MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH GUIDE TO SURVEILLANCE, REPORTING, AND CONTROL

**Chickenpox**

**Section 1**

**ABOUT THE DISEASE**

Chickenpox and shingles are vaccine-preventable. Vaccines prevent disease in those who are vaccinated and protect unvaccinated individuals by reducing the prevalence of the disease in the general population.

**A. Etiologic Agent**

Chickenpox (varicella) is caused by the varicella zoster virus (VZV), a DNA virus belonging to the herpes virus group. Primary infection with VZV causes chickenpox. Once infection occurs, the virus can remain dormant in the body as a latent infection after the primary infection. Shingles results from reactivation of latent infection.

Shingles is not a reportable condition in Massachusetts. However, cases of chickenpox can occur in susceptible individuals following close contact with people with shingles. Therefore, local boards of health may be involved in making recommendations to protect the close contacts of a person with shingles, or to exclude susceptible close contacts from public activities.

**B. Clinical Description**

Chickenpox is a febrile rash illness characterized by a diffuse (generalized), pruritic (itchy) rash, typically consisting of 250 to 500 lesions in unvaccinated people, that evolves from macules (spots) to papules (bumps) to vesicles (blisters), and eventually into dried crusts over 5–6 days. This is often referred to as “wild type” chickenpox, to differentiate it from “breakthrough” chickenpox which occurs in vaccinated individuals (see below). Vesicles have been described as superficial, delicate, and containing a clear liquid. All three types of lesions (macules, papules, and vesicles) are present at the same time, and they tend to be more abundant on covered parts of the body, with the highest concentration on the trunk. They can also occur on mucosal surfaces, such as the mouth and the throat. Prodromal symptoms, such as low-grade fever, malaise and other constitutional symptoms may precede the rash by 1–2 days, particularly in adults. Mild, atypical, and inapparent infections can occur, but are unusual in unvaccinated individuals. The disease is usually milder among children and can be more severe in adolescents and adults. Immunity following chickenpox infection is considered long-lasting, but rarely, second cases of chickenpox do occur among immunologically normal individuals, especially if the first infection is in the first year of life.

*Complications of Chickenpox*

Complications of chickenpox include bacterial superinfection of skin lesions with or without bacterial sepsis, pneumonia (viral and bacterial), central nervous system involvement (acute cerebellar ataxia, encephalitis, stroke/vasculopathy), thrombocytopenia, and rarer complications such as glomerulonephritis, arthritis, and hepatitis. Invasive group A streptococcal disease (GAS) has been reported as a complication of chickenpox and can result in cellulitis (relatively minor skin infection) or in necrotizing fasciitis (“flesh-eating bacteria”), overwhelming infection, and toxic shock syndrome (TSS). While primary viral pneumonia is not common among immunocompetent children, it is the most common complication in adults.

* Pregnant women, immunocompromised persons, children less than one year of age, older adolescents, adults, patients with chronic skin or pulmonary disorders, and patients receiving steroids or chronic aspirin therapy are more likely to experience serious complications with chickenpox. The risk is especially high when steroids, such as prednisone and cortisone, are given during the incubation period for chickenpox.
* Infants born to women who developed chickenpox within a period of five days before delivery to two days after delivery are at high risk of severe chickenpox, which can be fatal.
* Congenital varicella syndrome, characterized by developmental abnormalities, encephalitis, and low birth weight, may occur among 1–2% of infants born to women infected with chickenpox during the first two trimesters of pregnancy.

*Breakthrough Chickenpox (also known as Vaccine-Modified Varicella Syndrome or VMVS)*

Breakthrough chickenpox is a form of chickenpox that occurs in a vaccinated individual and is less severe due to the development of “partial immunity” sufficient to decrease symptoms and rash, but insufficient to prevent disease. Breakthrough chickenpox occurs more than 42 days after vaccination (and therefore is unlikely to be associated with recent vaccination). It usually presents as a generalized rash consisting of <50 lesions, with only a few vesicles. Patients are often afebrile and minimally symptomatic. Breakthrough cases with fewer than 50 lesions have been found to be one-third as contagious as varicella in unvaccinated persons with 50 or more lesions, but breakthrough cases with 50 or more lesions can be just as contagious as cases of varicella in unvaccinated persons. **Control measures are the same as with “wild type” chickenpox**. Crusting over and/or fading of lesions may occur more quickly than the usual 5 days after rash onset (e.g., 2–3 days after onset), allowing earlier return to childcare/school.

Breakthrough chickenpox can occur in up to 20% of vaccinated children and up to 30% of vaccinated adults. If the incidence of breakthrough disease is greater than 30% in any setting, the Massachusetts Department of Public Health (MDPH) should be notified for further investigation of the cases, and a vaccine ‘cold chain’ evaluation may be undertaken, as improper handling may affect the effectiveness of the vaccine.

*Varicella-like rash in recently vaccinated persons (vaccine side effects)*

Approximately 4% of children receiving varicella vaccine (compared with 2% of placebo recipients) develop a generalized rash, with a median of five lesions, 5-26 days postvaccination; and 4% develop a localized rash, with a median of two lesions, 8-19 days postvaccination. The rash may be atypical in appearance (maculopapular with no vesicles). Approximately 2% of children who received a placebo injection in the clinical trials also developed generalized rashes, some of which were varicella-like, indicating that not all rashes following vaccination are attributable to the vaccine. Rashes occurring 15-42 days after vaccination are more likely to be vaccine-type virus; rashes occurring within 2 weeks of vaccination or more than 42 days postvaccination are more likely to be wild type virus.

*Shingles*

Following primary infection (chickenpox), VZV remains in human nerve tissues and is reactivated later in life in approximately 32% of infected persons (50% of those living to age 85), resulting in shingles (herpes zoster). Shingles presents as a red, painful, itchy, and blistery rash, typically in one area on one side of the body, in the distribution of a nerve (dermatome). There is usually no fever or other systemic symptoms. Less commonly, the rash can be more widespread and affect three or more dermatomes. This condition is called disseminated shingles. Pain and itching in the area of the shingles rash may persist after the lesions have resolved (post-herpetic neuralgia, or PHN). People with PHN can have severe pain in the areas where they had the shingles rash, even after the rash has cleared up.

Shingles can be treated with several antiviral agents. It can become more serious in immunocompromised persons, with generalized skin eruptions and central nervous system, pulmonary, hepatic, and pancreatic involvement.

*Disseminated shingles*

Appearance of lesions outside the primary or adjacent dermatomes is known as disseminated shingles. This generally occurs only in people with compromised immune systems. Disseminated shingles can be difficult to distinguish from varicella. In patients with disseminated shingles, standard precautions plus contact precautions and airborne isolation should be used until lesions are dry and crusted.

Shingles in vaccinated individuals has been reported, although the risk of developing shingles from wild-type virus is 4–5 times greater than the risk from vaccine virus.

