Management of Varicella Zoster Virus Infections

Federal Bureau of Prisons
Clinical Practice Guideline

January 2009

What's New in this Document?

- Overview of available varicella laboratory tests (*Appendix 1*).
- Detailed contact investigation flow chart and checklist (*Appendix 3a* and *Appendix 3b*).
- Definition of exposure to varicella (chicken pox) and herpes zoster (shingles) (*Appendix 3b*).
- New criteria for "evidence of immunity" to varicella (*Appendix 3b*).
- Detailed information on post-exposure prophylaxis with varicella vaccine (VariVAX®) and varicella immune globulin (VariZIG®) (*Appendix 5*).

Clinical guidelines are made available to the public for informational purposes only. The Federal Bureau of Prisons (BOP) does not warrant these guidelines for any other purpose, and assumes no responsibility for any injury or damage resulting from the reliance thereof. Proper medical practice necessitates that all cases are evaluated on an individual basis and that treatment decisions are patient specific. Consult the BOP Clinical Practice Guideline web page to determine the date of the most recent update to this document:
http://www.bop.gov/news/medresources.jsp

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1. Purpose

The Federal Bureau of Prisons (BOP) Clinical Practice Guidelines for the Management of Varicella Zoster Virus (VZV) Infections provide recommendations for the medical management of federal inmates with varicella (chicken pox) and herpes zoster (shingles), as well as for prevention and control measures.

2. Varicella Zoster Virus Overview

Varicella zoster virus causes two distinct clinical conditions. Primary VZV infection causes varicella (chickenpox), a contagious rash illness typically occurring among children. Decades after the initial infection, VZV can reactivate to cause herpes zoster (shingles), a localized, generally painful cutaneous eruption that occurs most frequently among older adults.

Epidemiology

Before the development of varicella vaccine in the United States, almost all persons developed varicella, with 90% of the cases occurring before age 15. Data indicates that 97% of U.S. born persons who were born between 1960 and 1980 are immune. Persons born in tropical and subtropical regions are more likely to be susceptible and to develop chicken pox as adults; hence, many foreign born inmates are more likely to be susceptible. With increased vaccination coverage and decreased incidence of wild-type chicken pox, a higher proportion of chicken pox cases will occur in immunized people as "breakthrough disease." Beginning at ages 40–50, incidence rates of herpes zoster increase rapidly. Approximately 50% of persons who live to age 85 will experience zoster.

Varicella (Chicken Pox)

Natural history: Varicella, or chickenpox, is a highly contagious systemic disease that normally results in lifelong immunity. Persons with a prior history of varicella, who are re-exposed to wild-type VZV, develop an asymptomatic reinfection that boosts VZV antibody titers, but rarely causes a second bout of chicken pox.

Transmission: VZV infection is readily transmitted from person to person as follows:

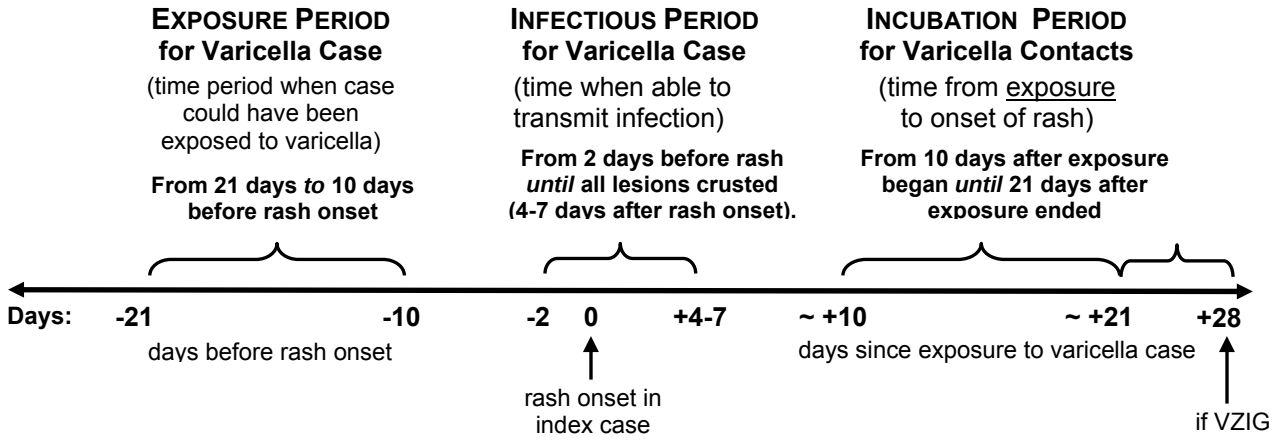
- **Droplet spread** when a person with chicken pox coughs or sneezes.
- **Direct contact** with upper respiratory secretions or with lesions that have not yet crusted.
- **Airborne spread**, which is more likely to occur when an individual is immunocompromised.
- **Congenital transmission**.

Secondary attack rates (involving transmission to previously uninfected persons) are extraordinarily high, ranging from 70–90%. Persons can be infected without immediate contact with an infectious person. However, for contact investigation purposes, direct contact of one hour or greater is usually considered significant (see exposure definition, page 6).

