

VARICELLA-ZOSTER INFECTIONS

(Chickenpox and Herpes Zoster [Shingles])

REPORTING INFORMATION

- **Class B:** Report by the end of the next business day after the case or suspected case presents and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report to the local public health department in which the reporting health care provider or laboratory is located.
- Reporting Form(s) and/or Mechanism: [Ohio Confidential Reportable Disease form](#) (HEA 3334, rev. 1/09), [Positive Laboratory Findings for Reportable Disease form](#) (HEA 3333, rev. 8/05), the local health department via the Ohio Disease Reporting System (ODRS), or telephone.

AGENT

Varicella-zoster virus (VZV), a member of the herpesvirus group.

CASE DEFINITION (Chickenpox)

Clinical Case Definition

An illness with acute onset of diffuse (generalized) papulovesicular rash without other apparent cause.

Laboratory Criteria for Diagnosis

- Isolation of varicella virus from a clinical specimen (vesicular fluid is best) *or*
- Direct fluorescent antibody (DFA) *or*
- Polymerase chain reaction (PCR) *or*
- Significant rise in serum varicella immunoglobulin G (IgG) antibody level by any standard serologic assay.

Case Classification

Probable: A case that meets the clinical case definition, is not laboratory confirmed and is not epidemiologically linked to another probable or confirmed case.

Confirmed: A case that meets the clinical case definition and is laboratory confirmed or is epidemiologically linked to a confirmed or probable case.

Not a Case: This status will not generally be used when reporting a case, but may be used to reclassify a report if investigation revealed that it was not a case.

Comments

Two probable cases that are epidemiologically linked are considered confirmed, even in the absence of laboratory confirmation.

An outbreak of varicella is defined as the occurrence of five or more cases in a specific setting (e.g. school) that are epidemiologically linked. Cases should be considered part of an outbreak if they occur within at least one incubation period (21 days) of the previous case-patient, and surveillance should continue through two full incubation periods (42 days) after the rash onset of the last identified case-patient to ensure that the outbreak has ended.

A cluster is defined as three to four cases. Clusters should also be reported and investigated in the same manner as an outbreak.

In vaccinated persons who develop varicella >42 days after vaccination

(breakthrough disease), the disease is almost always mild with <50 skin lesions and shorter duration of illness. The rash may also be atypical in appearance (maculopapular with few or no vesicles).

Vaccinated persons who develop varicella within 7-42 days after vaccination are marked as not a case. This is due to not knowing if the illness is due to wild-type or vaccine-type virus.

Laboratory confirmation of cases of varicella is not routinely recommended. However, laboratory confirmation is recommended for at least one case in outbreak settings, for fatal cases and in other special circumstances.

Evidence of immunity to varicella: Cases born in the United States before 1980 should be considered immune unless there is a note stating that the case was diagnosed by a physician as varicella (and not as shingles).

Note: For healthcare workers and pregnant women, birth before 1980 should not be considered evidence of immunity.

SIGNS AND SYMPTOMS

Primary infection with VZV results in chickenpox (varicella). Chickenpox infection may result in mild, atypical or inapparent disease. In general, the disease causes a skin eruption which first appears maculopapular for a few hours and then becomes vesicular for 3-4 days and leaves a granular scar. Lesions are pruritic and tend to be more abundant on covered areas of the body. Lesions may also be seen on mucous membranes. A fever (up to 102°) and malaise are also typical of chickenpox and adults may also experience headache and anorexia. Complications include infection of the skin lesions, pneumonia, arthritis, aseptic meningitis, thrombocytopenia, encephalitis and Reye syndrome.

VZV persists in a latent form after the primary infection. Reactivation results in zoster (shingles), which is a local manifestation of recurrent, recrudescence or reactivated infection. Grouped vesicular lesions appear in the distribution of one to three sensory dermatomes, sometimes accompanied by pain localized to the area. Systemic symptoms are few. Zoster occasionally may become generalized in immunocompromised patients, with lesions appearing outside the dermatomes and with visceral complications.

DIAGNOSIS

The virus may be isolated from fresh nonpurulent vesicular lesions during the first 3-4 days of the exanthematous illness. Herpesvirus particles can generally be seen by direct electron microscopic examination.

Culture

Can be performed on vesicular fluid or biopsy specimens from sterile sites (e.g., CSF, joint fluid). VZV culture is less sensitive than PCR and can take several days to obtain a result.

Rapid varicella zoster virus identification

Because viral DNA persists after cessation of viral replication or after viral death, DFA or PCR may be positive when viral cultures are negative. PCR is the method of choice for clinical diagnosis. Submit vesicular swabs or scrapings, scrapings from maculopapular lesions, scabs from crusted lesions, or biopsy tissue for testing.

