ataxia, encephalitis, viral pneumonia, hemorrhagic conditions, septicemia, toxic shock syndrome, necrotizing fasciitis, osteomyelitis, bacterial pneumonia, and septic arthritis
Congenital varicella infection

Primary maternal varicella infection in the first 20 weeks of gestation can rarely cause abnormalities in the newborn (<2%), including:

- low birth weight,
- hypoplasia of an extremity,
- skin scarring,
- localized muscular atrophy,
- encephalitis,
- cortical atrophy,
- chorioretinitis, and
- microcephaly
Chickenpox transmission

Infectious period: 1-2 days prior to rash until lesions crusted

Highly contagious:
- Through direct contact, inhalation of aerosols from vesicular fluid respiratory secretions
- 90% of susceptible close contacts will get disease
- People with breakthrough varicella are contagious

Less contagious than measles but more contagious than mumps and rubella

Study findings:
- Mild breakthrough varicella (< 50 lesions) were 1/3 as contagious as unvaccinated persons breakthrough
- Varicella with 50 or more lesions were equally contagious as unvaccinated persons
Chickenpox Vaccine

Before the vaccine was available:
- ~ 4 million people got chickenpox each year in the United States,
- > 10,500 of those people were hospitalized, and
- about 100-150 people died.

Two doses of the vaccine are about 90% effective at preventing chickenpox, 84% fewer hospitalizations, fewer than 20 deaths

Can get a few blisters and little or no fever
- Rare to spread, only 8 documented cases of spread

Healthcare personnel who develop varicella-like rash after getting vaccinated should stay away from people who do not have evidence of immunity and who are at risk for severe varicella.
- They should wait until all lesions resolve (crusted over).
- If they develop lesions that do not crust (macules and papules only), they should wait until no new lesions appear within a 24 hour period.
Chickenpox Outbreaks are Reportable

Strategies for the Control and Investigation of Varicella Outbreaks 2008

Adriana S Lopez, MHS and Mona Marin, MD

National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention
Shingles (Herpes zoster)

Reactivation of a latent infection = herpes zoster (shingles)

1 of every 3 people in the US will get shingles
- 1 million cases each year in the US
- Anyone who has recovered from chickenpox can get shingles (even children)
- Risk increases as you get older
- ½ of all cases occur in persons ≥60yrs
- ½ of people living until age 85 years will develop shingles

Usually only have once in your life, but some people have more 2-3 episodes
Symptoms of Shingles

Painful rash on usually on one side of face or torso
- Rash forms blisters that scab over in 7-10 days, usually clear up within 2-4 weeks
- From 1-5 days prior to rash onset, painful itching or tingling where the rash will develop

Most common, rash occurs in a single stripe around the left or right side
- In other cases, can occur on one side of face
- Rash may be widespread and look like chickenpox in immunosuppressed
- Can affect the eye and cause vision loss

Other symptoms
- Fever, headache, chills, upset stomach
Shingles Complications

Post-herpetic neuralgia – severe pain in areas where they had rash (even rash is gone)

- Pain may be severe and debilitating
- May lasts weeks or months – or even years in some
- More common in older patients- rare in <40 years and up to 1/3 of patients >60 years

Can also be complications of eye, pneumonia, hearing problems, blindness, encephalitis or death
Virus Transmission

Shingles can not be passed between people, but varicella zoster virus can be!

- Someone with shingles can cause chickenpox in someone else

Virus spread through direct contact with fluid from rash blisters (not infectious until blisters are formed)
- Infectious until rash has crusts and blisters are gone

**Recommendations:**

Keep the rash covered.
- Shingles are less contagious than chickenpox and risk is low as long as blisters are covered

Avoid touching or scratching the rash

Wash your hands often to prevent the spread of varicella zoster virus

Until rash has developed crusts, people with shingles should avoid contact with:
- pregnant women who have never had chickenpox or the chickenpox vaccine;
- premature or low birth weight infants; and
- people with weakened immune systems, such as people receiving immunosuppressive medications or undergoing chemotherapy, organ transplant recipients, and people with human immunodeficiency virus (HIV) infection.
Shingles Vaccine

Zostavax is the only vaccine approved for use in the US, given as a 1-dose shot. Used since 2006, reduced the risk of shingles by 51%, risk of post-herpetic neuralgia by 67%.

ACIP recommends for people aged 60 years and older, including:
- People who have had chickenpox (99% of Americans 40 yrs and older have had chickenpox),
- People who previously received the chickenpox vaccine, and
- People who have previously had shingles (rash should be completely gone first)

FDA approved use in people aged 50 years and older (no maximum age for getting vaccine)

People who have a weakened immune system may have to wait to get vaccinated, or should not get vaccinated at all

Vaccine has short-term efficacy – adults vaccinated at age 60 years or older, efficacy wanes within the first 5 years after vaccination
Questions?
Hepatitis: Laboratory Test Interpretation

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Topics

**Hepatitis C**
- Test types and interpretation for Hepatitis C
- Enhanced follow-up being conducted for Hepatitis C
  - Conducted by Bureau HIV, STDs, & Hepatitis
- Epidemiological Profile for Hepatitis C in Iowa

**Hepatitis B**
- Test types and interpretation for Hepatitis B
- Trends and geographic distribution of Hepatitis B cases in Iowa

**Hepatitis A**
- Test types and interpretation for Hepatitis A
- Trends and geographic distribution of Hepatitis A cases in Iowa
Hepatitis C Tests

- Screening tests for antibody to HCV (anti-HCV)
  - enzyme immunoassay (EIA)
  - enhanced chemi-luminescence immunoassay (CIA)
- Qualitative tests to detect presence or absence of virus (HCV RNA polymerase chain reaction [PCR])
- Quantitative tests to detect amount (titer) of virus (HCV RNA PCR)

https://www.cdc.gov/hepatitis/resources/professionals/training/serology/training.htm
HCV antibody