*VZV Meningitis*

VZV, when reactivated, can also result in VZV meningitis, with or without rash. Symptoms are usually consistent with aseptic meningitis: headache, stiff neck, neck pain, nausea and vomiting, and mental status changes. VZV is found in the CSF of patients with VZV meningitis. In one study (Ihekwaba et al., 2008), 88% of patients with VZV meningitis had a shingles rash. Like shingles, it can be treated with several antiviral agents. It can become serious in immunocompromised persons. Aseptic meningitis is a reportable condition in Massachusetts.

**C. Vectors and Reservoirs**

Humans are the only known host of VZV.

**D. Modes of Transmission**

Chickenpox is transmitted from person to person by droplet spread when a person coughs or sneezes; direct contact with upper respiratory secretions or lesions that have not yet crusted over; or, very rarely, airborne spread. (Note: *Although chickenpox can be airborne, this is rare. Airborne transmission would most likely occur in a poorly ventilated setting with a very ill immunocompromised case. Potential airborne spread should not routinely be used as a parameter to determine exposure. See Section 4B for guidance on how to identify those exposed to chickenpox.)*

**Chickenpox is highly infectious**, with secondary infection rates in susceptible household contacts as high as 90%. Exposure to chickenpox does not cause shingles. Exposure to shingles, however, can result in chickenpox in a susceptible person. VZV from shingles is transmitted primarily from person to person by direct contact with lesions. Call 617-983-6800 if you have questions about disseminated shingles in a patient with severe illness or immunocompromise.

**E. Incubation Period**

The incubation period for chickenpox is usually 14–16 days, with a range of 10–21 days after exposure to rash. This period may be prolonged for as long as 28 days by administration of varicella zoster immune globulin (VariZIG™) or immune globulin, intravenous (IGIV) after exposure, and it may be shorter in immunocompromised patients. Shingles has no incubation period; it is caused by reactivation of latent infection from primary chickenpox disease.**F. Period of Communicability or Infectious Period**

The infectious period for chickenpox is from 1–2 days before the rash appears until all of the vesicles have formed scabs, which usually occurs within 5 days of rash onset. Contagiousness may be prolonged in immunocompromised patients.

Vaccinated persons with breakthrough chickenpox may develop lesions that do not crust (macules and papules only). These people are no longer contagious once the lesions have faded (i.e., the skin lesions are in the process of resolving; lesions do not need to be completely resolved) or no new lesions appear within a 24-hour period, whichever is later.

The infectious period for shingles lasts until all lesions have crusted over.

**G. Epidemiology**

Chickenpox occurs worldwide, although incidence is lower in the tropics than in the temperate zones. In the U.S., during the pre-vaccine era, incidence was highest between March and May and lowest between September and November, and most cases of chickenpox in the U.S. occurred in children younger than ten years of age. High rates of vaccine coverage in the United States have effectively eliminated discernible seasonality of varicella. Prior to the availability of varicella vaccine, approximately 10,500 persons with varicella required hospitalization each year and 100 to 125 people died of chickenpox in the United States. Hospitalization rates were approximately 1 to 2 per 1,000 cases among healthy children and 14 per 1,000 cases among adults. Death occurred in approximately 1 in 60,000 cases. Most deaths occurred in immunocompetent children and adults. Since 1996, the number of hospitalizations and deaths from varicella has declined by more than 90%. Since recommendation of a routine second dose of vaccine in 2006, varicella outpatient visits have declined by an additional 60% and varicella hospitalizations have declined by an additional 40%.

Changes in the epidemiology of chickenpox have been observed as an increasing proportion of children in the U.S. become protected by vaccination. Over the last several years, the number of cases of chickenpox reported in Massachusetts has declined by over 50%. (In 2011, 606 cases were reported and in 2019, 299 cases were reported.) For the 2019-20 school year, national vaccine coverage for two doses of varicella vaccine was almost 95% in kindergarten children and in Massachusetts the estimated coverage was 97%. According to the Report of the Committee on Infectious Diseases of the American Academy of Pediatrics (the “Red Book”), the age of peak varicella incidence is shifting from children younger than 10 years of age to children 10 through 14 years of age, although the incidence in this and all age groups is lower than in the prevaccine era.

As vaccine coverage increases, and the incidence of wild-type chickenpox decreases, a higher proportion of chickenpox cases are likely to occur in immunized people as breakthrough disease. In 2019, approximately 33% of reported cases in Massachusetts occurred in individuals with at least one dose of varicella-containing vaccine.

Shingles is found worldwide and has no seasonal variation. There are an estimated one million cases of shingles in the United States annually. The overall annual incidence in the U.S. is approximately 4 cases per 1000 population (CDC, based on 2000 census). Annual incidence among people 60 or older in the U.S. is about 1 case per 100 population.

This disease increases with advancing age and is more common among immunocompromised persons and among children with a history of intra-uterine chickenpox or chickenpox occurring within the first year of life. The latter have an increased risk of developing shingles at an early age. Prior to the availability of shingles vaccine, it was estimated that approximately 32% of the general population would experience shingles during their lifetime.

**H. Vaccine Effectiveness**

Chickenpox vaccine has been available since 1995. A single dose of varicella vaccine has been shown to be 70–90% effective at preventing chickenpox in general and over 95% effective at preventing severe disease. Two doses are 88% - 98% effective in preventing any form of varicella disease, according to CDC, and 100% effective in preventing severe varicella.

Cases of varicella in vaccinated persons (i.e., breakthrough cases) are generally much milder, often with fewer than 50 lesions and fewer vesicles compared with 300 or more lesions and many vesicles typically seen in unvaccinated persons. Persons with breakthrough cases are also less likely to have fever and more likely to have fewer days of illness. Given its modified clinical presentation, breakthrough varicella illness can be challenging for practitioners and parents to recognize clinically.

The vaccine for shingles (Shingrix®) is recommended for use in people 50 years old and older to prevent shingles and for adults aged 19 years or older who are or will be immunodeficient or immunosuppressed because of disease or therapy. Shingrix is administered as a 2-dose series by the intramuscular route. The second dose should be given 2 to 6 months after the first dose, with a minimum interval of 1 month (4 weeks) between doses.

Efficacy against shingles was 97% for people 50-59 and 60-69 years of age, and 91% for people 70 years and older. Among people 70 years and older vaccine efficacy was 85% four years after vaccination. Vaccine effectiveness (VE) has been evaluated for a limited number of specific immunocompromising conditions. VE estimates vary depending upon the underlying cause of immunocompromise. Studies have estimated VE of 68.2% for autologous hematopoietic cell transplant recipients, and 87.2% and 90.5% for patients with hematologic malignancies and potential immune-mediated diseases, respectively.

**Special Considerations in the Administration of Varicella Vaccine**

For the most up-to-date information on vaccine contraindications and precautions, see the package insert, the CDC [Guide to Contraindications and Precautions](https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html) and/or the ACIP [General Best Practice Guidelines for Immunization](https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/index.html) and/or the Red Book of the American Academy of Pediatrics.

**I. Bioterrorist Potential**

VZV is not considered to be of risk for use in bioterrorism.

