



# CHICKENPOX

1. **Agent:** Varicella-zoster virus (VZV), a member of the herpesvirus family.

2. **Identification:**

a. **Symptoms:**

Varicella (chickenpox): Varicella, the primary infection with VZV is an acute, generalized disease that occurs most commonly in children and is characterized by a maculopapular rash (few hours), then vesicular rash (3-4 days), often accompanied by fever. Lesions are typically more abundant on trunk; but sometimes present on scalp, mucous membranes of mouth and upper respiratory tract. Lesions commonly occur in successive crops, with several stages of maturity present at the same time. Lesions are discrete, scattered and pruritic. Mild, atypical and inapparent infections also occur. "Breakthrough" chickenpox which can be seen in previously vaccinated persons, is usually a mild illness characterized by few lesions, most of which are papular or papulovesicular. The most common complications of varicella are secondary bacterial infection of skin lesions, dehydration, pneumonia, and central nervous system involvement. Hospitalization occurs in ~3 per 1,000 cases. The overall death rate is ~1 per 60,000 cases. Complications increase with age; death rates as high as 25 per 100,000 have been reported for persons in the 30-49 age group.

Zoster (herpes zoster, shingles): Zoster occurs more often in adults or immunocompromised persons and results from reactivation of latent VZV in sensory ganglia. Grouped vesicular lesions appear unilaterally in the distribution of 1 to 3 sensory dermatomes. Severe pain and paresthesia are common.

Congenital Varicella Syndrome: Primary varicella infection in the first 20 weeks of gestation is occasionally associated with abnormalities in the newborn that include low birth weight, limb hypoplasia, cicatricial

skin scarring, localized muscular atrophy, encephalitis, cortical atrophy, chorioretinitis, and microcephaly.

Perinatal Varicella: Perinatal varicella occurs within first 10 days of life from a mother infected from 5 days before to 2 days after delivery; it has a 30% fatality rate. The severity of disease results from fetal exposure to the virus without the benefit of passive maternal antibody. Postnatally acquired varicella occurs after 10 days of age and is rarely fatal.

b. **Differential Diagnosis:** Generalized herpes simplex, impetigo, drug rash, secondary syphilis, smallpox, and other viral exanthems. See **EXANTHEMS—DIFFERENTIAL DIAGNOSIS** in Appendix A.

c. **Diagnosis:** Serum antibody studies, direct smear and culture of lesion fluid.

3. **Incubation:** Usually 14-16 days but can be as short as 10 or as long as 21 days. May be prolonged after receipt of varicella zoster immune globulin (VZIG) and in the immunodeficient.

4. **Reservoir:** Human.

5. **Source:** Mucous membranes and vesicles.

6. **Transmission:** Direct contact with patient with varicella or zoster; droplet or airborne spread of vesicle fluid (chickenpox and zoster) or secretions of the respiratory tract (chickenpox); indirectly by contaminated fomites. Scabs are not infectious.

7. **Communicability:** Communicable 5 days before eruption (especially 1-2 days before eruption) and for up to 5 days after onset of lesions. Communicability may be prolonged in persons with altered immunity.

8. **Specific Treatment:**

For cases: Acyclovir (IV) in susceptible immunocompromised persons, when administered within 24 hours of rash onset,



has been effective in reducing morbidity and mortality associated with varicella. The FDA has licensed oral acyclovir for varicella in otherwise healthy children. The American Academy of Pediatrics considers the use of oral acyclovir appropriate in otherwise healthy persons at increased risk of moderate to severe varicella, such as those older than 12 years, those with chronic skin or pulmonary disorders, those receiving chronic salicylate therapy or short, intermittent or aerosolized corticosteroids or in secondary case-patients that live in the households of infected children.

9. **Immunity:** Infection confers long immunity; second attacks of chickenpox can occur.

### REPORTING PROCEDURES

1. Outbreaks NOT associated with a healthcare facility: report immediately by telephone (Title 17, Section 2500, *California Code of Regulations*).