Nonreactive

No HCV antibody detected

STOP*

Reactive

HCV RNA

Not Detected

No current HCV infection

Additional testing as appropriate†

Detected

Current HCV infection

Link to care
<table>
<thead>
<tr>
<th>TEST OUTCOME</th>
<th>INTERPRETATION</th>
<th>FURTHER ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCV antibody nonreactive</td>
<td>No HCV antibody detected</td>
<td>Sample can be reported as nonreactive for HCV antibody. No further action required.</td>
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<td></td>
<td></td>
<td>If recent exposure in person tested is suspected, test for HCV RNA.*</td>
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<tr>
<td>HCV antibody reactive</td>
<td>Presumptive HCV infection</td>
<td>A repeatedly reactive result is consistent with current HCV infection, or past HCV infection that has resolved, or biologic false positivity for HCV antibody. Test for HCV RNA to identify current infection.</td>
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<td>HCV antibody reactive, HCV RNA detected</td>
<td>Current HCV infection</td>
<td>Provide person tested with appropriate counseling and link person tested to care and treatment.†</td>
</tr>
<tr>
<td>HCV antibody reactive, HCV RNA not detected</td>
<td>No current HCV infection</td>
<td>No further action required in most cases.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If distinction between true positivity and biologic false positivity for HCV antibody is desired, and if sample is repeatedly reactive in the initial test, test with another HCV antibody assay.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In certain situations,§ follow up with HCV RNA testing and appropriate counseling.</td>
</tr>
</tbody>
</table>
HCV testing is recommended for those who:

- Were born from 1945 through 1965 ("Baby Boomers") without ascertainment of risk factors;
- Currently inject drugs;
- Ever injected drugs, even once or a few times many years ago;
- Have certain medical conditions, including people:
  - Who received clotting factor concentrates produced before 1987;
  - Who were ever on long-term hemodialysis;
  - With persistently abnormal alanine aminotransferase levels (ALT); or
  - Who have HIV infection.
- Were prior recipients of transfusions or organ transplants, including people who:
  - Were notified they received blood from a donor who later tested positive for HCV infection; or
  - Received a transfusion of blood, blood components, or an organ transplant before July 1992.

HCV testing based on a recognized exposure is recommended for:

- Health care, emergency medical, and public safety workers after needle sticks, lacerations from sharps or other instruments, or mucosal exposures to HCV-positive blood; or
- Children born to HCV-positive women.

Source: Centers for Disease Control and Prevention: [http://www.cdc.gov/hepatitis/hcv/guidelinesc.htm](http://www.cdc.gov/hepatitis/hcv/guidelinesc.htm)
Hepatitis C - Case Evaluations

Bureau of HIV, STD, and Hepatitis; follow-up on individuals age 30 and younger:

- Follow-up care and referrals
- Pregnancy status
- ALT values
- Signs/symptoms (jaundice and/or acute gastroenteritis)
- Medical risk history (blood or blood products and/or organ transplant prior to 1992, clotting factor concentrates prior to 1987, and long-term hemodialysis)
- Drug risk history (ever injecting drugs)
- Sexual risk history (sexual contact with a confirmed HCV case)
- Other risk history (household (non-sexual) contact of confirmed case)
Epidemiological Profile of Hep C in Iowa

As of December 31, 2015, 21,748 Iowans diagnosed/reported with hepatitis C.
- Estimate = 35,865 to 136,900 Iowans with Hep C (15,330 to 117,174 undiagnosed).

HCV diagnoses have increased sharply in Iowa since 2000.
- Over 2,200 Iowans were diagnosed in 2015, a nearly three-fold increase since 2000.
- HCV diagnoses among those 30 years of age and younger have more than quadrupled since 2009, with 303 diagnoses in 2015.

There are disparities among persons with HCV for gender and age.
- Over 61% of persons reported with HCV were men.
- The majority (63%) of reports from those diagnosed between 45 and 64 years old.

Although race and ethnicity were not reported on nearly 70% of cases, of those reported - over 10% were black and non-Hispanic (but only 3% of Iowa population)
Over 55% of people living with HCV who were ages 18 to 64 reported residency in one of six counties: Polk, Linn, Scott, Woodbury, Pottawattamie, and Black Hawk.

In 2015, IDPH began conducting follow up on people ages 30 or under, and of those on whom data was collected, over 51% reported injection drug use.

HCV-related hospitalizations have increased significantly since 2000 in Iowa.
- The incidence of liver/bile duct cancers increased about 5.6% per year from 2000 to 2012 in Iowa.
- Approximately 25% of liver transplants in Iowa between 2000 and 2015 were HCV-related.

Between 2000-2014, 401 deaths had chronic viral hepatitis C listed as the primary cause of death; a significant increase between 2000 (n=3) and 2014 (n=40).

215 people reported being co-infected with HIV and HCV in Iowa.

Heroin/opioid-related overdoses, ER department visits, and hospitalizations increased significantly between 2008 and 2014 (Injection of opioids associated with increased risk of hepatitis C).
Counts and Rates of HCV by County of Residence in Iowa
Hepatitis B Tests

1. Hepatitis B surface antigen (HBsAg)
2. Hepatitis B surface antibody (anti-HBs)
3. Total hepatitis B core antibody (anti-HBc)
4. IgM antibody to hepatitis B core antigen (IgM anti-HBc)

www.cdc.gov/hepatitis/resources/professionals/training/serology/training.htm
Hepatitis B surface antigen (HBsAg)

A protein on the surface of hepatitis B virus; it can be detected in high levels in serum during acute or chronic hepatitis B virus infection.

- The presence of HBsAg indicates that the person is infectious.
- The body normally produces antibodies to HBsAg as part of the normal immune response to infection.

HBsAg is the antigen used to make hepatitis B vaccine.
Hepatitis B surface antibody (anti-HBs)

The presence of anti-HBs is generally interpreted as indicating recovery and immunity from hepatitis B virus infection.