Incubation period: The average incubation period for varicella (time period from exposure to onset of rash) is 14–16 days, but can range from 10–21 days. After varicella-zoster immune globulin (VZIG) is administered, the incubation period may be prolonged (28 days or longer).

Infectious period: The period of contagiousness begins 1–2 days before the onset of rash and ends with the crusting of the lesions (usually 4–7 days after the onset of rash). Immunocompromised persons may be contagious for a somewhat longer period of time.

Figure 1. Varicella Timeline



Presentation: Chickenpox normally presents with mild constitutional symptoms and the sudden onset of a maculopapular rash that rapidly evolves to a vesicular exanthem. The rash classically spreads in successive crops, resulting in lesions appearing in various stages of evolution, including papules, superficial vesicles ("dew drops"), pustules, and crusted lesions. Lesions are concentrated on the trunk, with fewer lesions on the distal extremities (but not involving the palms of the hands or soles of the feet).

Note on small pox differential: An important distinction between varicella and variola (small pox) is the progression of the rash.

- With **varicella**, *different stages of the rash (*macules, papules, vesicles, and scabs) *are present at the same time.*
- With **small pox**, *all stages of the rash appear in the same stage simultaneously*, evolving from macules to papules to pustules over several days, with each stage lasting 1–2 days. Small pox lesions occur preferentially on the face and distal extremities and, unlike varicella, may be found on the palms of the hands and soles of the feet.

Atypical and subclinical cases of varicella without a rash are rare, but do occur. Most cases of chickenpox are self-limited without serious sequelae, particularly in children. Life threatening complications, such as encephalitis, pneumonia, and hepatitis, occur more commonly in newly infected adults and immunocompromised persons.

Pregnancy: Primary infection with VZV during pregnancy may result in viral transmission to the fetus or newborn. Intrauterine transmission of VZV can result in congenital varicella syndrome, neonatal varicella, or herpes zoster during infancy. Congenital varicella syndrome is most commonly associated with primary VZV maternal infection during the first trimester of

pregnancy and is characterized by low birth weight, limb deformities, and ocular problems in the newborn. Maternal infection with VZV, from 5 days before delivery to 2 days after, is associated with severe, potentially fatal, perinatal chickenpox in the newborn infant.

Herpes Zoster (Shingles)

Natural history: Following primary VZV infection, varicella infection persists in a dormant state in the dorsal-root ganglia. Reactivation of VZV infection results in herpes zoster (shingles). Shingles occurs sporadically in otherwise healthy individuals, but more commonly affects the elderly and immunocompromised persons, particularly those with lymphoproliferative cancers, organ transplantations, and infection with human immunodeficiency virus (HIV).

Transmission: Herpes zoster is less contagious than chickenpox; however, VZV can be transmitted by direct contact, droplet, or aerosol exposures to the vesicular lesions of a person with shingles. The infectiousness of herpes zoster is greatly increased for immunocompromised persons and when disseminated disease is present. In susceptible contacts, transmission of VZV from persons with herpes zoster may result in chickenpox.

Presentation: Herpes zoster commonly presents as a severe, painful, unilateral dermatomal rash. Malaise, headache, and a severe neuropathic type pain may precede the rash and may be misdiagnosed by the evaluating clinician until the dermatomal rash becomes apparent. The rash is initially papular, then vesicular, and eventually crusts in 10–15 days. Cranial nerve involvement, if present, results in nerve-specific signs.

Note: *Eyelid and nose lesions indicate potentially sight-threatening keratitis.*

Severe sequelae are more common with concurrent immunosuppression and may include disseminated dermatologic disease, meningoencephalitis, cerebral angiitis presenting as stroke, visceral disease, and acute retinal necrosis. Once the shingles rash has resolved, post-herpetic neuralgia may persist chronically, particularly in the elderly.

3. Screening

For all inmates entering BOP custody, a positive or negative history of varicella and herpes zoster should be ascertained by inmate interview and documented in the medical record. When a varicella case has been identified in a facility, inmate contacts should be re-interviewed by a health care provider. Only the inmates who have a history of varicella, *and* either epidemiologic links to other cases or laboratory documentation of varicella, will be considered immune based on their history. See "Criteria for 'Evidence of Immunity'" (page 7).

4. Diagnosis

Inmates presenting with unilateral dermatomal pain or a vesicular rash should be evaluated for possible VZV infection. The diagnosis of VZV infection can be made or supported by any one or more of the following:

- **Physical examination** to identify the symptoms typical of VZV rash:

- **Varicella:** lesions that are simultaneously in all stages of development—from vesicles on a red base, to umbilicated pustules, to crusted lesions.
- **Herpes zoster:** unilateral, dermatomal distribution of a painful vesicular rash.

  Note: *Zoster or a history of zoster in an inmate should prompt a recommendation for HIV testing.*

- **Patient history** of exposure to VZV or herpes zoster in the past 3 weeks, in a susceptible contact (requires patient follow-up to confirm diagnosis or provide prophylaxis).
- **Laboratory tests** are not routinely required, but can be useful for confirmation of the diagnosis, particularly if the presentation is atypical. (See *Appendix 1, Varicella Virus and Immunity Testing*, for more detail on available tests and specimen collection procedures.)
  - **Varicella virus testing**
    - *Rapid varicella zoster identification*. Polymerase chain reaction (PCR) testing is widely available from commercial labs, with results available in several hours.
    - *Viral culture* is rarely necessary.
  - **Varicella immunity testing** (*IgG*) is useful in outbreak situations.

