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## Varicella (chickenpox) and Varicella deaths

[Varicella](#)

[Varicella Fact Sheet](#) (CDC)


Disease Case Report (CD-1)      [PDF format](#)      [Word format](#)

[Missouri Outbreak Surveillance Form](#) (CD-51)

[Varicella Surveillance Worksheet](#) (CDC)

[Varicella Death Investigation Worksheet](#) (CDC)

[Sample Letter to Parents and Caregivers Informing Them of Outbreak](#) (CDC)

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## Varicella (chickenpox) and Varicella deaths

### **Overview**<sup>(1,2,5,6)</sup>

Humans are the only known reservoir for varicella-zoster virus, which causes two distinct clinical diseases. Varicella (chickenpox) is the primary infection and results from exposure of a person susceptible to the virus. Recurrences of infection (shingles) result in a more localized phenomenon known as *herpes zoster*, a common infection among the elderly.


The medical significance of varicella-zoster (chickenpox) should be stressed, in that there have been approximately 250 deaths per year in the United States, even with the availability of the chickenpox vaccine since 1995<sup>(5)</sup>. Before the availability of varicella vaccine in the United States, almost everyone developed varicella. Thus the cases approximated the birth cohort over time, resulting in an estimated 4 million cases of varicella with approximately 11,000 hospitalizations in the early 1990s. For the healthy child, chickenpox mortality is less than 2 per 100,000 cases. The risk increases by more than 15-fold for adults.

Chickenpox is an acute viral infectious disease that ordinarily manifests as a generalized pruritic (itching), maculopapular rash typically consisting of 250 to 500 lesions with malaise and fever up to 102°F for 2 to 3 days. The incubation period is from 14 to 16 days from exposure, with a range of 10 to 21 days. The rash usually appears first on the scalp, followed by the trunk, and then the extremities, with the highest concentration of lesions on the trunk (centripetal distribution). The unilocular rash rapidly progresses from macules to papules to vesicular lesions before crusting. Successive crops of lesions appear across several days, with lesions present in several stages of development (a non-synchronous rash).

Chickenpox is spread by coughing and sneezing (highly contagious). The varicella vaccine is a live-attenuated preparation of the serially propagated and attenuated wild Oka strain. The product contains trace amounts of neomycin and gelatin. The vaccine is licensed for use in healthy people 12 months of age or older who are susceptible to varicella disease.

For a complete description of *Varicella (Chickenpox)*, refer to the following texts:

- *Control of Communicable Diseases Manual*. (CCDM), American Public Health Association. 19th ed. 2008.
- American Academy of Pediatrics. *Red Book: 2009 Report of the Committee on Infectious Diseases*. 28th ed. 2009.
- Centers for Disease Control and Prevention. *Epidemiology and Prevention of Vaccine-Preventable Diseases*. 11th ed. 2009.
- *Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases*. 7<sup>th</sup> ed. 2010.

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## **Case Definitions**<sup>(3)</sup>

### ***Clinical description***

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

### ***Laboratory criteria for diagnosis***

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

### ***Case classification - Varicella (Chickenpox)***

***Probable:*** An acute illness with

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

***Confirmed:*** An acute illness with diffuse (generalized) maculopapulovesicular 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
  - Direct fluorescent antibody (DFA), OR
  - Polymerase chain reaction (PCR), OR
  - Significant rise in serum anti-varicella immunoglobulin G (IgG) antibody level by any standard serologic assay.

### ***Case classification - Varicella Deaths***


***Probable:*** A probable case of varicella which contributes directly or indirectly to acute medical complications which result in death.

***Confirmed:*** A confirmed case of varicella which contributes directly or indirectly to acute medical complications which result in death.

### ***Comment:***

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

Laboratory confirmation of cases of varicella is **not** routinely recommended; laboratory confirmation **is** recommended for fatal cases (***Varicella Deaths***) and in other special circumstances.

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### **Information Needed for Investigation**

**Verify clinical diagnosis.** What laboratory tests were conducted? What were the results? What are the patient’s clinical symptoms? Was the patient vaccinated for chickenpox? Is varicella included among hospital discharge diagnosis data? Is varicella included as cause of death or a contributing condition on death certificate?

**Establish the extent of illness.** Determine if household or other close contacts at high risk for exposure or transmission (e.g., teachers and staff in child care, school, or institutional settings; health care workers; family members of immunocompromised persons) are, or have been, ill by contacting the health care provider, patient, or family member.