**Section 2**

**REPORTING CRITERIA AND LABORATORY TESTING**

**A. What to Report to the Massachusetts Department of Public Health (MDPH)**

Report any of the following:

* Individual cases of clinically diagnosed chickenpox; or
* Laboratory evidence of infection with varicella-zoster virus (VZV), including:
  + Isolation of VZV from a clinical specimen; or
  + Demonstration of VZV in a clinical specimen by detection of antigen or nucleic acid (DFA or PCR); or
  + Significant rise in serum varicella IgG antibody level by any standard serologic assay (please report both acute and convalescent antibody titers); or
  + Positive serology test for varicella IgM; or
* Unusual case(s)/clusters, as outlined in Section 3B; or
* Deaths for which chickenpox was a contributing cause.

*Note: See Sections 3B and 3C for information on how to report a case.*

**B. Laboratory Testing Services Available**

Most testing is done at commercial and hospital laboratories. The PCR assay is the most useful in terms of timeliness and sensitivity.

The MDPH State Public Health Laboratory Institute (MA SPHL) provides very limited testing services for chickenpox, under special circumstances only. Prior approval from an MDPH epidemiologist at (617) 983-6800 is required for all chickenpox testing at MA SPHL. The MA SPHL can also perform rapid and conventional viral culture(s), if necessary.

Varicella IgM antibody testing is “inherently prone to poor specificity” (CDC, 2021) and is less sensitive than PCR testing of skin lesions. It is not performed at the MA SPHL. For more information about laboratory testing for varicella at the MA SPHL, please go to: [State Public Health Laboratory Services](https://www.mass.gov/state-public-health-laboratory-services).

**Section 3**

**REPORTING RESPONSIBILITIES AND CASE INVESTIGATION**

**A. Purpose of Surveillance and Reporting**

* To monitor the impact of vaccination on age-specific incidence and on severity of chickenpox.
* To evaluate vaccine effectiveness under conditions of routine use and to track instances of vaccine failure.
* To identify groups and areas in which risk of disease is highest so prevention and control efforts can be focused.
* To track and minimize the occurrence of complications, such as invasive GAS infection.

**B. Laboratory and Health Care Provider Reporting Requirements**

**Healthcare providers** and other health professionals who identify a case of chickenpox, as defined by the reporting criteria in Section 2A, should report the case by completing the web-based MDPH *Varicella (Chickenpox) reporting form online at* [*https://infectious-disease-reporting.dph.mass.gov/pages/CaseReportForms*](https://infectious-disease-reporting.dph.mass.gov/pages/CaseReportForms)*.* MDPH will then notify the appropriate LBOH as described in Section C below.

In addition, healthcare providers and others should report any unusual cases, outbreaks, or cases in high-risk settings or among high-risk populations immediately by telephone to the LBOH and to the MDPH Division of Epidemiology at (617) 983-6800, so that epidemiologists can collect additional information and assist with investigation and control measures, as needed.

Examples of such cases include:

* Unusual presentation or severe complications (including invasive GAS infection, pneumonia, hospitalization)
* Deaths for which chickenpox was a contributing cause
* Immunocompromised individuals, pregnant women, and other individuals at high risk of complications, as described in section 1B
* Cases or clusters of cases in healthcare settings, childcare centers with infants, and other high-risk institutional settings (e.g., prisons, jails, group homes, dormitories, shelters, military settings)
* Outbreaks in any setting

**Laboratories** performing examinations on any specimens derived from Massachusetts residents that yield evidence of active varicella virus infection (not just immunity) shall report such evidence of infection directly to the MDPH *through secure electronic laboratory reporting (ELR) mechanisms,* or other method, as defined by the Department, within 24 hours. MDPH will then notify the appropriate LBOH as described in Section 3C below.

***Please note:*** *Shingles cases* ***should not*** *be reported to the LBOH or to the MDPH.*

**C. Local Board of Health (LBOH) Reporting and Follow-Up Responsibilities**

*Reporting Requirements*

MDPH regulations (105 CMR 300.000) stipulate that chickenpox is reportable to the LBOH and that each LBOH must report any case of chickenpox or suspect case of chickenpox, as defined by the reporting criteria in Section 2A. The majority of chickenpox cases are reported directly to MDPH via case reporting form or through ELR. Cases reported directly to MDPH will populate the MAVEN “LBOH Notification but no follow-up required” workflow for acknowledgement by the appropriate LBOH.

Cases not already in MAVEN should be reported to the MDPH Division of Surveillance, Analytics and Informatics (DSAI) using the *web-based MDPH Varicella (Chickenpox) reporting form online at* [*https://infectious-disease-reporting.dph.mass.gov/pages/CaseReportForms*](https://infectious-disease-reporting.dph.mass.gov/pages/CaseReportForms) *or may be entered directly into MAVEN. Clusters (three or more cases related in time and space) should be reported using the new web-based varicella* ***cluster*** *report form, also at* [*https://infectious-disease-reporting.dph.mass.gov/pages/CaseReportForms*](https://infectious-disease-reporting.dph.mass.gov/pages/CaseReportForms)

*Case Investigation & Using MAVEN*

For routine cases of chickenpox, information should be reported by the provider or other health professional via the web-based case report form. These cases will populate the “LBOH Notification but no follow-up required workflow” and can be acknowledged by the LBOH by checking the box next to the event in the workflow and clicking the “Populate LBOH Notified to Yes” button at the bottom of the screen. Events can also be acknowledged by opening the Administrative Question Package (QP) and selecting “Yes” for the first question “Step 1 ‐ LBOH acknowledged” under the “Local Health and Investigation” section.

**For unusual cases, outbreaks, and cases in high-risk settings, as described above in section 3B, additional follow-up by the LBOH may be necessary** in collaboration with an MDPH epidemiologist. Institution of disease control measures is an integral part of case investigation. It is the responsibility of the LBOH to understand, and if necessary, institute the control guidelines listed in Section 4.

**Section 4**

**CONTROLLING FURTHER SPREAD**

*About control measures:* The rigor of control measures for chickenpox depends on the setting and the population at risk for infection. While the general chickenpox control measures outlined below are appropriate for most settings and populations (e.g., healthy vaccinated daycare attendees; school-age youth with high vaccination rates; workplaces with employee populations thought to be highly vaccinated or with prior history of disease; LTCFs with residents presumed to have already had chickenpox) more stringent control measures are needed in certain settings where the risk of transmission, as well as the likelihood of severe disease among those exposed, is increased. **These more stringent control measures are discussed in Part C, Managing Special Situations.**

**A. Isolation and Quarantine Requirements *(105 CMR 300.200)***

*Minimum Period of Isolation of Patient with Chickenpox*

If vesicles are present, until lesions have dried and crusted or until no new lesions appear, usually by the fifth day (counting the day of rash onset as day zero). If no vesicles are present, until the lesions have faded (i.e., the skin lesions are in the process of resolving; lesions do not need to be completely resolved) or no new lesions appear within a 24-hour period, whichever is later.