Serology

The complement fixation test (CF) is best to determine diagnostic rises in titer. A four-fold or greater rise between acute and convalescent sera denotes a recent infection. Enzyme-Linked Immunosorbent Assay (EIA) is best for assessing immune status. One serologic specimen is adequate. Routine testing for varicella immunity following vaccination is not recommended.

For general testing, specimens may be sent to the usual laboratory used by the physician or facility.

If you want to submit a specimen associated with an outbreak to the Ohio Department of Health Laboratory for testing at the Vaccine-Preventable Disease (VPD) reference laboratory, please notify the ODH VPD Epidemiology Program at (614) 995-5599 before shipping the specimen. To submit a specimen for PCR testing, complete the Ohio Department of Health Laboratory Microbiology Specimen Submission Form found at: <http://www.odh.ohio.gov/pdf/IDCM/frm2530.pdf> and the Wisconsin (WI) VPD Submission Form found at: <http://www.odh.ohio.gov/pdf/idcm/frmwivpd.pdf>

EPIDEMIOLOGY

Source

Humans are the only source of infection.

Occurrence

Worldwide, most cases of chickenpox occur in children 5-10 years of age. Chickenpox is seen most often during the late winter and early spring. The vast majority of people contract the disease during childhood. Cases in adults are often severe.

Zoster occurs mainly in older adults although there is some evidence that almost 10% of children being treated for a malignant neoplasm are prone to develop zoster. Intrauterine infection with VZV or chickenpox infection acquired before two years of age is also associated with zoster at an early age. Zoster is not seasonal.

Mode of Transmission

Transmission may be either direct or indirect. Persons with chickenpox spread the disease to others via direct contact with the drainage from lesions, droplets or airborne respiratory tract secretions. Vesicle fluid of patients with zoster is infectious. Indirect transmission occurs through articles freshly soiled with discharge from vesicles and mucous membranes of infected persons. Scabs of chickenpox lesions are not infective.

While chickenpox is highly infective, patients with zoster have a much lower rate of transmission. Susceptible contacts of either develop chickenpox. Introduction of a case of VZV into a household generally results in infection for almost all susceptible persons.

Period of Communicability (chickenpox)

One or 2 days (maximum of 5 days) prior to rash onset through a maximum of 6 days after the first appearance of vesicles, or until lesions have formed crusts and dried. Immunocompromised patients with progressive chickenpox probably are contagious during the entire period that new lesions are appearing. Breakthrough

cases often do not develop vesicles or have crusting and are considered contagious as long as new lesions are appearing.

Incubation Period

Incubation is generally 14-16 days, with a range of 11-21 days. The incubation period may be prolonged in Varicella Zoster Immune Globulin (VZIG) recipients and tends to be shortened in immunocompromised persons.

PUBLIC HEALTH MANAGEMENT

Case

Treatment

Symptomatic. Aspirin or aspirin-containing products should not be used to treat infants, children or teenagers with chickenpox, because of the increased risk for developing Reye syndrome.

The American Academy of Pediatrics (AAP) recommends that certain groups at increased risk for moderate to severe varicella be considered for oral acyclovir treatment. These high risk groups include the following:

- Healthy, persons older than 12 years of age
- Persons with chronic cutaneous or pulmonary disorders
- Persons receiving long-term salicylate therapy
- Persons receiving short, intermittent, or aerosolized courses of corticosteroids.

Some healthcare providers may elect to use oral acyclovir for secondary cases within a household. For maximum benefit, oral acyclovir therapy should be given within the first 24 hours after the varicella rash starts. Oral acyclovir therapy is not recommended by the Advisory Committee on Immunization Practices (ACIP) or AAP for use in otherwise healthy children experiencing typical varicella without complications.

Acyclovir is a category B drug based on US Food and Drug Administration (FDA) Drug Risk Classification in pregnancy. Some experts recommend oral acyclovir or valacyclovir for pregnant women with varicella, especially during the second and third trimesters. Intravenous acyclovir is recommended for the pregnant patient with serious complications of varicella.

Isolation

The Ohio Administrative Code (OAC 3701-3-13, (C)) states that "a person with chickenpox shall be isolated, including exclusion from school, child care center, and public places until the sixth day after onset of rash, or until all lesions are dry. Contagiousness may be prolonged in patients with altered immunity. Persons with chickenpox shall avoid contact with susceptible persons."