### **Notification and Control Measures**

- Contact the [District Communicable Disease Coordinator](#), the [Senior Epidemiology Specialist](#), or the Department of Health and Senior Services’ Situation Room (DSR) at 800-392-0272 (24/7) upon learning of a suspected outbreak of varicella disease.
- Contact the Section for Child Care Regulation (573) 751-2450 if cases are associated with a child care facility.
- Contact the Section for Long-Term Care Regulation (573) 526-8524 if cases are associated with a long-term care facility.
- Contact the Bureau of Health Services Regulation (573) 751-6303 if cases are associated with a hospital or hospital-based long-term care facility.

### **Control Measures**<sup>(2)</sup>

**For Children 12 Months Through 12 Years of Age:** Both monovalent varicella vaccine and MMRV (measles, mumps, rubella, and varicella vaccine) have been licensed for use for healthy children 12 months through 12 years of age. Children in this age group should receive two 0.5-ml doses of varicella vaccine administered subcutaneously, separated by at least three (3) months. The recommendation for at least a three (3) month interval between doses is based on the design of the studies evaluating two (2) doses in this age group; if the second dose inadvertently is administered between 28 days and three (3) months after the first dose, the second dose does not need to be repeated.

All children routinely should receive the first dose of varicella-containing vaccine at 12 through 15 months of age. Because of the potential for increased febrile seizures after the first dose of MMRV vaccine in children 12 through 15 months of age, the American Academy of Pediatrics and the Advisory Committee on Immunization Practices (ACIP) do not express a preference for use of MMRV vaccine over separate injections of equivalent component vaccines (MMR and varicella vaccines). The varicella vaccine should be administered to all children in this age range unless there is evidence of immunity to the varicella zoster virus (VZV) or a contraindication to administration of the vaccine. The second dose of varicella-containing vaccine is recommended routinely when children are four (4) through six (6) years of age (i.e., before a child enters kindergarten or first grade) but can be administered at an earlier age. A routine health maintenance visit at 11 through 12


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years of age is recommended for all adolescents to evaluate immunization status and administer necessary vaccines, including the varicella vaccine.


**For People 13 Years of Age or Older:** People 13 years of age or older, without evidence of immunity, should receive two 0.5-ml doses of varicella vaccine separated by at least 28 days. The recommendation for at least a 28-day interval between doses is based on the design of the studies evaluating two (2) doses in this age group. For people who previously received only one (1) dose of varicella vaccine, a second dose is necessary to provide evidence of immunity. Monovalent varicella vaccine, but not MMRV vaccine, is licensed for use in this age group.

**Contraindications and Precautions<sup>(2)</sup>:**

- Varicella vaccine should not be administered to people who have moderate or severe illnesses, with or without fever.
- Varicella vaccine should not be administered routinely to children who have congenital or acquired T-lymphocyte immunodeficiency, including people with leukemia, lymphoma, and other malignant neoplasms affecting the bone marrow or lymphatic systems, as well as children receiving long-term immunosuppressive therapy. An exception includes certain children infected with HIV, as discussed later. Children with impaired humoral immunity may be immunized.
  - Immunodeficiency should be excluded before immunization in children with a family history of hereditary immunodeficiency. The presence of an immunodeficient or HIV-seropositive family member does not contraindicate vaccine use in other family members.
  - When immunizing people with altered immunity against chickenpox, only monovalent varicella vaccine should be used. The Oka vaccine strain remains susceptible to acyclovir, and if a high-risk patient develops vaccine-related varicella, then acyclovir should be used as treatment.
  - Acute lymphocytic leukemia. Before routine immunization of healthy children against varicella was instituted in the United States in 1995, many young children with leukemia were susceptible to chickenpox. To protect them against serious and fatal varicella, a research protocol for immunization against chickenpox was in place, but the protocol has been terminated. Considering the variability of chemotherapy regimens and the current decreasing incidence of varicella in the United States, these high-risk children should not be immunized routinely. Immunization of leukemic children without evidence of immunity in remission should be undertaken only with expert guidance and with availability of antiviral therapy should complications occur.
    - Live-virus vaccines usually are withheld for an interval of at least 3 months after immunosuppressive cancer chemotherapy has been discontinued. The interval until immune reconstruction varies with the intensity and type of immunosuppressive therapy, radiation therapy, underlying disease, and other factors. Therefore, it often is not possible to make a definitive recommendation for an interval after cessation of immunosuppressive therapy when live-virus vaccines can be administered safely and effectively.