*Minimum Period of Quarantine of Contacts*

Susceptible contacts in non-healthcare settings, who are not appropriately immunized or are without laboratory evidence of immunity or a reliable history of chickenpox, shall be excluded from school, work and other public activities from the 8th through the 21st days after their exposure to the case while the case was infectious. If the exposure was continuous, susceptible contacts shall be excluded from days 8–21 after the case’s rash onset. In high-risk settings, the MDPH may impose more rigorous exclusion criteria. Healthcare workers who are not appropriately immunized, are without laboratory evidence of immunity, or do not have a reliable history of chickenpox, shall be excluded from work from the 8th day after their first exposure during the case’s infectious period through the 21st day after the last exposure during the case’s infectious period. Anyone receiving VariZIG™ or IGIV shall extend their exclusion to 28 days post-exposure.

**B. Protection of Contacts of a Case**

1. **Verify diagnosis and determine the type of rash.**

Contact must be made with the diagnosing healthcare provider to confirm the diagnosis, if exclusions are going to occur. Types of chickenpox rash illness are: 1) wild type, 2) breakthrough, or 3) vaccine-associated. Use *Attachment B: Guidelines for Evaluating Chickenpox-like Rash* as a guide or call the Division of Epidemiology at 617/983-6800.

Cases of wild-type chickenpox and breakthrough chickenpox disease are treated equally with regard to infectiousness and control measures, as outlined below. Vaccine-associated rashes, which typically occur 15-42 days after vaccination, are thought to be only rarely infectious. For this reason, control measures are generally not necessary and neither is exclusion, provided no high-risk susceptible contacts are identified.

1. **Isolate the case.**

Case should be isolated if vesicles are present, until all lesions have crusted over, usually by the 5th day after rash onset, but sometimes longer in immunocompromised patients. If no vesicles are present, isolate the patient until the lesions have faded (i.e., the skin lesions are in the process of resolving; lesions do not need to be completely resolved) or no new lesions appear within a 24-hour period, whichever is later.

1. **Identify all those exposed.**

Exposure to chickenpox is defined as contact with nasopharyngeal secretions or lesions, face-to-face interaction, or sharing indoor airspace with an infectious person (e.g., occupying the same 2–4-bed ward or adjacent beds in a large ward) during the patient’s infectious period (2 days before rash onset until lesions have crusted over). For example:

* Household members/close friends (include staff and clients in a group home or shelter)
* School/childcare students and staff
* Staff and patients of healthcare facilities
* Work-place contacts (especially in childcare, school, and healthcare settings)
* Social, sport, extracurricular and religious groups/events
* Bus/carpool/other travel

**Note: See Section 4C for more information on managing special situations, including schools, prisons and jails, infant daycare and healthcare settings.**

1. **Identify susceptible individuals among the exposed.**

Susceptible individuals are those without evidence of immunity, as defined in Attachment A. Note: A positive antibody titer drawn immediately after exposure may be acceptable evidence of immunity depending on the setting. However, vaccination of exposed individuals should not be delayed pending the results of antibody testing.

1. **Identify and exclude susceptible individuals at high risk for complications who can’t be immunized: infants, pregnant women, and immunosuppressed.**

Recommend the exclusion of high-risk susceptible contacts from a setting until 1 incubation period (21 days) after their last exposure, or if they receive VariZIG® or IGIV, until 28 days after their last exposure (to protect others should they develop infection). After this time, they may return if no additional cases have been identified. For more information about VariZIG® and IVIG see Appendix D.

1. **Immunize all other susceptible individuals.**

Recommend varicella vaccine to eligible, susceptible, exposed individuals ASAP. Anyone with a history of receiving 1 dose should receive a second dose. Contact MDPH at (617) 983-6800 if you have questions. (For the most up-to-date information on vaccine contraindications and precautions, see the package insert, the CDC [Guide to Contraindications and Precautions](https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html), the ACIP [General Best Practice Guidelines for Immunization](https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/index.html), and/or the Red Book of the American Academy of Pediatrics for information about varicella vaccine.

Varicella vaccination within 3-5 days following exposure may be effective in preventing disease and even more effective in modifying disease. (However, not every exposure to varicella leads to infection, so for future immunity, varicella vaccine should be given even if more than 5 days have passed since an exposure.)Vaccinating someone who is incubating chickenpox or is immune to chickenpox is not harmful. If vaccine is given following exposure, recipients should be informed that chickenpox could occur despite vaccination.

Please note the following about vaccination within 3 days (more conservative approach) vs. within 5 days (less conservative approach):

* In most healthcare settings, and some other high-risk settings, such as infant daycare facilities, prisons, shelters and group homes vaccination should occur within three days of exposure, if possible.
* In many non-healthcare settings, including schools, vaccination within five days is acceptable.
* Long-term care facilities, depending on their population (e.g., lower risk situation of relatively healthy, previously infected, U.S.-born individuals), may choose vaccination within five days after exposure. Those with high-risk patients (e.g., many susceptible patients with underlying medical problems, including those who require mechanical ventilation, have immunosuppression, or have neurologic compromise) should choose vaccination within three days after exposure.

*Although only 1 dose of varicella vaccine is needed post-exposure to return to school or work (lower risk settings) those with one dose should routinely receive a 2nd dose at least 28 days after the 1st or at least 3 months after the first dose, if younger than 13 years of age.*

1. **Exclude/quarantine all other exposed susceptible contacts who have not been immunized** **as follows:**

* If there was a discrete (one time) exposure, exclude susceptible contacts on days 8–21 from exposure.
* If there was continuous exposure (e.g., attended school for two or more days while person with chickenpox was infectious), exclude susceptible contacts on day 8 through day 21 following the case’s rash onset. This does not apply to high-risk settings or populations (e.g., healthcare).

8. Document key requirements/recommendations and educate individuals who may have been exposed.

Supply potentially exposed individuals with resources:

1) Written or verbal notice of the case or outbreak (without personal identifiers), containing dates by which vaccination must occur and exclusion period dates, as appropriate – call (617) 983-6800 for a sample notice (also referred to as advisories and alerts)

2) The MDPH *Chickenpox Fact Sheet,* available at <http://www.mass.gov/eohhs/gov/departments/dph/programs/id/epidemiology/factsheets.html>

3) The *Varicella Vaccine Information Statement* (VIS), available at <http://www.cdc.gov/vaccines/hcp/vis/vis-statements/varicella.html> and <http://www.immunize.org/vis/index.htm>.

Review the importance of careful hand washing with staff and students, especially after touching discharges from nose, throat, or chickenpox lesions, and the importance of not sharing eating utensils or toys that are put into the mouth.

9. **Conduct surveillance.**

Surveillance for chickenpox should occur for 42 days (2 incubation periods) after the last exposure to chickenpox. For those who received VariZIG® or IGIV and where immunocompromised individuals are involved, surveillance should continue for 56 days.