Anti-HBs also develops in a person who has been successfully vaccinated against hepatitis B.
Total hepatitis B core antibody (anti-HBc)

Appears at the onset of symptoms in acute hepatitis B and persists for life.

The presence of anti-HBc indicates previous or ongoing infection with hepatitis B virus in an undefined time frame.
IgM antibody to hepatitis B core antigen (IgM anti-HBc)

Positivity indicates recent infection with hepatitis B virus (<6 mos).

Its presence indicates acute infection.
<table>
<thead>
<tr>
<th>HBsAg</th>
<th>anti-HBc</th>
<th>anti-HBs</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>negative</td>
<td>negative</td>
<td>negative</td>
<td>Susceptible</td>
</tr>
<tr>
<td>HBsAg</td>
<td>anti-HBc</td>
<td>anti-HBs</td>
<td>Immune due to natural infection</td>
</tr>
<tr>
<td>negative</td>
<td>positive</td>
<td>positive</td>
<td></td>
</tr>
<tr>
<td>HBsAg</td>
<td>anti-HBc</td>
<td>anti-HBs</td>
<td>Immune due to hepatitis B vaccination</td>
</tr>
<tr>
<td>negative</td>
<td>negative</td>
<td>positive</td>
<td></td>
</tr>
<tr>
<td>HBsAg</td>
<td>anti-HBc</td>
<td>IgM anti-HBc</td>
<td>anti-HBs</td>
</tr>
<tr>
<td>positive</td>
<td>positive</td>
<td>positive</td>
<td>negative</td>
</tr>
<tr>
<td>HBsAg</td>
<td>anti-HBc</td>
<td>IgM anti-HBc</td>
<td>anti-HBs</td>
</tr>
<tr>
<td>positive</td>
<td>positive</td>
<td>negative</td>
<td>negative</td>
</tr>
<tr>
<td>HBsAg</td>
<td>anti-HBc</td>
<td>anti-HBs</td>
<td>Interpretation unclear; four possibilities:</td>
</tr>
<tr>
<td>negative</td>
<td>positive</td>
<td>negative</td>
<td>1. Resolved infection (most common)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. False-positive anti-HBc, thus susceptible</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. “Low level” chronic infection</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. Resolving acute infection</td>
</tr>
</tbody>
</table>
Hepatitis B

Clinical information important to determine if infection is acute or chronic:
◦ What prompted testing?
◦ What were the symptoms?
◦ Were liver enzyme tests performed?

Negative test results are not reported, however often a negative result can impact the determination of acute versus chronic, so always ask if others tests were done.

If you find that labs were done but not in IDSS, please either enter the information into IDSS or fax the lab reports for CADEto enter. Please indicate on the fax cover sheet the reason for faxing them (e.g. “Additional labs for case # ______”).
Counts and Rates of HBV by County of Residence in Iowa: 2006-2016

Total HBV Rate per 100,000

- 0.0 - 13.4
- 13.5 - 33.6
- 33.7 - 66.1
- 66.2 - 118.7
- 118.8 - 199.3
Hepatitis A Tests

Hep A Total - not helpful in diagnosis acute disease

Hep A IgM - positive indicates acute disease
  - High number of false positive results, especially in older adults
  - Easiest way to sort out the false positives - results of liver enzyme tests

www.cdc.gov/hepatitis/resources/professionals/training/serology/training.htm
Hepatitis A Investigations

Important to know symptoms to assess risk of spread: highest risk = Healthcare worker (works with high risk patients), foodservice worker (can spread to many people in short period of time)

Infectious Period: 14 days prior to symptom onset to 7 days post symptom onset

Timeline for Prophylaxis: ASAP- no later than 14 days after the last exposure

Vaccine versus IG for post exposure prophylaxis:
- Vaccine: 12 months through 40 years (many state vaccinate older, and sometimes IG is not available)
- IG: <12 months and >40 years
Counts and Rates of HAV by County of Residence in Iowa: 2007-2016

Total HAV Rate per 100,000

- 0.0
- 0.1 - 7.7
- 7.8 - 12.5
- 12.6 - 24.7
- 24.8 - 50.0
Questions?
Specimen Collection

IOWA DEPARTMENT OF PUBLIC HEALTH
Protecting and Improving the Health of Iowans
Overview

1. Proper specimens, packaging, and test request forms for individual diseases
   - Measles, influenza, pertussis, respiratory outbreak, enteric outbreak, ova and parasite, exclusion testing, rabies

2. Common challenges with sample collection
Measles

Need 2 specimens:

1. Serum
   - Adults: 4 to 6 mL of blood in a red top or serum separator tube
   - Infants: 2 to 3 mL of blood in a red top or serum separator tube
   - Send on a cold pack (not frozen)

2. Throat Swab
   - Rub tonsils and posterior pharynx with Dacron-tipped plastic swab
   - Place swab in a tube with M4 viral transport medium (Virus isolation and detection kit)
   - Send on cold pack (not frozen)

Test Request Form: IDPH Epidemiological Investigation Test Request Form
Transport: SHL Courier (CDS)- next morning delivery, coordinate with Field Epidemiologist
Test of public health significance- No charge to submitter
State Hygienic Laboratory and Iowa Department of Public Health
Influenza Surveillance Testing Guidance 2017/2018

Patients must have **influenza-like illness (fever and respiratory symptoms without other apparent cause)**. Contact IDPH or SHL for guidance in the event of an ILI outbreak.