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- HIV infection. Screening for HIV infection is not indicated before routine VZV immunization. After weighing potential risks and benefits, varicella vaccine should be considered for HIV-infected children with a CD4+ T-lymphocyte percentage of 15% or greater. Eligible children should receive two (2) doses of monovalent varicella vaccine with a three (3) month interval between doses and return for evaluation if they experience a postimmunization varicella-like rash. With increased use of varicella vaccine and the resulting decrease in incidence of varicella in the community, exposure of immunocompromised hosts to VZV will decrease. As the risk of exposure decreases and more data are generated on the use of varicella vaccine in high-risk populations, the risk versus benefit of VZV immunization in HIV-infected children will need to be reassessed.
- Children receiving corticosteroids. Varicella vaccine should not be administered to people who are receiving high doses of systemic corticosteroids (2 mg/kg per day or more of prednisone or its equivalent or 20 mg/day of prednisone or its equivalent) for 14 days or more. The recommended interval between discontinuation of corticosteroid therapy and immunization with varicella vaccine is at least one (1) month. Varicella vaccine may be administered to people on inhaled, nasal, and topical steroids.
- Children with nephrotic syndrome. The results of one small study indicate that two (2) doses of the varicella vaccine in 29 children between 12 months and 18 years of age generally were well tolerated and immunogenic, including children receiving low-dose, alternate-day prednisone.
- Households with potential contact with immunocompromised people. Transmission of vaccine-strain VZV from healthy people has been documented in five (5) instances, resulting in six (6) secondary cases. Even in families with immunocompromised people, including people with HIV infection, no precautions are needed after immunization of healthy children in whom a rash does not develop. Immunized people in whom a rash develops should avoid direct contact with immunocompromised hosts without evidence of immunity for the duration of the rash.
- Pregnancy and Lactation. Varicella vaccine should not be administered to pregnant women because the possible effects on fetal development are unknown, although no pattern of malformation has been identified after inadvertent immunization of pregnant women. When postpubertal females are immunized, pregnancy should be avoided for at least one (1) month after immunization. A pregnant mother or other household member is not a contraindication for immunization of a child in the household. Reporting of instances of inadvertent immunization with a varicella zoster virus-containing vaccine during pregnancy by telephone is encouraged (800-986-8999).
  - A study of nursing mothers and their infants showed no evidence of excretion of vaccine strain in human milk or of transmission to infants who are breastfeeding. Varicella vaccine should be administered to nursing mothers who lack evidence of immunity.
- Immune Globulin (IG). It is unknown if IG can interfere with varicella vaccine-induced immunity. However, IG can interfere with immunity induction by measles vaccine. Pending additional data, varicella vaccine should be withheld for the same intervals after receipt of any form of IG or other blood product as measles vaccine. Conversely, IG should be withheld for at

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least 2 (two) weeks after receipt of varicella vaccine. Transplacental antibodies to VZV do not interfere with the immunogenicity of varicella vaccine administered at 12 months of age or older.

- Salicylates. It is unknown if Reye Syndrome results from administration of salicylates after immunization for varicella in children. No cases have been reported. However, because of the association among Reye Syndrome, natural varicella infection, and salicylates, the vaccine manufacturer recommends that salicylates be avoided for 6 weeks after administration of varicella vaccine. Physicians need to weigh the theoretical risks associated with varicella vaccine against the known risks of wild-type virus in children receiving long-term salicylate therapy.
- Allergy to Vaccine Components. Varicella vaccine should not be administered to people who have had an anaphylactic-type reaction to any component of the vaccine, including gelatin and neomycin. Most people with allergy to neomycin have resulting contact dermatitis, a reaction that is not a contraindication to immunization. Monovalent varicella vaccine does not contain preservatives or egg protein, and although the measles and mumps vaccines included in MMRV vaccine are produced in chick embryo culture, the amount of egg cross-reacting proteins are not significant. Therefore, children with egg allergy routinely may be given MMRV without previous skin testing.