5. Treatment

Drug treatment options for VZV infections are outlined in *Appendix 2, Antiviral Therapy for VZV Infections*.

Treatment of Varicella/Chicken Pox

Antiviral treatment of adults with varicella has been shown to decrease the duration and severity of illness. However, treatment for varicella should be considered only if the inmate is diagnosed within 24 hours of the rash or soon thereafter. Antiviral therapy with **acyclovir (800 mg, administered orally 4 times per day, for 5 days)** may result in fewer skin lesions and fewer constitutional symptoms if it is initiated at the onset of the rash. Intravenous acyclovir (and possibly hospitalization) is indicated for immunocompromised persons with chicken pox. Consult with a physician expert regarding inmates who have complicated, primary VZV infections such as varicella pneumonia, varicella during pregnancy, or varicella in an immunocompromised host.

Pruritus should be treated topically (e.g., calamine lotion or oatmeal bath) and, if necessary, with systemic antihistamines to minimize scratching and the serious secondary bacterial infections that could result. Fingernails should be cut short. As feasible, the inmate should be allowed to shower frequently (i.e., several times a day) with soap.

Treatment of Herpes Zoster/Shingles

Treatment with **Acyclovir (800 mg, administered orally every 4 hours, 5 times daily, for 7–10 days)** decreases viral shedding, accelerates healing of skin lesions, reduces acute pain, and decreases the risk of post-herpetic neuralgia in some persons. Famciclovir and valacyclovir, although more simply dosed, offer no major therapeutic advantages over acyclovir; therefore,

they should be only selectively considered. To be maximally effective, antiviral therapy must be administered within 72 hours of the onset of the rash. The benefits of later treatment have not been studied.

The concurrent administration of a tapering course of prednisone to reduce post-herpetic neuralgia has been demonstrated to decrease zoster pain and decrease time for cutaneous healing. However, steroids should not be prescribed for inmates who have absolute or relative contraindications, e.g., diabetes mellitus. Topical antiviral agents are of no benefit. Patients should be advised to keep the lesions clean to prevent secondary bacterial infections. A nonocclusive, nonadherent, sterile dressing can prevent the irritation caused by contact with clothing. Pain may be severe and should be aggressively managed.

HIV infection: Orally administered acyclovir in standard doses is effective in treating herpes zoster in persons with HIV co-infection. Acyclovir therapy should be continued until all lesions have crusted over, due to the risk of relapse in this population. Intravenous acyclovir is recommended for disseminated herpes zoster (rash involving multiple noncontiguous dermatomes). The risk of post-herpetic neuralgia is no greater in persons with HIV infection.

Herpes zoster ophthalmicus: VZV reactivation involving the first branch of the trigeminal nerve often presents with unilateral pain and lesions involving the nose, forehead, or periocular areas. Left untreated, these patients may develop potentially sight-threatening keratitis, and other ocular complications such as episcleritis and iritis. *Diagnosis of herpes zoster ophthalmicus warrants immediate referral to an ophthalmologist.*

Post-herpetic neuralgia: Chronic pain following a bout of herpes zoster can be protracted, incapacitating, and refractory to therapy, particularly in the elderly. Potentially effective treatments, alone or in certain combinations, include: tricyclic antidepressants, gabapentin, or opioids; topical capsaisin applied to healed, intact skin; and 5% lidocaine patches applied to healed, intact skin. Therapy should be individualized, based on the severity of pain and the risk of complications associated with the various treatment options.

Patient Education

Inmates with varicella or herpes zoster can be offered the following practical advice.

Table 1. Educational Messages for Inmates about Chicken Pox and Shingles

- **Take medications as prescribed by your physician.**
- **Don't scratch!** Scratching can make the sores harder to heal, lead to scarring, and increase the risk that the sores will become infected. If itching is particularly severe, over-the-counter or prescribed antihistamines may be helpful.
- **Take showers.** Cool showers every 3 to 4 hours can help relieve itching.
- **Apply lotion.** Applying calamine lotion or a similar agent to the rash may help relieve the itching.
- **Rest, and eat a bland diet if necessary.** Getting plenty of rest is helpful in getting over any infection. If chickenpox sores develop in your mouth, switch to a diet of soft, bland foods. Spicy, acidic, or hard, crunchy foods can irritate mouth sores.
- **Treat a fever.** Fever can be reduced with acetaminophen (tylenol).

6. Control Measures

Housing Inmates with Varicella

- **All inmates with varicella or disseminated herpes zoster, and immunocompromised inmates with herpes zoster:** These inmates should be transferred to a community hospital, if medically indicated. Otherwise, they should be housed *either* in the institution's airborne infection isolation (AII) room *or* in a single cell with a door that closes—and their contact with other inmates restricted—per BOP policy. AII rooms are preferred for immunocompromised inmates who have chicken pox or shingles, or for *any* inmate with disseminated shingles. The inmate can return to general population housing when skin lesions have crusted.