**C. Managing Special Situations**

*General control measures are found in Section 4B: Protection of Contacts of a Case. In some situations, some control measures may be stricter in order to protect vulnerable susceptible populations or intervene in an outbreak. This section explains those differences for schools, infant daycares, healthcare (acute and long-term care), congregate housing (prison, jails, dormitories, shelters, group homes, military housing) and institutional settings where group A streptococcal (GAS) infection is also present.*

*Schools*

Exposure to chickenpox is defined as contact with nasopharyngeal secretions or lesions, face-to-face interaction, or sharing close indoor airspace with an infectious person during the patient’s infectious period (2 days before rash onset until lesions have crusted over). Close proximity and sustained contact are high-risk for chickenpox transmission. Identifying “zones of exposure” is a critical step in developing specific control interventions for chickenpox. When dealing with schools, identify zones of exposure, starting with the closest contacts:

* Sharing the same small group of desks;
* Sharing the same classroom (especially younger students);
* Sitting at the same table in a lunchroom;
* Riding the same bus/carpooling; or
* Participating on the same sports team or extracurricular activity.

In most settings, casual, brief contact would not constitute exposure for a contact or for an entire school. However, if the individual with chickenpox is immunocompromised or if any contacts are immunocompromised, wider “zones of exposure” may be considered, after consultation with the MDPH.

Because school populations are usually highly vaccinated, and school nurses frequently know which students are susceptible and/or at high risk for medical complications from chickenpox, the general chickenpox follow-up recommendations described in Section 4B, items 1-9, are usually accomplished fairly quickly. The challenge is determining who is exposed, which can depend on how classes and activities are conducted at the school, transportation to and from school, afterschool activities, and so forth.

Typically, parents of susceptible close contacts are notified individually, via a phone call/email from the school nurse providing specific dates by which vaccination must occur or exclusion will begin, and a general letter about chickenpox in the school may be sent to those who have not been identified as close contacts (but may be in the same class or the same grade).

Parents of children with valid medical or religious exemptions should confirm that these children are susceptible. A child may have a history of chickenpox or laboratory evidence of immunity, despite having a religious exemption on file. If these children are susceptible and refuse vaccination they are to be excluded, as indicated below. The scope of this notification varies by the situation and the school. Sample letters are available by calling (617) 983-6800.

*Clusters (three or more cases related in time and space) should be reported using the new web-based varicella* ***cluster*** *report form, also at* [*https://infectious-disease-reporting.dph.mass.gov/pages/CaseReportForms*](https://infectious-disease-reporting.dph.mass.gov/pages/CaseReportForms)

*Daycare with Infants under 1 Year of Age*

Vaccination is not recommended for persons under the age of 12 months, but these infants may be at increased risk for complications of chickenpox. In the daycare setting, any exposed infant for whom vaccination is not recommended should be excluded from the daycare and other activities from day 8 to day 21. Any children who are over 12 months of age should get a first dose of vaccine, if there are no contraindications. If the vaccine is given within 3-5 days of exposure, that child usually may return to daycare. Daycare centers with multiple high-risk children should take a more conservative approach. A child who has 1 dose of vaccine when exposed may get a second dose as long as 3 months have elapsed since the first dose. Teachers and caregivers should also confirm their immune status either by titer, 2 dose vaccine history, birth in the US before 1980, or physician certified disease.

Neonates born to mothers with active chickenpox shall be isolated from susceptible individuals until 21 days of age. According to the American Academy of Pediatrics (2012), mothers who develop varicella 5 days before through 2 days after delivery should be separated from their infants, but their expressed milk can be used for feeding.

*Healthcare Settings (Including Acute and Long-term Care Facilities)*

Immunization screening at time of employment is recommended for all healthcare workers and is particularly important for identification of susceptible healthcare workers who will have close contact with persons at high-risk for serious complications, including a) premature infants born to susceptible mothers; b) premature infants who are born at <28 weeks of gestation or who weigh ≤1,000 g at birth (regardless of maternal immune status); c) pregnant women; and d) immunocompromised individuals. Healthy unvaccinated adolescents and adults are also at higher risk for complications, and healthy, full-term newborns born to susceptible mothers may be as well.

**All healthcare workers should ensure that they have presumptive evidence of immunity to the varicella virus. Birth in the US before 1980 is not acceptable presumptive evidence of immunity for healthcare providers.**

* According to the Advisory Committee for Immunization Practices (ACIP), healthcare personnel (HCP) who have received 2 doses of varicella vaccine and who are exposed to VZV should be monitored daily during days 8-21 after exposure for fever, skin lesions and systemic symptoms suggestive of varicella. HCP should be excluded from work immediately if symptoms occur.
* HCP who have received 1 dose of vaccine and who are exposed to varicella should receive a second dose within 3 days after exposure (provided four weeks have elapsed after the first dose). After vaccination, management is similar to that of 2-dose vaccine recipients. Those who did not receive a second dose or who received the second dose >3 days after exposure should be excluded from work for 8-21 days after exposure. Vaccination within 5 days may be acceptable in some low-risk healthcare settings.
* Unvaccinated HCP, who have no other evidence of immunity, who are exposed to varicella are potentially infectious from days 8-21 after exposure and should be furloughed during this period. Susceptible healthcare workers shall be excluded from work from the 8th day after their first exposure during the case’s infectious period through the 21st day after the last exposure to the infectious case. They should receive postexposure vaccination as soon as possible. Vaccination within 3-5 days of exposure might modify the disease if infection occurred. Vaccination >5 days postexposure is still indicated because it induces protection against subsequent exposures (if the current exposure did not cause infection).

**In most healthcare settings, healthcare personnel who have received one dose of varicella vaccine will not need to be excluded if they have been vaccinated with a second dose within 3 days of exposure**. The exception may be long-term care facilities, which may use a five-day window for vaccination of staff if the patient population is low risk (believed to be immune, for example, due to age).

* In some very high-risk settings, infection preventionists may wish to exclude or reassign all susceptible individuals, regardless of timing of vaccination post-exposure. Decisions about exclusion will depend on such factors as the setting (e.g., neonatal ICU, oncology unit, transplant unit) and the degree of direct patient contact.
* Anyone receiving VariZIG® or IGIV shall extend their exclusion to 28 days post-exposure.
* In healthcare settings, discharge all exposed, susceptible patients as soon as possible. Isolate on contact precautions and airborne isolation all such patients who cannot be discharged from day 8 after first exposure through day 21 after last exposure to someone who was infectious.

**Serologic screening and antibody titers:** In healthcare institutions, serologic screening of personnel who have a negative or uncertain history of chickenpox disease is likely to be reliable and cost-effective. However, routine testing for chickenpox immunity after 2 doses of vaccine is unnecessary and is not recommended. HCP with evidence of two doses who subsequently have a negative titer for varicella should be considered immune. This is because serologic tests are generally not sufficiently sensitive to detect vaccine-induced antibody. On the other hand, HCP with a history of varicella disease who subsequently have a negative titer for varicella should not be considered immune. It is expected that the titer result would be positive in those with a history of varicella disease, and it makes sense to err on the side of caution when evaluating evidence of immunity in the healthcare setting.