**Child Care and School <sup>(2)</sup>:**


Children with uncomplicated chickenpox who have been excluded from school or child care may return when the rash has crusted, which may be several days in mild cases and several weeks in severe cases or in immunocompromised children.

Exclusion of children with zoster whose lesions cannot be covered is based on similar criteria. Children who are excluded may return after the lesions have crusted. Lesions that are covered seem to pose little risk to susceptible people. Older children and staff with zoster should be instructed to wash their hands if they touch potentially infectious lesions.

In outbreaks involving child care and/or schools, unvaccinated children with no history of varicella should be instructed to be vaccinated immediately or excluded for the duration of the period of communicability (i.e., from 10-21 days post-exposure or for the duration of the outbreak).

For outbreaks in child care or preschool settings, the minimum public health response should include informing parents, caregivers, and contacts of the occurrence of the outbreak, providing them with information on varicella and its potential to cause severe complications, and providing information about the availability of the vaccine. Sample letters are available at:

<http://www.cdc.gov/vaccines/vpd-vac/varicella/outbreaks/appx.htm#d> (3/2011).

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## Outbreak Investigation<sup>(6)</sup>:

### Steps for Investigation and Control of Varicella Outbreaks\*

Step	Description and Details
1.	A Single Varicella Case as a Potential Source for an Outbreak
2.	Confirm the Outbreak
3.	Identify Cases
4.	Implement Varicella Control Measures <ol style="list-style-type: none"> <li>a. Notification of the Outbreak</li> <li>b. Exclusion or Isolation of Case-patients</li> <li>c. Management of persons without evidence of immunity</li> </ol>
5.	Conduct case investigations
6.	Establish surveillance for additional cases
7.	Analyze and interpret the data
8.	Develop a plan for preventing future varicella outbreak

\*For full details of each step, and complete guidance, see the *Surveillance for Vaccine Preventable Disease Manual, Strategies for the Control and Investigation of Varicella Outbreaks 2008*, at: <http://www.cdc.gov/vaccines/vpd-xce/lxct/egrc/lqwdt/gcmulo/cpwctfj/vo%dlqz40>

## Exposed People<sup>(2)</sup>:

Potential interventions for susceptible people exposed to varicella include either varicella vaccine, administered ideally within three (3) days but up to five (5) days after exposure or when indicated, or VariZIG (1 dose up to 96 hours after exposure). If VariZIG is not available, IGIV (1 dose up to 96 hours after exposure) can be used. Prophylactic administration of oral acyclovir beginning seven (7) days after exposure may also prevent or attenuate varicella disease.

For complete postexposure immunization and passive immunoprophylaxis recommendations see the *Surveillance for Vaccine Preventable Disease Manual*, at:

<http://www.cdc.gov/vaccines/vpd-vac/varicella/outbreaks/manual.htm#box2>.

## Where to Obtain VariZIG:


VariZIG is available under an investigational new drug (IND) protocol and can be requested by calling the 24-hour telephone number of FFF Enterprises (800-843-7477).

## Hospital Exposure<sup>(2)</sup>:

If an inadvertent exposure in the hospital to an infected patient, health care professional, or visitor occurs, the following control measures are recommended:

- Health care professionals and patients who have been exposed and who lack evidence of immunity to varicella should be identified.



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- Varicella immunization is recommended for people without evidence of immunity, provided there are no contraindications to vaccine use.
- VariZIG should be administered to appropriate candidates. If VariZIG is not available, IGIV is recommended.
- All exposed patients without evidence of immunity should be discharged as soon as possible.
- All exposed susceptible patients who cannot be discharged should be placed in isolation from day 8 to day 21 after exposure to the index patient. For people who received VariZIG or IGIV, isolation should continue until day 28.
- All exposed health care professionals without evidence of immunity should be furloughed or excused from patient contact from day 8 to day 21 after exposure to an infectious patient or to day 28 for people who have received VariZIG or IGIV.
- Serologic testing for immunity is not necessary for health care professionals who have been immunized, because most adults are immune after the second vaccine dose and because most serologic assays will not reliably detect immunity resulting from vaccines.
- Immunized health care professionals who develop breakthrough infection should be considered infectious.