  All staff or inmates entering the cell of an inmate with contagious chickenpox or disseminated herpes zoster should wear masks (NIOSH-certified particulate respirators or surgical masks). They should wear gloves when any direct contact with the inmate is anticipated.

- **Inmates with herpes zoster (without immunosuppression).** These inmates can usually be maintained in general population so long as the inmate is cooperative and the lesions can be kept covered. If not, the inmate should be housed in a single cell. Contact precautions, including the use of gloves, should be utilized whenever dressings are changed.

Contact Investigations

Varicella contact investigations are complex. Seek consultation from the Central Office and local health department, as necessary. An overview of contact investigation steps is provided in *Appendix 3a*. A detailed checklist for contact investigations associated with varicella or herpes zoster is provided in *Appendix 3b*.

The updated guidance on varicella contact investigations includes the following:

- **Infectious and incubation periods:** A worksheet is available for calculating these time periods (see *Appendix 3b*).
- **Definition of "Significant Exposure":** The following specific definitions of "exposure" have been developed for contact evaluation. Cases are known to be infectious from 48 hours before onset of rash, until 7 days after onset of rash or until the case is isolated.

  For chicken pox:

  In general, exposure to chicken pox is defined as *at least one hour* of: 1) contact with nasopharyngeal secretions or lesions; 2) face-to-face interaction; or 3) sharing indoor airspace (usually within 3 feet, e.g., occupying the same 2–4 bed ward, or adjacent beds in a large ward) during the case infectious period (2 days before rash onset until all lesions are crusted).

  For shingles:

  - Exposure to *uncomplicated shingles* is defined as direct contact with lesions.
  - Exposure to *disseminated shingles,* or exposure to an *immunocompromised person with disseminated or localized shingles*, is defined as: 1) contact with lesions; or 2) sharing indoor airspace (e.g., occupying same 2–4 bed ward or adjacent beds in a large ward).

- **Criteria for "Evidence of Immunity":** In 2007, the Centers for Disease Control and Prevention (CDC) published criteria for determining whether an individual has "evidence of immunity" to varicella. With this criteria, the immunity of a group of exposed persons can be quickly determined. If *any* of the following four conditions are met, the contact is considered to be immune:

  1) History of varicella vaccine (documentation of 2 vaccine doses).

  2) History of chicken pox or shingles (documented by a health care provider*).

  3) Laboratory evidence of immunity (IgG positive) or confirmation of disease.

  4) *All* of the following:
     - U.S. born before 1980 *and*
     - *Not* pregnant *and*
     - *Not* immunocompromised (if HIV-infected, CD4 <1000 mg/dL) *and*
     - *Not* a health care worker.

  * Verification of a history of varicella must be obtained by a health-care provider. To be considered immune, persons who report a history of varicella must *also*:

    (1) Report a history of epidemiologic links to either another typical varicella case, i.e., sibling with chicken pox, or to a laboratory-confirmed case; *or*

    (2) Have evidence of laboratory confirmation at the time of acute disease.

    Persons who lack the above documentation *do not* have a valid history of varicella.

- **Post-exposure prophylaxis recommendations have been recently revised.** Refer to *Appendix 5* for more detailed information on varicella vaccine and VariZIG®.

  - **VariZIG®:** In 2006, the CDC recommended that high-risk, susceptible contacts receive post-exposure prophylaxis with varicella immune globulin (VariZIG®) within 96 hours (4 days) of exposure. The following categories of contacts should be considered for VariZIG: pregnancy, primary and acquired immunodeficiency (including HIV-infected and CD4 <200mg/dL), neoplastic diseases, and receiving immunosuppressive treatments.

    VariZIG is currently available only as an investigational drug as part of a research protocol. If VariZIG is not available, administration of immune globulin intravenous (IGIV) (also within 96 hours) should be considered. Staff contacts at high risk should be immediately referred to their provider for evaluation for VariZIG.

  - **Varicella Vaccine:** In 2007, the CDC revised its recommendations to include the use of varicella vaccine as post-exposure prophylaxis for susceptible contacts. Vaccination within 3 days of exposure to rash has been shown to be 90% effective in preventing varicella; vaccination within 5 days of exposure is approximately 70% effective in preventing varicella, and 100% effective in modifying severe disease. Administration of a second dose (4 weeks or more after the initial dose) is recommended for persons who receive a single dose following an exposure.

    Varicella vaccine is a live vaccine and should not be administered to pregnant women or HIV-infected persons with CD4 <200 mg/dL. (***Note:*** *If clinical status is unknown, screening for HIV infection and pregnancy is necessary prior to vaccine administration.*)

    The following groups should be considered for post-exposure varicella vaccine:

    - For inmates with HIV-infected with CD4 of 200–1000 mg/dL, post-exposure

prophylaxis with varicella vaccine is *definitely indicated*.