**When to submit specimens to SHL:**
- Labs performing **rapid antigen tests**: Submit specimens until one rapid A and one rapid B is confirmed by RT-PCR at SHL.*
- Labs performing **molecular tests**: May submit 2-3 positives per week to contribute to surveillance*
- **Hospitals**: Submit specimens on hospitalized patients with Influenza-Like Illness and without other apparent cause regardless of rapid antigen test results
- **ILINet Sentinel Providers**: Submit specimens on patients with ILI per IDPH guidelines

**What specimens to submit to SHL:**
- Specimen types
  - 1. Nasal swab and throat swab combined into one tube **OR** 2. Nasopharyngeal swab
  - Do not submit swabs or specimens that have been used for rapid testing
  - Must be in viral transport medium (OK to use any type of viral transport media, but not bacterial transport media)

SHL will run PCR for Influenza A and B and if positive will: Determine A subtype (H3 or 2009 H1N1 pdm) or Determine B lineage (Victoria or Yamagata)

*SHL confirmatory influenza testing serves the following purposes:
  1) Demonstrates influenza virus presence when prevalence is low and when the positive predictive value of rapid tests is low. Demonstrates regions in Iowa where influenza virus is circulating.
  2) Identification of the types and strains of influenza circulating in communities for treatment considerations and next season's vaccine. Allows for characterization of new or antigenic variant viruses and match to current vaccine.

Surveillance testing is provided at no cost and is partially supported by a grant from the Centers for Disease Control and Prevention. Thank you for your support of this program.

**NOTE:** This algorithm is subject to change based on the public health needs as the influenza season progresses.

IDPH 800-362-2736 http://kiph.iowa.gov/influenza  
SHL 319-335-4500 http://www.shl.uiowa.edu/dcd/influenza/index.xml
Influenza

Preferred specimen: Nasal swab and throat swab combined into one tube
- For lower respiratory tract infections: sputum, bronchial lavage/brush, tracheal aspirate

Do not submit swabs or specimens that have been used for rapid flu testing

Specimens should be placed in M4 viral transport media
Kit: Virus isolation and detection kit
Send on cold packs (do not freeze)
Test Request Form: Viral and Bacterial PCR and DFA
Transport: SHL Courier (CDS)- for routine delivery
Pertussis

Preferred Specimen: Nasopharyngeal Swab
Swab type: Hydra Flock or Dacron polyester NP
SHL Kit: *Bordetella pertussis*

Ship to SHL at ambient temperature

Test Request Form: Viral and Bacterial PCR and DFA Test Request Form
Transport: SHL Courier (CDS)- for routine delivery

This testing is generally charged to submitter
(contact IDPH with special circumstances)
Respiratory Outbreak

Nasal swab and throat swab combined into one tube
  ◦ Do not submit swabs or specimens that have been used for rapid flu testing

Specimens should be placed in M4 viral transport media (Virus isolation and detection kit)

Test Request Form: IDPH Epidemiological Investigation Test Request Form
  ◦ Mark “Influenza By PCR” or “Respiratory Panel” on the form, as directed by your field epidemiologist
  ◦ Mark “Disease Outbreak” as reason for no charge

Transport: SHL Courier (CDS) - for routine delivery
Enteric Outbreak

- Stool specimen using SHL Enteric Kit (orange sticker that says “enteric”)
  - Stool hats available from Field Epidemiologist

- Stool specimens are only valid for 72 hours once collected into kit
  - This becomes especially important over weekends / holidays
  - Remember to include transport time to SHL (overnight if specimen makes the courier)

- Test Request Form: IDPH Epidemiological Investigation Test Request Form
  - Most often you will mark “Enteric Pathogen Culture” and “Norovirus PCR” on the form
  - Mark “Disease Outbreak” as reason for no charge

- Transport: SHL Courier (CDS) - next morning delivery, coordinate with Field Epidemiologist
Ova and Parasite (Outbreak)

- Stool specimen using SHL Enteric Kit (green sticker that says “O&P”)
  - Stool hats available from Field Epidemiologist

- Stool specimens are valid indefinitely

- Test Request Form: IDPH Epidemiological Investigation Test Request Form
  - Mark “Other Test(s) Requested” on the form and write O+P
  - Mark “Disease Outbreak” as reason for no charge

- Transport: SHL Courier (CDS) - next morning delivery, coordinate with Field Epidemiologist
Exclusion Testing

- Testing to allow case to return to childcare / work, if necessary (see Epi Manual)

- Stool specimen using SHL Enteric Kit (orange sticker that says “enteric”)
  - Stool hats available from Field Epidemiologist

- Stool specimens are only valid for 72 hours once collected into kit
  - This becomes especially important over weekends / holidays
  - Remember to include transport time to SHL (overnight if specimen makes the courier)

- Test Request Form: IDPH Epidemiological Investigation Test Request Form
  - Mark “Enteric Pathogen Culture” on the form
  - Mark “Clearance for Childcare/School/Work” on the form and select the disease the case is being excluded for

- Transport: SHL Courier (CDS) - next morning delivery, coordinate with Field Epidemiologist
Link to specimen collection video:

https://www.youtube.com/watch?v=nt_YX_j-HXk&feature=youtu.be
Rabies

- SHL will test rabies specimens for free if there was a human exposure meeting national guidelines

- Rabies Test Request form is required (available on SHL website)
  - veterinarian or health care provider 24/7 phone number must be on the form – SHL won’t release results directly to the exposed individual

- Different packaging instructions for small animals, bats, and large animals, but in general requires double or triple bagged specimen in a hard-sided container or Styrofoam box, kept cool (see collection instructions on SHL website)
  - Small animals and bats – submit the whole animal
  - Large animals – submit the head only

- Best ways to get specimen to SHL:
  - CDS courier from nearby hospital (will not transport live bats)
  - Drive directly to SHL

- Call IDPH 24/7 with any questions regarding rabies/testing
3 Most Common Challenges with Specimen Collection and Submissions

1. Please ensure the patient initials and date of birth are on all specimen containers.

2. Discourage overfilling on enteric specimens (more is not always better).

3. Ensure that provider information is included on the test request form so they have access to results (if they are not listed on the form, they will not get results electronically, via mail, or over the phone).
Questions...
Exclusion Challenges for Patients and Public Health