### **Laboratory Procedures**

Laboratory testing for varicella is not routinely required but is indicated to confirm the diagnosis in severe or unusual cases or to determine varicella susceptibility. Diagnostic tests used to confirm recent varicella infection include virus isolation and identification, in addition to serologic tests. The Missouri State Public Health Laboratory (SPHL) routinely tests for VZV using vesicular lesion specimens for PCR and virus culture. Virus isolation collection and transport kits are available by calling (573) 751-3334, 8:00 a.m. – 5:00 p.m., Monday through Friday.

### **Reporting Requirements**

**Varicella (chickenpox) and Varicella deaths** are Category 3 diseases and shall be reported to the local health authority or the Missouri Department of Health and Senior Services (DHSS) within three (3) days of first knowledge or suspicion. **DHSS may be contacted 24 hours a day, 7 days a week at 800-392-0272.**

1. For reported cases of varicella, complete a “[Disease Case Report](#)” (CD-1).
2. The information collected on the CD-1 should be either entered into the WebSurv application or sent to your district health office for entry. The entry of the CD-1 into the WebSurv application negates the need for the paper CD-1 to be forwarded to the District Health Office.  
**Note:** Varicella case reports of special circumstance (see item 5) require entry into WebSurv.
3. Incomplete CD-1 information on varicella (chickenpox) does not necessarily require an investigation to collect the missing information, unless some other special circumstance exists (see item 5). [Disease Case Reports](#) (CD-1) with enough information provided to determine a case status “*confirmed*” or “*probable*” are to be entered into the WebSurv. Cases not meeting “*confirmed*” or “*probable*” status are to be considered “*suspect*” cases. If severity of illness is not


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documented without accompanying lab work to confirm the case, the case is considered “suspect”.

4. “Suspect” varicella cases are not entered into WebSurv application. The CD-1 on “suspect” varicella cases should be forwarded to the Bureau of Communicable Disease Control and Prevention, 930 Wildwood, PO Box 570, Jefferson City, MO 65102 for retention.
5. Investigation of a varicella (chickenpox) case is warranted for all deaths associated with varicella, outbreaks involving exposure of potentially susceptible persons at high risk for serious complications of varicella, or documentation of severe complications such as invasive Group A streptococcal infections.
6. For all varicella deaths, in addition to the CD-1, complete the “[Varicella Death Investigation Worksheet](#)”.
7. Cases requiring the completion of the “[Varicella Death Investigation Worksheet](#)” should be entered into WebSurv, with the worksheet being forwarded to the District Health Office. For the circumstances listed above in item 5, other than death, complete a “[Varicella Surveillance Worksheet](#)” on the case.
8. All outbreaks or “suspected” outbreaks of chickenpox must be reported as soon as possible (by phone, fax, or e-mail) to the [District Communicable Disease Coordinator](#) using the Missouri Outbreak Surveillance Report (CD-51).
9. Within 90 days from the conclusion of an outbreak, submit the final outbreak report to the [District Communicable Disease Coordinator](#). All outbreaks of vaccine-preventable disease should be investigated. A systematic approach to investigation and control of outbreaks includes confirming the outbreak, identifying susceptible persons, offering vaccine, establishing surveillance, analyzing data, and using data to make recommendations. The information gathered helps us understand whether the outbreak occurred because of failure to vaccinate, or failure of the vaccine. Occasionally, multiple varicella outbreaks could occur. The following table can be used to prioritize your outbreak response efforts.

#### Varicella Outbreaks: Priorities for Investigation<sup>(6)</sup>

Priority	Outbreak Description
1	Outbreaks involving patients and staff in healthcare settings.
2	Outbreaks involving patients with complications (i.e., pneumonia, encephalitis, invasive Group A streptococcal infection, or hemorrhagic complications) and/or hospitalizations ( $\geq 1$ case).
3	Outbreaks involving persons at risk for severe varicella because of their age or an underlying condition (i.e., immunocompromised persons, cancer patients, pregnant women, neonates whose mothers are not immune, etc.).
4	Outbreaks involving cases among persons vaccinated with two doses of varicella vaccine.

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## **Other Sources of Information**

1. The Blue Book: *Guidelines for the Control of Infectious Diseases*: “Chicken pox/Herpes zoster” 24 May 2004. [http://www.health.vic.gov.au/ideas/bluebook/chicken\\_pox.htm](http://www.health.vic.gov.au/ideas/bluebook/chicken_pox.htm) (3/2011)
2. Infection Control in the Child Care Center and Preschool. “Chickenpox.” Donowitz, 4th Edition, 1999: 308-314.