*Congregate Housing (prisons and jails, dormitories, shelters, group homes, military housing, etc.)*

As indicated previously, exposure to chickenpox is defined as contact with nasopharyngeal secretions or lesions, face-to-face interaction, or sharing close indoor airspace with an infectious person during the patient’s infectious period (2 days before rash onset until lesions have crusted over). In congregate housing settings, there may be many individuals who live in the facility who may have close contact with the patient while the patient is infectious. The population exposed may or may not be at high risk of complications from chickenpox or may have an uncertain vaccination history.

Because some settings include residents at increased risk for complications and residents with uncertain vaccination history living in close quarters that can facilitate transmission (e.g., a prison, jail or shelter), vaccination of susceptible residents and staff within three days of exposure may be necessary to avoid exclusion or quarantine. MDPH or the local board of health may need to determine acceptable vaccination intervals and evidence of immunity. As with schools, close proximity to the case should be evaluated in terms of zones of exposure, such as the following:

* Sharing the same bedroom or cell/cell block; sharing the same home-like residence
* Sitting at the same table in a lunchroom; sitting within several seats of the case in a TV room or living room; riding the same bus/carpooling; sharing a classroom or
* Participating in the same work, recreation or other activity

*Clusters (three or more cases related in time and space) should be reported using the new web-based varicella* ***cluster*** *report form, also at* [*https://infectious-disease-reporting.dph.mass.gov/pages/CaseReportForms*](https://infectious-disease-reporting.dph.mass.gov/pages/CaseReportForms)

*Institutional Settings Where Group A Streptococcal (GAS) Infection is Also Present*

Before use of varicella vaccine, varicella was the most commonly identified predisposing factor for invasive GAS infection. In the post-vaccine era, invasive GAS infection as a complication of chickenpox is relatively rare but can be very serious. In institutional settings where chickenpox cases are accompanied by GAS infection, whether invasive or non-invasive, rapid vaccination of exposed susceptibles and antibiotic treatment or prophylaxis with regard to GAS infection may be indicated. Contact the MDPH Division of Epidemiology immediately for assistance with GAS cases at (617) 983-6800. Also refer to the *Group A Streptococcus (Invasive)* chapter for more information about this infection.

*Shingles*

Exposure to uncomplicated shingles is defined as **contact with lesions**, (e.g., through close patient care, touching, or hugging). Susceptible individuals who are exposed to shingles lesions should be treated the same as susceptible chickenpox contacts.

Persons with shingles must be very careful about personal hygiene and must wash their hands if they touch their lesions. In otherwise healthy individuals, lesions that are covered appear to pose little risk to susceptible individuals. **Unless the shingles rash can be completely covered, it is advisable that individuals with shingles stay at home until the rash is crusted over and dry. Children with shingles whose lesions cannot be covered should be excluded from childcare/school until their lesions have crusted.**

In a high risk setting with patients at high risk of complications from varicella, if there is doubt about a case’s ability to comply with keeping lesions covered (e.g., young children, individuals with developmental delay), the case may be asked to stay home until he/she is no longer infectious. Additionally, those with shingles should avoid contact with those at higher risk for infection with VZV or complications from VZV infection (e.g., unvaccinated infants, immunocompromised people). This is not possible in some settings, and in these situations, exclusion of the case (or the high-risk individual[s]) may be considered.

**D. Preventive Measures**

Vaccination, including routine childhood vaccination, catch-up vaccination of adolescents, and targeted vaccination of high-risk adults, is the best preventive measure against chickenpox and subsequent shingles. To decrease the occurrence of breakthrough disease, CDC recommends:

* Implementation of a routine 2-dose varicella vaccination program for children, with the first dose administered at age 12–15 months and the second dose at age 4–6 years;
* A second dose catch-up varicella vaccination for children, adolescents, and adults who previously had received 1 dose;
* Routine vaccination of all healthy persons aged >13 years without evidence of immunity.

Prenatal assessment of women for evidence of varicella immunity is recommended. Birth before 1980 is not considered evidence of immunity for pregnant women. Women who do not have evidence of varicella immunity should receive the first dose of vaccine before discharge from the health-care facility after delivery. The second dose should be administered 4-8 weeks later, which may coincide with a postpartum visit. Women should be counseled to avoid conception for 1 month after each dose of varicella vaccine.

The vaccine for shingles (Shingrix®) is recommended for use in people 50 years old and older to prevent shingles and for adults ages 19 years or older who are or will be immunodeficient or immunosuppressed because of disease or therapy. Shingrix is administered as a 2-dose series by the intramuscular route. The second dose should be given 2 to 6 months after the first dose, with a minimum interval of 1 month (4 weeks) between doses.

Good personal hygiene (which consists of proper hand washing, disposal of used tissues, not sharing eating utensils, etc.) is also important. Please refer to the most current versions of the ACIP statements on varicella (listed under the References section), MDPH’s Immunization Guidelines, and MDPH’s Massachusetts Immunization Division-State Supplied Vaccines and Patient Eligibility Criteria for details about varicella vaccine, the recommended schedule, who should and shouldn’t get the vaccine, and who is eligible to receive state-supplied vaccine. These, as well as other relevant resources, are available through the MDPH Division of Epidemiology at (617) 983-6800. A Chickenpox (Varicella) Public Health Fact Sheet for the general public is available from the MDPH Division of Epidemiology or on the MDPH website at: <http://www.mass.gov/eohhs/gov/departments/dph/programs/id/epidemiology/factsheets.html>

**ADDITIONAL INFORMATION**

The following is the formal CDC surveillance case definition for chickenpox. It is provided for your information only and should not affect the investigation and reporting of a case that fulfills the criteria in Section 2A of this chapter. (The CDC and the MDPH use the CDC case definitions to maintain uniform standards for national reporting.) For reporting to the MDPH, always use the criteria outlined in Section 2A.

*Note: The most up-to-date CDC/CSTE case definitions are available on the CDC website at* [*https://ndc.services.cdc.gov/*](https://ndc.services.cdc.gov/)

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**ATTACHMENTS**

*Attachment A: Evidence of Immunity to Varicella*

*Attachment B: Guidelines for Evaluating Chickenpox-Like Rash*

*Attachment C: Guidance for Interpreting a Past History of Chickenpox*

*Attachment D: Notes about VariZIG and IVIG Following an Exposure*

**Attachment A**

|  |
| --- |
| **Evidence of Immunity to Varicella1** |
| Evidence of immunity to varicella includes any of the following:   * Documentation of age-appropriate vaccination against chickenpox; or * Laboratory evidence of immunity or laboratory confirmation of disease2; or * Born in the United States before 1980. **However, this should not be considered evidence of immunity for healthcare workers, pregnant women and immunocompromised persons**. Persons born outside the United States should meet one of the other criteria for varicella immunity. * A healthcare provider diagnosis or verification of chickenpox3; or * History of shingles (herpes zoster) based on healthcare provider diagnosis.4. |

1Bone marrow transplant recipients should be considered susceptible *regardless* of past history of disease.