- Staff who are susceptible contacts to a varicella case should be referred to their primary care provider for evaluation for prophylaxis with varicella vaccine.
- If a varicella case is identified, *any* facility health care worker with patient care responsibilities, who lacks "evidence of immunity", should be vaccinated.
- In the context of a varicella outbreak (2 or more related cases), varicella vaccine may be indicated as an outbreak containment measure—even if more than 5 days have passed since exposure.
- As a containment strategy, varicella vaccine prophylaxis should be considered case-by-case, based on the risk of complications.

Any health care providers who have been vaccinated should be carefully observed for the occurrence of vaccination-related rash. Health care providers who experience a vaccine-related rash should avoid contact with patients who do not have "evidence of immunity" and are at risk for severe disease and complications. Contact should be restricted until all lesions crust over or fade away, or until no new lesions appear within 24 hours.

Managing Inmates

- **Medical management of inmate contacts:** Outlined below are recommendations for medical management of inmates who have been exposed to varicella. Inmates who have been exposed and who lack "evidence of immunity" should be educated to report varicella symptoms immediately and monitored for the development of symptoms of chicken pox.

Table 2. Medical Management of Inmate Contacts with Significant Exposure

Contact Status	Recommendation
Varicella symptoms	Immediately isolate or cohort, either in an AII room or in a separate room.
High-risk and susceptible: Pregnant or Immunocompromised *and* IgG negative	**VariZIG:** The following categories of high-risk contacts are recommended for VariZIG within 96 hours of exposure: pregnant women; HIV-infected with CD4 <200 mg/dL; with other types of primary and acquired immunodeficiency; with neoplastic diseases; and on immunosuppressive drugs. In situations in which administration of VariZIG does not appear possible within 96 hours of exposure, administration of immune globulin intravenous (IGIV) within 96 hours should be considered as an alternative. ***Note:*** *VariZIG is currently available only as an investigational drug as part of a research protocol.* **Varicella Vaccine:** HIV-infected contacts with CD4 200-1000 mg/dL should receive varicella vaccine. Susceptible, high-risk inmate contacts should be observed closely for signs and symptoms of chickenpox. If symptoms develop, they should be promptly treated with antiviral therapy.
Not high-risk & no "evidence of immunity"	Consider varicella vaccine on a case-by-case basis as a containment strategy in the context of a varicella outbreak.* ***Note:*** *Vaccine must be administered within 3–5 days to protect against a given exposure. Consider vaccination, even if more than 5 days have passed, particularly in the context of a varicella outbreak.*
"Evidence of immunity"	Consider immune. No need for follow-up.
* "Outbreak" is defined as two or more related varicella cases.	

- **Housing of inmate contacts:** Outlined below are recommendations for housing inmates in a varicella exposure situation. Factors influencing the decisions about housing varicella contacts include the number and location of susceptible contacts, the degree and timing of exposures, security concerns, and housing options.

Table 3. Housing of Inmate Contacts with Significant Exposure	
Inmate Immune Status	**Recommendation**
High-risk, susceptible contacts: pregnant, or immunocompromised & IgG negative	Either house them separately or transfer them to a facility where they can be housed separately to prevent their exposure to subsequent, secondary varicella cases. They can be cohorted. Another option is to strategically house them with inmates who have "evidence of immunity."
Closest contacts with significant, sustained exposure (e.g., cell-mates who lack "evidence of immunity")	These contacts should be housed separately from other inmates (they can be cohorted) and observed closely. These are the inmates who are most likely to develop chicken pox and become "secondary" cases.
Other contacts with significant exposure who lack "evidence of immunity"	These contacts should be restricted to their unit, if feasible. Depending on the configuration of the space in the facility, all inmates in the facility may have to be considered contacts. As feasible, contact between known susceptible contacts should be limited. To the extent possible, house susceptible inmates in close proximity to contacts who have "evidence of immunity."
Contacts w/ "evidence of immunity"	No housing restrictions.

- **Transferring inmate contacts with significant exposure:**
  - **Susceptible inmate contacts (lack "evidence of immunity"):** In general, these inmates may not be transferred until after the 21-day period that followed the end of exposure (28-day period, if VariZIG is administered). Consider obtaining IgG if transfer is urgent.
  - **Inmate contacts with "evidence of immunity":** These inmates can be transferred without restrictions.

Managing Staff

- **Exposed staff:** If a varicella case is identified in a facility, all exposed staff should be evaluated for "evidence of immunity." Those who lack "evidence of immunity" should be referred for varicella vaccination (ideally within 3–5 days of the exposure).

- **Health care staff:** If a varicella case occurs in a facility, *all* health care staff should be evaluated for "evidence of immunity." If a health care staff member lacks "evidence of immunity," an IgG should be obtained. If the IgG is negative, that person should be referred for varicella vaccination (regardless of whether or not he or she was exposed).

- **Medical management of staff contacts:** Below are recommendations for the medical management of staff who are varicella contacts. Staff who have been exposed and who lack "evidence of immunity" should be educated to immediately report varicella symptoms—including fever, rash, or systemic symptoms.