Notification of an outbreak of varicella and increasing awareness in the affected setting or community is an important step for controlling the outbreak. For outbreaks in school settings, all parents of children attending day care centers or schools where an outbreak occurs should be sent a letter that notifies them about the outbreak and provides recommendations on intervention measures. In the letter, parents of children without evidence of varicella immunity should be advised to have their child vaccinated with the appropriate dose or, if vaccination is contraindicated or refused, exclude the child from school up to 21 days after the last case is identified. Active identification of persons with immunocompromising conditions who do not have evidence of immunity to varicella is also recommended so that appropriate control measures can be implemented. For more information on varicella outbreaks, please visit:

<http://www.cdc.gov/chickenpox/outbreaks/manual.html>.

Depending on the setting, isolation of persons with active disease consists of excluding, furloughing, or grouping together (cohorting) persons who are ill and are likely to transmit varicella until their rash has crusted over. Vaccinated persons with varicella may develop lesions that do not crust (macules and papules only). Isolation guidance for these persons is to exclude until no new lesions appear within a 24-hour period.

School settings: Immunocompetent persons with herpes zoster can remain at school as long as the lesions can be completely covered. Persons with herpes zoster should be careful about personal hygiene, wash their hands after touching their lesions and also avoid close contact with others. If the lesions cannot be completely covered and close contact avoided, children and staff should be excluded from the school setting until lesions have crusted over. If a person has disseminated herpes zoster, he or she should be excluded from school until lesions have crusted over (similar to the management of varicella case-patients).

Residential institutions and healthcare settings: For immunocompetent residents or patients with localized herpes zoster, lesions should be completely covered and contact precautions should be followed. For immunocompromised persons with herpes zoster or persons with disseminated herpes zoster, the management is similar to that of varicella case-patients. For healthcare personnel who develop herpes zoster, lesions should be completely covered with a taped dressing and, in addition to standard contact precautions, the healthcare worker should be removed from direct care of patients at high risk of severe complications from varicella. A healthcare worker with disseminated herpes zoster should be excluded from work until lesions have crusted over.

Contacts

Persons without evidence of immunity to varicella and who do not have a contraindication to vaccination should be vaccinated. Studies conducted among children showed that vaccine administered within 3 days of exposure to rash is most effective in preventing disease ($\geq 90\%$); however, vaccine administered within 5 days of exposure to rash is about 70% effective in preventing disease and 100% effective in modifying disease. In a varicella outbreak setting, ongoing exposures are likely and may continue for weeks and even months. Thus, to limit disease transmission during an outbreak and to provide protection against subsequent exposures, ACIP recommends that all persons without evidence of immunity to varicella be offered vaccine even if more than 5 days have passed since first exposure to the disease.

For people exposed to varicella or herpes zoster who cannot receive varicella vaccine, varicella zoster immune globulin can prevent varicella from developing or lessen the severity of the disease. It is only recommended for people who cannot receive the vaccine and 1) who lack [evidence of immunity to varicella](#), 2) whose exposure is likely to result in infection, and 3) who are at high risk for severe varicella. Persons at high risk of severe varicella include the following:

- Immunocompromised patients without evidence of immunity to varicella such as
 - Children with leukemia or lymphoma who have not been vaccinated;
 - People on medications that suppress the immune system, such as high-dose systemic steroids or chemotherapeutic agents;
 - People with cellular immune-deficiencies or other immune system problems.
- Newborns whose mothers have varicella from 5 days before to 2 days after delivery
- Premature exposed babies exposed to varicella or herpes zoster, specifically

- Hospitalized premature infants born at ≥ 28 weeks of gestation whose mothers do not have evidence of immunity;
- Hospitalized premature infants born at < 28 weeks of gestation or who weigh $\leq 1,000$ grams at birth regardless of their mothers' varicella immunity status
- Pregnant women without evidence of immunity to varicella.

The varicella zoster immune globulin product licensed for use in the United States is VariZIG™. VariZIG should be given as soon as possible after exposure to varicella-zoster virus (VZV) and within 10 days of exposure. For more information, see the *Morbidity and Mortality Weekly Report* article on [Updated Recommendations for Use of VariZIG – United States, 2013.](#)

Prevention and Control

A live attenuated varicella vaccine was licensed in the United States in 1995. Studies show that one dose of varicella vaccine is 85% effective and that two doses will provide additional protection (88 to 98% vaccine effectiveness).

Ohio School Requirement: Two doses of Varicella vaccine are required for school entry starting with the 2010-2011 school year.

Present control measures are limited to vaccination as described above and isolation of cases from neonates, pregnant women and immunocompromised individuals. Drainage from lesions is infectious and should be covered by a dressing or clothing. Hand washing by those caring for patients or touching lesions should be emphasized.