2Commercial assays can be used to assess disease-induced immunity, but they lack adequate sensitivity to detect vaccine-induced immunity reliably (may yield false negative results).Therefore, someone with documentation of age-appropriate vaccination and a subsequent negative titer should still be considered immune. On the other hand, someone with a history of chickenpox with a subsequent negative titer should be considered susceptible, particularly in healthcare and other high-risk settings.

3Self-reported history of chickenpox is acceptable for adults and college students, with review by appropriate healthcare or supervisory staff. Self reported history is not acceptable in healthcare settings.

4Verification of history or diagnosis of typical disease can be done by any healthcare provider (e.g., school or occupational clinic nurse, nurse practitioner, physician assistant, physician, appropriate supervisory or public health staff). For people reporting a history of, or presenting with, atypical and/or mild disease, assessment by a physician or their designee is recommended and one of the following should be sought: a) an epidemiologic link to a typical varicella case or b) laboratory confirmation, if laboratory testing 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.

**Attachment B**

**Guidelines for Evaluating Chickenpox-like Rash**

(Wild Type vs. Breakthrough vs. Vaccine-Associated)

The three most important features are: 1) the severity of the chickenpox-like illness, 2) any known exposure to chickenpox, and 3) the time interval since receipt of varicella vaccine, as outlined below.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **WILD TYPE** | **BREAKTHROUGH** | **VACCINE-ASSOCIATED** |
| **Symptoms** | * Generalized rash  (typically 200 – > 500 lesions with many vesicles) * Fever * Cough   (if “partial” immunity has developed, symptoms may be attenuated) | * Generalized rash, more maculo-papular than vesicular (usually < 50 lesions) * Often afebrile * Minimally symptomatic | * Generalized rash, more maculopapular than vesicular (< 20 lesions [median=5]) * Some localized vesicles at the site of injection (median=2) * Afebrile * Asymptomatic |
|  | *and* | *and* | *and* |
| **Exposure to chickenpox** | often a known or possible exposure | often a known or possible exposure | No known exposure |
|  | *and* | *and* | *and* |
| **Timing Post Vaccination** | rash occurs < 7 days or > 42 days  (but can also occur between 7 – 42 days)\* | rash usually occurs > 42 days  (but can also occur between 7 – 42 days)\* | rash occurs at 7-21 days  (but can occur up to 42 days)\* |
|  | ⇓ | ⇓ | ⇓ |
| **Occurrence** |  | Up to 30% of vaccinated children and adults, respectively, with household exposure to wild-type varicella | Side effect of the vaccine  (occurs in 4% of vaccinees) |
|  | ⇓ | ⇓ | ⇓ |
| **Infectious** | **Highly infectious** | **< 50 lesions, one-third as infectious as wild type**  **>50 lesions, as highly infectious as wild type** | * *Much less* infectious than non-vaccine modified wild-type disease * If transmission occurs, infection may be asymptomatic or attenuated |
|  | ⇓ | ⇓ | ⇓ |
| **Exclude** | Exclude from school until all lesions have dried and crusted over, or until no new lesions appear, usually by the 5th day after rash onset. | If vesicles are present, exclude as for wild-type chickenpox. If no vesicles are present, until lesions have faded (i.e., the lesions are in the process of resolving; lesions do not need to be completely resolved) or no new lesions appear within a 24-hour period, whichever is later. | If no high-risk susceptible contacts are identified and local policy permits, the child may attend school. |

\*Rashes occurring days 7-42 post vaccination may be due to either wild-type or vaccine-type virus. PCR testing may be used to differentiate.

[Please see the accompanying page for more details.]

**Guidelines for Evaluating Chickenpox-like Rash, cont.**

|  |
| --- |
| Distinguishing rash induced by varicella vaccine virus from rash caused by wild-type virus in a vaccine recipient is critical in making appropriate infection control decisions and patient management decisions, particularly regarding individuals at risk for serious complications of varicella.  The three most important features to consider in making these determinations are:  1) the severity of the chickenpox-like illness,  2) any known exposure to chickenpox, and  3) the time interval since receipt of varicella vaccine.  The guidance outlined below is provided to assist in making this determination. |

There are three possible categories of chickenpox-like rash in vaccine recipients:

1. **Wild-type chickenpox** (can occur at any time post-vaccination, but rashes occurring < 7 and > 42 days should be considered wild type):
2. *<* 7 days post-vaccination – In this case, exposure to wild-type virus happens prior to or immediately following vaccination. Wild-type chickenpox can occur in this scenario because there has been insufficient time for immunity to develop prior to exposure.
3. 7 - 42 days post-vaccination – In this case, it is difficult to determine if the rash is due to wild-type or vaccine-type virus. PCR testing is available at CDC to make this determination. This test is not done routinely and results are not usually available quickly. Therefore, if the rash does not appear to be a “side effect” of the vaccine (as described in #3 below), it should be considered wild-type with regard to infectiousness and susceptible contacts should be excluded, as indicated.
4. > 42 days post-vaccination – In this case, the vaccine recipient has not responded sufficiently to the vaccine prior to exposure. The lack of vaccine-induced protection may also reflect insufficient time post-vaccination for immunity to develop, or it may be due to host- or vaccine-specific issues impairing response to vaccine (“vaccine failure”). In these instances, the illness usually presents as typical chickenpox with a generalized rash with 200 to > 500 lesions with many vesicles, fever, and cough. There is often a known or possible exposure to chickenpox. The patient should be considered infectious and excluded until the lesions dry and crust over, usually 5 days after rash onset.
5. **Breakthrough chickenpox** or vaccine-modified varicella syndrome (VMVS) is a form of wild-type chickenpox that is less severe due to the development of “partial immunity” that was not sufficient to prevent disease but was able to attenuate symptoms. It usually occurs > 42 days post-vaccination but can also occur between 7–42 days. VMVS can occur in up to 10% of vaccinated children and 30% of adults. VMVS usually presents as a generalized rash consisting of < 50 lesions, usually more maculopapular, with a few vesicles. Breakthrough cases with fewer than 50 lesions have been found to be one third as contagious as varicella in unvaccinated persons with 50 or more lesions, but breakthrough cases with 50 or more lesions can be just as contagious as cases in unvaccinated persons. Patients are often afebrile and minimally symptomatic. If vesicles are present, exclusion is the same as for a wild-type case of varicella. If no vesicles are present, exclude until the lesions have faded (i.e., the skin lesions are in the process of resolving; lesions do not need to be completely resolved) or no new lesions appear within a 24-hour period, whichever is later. If the incidence of breakthrough disease is greater than 30% in any particular setting, MDPH should be notified for further investigation of the cases and a vaccine ‘cold chain’ evaluation should be performed.
6. **Vaccine-associated rash** (“side effect” from vaccine) – This is reported in 4% of vaccine recipients, although in trials, 2% of placebo recipients also developed varicella-like rashes. Approximately 4% of children receiving varicella vaccine (compared to 2% of placebo recipients) develop a generalized rash with a median of five lesions 5-26 days postvaccination, and 4% develop a localized rash with a median of two lesions 8-19 days postvaccination. This rash typically occurs at 7–21 days but is possible up to 42 days post-vaccination. It usually presents as a generalized rash, more maculopapular than vesicular, consisting of < 20 lesions and/or a few vesicles at the site of injection (median = 2). If there are more than 20 lesions, the rash is unlikely to be a vaccine-associated rash. Patients are afebrile and otherwise asymptomatic. If the clinical presentation fits these criteria, and there is no known exposure to chickenpox, this rash may be attributed to varicella vaccine. Rash occurring within 2 weeks of or more than 42 days after vaccination is more likely to be wild-type virus, and rash occurring 15-42 days postvaccination is more likely to be vaccine-type virus. Although there are no official guidelines, the rash is caused by attenuated vaccine virus, and for this reason, many experts believe that it is much less infectious than disease caused by wild-type virus. When transmission of vaccine virus has occurred, infection has been found to be mild or asymptomatic. Cases of vaccine associated rash may be considered to be NOT infectious, if there are no susceptible contacts at high-risk for complications of varicella. If local childcare/school policy permits, the vaccinee does NOT need to be excluded. However, they should be advised to avoid close contact with high-risk individuals until the rash has resolved. Childcare and school programs will need to develop their own policies. *Note*: Chickenpox-like rashes occurring during this time period may be caused by wild-type virus, particularly if there is a known or possible exposure to chickenpox. (See wild-type above.)