Table 4. Medical Management of Staff Contacts with Significant Exposure	
Staff Status	**Recommendation**
Varicella symptoms	Send home immediately and refer to PMD.
Pregnant or immunocompromised	Immediately refer to PMD for evaluation for VZIG, regardless of reported history of varicella. (***Note:*** *VZIG needs to be administered within 96 hrs.)*
No "evidence of varicella immunity"	*Health care workers:* Obtain IgG. If negative, refer for vaccination. *All others:* Refer for evaluation for varicella vaccination. ***Note:*** *Vaccine must be administered within 3–5 days to protect against this exposure. Consider vaccination if more than 5 days have passed, particularly in the context of a varicella outbreak.*
"Evidence of immunity"	No follow-up is required.

- **Staff work assignments in a varicella exposure situation:** Outlined below are recommendations for assignments for susceptible staff after a varicella case has been identified in a facility. Staff with "evidence of immunity" can be assigned to work with all inmates (including varicella cases and contacts). All staff should be educated to report chicken pox symptoms and to stay home if they occur.

Table 5. Work Assignments for Asymptomatic Staff Contacts Who Lack "Evidence of Immunity"		
Exposure Type	**Immune Status**	**Work Assignment**
*Significant exposure** ▸ Continuous contact ▸ Same room space for one hour or more	*High risk condition – pregnant or immunocompromised (*refer for VariZIG)	Administrative duties with no inmate contact for 28 days or extent of outbreak. Monitor for signs & symptoms (S&S).
	Vaccinated previously (with 2nd dose given either prior to exposure or within 3–5 days of exposure)	No work restrictions. Monitor for S&S.
	No prior vaccine (with 1st dose of vaccine administered within 3–5 days of exposure)	In general, no work restrictions. Monitor for S&S. Health care providers (HCPs) resume patient care, but no contact with immunocompromised patients for 21 days.
	No prior vaccine or single dose only and - vaccine not administered post-exposure or - vaccine given more than 5 days post-exposure	Administrative duties. No work with varicella cases or where exposed contacts are housed. HCPs can only provide patient care to inmates with "evidence of immunity" (for 21 days or extent of outbreak).
Short-term exposure ▸ Brief encounters with case ▸ Entry into affected area, possible or uncertain exposure	*High risk condition – pregnant or immunocompromised (*refer for evaluation)	No work with varicella cases or where varicella contacts are housed. Monitor for S&S.
	All others (no intervention necessary)	
No known exposure	*High-risk condition* (consider referral for evaluation)	No work with varicella cases or where varicella contacts are housed.
	All others (no intervention necessary)	
*See page 6 for a more complete definition of significant exposure (in *Section 6. Control Measures*).		

Visitors

If chicken pox has been identified in the institution, all visitors (particularly women of childbearing age) should be notified about the possible risk of exposure to chicken pox. For example, warnings should be posted in the visiting room. Inmate visitations can continue, although limitations should be considered for susceptible inmate contacts. Restrictions on visitors should be imposed for inmates with varicella.

Definitions

Breakthrough chickenpox is defined as a case of wild-type varicella infection occurring more than 42 days after vaccination.

Chicken pox is the common term for primary *varicella infection*.

"Evidence of immunity" is a set of criteria for varicella immunity that was published by the CDC in 2007. A person has evidence of varicella immunity if he or she meets any *one* of the following four criteria:

1) History of varicella vaccine (documentation of 2 vaccine doses).
2) History of chicken pox or shingles (documented by a health care provider*).
3) Laboratory evidence of immunity (IgG positive) or confirmation of disease.
4) *All* of the following:
   - U.S. born before 1980 *and*
   - *Not* pregnant *and*
   - *Not* immunocompromised (if HIV-infected, CD4 <1000 mg/dL) *and*
   - *Not* a health care worker.

* Verification of a history of varicella must be obtained by a health-care provider. To be considered immune, persons who report a history of varicella must *also*:

(1) Report a history of epidemiologic links to either another typical varicella case, i.e., sibling with chicken pox, or to a laboratory confirmed case; *or*

(2) Have evidence of laboratory confirmation at the time of acute disease.

Persons who lack the above documentation *do not* have a valid history of varicella.

Herpes zoster, commonly called shingles, is a primarily dermatologic disease caused by the reactivation of latent (dormant) varicella zoster virus.

Incubation period for an infectious disease is the time period between exposure to the disease and the development of symptoms.

Index case is the first case of a contagious disease in a group or population that serves to call attention to the presence of the disease.

Infectious period is the time period during which an infected host can transmit infection.

Recurrent infection: Although immunity following varicella is considered to be long-lasting, second cases of varicella do occur rarely among immunologically normal persons.

Shingles is the common term for *herpes zoster*.

Varicella, commonly called chicken pox, is a highly contagious systemic disease that usually occurs in childhood and is caused by an acute infection with varicella zoster virus.

Varicella zoster virus (VZV) is a Herpes family virus that causes chicken pox and shingles.

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Appendix 1. Varicella Virus and Immunity Testing

Varicella Virus Testing

Laboratory diagnosis is not routinely required, but can be useful to confirm the diagnosis. While it is possible to isolate varicella zoster virus (VZV) in tissue culture, it is rarely necessary for diagnosis. Vesicular fluid is the most frequent source for isolation. Laboratory techniques allow differentiation of wild type and vaccine strains of VZV.