IOWA DEPARTMENT OF PUBLIC HEALTH
Protecting and Improving the Health of Iowans
Enteric Pathogen Exclusion Requirements

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Food Worker</th>
<th>Healthcare Worker</th>
<th>Childcare Provider</th>
<th>Childcare Attendee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shigella</td>
<td>2 Negative</td>
<td>2 Negative</td>
<td>2 Negative</td>
<td>1 Negative</td>
</tr>
<tr>
<td>E. coli</td>
<td>2 Negative</td>
<td>2 Negative</td>
<td>2 Negative</td>
<td>2 Negative</td>
</tr>
<tr>
<td>Cholera</td>
<td>1 Negative</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Typhoid Fever</td>
<td>3 Negative</td>
<td>3 Negative</td>
<td>3 Negative</td>
<td>3 Negative</td>
</tr>
</tbody>
</table>

- Must be consecutive negatives- if get a positive the process starts over
- Exclusion can be based upon a culture or a culture-independent test (i.e., Biofire)
  - Required to send to either culture or specimen to SHL for confirmation and typing
  - Even if culture does not confirm, still enforce exclusion because PCR is considered more sensitive
Culture should be performed to lift the exclusion

Please discourage patients/providers from running the PCR to lift the exclusion because:

◦ We expect the PCR to be positive longer than culture--- PCR detects dead organism
◦ Repeat PCRs are being run in some cases, resulting in more expenses for patients and wasted resources
  ◦ *Culture at SHL is performed as a “test of public health significance” at no cost to patient*
◦ Tracking the negatives when sent to reference laboratories for PCR is fraught with difficulties and often results in delays in lifting the exclusions (negative results are not reportable)
◦ SHL will call exclusion results to expedite lifting exclusions
2017 Newly Reportable Diseases
Tularemia and Q Fever

IOWA DEPARTMENT OF PUBLIC HEALTH
Protecting and Improving the Health of Iowans
Tularemia

Rabbit hunters in Edgartown, circa 1910. Courtesy A. Bowdoin Van Riper.
Ulceroglandular - This is the most common form of tularemia and usually occurs following a tick or deer fly bite or after handling an infected animal. A skin ulcer appears at the site where the organism entered the body. The ulcer is accompanied by swelling of regional lymph glands, usually in the armpit or groin.

Glandular - Similar to ulceroglandular tularemia but without an ulcer. Also generally acquired through the bite of an infected tick or deer fly or from handling sick or dead animals.

Oculoglandular - This form occurs when the bacteria enter through the eye. This can occur when a person is butchering an infected animal and touches his or her eyes. Symptoms include irritation and inflammation of eye and swelling of lymph glands in front of the ear.

Oropharyngeal - This form results from eating or drinking contaminated food or water. Patients with oropharyngeal tularemia may have sore throat, mouth ulcers, tonsillitis, and swelling of lymph glands in the neck.

Pneumonic - This is the most serious form of tularemia. Symptoms include cough, chest pain, and difficulty breathing. This form results from breathing dusts or aerosols containing the organism. It can also occur when other forms of tularemia (e.g. ulceroglandular) are left untreated and the bacteria spread through the bloodstream to the lungs.
Tularemia

Humans can become infected through several routes, including:
- Tick and deer fly bites
- Skin contact with infected animals
- Ingestion of contaminated water
- Laboratory exposure
- Inhalation of contaminated dusts or aerosols

1-2 cases occur in Iowa yearly
- Look for a history of skinning animals, tick bites, or spending a lot of time outdoors

Recommend prophylaxis for laboratory exposures
Monthly reported cases nationwide – 2001-2015
Reported Tularemia Cases, 2004-2013

1 dot placed randomly within county of residence for each reported case
Tularemia has been reported from all states except Hawaii, but is most common in the south central United States, the Pacific Northwest, and parts of Massachusetts, including Martha’s Vineyard.
Tularemia is more common in males, possibly because of a greater likelihood of exposure through hunting and landscaping. Tularemia occurs in persons of all ages, but is most common in children.
Transmission
Most important information for follow-up

Risk factors?
- Hunter/trapper
- History of tick bite
- History of cat bite

Diagnosed from culture?
Likely laboratorians exposed

Are others ill?
Tularemia Reports so far in 2017

2 confirmed/probable cases this year in Polk and Warren Counties

- Pneumonic- only potential risk factor was owning a cat
- Glandular- known tick bite
Q Fever

Gram negative bacteria
Goats, sheep, and cattle primary reservoirs and principle sources of human infection

• Primary mode of transmission is inhalation of pathogen-contaminated aerosols from excreta, especially birth products
• 94% herd level prevalence in bulk milk tank study
• *Coxiella burnetii* infection in livestock species is generally asymptomatic.
  • Abortions, stillbirths, and early neonatal mortality have been most frequently documented in goats and sheep
  • Abortion in cattle due to *C. burnetii* infection has been reported
Q Fever Background

Also identified in a wide variety of other animals, including livestock, wildlife, and pets
• Studies have found varied prevalence in cats- 8.5% in owned cats to 41.7% in stray cats
Transmission may also occur from tick bites, and a number of tick species have been implicated
Foodborne transmission from drinking contaminated raw milk
Ubiquitous in environment, can persist in spore-like form for years
• Extremely hardy and may become airborne, travelling on wind currents for over a mile
• Exposure can occur without direct contact with infected animals- 63% of U.S. cases reported to CDC from 2000 to 2010 did not report contact with livestock
Q Fever- Acute Illness

Less than 50% have symptoms of disease
Most begin with sudden onset of one or more of the following:

- High fevers (up to 104-105° F) lasting for 1 to 2 weeks
- Severe headache
- General malaise
- Myalgia
- Confusion
- Sore throat

- Chills
- Sweats
- Non-productive cough
- Nausea
- Vomiting
- Diarrhea
- Abdominal pain
- Chest pain

Most will recover and may have lifelong immunity
- Approximately 3% of the U.S. adult general population is seropositive for *C. burnetii*
Q Fever- Chronic Illness

Less than 1% will develop chronic symptoms, such as infection of the heart valves, liver, or kidney.