**Attachment C**

**Guidance for Interpreting a Past History of Chickenpox**

History of chickenpox should be carefully evaluated in order to determine the likelihood that the patient has actually had chickenpox in the past, and is therefore no longer susceptible:

* In the pre-vaccine era (before 1995), the rash of chickenpox was distinct and subclinical cases were rare.
* Since chickenpox has been endemic in the U.S., epidemiologic and serologic studies indicate that >95% of U.S. adults born after 1980 are immune to chickenpox, and such adults with a negative or uncertain history are actually 71–93% likely to have VZV antibodies when tested. **Those individuals born in the U.S. before 1980 are considered immune (Note: does not apply to healthcare providers).**
* In foreign-born adult populations, particularly those from tropical countries, the proportion immune to chickenpox is likely to be much lower as chickenpox may be less common in these countries. **Therefore, those born outside the U.S. before 1980 should be considered immune only if they have a reliable history of disease.**
* History of disease is likely to vary in different populations, and every effort should be made to obtain accurate histories of disease. These efforts should include the use of interpreters, as available, and verification of history with family members.
* For those individuals reporting atypical or mild cases of chickenpox, it is important to help establish the likelihood of disease by asking if household members or other close contacts (e.g., contacts in childcare, school, or other outbreak settings) had chickenpox within three weeks of the individual’s illness (or if there was laboratory confirmation at time of acute illness). If such documentation is lacking, persons should not be considered as having a valid history of disease because other diseases may mimic mild atypical chickenpox.
* **If there is any question about the ‘reliability’ of the past history of chickenpox, the individual should be considered susceptible, unless serologic evidence of immunity is obtained.**
* Serologic testing for immunity is an option for individuals with a negative or uncertain history of disease. If the person believes that they have had chickenpox, but they have a negative titer, they should be considered susceptible.

**Attachment D**

**Notes about VariZIG and IVIG Following an Exposure**

For people exposed to varicella who cannot receive live varicella vaccine, varicella zoster immune globulin can prevent varicella from developing or lesson the severity of the disease. Once these individuals are identified they should be referred for medical evaluation.Varicella-zoster immune globulin (VariZIG®) prophylaxis (or immune globulin, intravenous, if varicella-zoster immune globulin is not available) is recommended for all high-risk individuals including:

* immunocompromised individuals without evidence of immunity to varicella,
* pregnant women without evidence of immunity to varicella
* and certain newborns (see below)*.*

VariZIG® is approved for administration as soon as possible following varicella-zoster virus exposure, ideally within 96 hours (4 days) for greatest effectiveness, and within 10 days. After 10 days this treatment is not likely to be helpful. Patients receiving monthly high-dose (≥400 mg/kg) immune globulin, intravenous (IGIV) are likely to be protected and probably do not require VariZIG®, if the most recent dose of IGIV was administered ≤ 3 weeks before exposure. Post-exposure prophylaxis with acyclovir should also be considered if VariZIG® and IGIV within 10 days are not an option. Please see the Guidelines on VariZIG® or IGIV prophylaxis at <http://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/varicella.html>. For intervals between Administration of Immunoglobulin Preparations and Live Virus Vaccines, including Measles-Containing and Varicella Vaccines, please go to the CDC web site, the CDC Pink Book, the Red Book of the American Academy of Pediatrics, and other resources for clinicians.

*Immunocompromised individuals without evidence of immunity to varicella*

An immunocompromised individual should be referred to their healthcare providers. Examples include 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, and people with cellular immune-deficiencies or other immune system problems. These individuals have a higher risk for serious complications with chickenpox infection, including disseminated disease resulting in multiple organ system involvement. Complications include pneumonia and encephalitis.

*Pregnant women without evidence of immunity to varicella*

A pregnant woman should be referred to her obstetrician. Susceptible pregnant women who contract varicella may be at higher risk for serious complications than adults in general, and their fetuses are at risk for congenital varicella syndrome.

* Prenatal assessment of women for evidence of varicella immunity is recommended. Birth before 1980 is not considered evidence of immunity for pregnant women exposed to varicella.
* Women who do not have evidence of varicella immunity should receive the first dose of vaccine before discharge from the health-care facility after delivery. The second dose should be administered 4-8 weeks later which may coincide with a postpartum visit. Women should be counseled to avoid conception for 1 month after each dose of varicella vaccine.
* Susceptible pregnant women who cannot receive VariZIG® (or IGIV if varicella-zoster immune globulin is not available) as soon as possible following exposure, and within 10 days of exposure, should be closely monitored by their clinicians for signs and symptoms of varicella. Institute treatment with acyclovir, if illness occurs.

*Certain newborns*

Some newborns (e.g., immunocompromised, hospitalized or underweight pre-term, or born to a mother with chickenpox) are also at increased risk for complications and should receive treatment:

* Newborns whose mothers have varicella from five days before to 2 days after delivery
* Premature babies exposed to varicella (or herpes zoster) during the period for which they require hospital care for their prematurity, 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 ≤1000 grams at birth **regardless** of their mother’s varicella immune status
* According to the American Academy of Pediatrics (2018-2021), mothers who develop varicella 5 days before through 2 days after delivery should be separated from their infants, but their expressed milk can be used for feeding.

When deciding whether or not VariZIG® or IGIV is indicated, three factors should be considered carefully:

1. The likelihood the exposed person is susceptible to varicella;
2. The probability that a given exposure to varicella or zoster will result in infection; and
3. The likelihood that complications will develop if the person is infected.

In the absence of both VariZIG and IVIG, some experts recommend prophylaxis with acyclovir for people without evidence of immunity who have contraindications to varicella vaccination. Published data on the benefit of acyclovir as postexposure prophylaxis among immunocompromised people are limited.