Rapid varicella zoster virus identification

Rapid virus identification techniques are indicated when initiating antiviral therapy for a case with severe or unusual disease. They may also be useful in identifying the source of an outbreak in a closed population such as a prison. VZV polymerase chain reaction (PCR) is the method of choice for rapid clinical diagnosis. Real-time PCR methods are widely available in commercial reference laboratories and are the most sensitive and specific types of available tests. Results are available within several hours of initiating testing. Because viral proteins persist after cessation of viral replication, PCR tests may be positive when viral cultures are negative.

Specimen collection

- Vesicular fluid, preferably from a fresh, fluid-filled vesicle, is the specimen of choice. Crusts from lesions are also excellent specimens. Less desirable specimen sources include nasopharyngeal secretions, saliva, blood, urine, bronchial washings, and cerebrospinal fluid because they have a lower yield for positive tests.
- Specimens are best collected by unroofing a vesicle and then rubbing the base of a skin lesion with a polyester swab. Calcium alginate-tipped swabs, wood swabs, and transport swabs containing gel are not acceptable for PCR testing. Enough pressure should be applied to collect epithelial cells without causing bleeding. Collection of infected epithelial cells in the base of the lesion is important because they usually contain a significant amount of virus. Crusts from lesions can be transferred directly into sterile breakage-resistant, snap-cap or screw-top tubes.

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Appendix 1. Varicella Virus and Immunity Testing *(continued)*

Varicella Immunity Testing

The "Evidence of Immunity" guidelines can be used to make an assumption about varicella immunity (see #6 on *Appendix 3b, Varicella Contact Investigation Checklist*). However, serologic testing may be useful in the context of a chicken pox outbreak, particularly for those who do not meet the immunity criteria. Serologic evaluation of immunity should always include testing for IgG. Testing for IgM antibodies may be useful as an epidemiologic tool to determine if infection with varicella was recent. The antibody titer resulting from vaccination is generally lower than the antibody titer that results from varicella disease. Because of the potential for false negative serologic tests, routine post-vaccination serologic testing is not recommended.

Interpretation of varicella IgG and IgM antibody test results

IgG Test Result	IgM Test Result	Interpretation
Positive	Positive	Recent infection with varicella-zoster virus and immunity
Positive	Negative	Previous exposure to varicella-zoster virus and immunity
Negative	Negative	Non-immune (does not rule out varicella-zoster virus infection)

Specimen collection

To collect a blood specimen for varicella immunity testing:

- Perform a venipuncture on the individual.
- Draw blood in a serum-separator vacutainer tube.
- Allow the specimen to clot completely.
- Centrifuge for 15 minutes.
- Submit at least 1 ml of serum in a screw-capped plastic vial to the testing laboratory.
- Serum should be stored at refrigerated temperatures before and during shipment.

Source:

Centers for Disease Control and Prevention. Varicella (Chapter 13). In: *Epidemiology and Prevention of Vaccine-Preventable Diseases.* Atkinson W, Hamborsky J, McIntyre L, Wolfe S, eds. Updated 10th ed. 2nd printing. Washington, DC: Public Health Foundation; March 2008. Available at: http://www.cdc.gov/vaccines/pubs/pinkbook/downloads/varicella-508.pdf

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Appendix 2. Antiviral Therapy for Varicella Zoster Virus (VZV) Infections

Antiviral Therapy for Varicella Zoster Virus (VZV) Infections			
	Herpes Zoster (Adults)	**Varicella (Adults)**	**Notes***
Acyclovir 200, 400, 800 mgs	800 mg po 5X day for 7–10 days 5–10 mg/kg IV q8h for 7 days (Use 10 mg/kg in immunocompromised persons.)	800 mg po QID X 5 days	- ↓ if renal function is impaired. - May take without food. - Infuse acyclovir IV over 1 hour. Rapid infusion may cause renal damage. - Closely monitor and hydrate. - In immunocompromised persons, thrombocytopenic purpura/hemolytic uremic syndrome (TTP/HUS) has been reported.
Famciclovir (Famvir) 125, 250, 500 mgs	500 mg po q8h X 7 days		↓ if renal function is impaired.
Valcyclovir (Valtrex) 500 mgs, 1 gm	1000 mg po TID X 7 days		↓ if renal function is impaired.

***** Antiviral therapy should be initiated *within 72 hours* of the onset of the rash. In persons with HIV infection or other potentially immunocompromised conditions, continue antiviral therapy until lesions have crusted. Intravenous acyclovir is required for disseminated disease or serious complications of VZV infection.

Appendix 3a. Varicella Contact Investigation Steps

The steps involved in conducting a varicella contact investigation are listed below. For more detail about each step, see *Appendix 3b, Varicella Contact Investigation Checklist.*

1. Identify, isolate, confirm, and characterize the varicella case.

2. Make notifications regarding the potential for a varicella outbreak.

3. Convene contact investigation team.

4. Stop movement of potential inmate contacts.

5. Identify and prioritize inmate and staff contacts.

6. Check if contacts have varicella symptoms or "evidence of immunity."

For each identified contact, determine if *any* of the following four conditions are met:

- ☐ **1) History of varicella vaccine** (documentation of 2 vaccine doses)
- ☐ **2) History of chicken pox or shingles** (documented by health care provider—see p. 12.)
- ☐ **3) Lab evidence of immunity (IgG positive) or confirmation of disease**
- ☐ **4) *All* of the following:**
  - U.S. born before 1980 ***and***
  - *Not* pregnant ***and***
  - *Not* immunocompromised (if HIV-infected--CD4 <1000 mg/dL) ***and***
  - *Not* a health care worker

If *any* of the four conditions above are met, the contact is considered immune.