Management of Patients with Varicella

Patients with varicella should be cared for by staff with evidence of immunity to varicella. In addition, the management of patients with varicella in the healthcare setting includes following standard precautions plus airborne precautions (negative air-flow rooms) and contact precautions until lesions are dry and crusted. If negative air-flow rooms are not available, patients with varicella should be isolated in closed rooms with no contact with persons without evidence of immunity.

Management of Patients with Zoster

Patients with zoster should be cared for by staff with evidence of immunity to varicella. Infection control measures depend on whether the patient with herpes zoster is immunocompetent or immunocompromised and on whether the rash is localized or disseminated. In all cases, standard infection control precautions should be followed.

If the patient is immunocompetent with

- Localized herpes zoster, then standard precautions should be followed and lesions should be completely covered.
- Disseminated herpes zoster (defined as appearance of lesions outside the primary or adjacent dermatomes), then standard precautions plus airborne and contact precautions should be followed until lesions are dry and crusted.

If the patient is immunocompromised with

- Localized herpes zoster, then standard precautions plus airborne and contact precautions should be followed until disseminated infection is ruled out. Then standard precautions should be followed until lesions are dry and crusted.
- Disseminated herpes zoster, then standard precautions plus airborne and contact precautions should be followed until lesions are dry and crusted.

Management of Healthcare Personnel

The following steps should be taken when healthcare personnel (HCP) are exposed to someone with varicella or herpes zoster:

- HCP who have received 2 doses of varicella vaccine should be monitored daily during postexposure days 8–21 for fever, skin lesions, and systemic symptoms suggestive of varicella. HCP can be monitored directly by employee health program or infection control practitioners or instructed to report fever, headache, or other constitutional symptoms and any atypical skin lesions immediately. If symptoms occur, the HCP should be immediately removed from patient care areas and receive antiviral medication. Healthcare personnel with varicella and disseminated herpes zoster should be excluded from work until all lesions have dried and crusted or, in the absence of vesicular lesions, until no new lesions have appeared for 24 hours.
- HCP who have received 1 dose of varicella vaccine should receive the second dose at any interval after exposure to someone with rash (provided 4 weeks have elapsed after the first dose). After vaccination, management is the same as that of HCP who have received 2 doses of varicella vaccine.
- Unvaccinated VZV-susceptible HCP are potentially infective from days 8 to 21 after exposure and should be furloughed or temporarily reassigned to locations remote from patient-care areas during this period. Exposed HCP without evidence of immunity should receive postexposure vaccination as soon as possible. Vaccination within 3–5 days of exposure to rash may modify the disease if infection occurred. Vaccination 6 or more days after exposure is still indicated because it induces protection against subsequent exposures (if the current exposure did not cause infection). For unvaccinated VZV-susceptible HCP at risk for severe disease and for whom varicella vaccination is contraindicated (e.g. pregnant HCP), varicella-zoster immune globulin after exposure is recommended.

To prevent disease and nosocomial spread of VZV health care institutions should ensure that all HCP have [evidence of immunity to VZV](#). Evidence of immunity should be documented and readily available at the work location. HCP without evidence of immunity should be alerted to the risks of possible infection and offered 2 doses of varicella vaccine administered 4–8 weeks apart when they begin employment. In addition, health care institutions should establish protocols and recommendations for screening and vaccinating HCP and for management of HCP after exposures in the workplace.

Evidence of immunity to VZV for HCP includes any of the following:

- Documentation of vaccination with two doses of varicella vaccine;
- Laboratory evidence of immunity or laboratory confirmation of disease;
- Diagnosis or verification of a history of varicella disease by a healthcare provider;
- Diagnosis or verification of a history of herpes zoster by a healthcare provider.

What is chickenpox?

Chickenpox is a highly contagious disease caused by the varicella-zoster virus, a member of the herpes virus family. In temperate climates, chickenpox occurs most frequently in winter and early spring.

Who gets chickenpox?

Chickenpox is common in the United States; however, cases of chickenpox are expected to decrease as more individuals are immunized with the varicella (chickenpox) vaccine.

How is chickenpox spread?

Chickenpox is transmitted to others when an infected person coughs or sneezes and sends the virus into the air. A susceptible person then inhales the virus into his or her mouth and nose and then becomes infected by the virus. Chickenpox may also be spread to a susceptible person if the susceptible person comes in contact with the infected person's skin lesions (rash) or comes in contact with clothing or linens that have been soiled with discharges from the infected person's skin lesions or respiratory tract (nose, mouth, lungs). When the rash of chickenpox scabs over, the scabs are not considered infectious.

What are the symptoms of chickenpox?

