

Varicella-Zoster Infections (Chickenpox and Shingles)

Summary

Varicella (chickenpox) is primarily a disease of childhood. Diagnosis is often made clinically, but can be confirmed with polymerase chain reaction (PCR), direct fluorescent antibody (DFA), culture, or serology. Universal immunization is recommended, and vaccine can also be used for post exposure prophylaxis in exposed susceptible persons as appropriate. Since the introduction of varicella vaccine, atypical chickenpox has become increasingly common.

Herpes zoster (“shingles”) is a re-activation of latent varicella-zoster virus in the dorsal root ganglia.

Agent

Varicella-zoster virus (human herpesvirus 3).

Transmission

Reservoir:

Humans.

Mode of transmission:

Person-to-person transmission occurs when the virus comes in contact with the mucosa of the upper respiratory tract or the conjunctiva, most commonly by the airborne route from direct contact with patients with chickenpox or herpes zoster. In utero infection can occur as a result of transplacental passage of virus during maternal varicella infection.

Period of communicability:

Most contagious 1-2 days before onset of rash and continuing until all lesions have crusted (usually five days). Contagiousness may be prolonged in patients with altered immunity. Susceptible exposed persons should be considered infectious from 8-21 days following exposure.

Clinical Disease

Incubation period:

Usually 14-16 days (up to 21 days); may be prolonged up to 28 days after administration of passive immune globulin (Vari-ZIG).

Illness:

Some infections are subclinical or missed because of few lesions. Children typically have low-grade fever and mild upper respiratory tract symptoms before onset of rash. Rash appears in successive crops, with several stages of maturity at the same time. If severe, lesions may occur on the conjunctiva, mucous membranes, palms and soles. Initial lesions are maculopapular on an erythematous base, and then evolve from papule to vesicle to pustule to crust over 2-5 days. Lesions usually do not scar unless unusually deep or secondarily infected. The disease can be more severe in adolescents, adults, and immunocompromised persons.

In vaccinated persons who develop varicella more than 42 days after vaccination (breakthrough disease), the disease is almost always mild with fewer than 50 skin lesions

and shorter duration of illness. The rash may also be atypical in appearance (maculopapular with few or no vesicles).

Herpes zoster (shingles) is a dermatomal re-activation of varicella-zoster virus that has remained latent in the dorsal root ganglia. Grouped vesicular lesions appear in the distribution of 1-3 dermatomes. Zoster can become disseminated in immunocompromised persons.

Laboratory Diagnosis

For both unvaccinated and vaccinated persons, DNA detection methods (PCR, DFA) and culture are the methods of choice for laboratory confirmation. Of these, PCR is the most reliable method for confirming infection.

In unvaccinated persons, experience is limited with IgM antibody tests and with timing of the IgM response. In vaccinated persons, even less experience with serologic methods for laboratory confirmation is available. Therefore, DNA detection methods are the laboratory methods of choice for diagnosis. A negative IgM result should not be used to rule out the diagnosis. A positive IgM in the absence of rash should not be used to confirm a diagnosis.

A four-fold rise in IgG antibody may not occur in vaccinated persons.

Laboratory tests available for varicella confirmation.

Test	Specimen	Comments
Tissue culture	Vesicular fluid; biopsy specimens from sterile sites (e.g., CSF, joint fluid)	Used to detect VZV. Can be expensive. Limited availability. Requires up to a week for result.
PCR	Vesicular swabs or scrapings; scrapings from maculopapular lesions; scabs from crusted lesions; biopsy tissue	Very sensitive and specific for detecting VZV. Real-time methods (not widely available and require special equipment) have been designed that distinguish vaccine strain from wild-type. Results rapidly available (within 3 hours).
DFA	Vesicle scraping; swab of lesion base (must include cells)	Identify VZV. More rapid and sensitive than culture. Less sensitive than PCR.
Tzanck smear	Vesicle scraping; swab of lesion base (must include cells)	Detects multinucleated giant cells with inclusions. Diagnostic of alpha herpes viruses (VZV, herpes simplex viruses). Less sensitive than DFA.
Capture IgM	Acute or convalescent serum specimens for VZV IgM	Specific. IgM inconsistently detected. Not reliable method for routine confirmation, especially in vaccinated persons, but positive result indicates current/recent VZV immune response. However,

		positive results in the absence of clinical disease would not be considered confirmation of active varicella disease. Requires special equipment.
EIA	Acute and convalescent serum specimens for IgG	Requires special equipment. Specific but may not be sensitive enough to identify vaccine-induced immunity.
LA	Acute and convalescent serum specimens for IgG	Rapid (15 min). No special equipment needed. More sensitive but less specific than EIA. Can produce false-positive results.
IFA	Acute and convalescent serum specimens for IgG	Requires special equipment. Good sensitivity, specificity.
gpELISA	Acute and convalescent serum specimens for IgG	Highly specific and sensitive but not widely or commercially available. Suitable for evaluation of vaccine seroconversion.
FAMA	Acute and convalescent serum specimens for IgG	Highly specific and sensitive but not widely or commercially available. Suitable for evaluation of vaccine seroconversion.