**Report Form: OUTBREAK / UNUSUAL DISEASE REPORT (DHS 8554, 7/04 fillable).**

2. Outbreaks associated with a healthcare facility: report immediately by telephone (Title 17, Section 2500, *California Code of Regulations*).

**Report Form: CD OUTBREAK NOTICE—HEALTH CARE FACILITY INVESTIGATION (H-1163, 1/78).**

**Report Form: CD OUTBREAK INVESTIGATION—HEALTH CARE FACILITY INVESTIGATION (H-1164, 1/78).**

3. Fatal cases: report immediately by telephone to Immunization Program.

Immunization Program will file: **VARICELLA DEATH INVESTIGATION WORKSHEET** and must notify the State Division of Communicable Disease Control immediately.

4. Hospitalized cases (not cases of herpes zoster/shingles): report within 7 calendar days from time of identification by mail, telephone, or electronic report.

Immunization Program will file: **VARICELLA (CHICKEN POX) CASE REPORT (DHS 8299, 10/05).**

### 5. Epidemiologic Data:

- Exposure to known case.
- History of either varicella or shingles implies immunity from reinfection.
- Lack of varicella history is not proof of susceptibility. Obtain serologic tests to determine immune status if indicated.

### CONTROL OF CASE, CONTACTS & CARRIERS

Routine investigation of individual cases of chickenpox or shingles is not required.

#### CASE:

- Chickenpox (Varicella): Avoid contact with immunologically compromised persons. Exclude from school or work until the 6th day after onset of rash, or sooner if all lesions are dry.
- Zoster (Shingles): Avoid all contact with immunocompromised persons. Case may work with immunocompetent persons as long as all lesions are covered.

#### CONTACTS:

**Note:** The following guidelines apply mainly to chickenpox contacts—contact to a shingles case is defined as direct contact with active lesions.

- Passive Immunization with VZIG: Effective in preventing or modifying disease if given within 96 hours after exposure. Immunologically normal adults and adolescents should be evaluated on an individual basis. Serologic determination of immune status is advised. Candidates for VZIG include:
  - Immunocompromised, susceptible children.
  - Susceptible pregnant women. Serologic determination of immune status is advised.
  - Newborn infant of a mother who had onset of chickenpox within 5 days before delivery to 48 hours after delivery.
  - Hospitalized premature infant ( $\geq 28$  week gestation) whose mother has no history of chickenpox or serologic evidence of immunity.



- e. Hospitalized premature infants (<28 week gestation or  $\leq 1,000$  g), regardless of maternal history.

**Note:** The only U.S. licensed manufacturer of VZIG has discontinued production. However, a similar product, sometimes referred to as VarIZIG, is produced by a Canadian manufacturer and has been approved by the FDA for use in the U.S. under investigational new drug (IND) procedures. This product will be available to DPH through the LAC+USC Pharmacy. Additional paperwork must be completed by the staff administering this product. Consult SPA administration for additional information. In the event that you need to contact the distributor, call FFF Enterprises at their 24-hour telephone number: 1-800-843-7477. In situations where VarIZIG is indicated but cannot be administered within 96 hours of exposure, administration of immune globulin intravenous (IGIV) at a dose of 400mg/kg, once, intravenously (not intramuscularly) should be considered.

2. Active Immunization with Varicella Vaccine: Susceptible adults and children should be considered for varicella vaccination. The American Academy of Pediatrics recommends varicella vaccine administration to susceptible children up to 5 days after exposure to prevent or modify disease. The Advisory Committee on Immunization Practices has updated its routine varicella recommendations to add a second dose of varicella vaccine for children 4-6 years of age. Especially during varicella outbreaks, persons who have received only one dose of varicella vaccine should receive their second dose, provided the appropriate minimal interval has elapsed since the first dose (3 months for children 12 months through 12 years and 4 weeks for person 13 years and older). Patients should be advised that some contacts may have been exposed at the same time as the index case and that the vaccine will not protect against disease in such circumstances.
3. Determination of Susceptibility: Contacts with a positive disease history can be considered immune. Those with negative or unknown history should be assumed to be susceptible. If VZIG is being considered rather than varicella vaccine, test serologically for immunity promptly.