Most people with chronic Q fever have underlying medical conditions that put them at higher risk:
1. Heart valve disease
2. Pregnancy
3. Immunosuppressive conditions, such as cancer, HIV/AIDS, or chronic steroid treatment.

It is recommended that anyone who is exposed to Q fever and is in one of the high risk groups be regularly monitored by their physician.
Indirect Fluorescent Antibody test (IFA) most commonly used
- 2 distinct antigenic phases detected by serology: Phase I and Phase II
  - Acute Q Fever- Phase II IgG titer is elevated higher than Phase I IgG titer
  - Chronic Q Fever- Phase I IgG titer is elevated and is typically higher than Phase II IgG titer

Treatment Acute Q fever:
- Most cases of acute Q fever will recover without antibiotic treatment.
- Those that do require treatment can be effectively treated with the antibiotic doxycycline.

Treatment Chronic Q fever:
- Chronic Q fever is a serious infection and requires several months of antibiotic treatment.
- Chronic Q fever is treated with a combination of antibiotics including doxycycline and hydroxychloroquine for several months.
Most important information for follow-up

Are other people around the infected person sick?
- There have been several Q Fever outbreaks in Iowa

If there is a likely animal exposure, get detailed information about it.
- Especially if there have been abortions or reproductive losses in the animals
Q Fever Reports so far in 2017

14 confirmed and probable cases
Questions…
CRE reporting in Iowa

Carbapenem-resistant Enterobacteriaceae – became temporarily reportable on January 1, 2017
• Will be renewed January 1, 2018 and may be expanded

Currently CRE reporting requirement in Iowa includes:
• Specifically listed: E. coli, Klebsiella spp., Enterobacter spp., and Citrobacter spp.
• Resistant to ertapenem, meropenem, imipenem, doripenem

May be expanded to include:
• All carbapenemase producing CRE: i.e., Proteus, Morganella (not just those specifically listed on the current reporting order ... E. coli, Klebsiella spp., Enterobacter spp., and Citrobacter spp)
• We are expanding because concerned that the carbapenemase can be shared between organism

Requires providers to: 1) submit report to IDPH, 2) submit isolate to SHL for additional testing
Clarification of Carbapenemase Production versus Resistance Testing

An organism does not need to produce Carbapenemase to be considered CRE, if the organism shows resistance to one of the four Carbapenems (ertapenem, meropenem, imipenem, doripenem) it is CRE.

**SHL does not verify susceptibility, they test for carbapenem production**

IDPH conduct full investigations on Carbapenemase producers
- Investigations are abbreviated with CRE that are not Carbapenemase producing- unless and outbreak or cluster is identified
- All CRE are going into IDSS
CRE reporting

92 events reported to IDPH
- Age range from 2 years to 102
- Reported in 37 counties

15 of those were identified as carbapenemase producers
- including 2 Oxa-48

2 clusters of CRE in long term care facilities have been identified
- IMP related to a long term care (7 cases), follow-up testing indicates no additional spread in facility
- Currently investigating cluster of KPC CRE in a long term care (12 cases), transmission is likely ongoing
  control measures are being implemented

Contact Nancy Wilde with questions 515-242-3892
Acute Flaccid Meyelitis

A temporary reporting order remains in place requiring reporting of patients meeting the following criteria:

1. A person with onset of acute focal limb weakness, AND
2. A magnetic resonance image showing a spinal cord lesion largely restricted to gray matter, and spanning one or more spinal segments OR
3. Cerebrospinal fluid (CSF) with pleocytosis (CSF white blood cell count >5 cells/mm³, may adjust for presence of red blood cells by subtracting 1 white blood cell for every 500 red blood cells present.

These reports would likely come from infectious disease physicians or neurologist

There has been 1 report, testing at CDC is ongoing
Questions…
Emerging Tick Illnesses: Powassan, Heartland and Bourbon Viruses

IOWA DEPARTMENT OF PUBLIC HEALTH
Protecting and Improving the Health of Iowans
In the News-Summer 2017

New York Man Dies From 'Exceedingly Rare' Tick Virus Transmitted Within Minutes

Third Case of Powassan Virus Reported in Upstate New York County

Cape Cod teacher talks about partner's Powassan death

Man "lucky" to be alive after getting Powassan virus from tick bite

Two Hoosiers test positive for rare Heartland virus transmitted by tick bite

Case of tick-borne illness, Heartland virus, found in Arkansas resident

Missouri woman dies of rare tick-borne illness called 'Bourbon virus'

Protecting and Improving the Health of Iowans
Powassan Virus

- Related to West Nile, St. Louis encephalitis, and Tick-borne encephalitis viruses (flaviviruses)

- Powassan virus infections have been recognized in the US, Canada and Russia
  - In US, cases most likely to occur in the Northeast and Great Lakes regions
Symptoms of Powassan

- Many people are asymptomatic *(Data not available to determine %)*
- Incubation period ranges from 1 week to 1 month
- Inflammation of the brain, fever, headache, vomiting, weakness, confusion, loss of coordination, speech difficulties, and seizures
  - Long-term neurologic problems are possible
  - ½ of survivors have permanent neurological symptoms
  - 10% of encephalitis cases are fatal
- Supportive treatment
Powassan Virus Transmission

- Transmitted by ticks that are infected with the virus
  - Cannot be transmitted person-to-person

- Cycle maintained between ticks and small-to-medium sized rodents

- Three known tick vectors:
  - *Ixodes scapularis* (white-footed mice)- Often bite humans
  - *Ixodes cookei* (woodchucks)- Rarely bite humans
  - *Ixodes marxi* (squirrels)- Rarely bite humans