Abbreviations: CSF, cerebrospinal fluid; VZV, varicella-zoster virus; PCR, polymerase chain reaction; DFA, direct fluorescent antibody; EIA, enzyme immunoassay; LA, latex agglutination; IFA, indirect fluorescent antibody; gpELISA, glycoprotein-based enzyme-linked immunosorbent assay; FAMA, fluorescent antibody to membrane antigen.

Treatment

- Symptomatic treatment primarily.
- A variety of antiviral agents are available for treatment of complicated cases or cases at high-risk for complications (e.g., immunocompromised persons).
- Children with varicella should not receive salicylates because of the risk of subsequent Reye syndrome.

Surveillance

Case Definition:

Clinical case definition – An illness with acute onset of diffuse (generalized) maculopapular vesicular rash without other apparent cause. In vaccinated persons who develop varicella more than 42 days after vaccination (breakthrough disease), the disease is usually mild with fewer than 50 skin lesions and shorter duration of illness. The rash may also be atypical in appearance (maculopapular with few or no vesicles).

Laboratory Criteria for Diagnosis:

- Isolation of varicella-zoster virus (VZV) or demonstration of VZV DNA by direct fluorescent antibody (DFA) or by polymerase chain reaction (PCR) tests from a clinical specimen, ideally scabs, vesicular fluid, or cells from the base of a lesion. These tests are also useful for diagnosing breakthrough disease (See above table).
- Positive serologic test for varicella-zoster IgM antibody.
- Four-fold or greater rise in serum varicella IgG antibody titer by any standard serologic assay.

Confirmed - An acute illness with diffuse (generalized) maculopapular vesicular rash, and epidemiologic linkage to another probable or confirmed case, or laboratory confirmation by any of the following:

- Isolation of varicella virus from a clinical specimen, or
- Varicella antigen detected by direct fluorescent antibody test, or
- Varicella-specific nucleic acid detected by polymerase chain reaction (PCR), or
- Significant rise in serum anti-varicella immunoglobulin G (IgG) antibody level by any standard serologic assay.

Probable - An acute illness with

- Diffuse (generalized) maculopapular vesicular rash, and
- Lack of laboratory confirmation, and
- Lack of epidemiologic linkage to another probable or confirmed case.

Suspect -

- IgM positive without clinical signs or symptoms associated with chickenpox.

Reporting:

Report all confirmed or probable cases of primary varicella to the Epidemiology and Response Division (ERD) at 505-827-0006. Information needed includes: patient's name, age, sex, race, ethnicity, home address, home phone number, occupation, health care provider, varicella immunization history, an estimation of disease severity based on the number of lesions (see below), and the name of the diagnosing health care provider. Investigation information should also be entered in NM-EDSS per established procedures.

Case Investigation:

Assess susceptible exposed persons, including household contacts.

Control Measures

1. Case management

1.1. Isolation:

1.1.a Exclude infected persons from child care, school, health care, or care of immune impaired individuals until all lesions are crusted. Zoster (shingles) that can be covered by clothing does not require exclusion except for contact with immune impaired persons.

1.1.b For hospitalized patients, standard, airborne and contact precautions should be used for as long as the rash remains vesicular (minimum of five days after the onset of rash).

- Immunocompromised persons with herpes zoster or patients with disseminated herpes zoster require airborne and contact precautions for the duration of illness.

1.2. Prophylaxis: Not applicable.

2. Contact management

2.1. Isolation:

2.1.a For hospital exposure, all exposed susceptible patients should be placed in airborne and contact precautions from 8-21 days after exposure to the index patient. Precautions should be maintained until 28 days after exposure for those who received passive immune globulin (Varicella-zoster immune globulin (VariZIG), or IGIV if VariZIG is unavailable.