#### 4. Contacts In Health Facilities:

- a. Interview exposed patients and staff about prior varicella disease to determine susceptibility. See above.
- b. Susceptible exposed patients should be discharged, isolated, or cohorted for the same time period. Only immune staff should care for these patients. Exposed, susceptible patients who are immunosuppressed should be given VZIG if it can be administered within 96 hours of exposure. Varicella vaccine is usually not an option for immunocompromised contacts.
- c. Susceptible exposed employees involved in the care of high-risk patients should not work from the 8th through the 21st day after exposure, even if varicella vaccine is given. If VZIG was given to an employee, he/she should remain off work from days 8-28 after exposure.

5. Contacts in Non-Healthcare Settings: Contacts for whom varicella vaccine is indicated must be <19 years of age to receive DPH-supplied vaccine. Those  $\geq 19$  for whom VZIG is not appropriate should be referred to their medical provider for varicella vaccine.

### OUTBREAK DEFINITION

In general, the threshold for a community outbreak investigation should be 5 or more cases related in place within a 3-week period. In the presence of nosocomial varicella or known or suspected concurrent streptococcal infections, or among populations at high risk for complications (e.g., immunocompromised or susceptible adolescents or adults), the threshold for response should be 2 cases.

### INVESTIGATION AND CONTROL OF SCHOOL OUTBREAKS OF VARICELLA

A template-letter for parent notification of student exposure is available through the Immunization Program.

**Note:** For outbreaks involving Los Angeles Unified School District (LAUSD) schools, work with the LAUSD nursing services office when initiating the investigation and when conducting follow-up activities.



1. Identify and exclude all acute chickenpox cases from school until all lesions have crusted over (usually 5 days for unvaccinated persons). (Vaccinated persons with varicella may develop macules and papules only; these persons are no longer contagious when the macules and papules have faded. Skin lesions can be in the process of resolving but do not need to be completely resolved.)
2. Identify persons that have had close contact with the case or cases during the time period of two days before, to five days after case had rash onset. (Close contact is defined as direct physical or face-to-face contact, or one or more hours of room contact with an infectious person.)
3. Identify susceptible persons among the close contacts. (Persons who have a reliable history of varicella disease or a documented history of vaccination or serological evidence of varicella are all considered immune.) Also, identify susceptible close contacts that are at high risk for serious disease or complications if they get varicella and recommend VZIG for these persons if it can be given within 96 hours of first exposure to the varicella case.
4. For grades where students are of the age to have been covered by the California school varicella vaccination entry requirement that was implemented on July 1, 2001 and after consultation with Los Angeles County Immunization Program (LACIP) surveillance staff, advise the school to exclude all unvaccinated children who refuse or are unable for medical reasons to be vaccinated against varicella. These students should be excluded from the start of the outbreak for up to 21 days after the onset of the last case. (Exclude all high-risk susceptible persons, regardless of varicella school entry requirement applicability as soon as a single probable or confirmed case of varicella has been identified.) Previously unvaccinated persons who are vaccinated during an outbreak may return to school after receipt of one dose of vaccine. Such students would still need to receive the second dose of vaccine in order to be in compliance with current varicella vaccine recommendations.
5. As soon as an outbreak has been identified, advise the school to send out notification letters to parents and staff informing them about the outbreak. The letter should recommend that susceptible persons for whom varicella vaccine is not contraindicated be vaccinated as soon as possible (includes a second vaccination for children under 13 years of age who routinely receive only one vaccination—see item 2 in “**CONTACTS**” section of this document). The letter should also inform all high-risk persons to consult with their health care provider about the chickenpox exposure (pregnant women should inform their prenatal care provider as soon as possible). Based on patterns of transmission, it may only be necessary to notify parents and staff of children in the same classroom where the exposure occurred; however, in other instances it may also be reasonable to notify persons in groups such as the band or sports team with which the case participates. If there is documented transmission among several grade levels, it may even be necessary to notify the entire school. Templates of notification letters are available from the LACIP.
6. District public health nursing should continue to follow the outbreak and provide weekly updates to LACIP surveillance staff until there have been no new cases for 21 days after the last case. Notify LACIP surveillance staff by phone when the outbreak has been closed.
7. When the outbreak has been closed, complete the Outbreak Investigation form DHS 8554 (7/04),” obtain necessary review and approval by SPA medical director, and forward to the Morbidity Central Reporting Unit.