Protecting and Improving the Health of Iowans
Powassan Virus Testing

- No commercially-available tests

- Testing available at CDC
  - RT-PCR is available for acute CSF specimens or tissues, but the sensitivity is unknown.
  - IgM serological testing is available for serum or CSF. Cross-reaction with other flaviviruses can occur, Plaque Reduction Neutralization Test (PRNT) can help with confirmation
Powassan virus neuroinvasive disease cases reported by state, 2006–2015

Source: ArboNET, Arboviral Diseases Branch, Centers for Disease Control and Prevention
Powassan virus cases in 2017
(as of September 5, 2017)
Powassan virus cases in 2017
(as of September 5, 2017)

<table>
<thead>
<tr>
<th>State</th>
<th>Neuroinvasive disease cases</th>
<th>Non-neuroinvasive disease cases</th>
<th>Total cases*</th>
<th>Deaths</th>
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<tr>
<td>Maine</td>
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<td>New York</td>
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<td>North Dakota</td>
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<td>Pennsylvania</td>
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<td>0</td>
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<tr>
<td>Rhode Island</td>
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<td><strong>Totals</strong></td>
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<td><strong>2</strong></td>
<td><strong>19</strong></td>
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*Includes confirmed and probable cases.
### Powassan virus cases, 2006-2015

<table>
<thead>
<tr>
<th>Year</th>
<th>Neuroinvasive disease</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Total</th>
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<tbody>
<tr>
<td></td>
<td>Cases</td>
<td>Deaths</td>
<td>%</td>
<td>Cases</td>
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<td>Deaths</td>
<td>%</td>
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<td>0</td>
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<tr>
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<td>0</td>
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<td>0</td>
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<tr>
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<tr>
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<td>8</td>
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<tr>
<td>2015</td>
<td>6</td>
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<td></td>
<td>1</td>
<td>0 (0)</td>
<td>7</td>
<td>1 (14)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>68</strong></td>
<td><strong>8 (12)</strong></td>
<td></td>
<td><strong>9</strong></td>
<td><strong>0 (0)</strong></td>
<td><strong>77</strong></td>
<td><strong>8 (10)</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: ArboNET, Arboviral Diseases Branch, Centers for Disease Control and Prevention
What is Heartland Virus?

- A viral infection believed to be spread to humans by ticks
- Recent studies have shown the Lone Star tick can transmit the virus
  - It is unknown if other species of ticks might also transmit the virus
- Cases have been reported in the Midwest and southern states
Symptoms of Heartland Virus

- Fever, headache, fatigue, decreased appetite, nausea, diarrhea, and muscle or joint aches
  - Can also see low white blood cell and platelet counts
  - Sometimes patients have increased levels of liver enzymes
- No treatments available for the virus, but supportive treatment can relieve problems associated with infection.
- Almost all patients with the virus have been hospitalized. A few patients have died
- Incubation period is not known but most patients have reported a tick bite in the 2 weeks before they became sick
- Most people have become sick May-September
Heartland virus cases
As of July 2017, more than 30 cases of Heartland virus disease in US
What is Bourbon Virus?

- Do not fully know how people become infected
  - Likely spread through tick or other insect bites

- A limited number of cases have been identified
  - Cases in Midwest and southern states.
  - Do not know if the virus might be found in other areas of the US
Symptoms of Bourbon Virus

- Signs and symptoms can include: fever, fatigue, headache, anorexia, nausea, vomiting, and rash
- Patients also had low white blood cell and platelet counts
- Deaths during acute illness have been reported
- Symptomatic treatment is only option available
Heartland and Bourbon Virus Testing

- No commercially available testing
- Testing available at CDC as part of a research protocol
- Tests are experimental, patient consent is required
Heartland and Bourbon Virus Testing

- Current inclusion criteria to participate include:
  - Aged ≥ 12 years
  - Fever (≥ 38 degrees C or 100.4 degrees F)
  - Leukopenia (WBC < 4,500 cells/µL)
  - Thrombocytopenia (PLT < 150,000 cells/mL)
  - Recent illness onset with an acute specimen obtained within four weeks of illness onset
  - No other non-infectious condition that could explain their current symptoms
  - Provide a convalescent serum sample 3-6 weeks after the acute sample was obtained
Heartland and Bourbon Virus Testing

- RT-PCR assays for Heartland and Bourbon viruses
- IgM and IgG testing for Heartland virus
- Confirmatory neutralizing antibody tests against Heartland and Bourbon viruses
Powassan, Heartland and Bourbon Virus Testing

Please call us Center for Acute Disease Epidemiology to start the submission process to CDC

515-242-5935 or 1-800-362-2736
How to Prevent Tick-borne Illness

- Avoid contact with ticks and their habitats (wooded, bushy areas)
- Use an insect repellent containing DEET
- Wear long sleeves and pants; clothing treated with permethrin can be beneficial
- Do thorough tick checks and remove immediately
Questions?
Animal Related Diseases:

IOWA DEPARTMENT OF PUBLIC HEALTH
Protecting and Improving the Health of Iowans
Animal Related Disease Update

- Seoul Virus
- Rabies Data Analysis
- Flu in Fido and Fluffy
Hantavirus

Carried by persistently infected asymptomatic rodents
  ◦ Excreted in urine, feces, and saliva

25 antigenically distinguishable viral species
  ◦ Each associated primarily with a single rodent species
Hantavirus - 2 Syndromes

- Hemorrhagic fever with renal syndrome (HFRS): fever, lower back pain, hemorrhagic manifestations, and renal involvement
  - Hantaan, Dobrava, Puumala, Saaremaa, Seoul
  - Case fatality 5%-15%

- Hantavirus pulmonary syndrome (HPS): fever, myalgia, GI, respiratory distress
  - Andes, Laguna Negra, Juquitiba, Choclo, Black Creek Canal & Bayou, New York-1, Monongahela, Sin Nombre
  - Case fatality 35%-50%
Sin Nombre- HPS
Deer Mouse