2.1.b Airborne and contact precautions are recommended for neonates born to mothers who developed varicella during the peripartum period. Precautions should be continued until 21 days of age (or 28 days if VariZIG or IGIV given) if the neonate remains hospitalized.

2.1.c Susceptible contacts should be furloughed or excused from patient contact from 8-21 days after exposure unless VZIG or IGIV has been given (then continue exclusion to 28 days).

2.1.d Occurrence of a case (either patient or staff) in a health care facility should result in rapid identification of non-immune individuals and those at risk of severe illness. Healthy non-immune contacts may be offered immunization, but quarantine 8-21 days after exposure will still be necessary. Pregnant or immune impaired contacts should be assessed for immunity and given VZIG or IGIV and/or antiviral treatment as indicated.

2.2. Prophylaxis:

2.2.a Varicella-zoster immune globulin (VariZIG) or IGIV given from 96 hours to 10 days of exposure may prevent or modify illness in susceptible exposed contacts. It is indicated for susceptible high-risk persons (i.e., immunocompromised children with no history of varicella and/or unknown or negative serologic tests; non-immune pregnant women; immunocompromised persons; neonates born to mothers who develop varicella within five days before to two days after delivery; hospitalized preterm infants \geq 28 weeks whose mother lacks a reliable history or serologic evidence of previous infection; hospitalized preterm infants $<$ 28 weeks regardless of maternal history or immune status). The decision to administer VariZIG or IGIV depends on three factors: 1) the likelihood that the exposed person has no immunity to varicella; 2) the probability that a given exposure to varicella or zoster will result in infection; and, 3) the likelihood that complications of varicella will develop if the person is infected. The degree and type of immunosuppression should be considered in making this decision.

2.2.b Varicella vaccine may be used to prevent or modify illness if given to susceptible persons who are appropriate candidates ideally within 3 but up to 5 days after exposure to varicella. Immunization of susceptible exposed persons more than

five days after exposure is not effective in preventing disease but will produce immunity in persons who are not infected and should be considered, particularly in outbreak settings where prolonged transmission is anticipated.

3. Prevention

3.1. Immunization: Universal immunization with attenuated live virus vaccine is recommended for infants beginning at 12 months of age with a second dose recommended at 4 to 6 years of age. However, the minimum interval between first and second doses in children up to 13 years of age is three months. This interval is based on the design of the studies evaluating two doses in this age group. If a second dose is inadvertently administered between 28 days and 3 months after the first dose, it does not need to be repeated. Adolescents 13 years of age and older, and adults born after 1980, who do not have a documented history of primary varicella or serologic evidence of immunity, should also receive two doses of varicella vaccine at least 4-8 weeks apart. Children and adults with impaired immunity should be immunized only with the concurrence of their physician. Their household contacts should be immunized to minimize their exposure.

4. Evidence of immunity to varicella: Evidence of immunity to varicella includes any of the following:

4.1. Documentation of age appropriate immunization.

- Preschool-aged children (i.e., ≥ 12 months of age): One dose
- School-aged children, adolescents, and adults: Two doses

Post-immunization serologic testing is neither necessary nor recommended following immunization, including in health care personnel.

4.2. Laboratory evidence of immunity or laboratory confirmation of disease.

4.3. Varicella diagnosed by a health care provider (physician, nurse practitioner, physician assistant or nurse) or verification of history of varicella disease. In cases of atypical and/or mild disease, assessment by a physician or physician designee is recommended and one of the following should be sought: 1) an epi-link to a typical varicella case or to a laboratory confirmed case; or 2) laboratory confirmation, if it was performed at the time of acute disease. When such documentation is lacking, people should not be considered as having a valid history of disease because other diseases may mimic mild atypical varicella.

4.4. History of herpes zoster diagnosed by a physician.

4.5. Birth in the United States before 1980. However, for health care professionals, pregnant women and immunocompromised people, birth before 1980 should not be considered evidence of immunity.

Managing Varicella in Child Care Centers and School Settings

1. Report all suspected child care center or school outbreaks to ERD at 505-827-0006.
2. Exclude infected persons from child care or school until all lesions are crusted (usually 5-6 days).
3. Identify all pregnant females and immunocompromised individuals (students and staff) who have been exposed to varicella and consult ERD for further recommendations.

4. Varicella vaccine should be considered, in coordination with ERD, to control outbreaks in child care centers and schools.

References

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See Chickenpox (Varicella) Fact Sheets ([English](#)) ([Spanish](#)).

See Shingles (Zoster) ([English](#)) ([Spanish](#)).