#### PREVENTION-EDUCATION

1. Children entering kindergarten, as well as children 18 months and older entering or already in childcare are required to show proof of vaccination or physician documentation of prior varicella disease, as of July 1, 2001.
2. Keep fingernails short and control scratching of lesions.
3. Alert patient to possible complications: viral pneumonia, encephalitis, secondary infections, Reye syndrome.
4. Children with varicella should **not** receive aspirin or medication containing salicylate,



which is associated with development of Reye syndrome.

5. Greatest risk for complications is for immunocompromised persons (e.g., those with leukemia, cancer, HIV/AIDS, etc.), as well as those on steroids or other immunosuppressive drugs.
6. Disinfect fomites soiled with discharges of nose, throat, and lesions.
7. VZV vaccine was licensed in 1995 in the USA for use in healthy children (>12 months) and most adults. This vaccine should not be used to immunize women who are pregnant or who intend to become pregnant within one month. If a pregnant woman is inadvertently immunized call the Varicella Vaccination in Pregnancy registry (1-800-986-8999).

## DIAGNOSTIC PROCEDURES

Laboratory diagnosis of varicella is not routinely required. However, with the decreased incidence of varicella as a result of widespread vaccination, it should be considered in confirming outbreaks, especially if some of the cases have previously been vaccinated and are experiencing breakthrough disease. In addition, hospitalized and fatal varicella cases must be confirmed so as to rule out the rare possibility of smallpox; see chapter on SMALLPOX. Serological testing is helpful in confirming current or past disease, or susceptibility to future disease. Clinical and epidemiological history is required to aid the laboratory in test selections.

1. **Serology for diagnosis:** Paired sera required (IgG).

Note: IgM antibody test is available but not routinely offered; it is limited to special cases such as high-risk contacts during outbreaks.

**Container:** VR SEROLOGY—contains a serum separator tube (SST, a red-gray top vacutainer tube).

**Laboratory Form:** Test Requisition and Report Form H-3021 or online request if electronically linked to the Public Health Laboratory.

**Examination Requested:** VZV Serology.

**Material:** Whole clotted blood.

**Amount:** 8-10 ml.

**Storage:** Refrigerate.

**Remarks:** Collect first blood specimen as early as possible. Collect the second approximately 2 weeks after the first. Send each specimen as it is collected. Do not store.

2. **Serology to Determine Immunity Status:** Submit single blood specimen as outlined above for IgG testing.
3. **Microscopy (Smear):** When doing smear of lesion(s), collect swab for culture at the same time.

**Container:** Two clean slides in a holder.

**Laboratory Form:** Test Requisition and Report Form H-3021 or online request if electronically linked to the Public Health Laboratory.

**Examination Requested:** VZV DFA.

**Material:** Cellular material from base of lesions. Use sterile cotton swab (viral culturette) to break open early-stage vesicles (before crusting state), absorb fluid, and scrape cells from the base of the lesion. Spread material evenly onto clean slides in circular areas about the size of a dime. Make at least 1 slide with 2 smears—2 slides if possible. Air-dry and submit in closed slide container, then place swab back into culturette for culture (see below).

**Storage:** Ambient temperature.

4. **Culture:**

**Container:** Viral culturette or capillary tube with holder.

**Laboratory Form:** Test Requisition and Report Form H-3021 or online request if electronically linked to the Public Health Laboratory.

**Examination Requested:** VZV Culture.

**Material:** Fluid and cellular material from early-stage lesion. Collect vesicular fluid in capillary tube and place in holder or collect fluid and



cellular material with culturette swab as above for smears and place swab back into the culturette transport tube.

**Storage:** Keep refrigerated at 4°C and deliver to the Virus Laboratory within 72 hours. Do not freeze any specimen when the clinical background suggests VZV, CMV, or RSV.