The Deer Mouse (*Peromyscus maniculatus*)
Found throughout North America, preferring woodlands, but also appearing in desert areas.
Cases of HPS have been reported in 35 states

More than 96% of cases occurred in states west of the Mississippi River

- Caucasians account - 78%
  - American Indians – 18%
  - African Americans – 1%
  - Asians – 1%

Of cases with known ethnicity, 19% of HPS cases reported among Hispanics
Prevention

Eliminate or minimize contact with rodents at home or in the workplace
Seal up holes and gaps in home or garage
Place traps to decrease rodent infestation
Clean up food that is easily accessible
Follow good hand hygiene practices
Utilize proper personal protective equipment if cleaning up rodent environments
Proper waste disposal
Follow proper cleaning methods
Seoul Virus – HFRS
Norway & Black Rat

Natural host is the Norway rat (*Rattus norvegicus*) and the black rat (*Rattus rattus*)

Virus has been found in both pet rats and wild rat populations around the world

Asymptomatic, persistently infected (shed for life)

Rats spread to other rats through wounding or biting and by contact with the urine and feces of infected rats
Human Illness- Seoul Virus

Often mild or no symptoms

Some HFRS, 1-2% mortality rate (1-2 of every 100 people infected)

Incubation period: 1-2 weeks, rarely up to 8 weeks

Recovery can take weeks / months

Common symptoms: Fever, Headache, Back and abdominal pain, Chills, Nausea, Blurred vision, Flushed face, Red or inflamed eyes, Rash
Transmission to Humans

Contact with urine, droppings, or saliva of infected rodents—
- aerosolization,
- virus gets directly into a cut or other broken skin or into your eyes, nose, or mouth, or
- bites from infected animals.

Seoul virus is not known to be spread from person to person.
Multi-state Outbreak of Seoul Virus

Number of laboratory-confirmed recent human cases of Seoul virus
- 17 people in 7 states

Individuals exposed to infected rats in several rat-breeding facilities

CDC – Trace-out investigations to identify clients who purchased rats from, or were exposed to, home rat-breeding facilities

Potentially infected rodents may have been distributed or received in Colorado, Delaware, Georgia, Illinois, Idaho, Iowa, Minnesota, Missouri, New Jersey, Pennsylvania, South Carolina, Tennessee, Utah, and Wisconsin

Canadian health authorities are investigating Seoul-infected facilities with epidemiological links to U.S. rat facilities

As of March 14, 2017, investigation is ongoing
Historic Rabies Data –
prepared by DVM/MPH student Leah Riley
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prepared by DVM/MPH student Leah Riley

Number of Rabies Positive Animals by Species 2007-2016

- Dog
- Fox
- Feline
- Skunk
- Bat
- Squirrel
- Bovine
- Horse

Yearly distribution of rabies positives from 2007 to 2016.
Historic Rabies Data –
prepared by DVM/MPH student Leah Riley
Rabies Cases by Month, 2007-2016

Canine:  
- January: 0
- February: 1
- March: 1
- April: 2
- May: 3
- June: 4
- July: 5
- August: 50
- September: 20
- October: 10
- November: 5
- December: 3

Feline:  
- January: 0
- February: 1
- March: 1
- April: 2
- May: 3
- June: 4
- July: 5
- August: 5
- September: 10
- October: 20
- November: 30
- December: 40

Skunk:  
- January: 0
- February: 1
- March: 1
- April: 2
- May: 3
- June: 4
- July: 5
- August: 5
- September: 10
- October: 20
- November: 30
- December: 40

Bat:  
- January: 0
- February: 1
- March: 1
- April: 2
- May: 3
- June: 4
- July: 5
- August: 5
- September: 10
- October: 20
- November: 30
- December: 40

Bovine:  
- January: 0
- February: 1
- March: 1
- April: 2
- May: 3
- June: 4
- July: 5
- August: 5
- September: 10
- October: 20
- November: 30
- December: 40

Equine:  
- January: 0
- February: 1
- March: 1
- April: 2
- May: 3
- June: 4
- July: 5
- August: 5
- September: 10
- October: 20
- November: 30
- December: 40

Fox:  
- January: 0
- February: 1
- March: 1
- April: 2
- May: 3
- June: 4
- July: 5
- August: 5
- September: 10
- October: 20
- November: 30
- December: 40

Squirrel:  
- January: 0
- February: 1
- March: 1
- April: 2
- May: 3
- June: 4
- July: 5
- August: 5
- September: 10
- October: 20
- November: 30
- December: 40
Skunks & Bats
Canine Influenza

2 different influenza A viruses: H3N8 and H3N2

- H3N8 – originated in horses and spread to dogs (1st observed canine infections in 2004 in greyhounds)
- H3N2 - avian strain that adapted to dogs, different than season strain infecting humans (1st observed in dogs in South Korea in 2007, found in US for first time in April 2015).

No human canine influenza infections have ever been reported

Illness is dogs: cough, runny nose, fever, lethargy, eye discharge, and reduced appetite
- Illness ranges from asymptomatic to severe
- Most dogs recover in 2 to 3 weeks

Canine vaccine is available and covers both strains
Avian Influenza (H7N2) in cats

Outbreak of H7N2 in cats at an animal shelter in NYC last December

- One associated human illness in a person with close, prolonged unprotected exposure to secretions from sick cats
  - Mild illness in the human, no person-to-person spread

Cats can be infected with influenza (including Avian strains)

- This was a low pathogenic avian influenza virus
- Over 40 infected cats identified
- All 40 were symptomatic with respiratory illness: lethargy, anorexia, nasal discharge, ocular discharge, and sneezing (mild to moderate illness and 1 with severe pneumonia)
Questions…

Protecting and Improving the Health of Iowans