The main symptom of chickenpox is an itchy, blister-like rash that occurs more on the face, scalp, and trunk than on other areas of the body. The blisters eventually dry, crust over, and form scabs. Adults sometimes get one to two days of fever and tiredness before developing the rash. Children usually have the rash occur at the same time as the fever and tiredness. The disease is usually more serious in adults than in children. Mild or inapparent infections occasionally occur in children.

How soon do symptoms appear?

Symptoms commonly appear 14 to 16 days (range of 10 to 21 days) after exposure to someone with chickenpox or herpes zoster (shingles).

When and for how long is a person able to spread chickenpox?

A person is most able to transmit chickenpox from one to two days before the onset of rash until all lesions have crusted. People who are immunocompromised may be contagious for a longer period of time.

Does past infection with chickenpox make a person immune?

Chickenpox infection generally results in lifelong immunity.

What are the complications associated with chickenpox?

The most common complications from chickenpox are bacterial infections of the skin and soft tissues in children and pneumonia in adults. These infections may be severe. Other complications from varicella include cerebellar ataxia, encephalitis and hemorrhagic complications leading to bleeding disorders including disseminated intravascular coagulation. Newborn children (less than one month old) whose mothers are not immune and patients with leukemia may suffer severe, prolonged or fatal chickenpox. Immunocompromised patients, including those on immunosuppressive drugs, may have an increased risk of developing a severe form of chickenpox or shingles. Reye syndrome has been a potentially serious complication associated with clinical chickenpox involving those children who have been treated with aspirin. Aspirin or aspirin-containing products should never be given to a child or adolescent with chickenpox.

Is there a vaccine for chickenpox?

Yes. While no vaccine is 100% effective in preventing disease, the chickenpox vaccine is

very effective: about 8 to 9 of every 10 people who are vaccinated are completely protected from chickenpox. In addition, the vaccine almost always prevents severe disease. If a vaccinated person does get chickenpox, it is usually a very mild case lasting only a few days and involving fewer skin lesions (usually less than 50), mild or no fever, and few other symptoms. Children should receive two doses of vaccine: the first at 12 to 15 months of age and the second at 4 to 6 years of age. Older children and adults without evidence of immunity to chickenpox should be vaccinated as well. Older children and adults who have previously had chickenpox do not need to be vaccinated. Contact your doctor or local health department for further information about the chickenpox vaccine.

What can a person or community do to prevent the spread of chickenpox?

The best method to prevent further spread of chickenpox is for people infected with the disease to remain home and avoid exposing others who may be susceptible. Someone with chickenpox should remain home until one week after the rash began or until the lesions become dry and crusted. Individuals with chickenpox (or shingles) should pay particular attention to avoiding unnecessary exposure of non-immune newborns, pregnant women and immunocompromised people to varicella.

Is there a treatment for chickenpox?

In 1992, acyclovir was approved by the U. S. Food and Drug Administration for treatment of chickenpox in healthy children. However, because chickenpox tends to be mild in healthy children, most physicians do not feel that it is necessary to prescribe acyclovir. A shot of varicella zoster immune globulin (VZIG) may be indicated for some susceptible individuals (for example pregnant women, high-risk newborns, and immunocompromised patients) who have had exposure to a case of chickenpox (or shingles). The VZIG may modify or prevent disease in these individuals if the shot is given within 96 hours after the exposure.

What is shingles?

Shingles (herpes zoster) is caused by the chickenpox virus that remains in the nerve roots of all persons who had chickenpox and can come out in the body again years later to cause illness. Shingles is more common after the age of 50 and the risk increases with advancing age. Shingles causes numbness, itching or severe pain followed by clusters of blister-like lesions in a strip-like pattern on one side of the body. The pain can persist for weeks, months or years after the rash heals and is then known as post-herpetic neuralgia.

Is shingles contagious?

Yes, people with shingles are contagious to persons who have not had chickenpox. Therefore, people who have not had chickenpox can catch chickenpox if they have close contact with a person who has shingles. However, a person cannot catch shingles itself from someone else. Shingles is caused by the chickenpox virus which has been dormant (staying quiet) in a person's body ever since that person had chickenpox. So, a person gets shingles from his or her own chickenpox virus, not from someone else.

Is there a vaccine for shingles?

A vaccine to reduce the risk of shingles was licensed in 2006. CDC recommends that adults age 60 years or older be vaccinated. While the shingles vaccine is approved by the FDA for people age 50 years and older, CDC does not have a recommendation for routine use of shingles vaccine in people who are 50 through 59 years of age. Individuals should talk with their doctor about the shingles vaccine.