7. Consider STAT IgG for contacts with no "evidence of immunity."

If IgG is "positive," contact is immune. If IgG is "negative," contact is susceptible.

8. Develop containment plan for susceptible contacts.

9. Observe for new cases of chicken pox among staff and inmates.

10. Summarize outbreak.

Appendix 3b. Varicella Contact Investigation Checklist

A contact investigation should be initiated whenever a single case of varicella or herpes zoster is suspected. The contact investigation steps below may overlap in time. Promptly evaluate close contacts as they are identified.

√	Date	Task
		1. Identify, isolate, confirm, and characterize the varicella case.
		☐ varicella (chicken pox) *or* ☐ herpes zoster (shingles)
		a. Appropriately isolate (if chicken pox, disseminated shingles, or immunocompromised with shingles) or **contain drainage** (if uncomplicated shingles) (see *Section 6* in guidelines)**. Begin treatment**, if it is indicated (see *Section 5* in guidelines).
		b. Consider lab confirmation, particularly if clinical presentation is atypical (*Appendix 1*).
		c. Determine the incubation and infectious periods for the varicella case, and the incubation period for the varicella contacts. Fill in the blanks below.

c.1 EXPOSURE PERIOD for *Varicella Case* (time period when VZV exposure could have occurred)

It can be determined when a varicella case could have been exposed to VZV by using the dates for the incubation period--from 10 to 21 days before the onset of rash. Knowing these dates allows the investigator to determine when (and where) the varicella case could have been exposed to VZV.

___/___/___ = **Date varicella case developed rash**

___/___/___ = **Exposure Period for varicella case begins** (21 days *before* rash developed)

___/___/___ = **Exposure Period for varicella case ends** (10 days *before* rash developed)

c.2 INFECTIOUS PERIOD for *Varicella Case* (time period when case was able to transmit VZV)

The infectious period is used to identify the group of contacts who were exposed while the case was infectious.

___/___/___ = **Infectious Period for varicella case begins** (2 days *before* rash developed)

___/___/___ = **Infectious Period for varicella case ends** (when all lesions crusted: 4-7 days *after* rash onset)

c.3 INCUBATION PERIOD for *Varicella Contact* (time period from VZV exposure to onset of varicella)

The incubation period is used to determine when susceptible contacts are at risk for developing varicella.

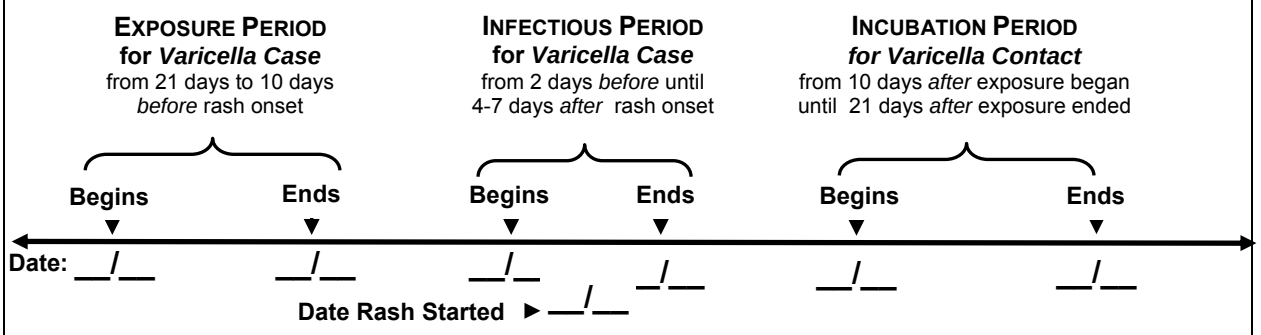
___/___/ ___ = **Date exposure began.** If contact has been ongoing, then the "date exposure began" is the date that the case infectious period began. Date may vary depending on exposure history.

___/___/ ___ = **Date exposure ended.** The date that exposure to the varicella case ended is often either (1) the end of the case infectious period, or (2) the date that the case was isolated from general population. This date may vary depending on the exposure history of individual contacts.

___/___/___ = **Incubation Period for contact begins** (10 days after exposure to varicella case *began*)

___/___/___ = **Incubation Period for contact ends** (21 days after exposure to varicella case *ended*)

c.4 Varicella Timeline: Fill in the dates calculated above.



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Appendix 3b. Varicella Contact Investigation Checklist *(continued)*

√	Date	Task
		2. Make notifications regarding the potential for a varicella outbreak.
		Notify correctional management officials of the need to stop movement of possible contacts. Alert facility clinicians and staff regarding the need to detect and report new cases. Report to public health authorities and BOP regional & central offices per local law and BOP policy.
		3. Convene contact investigation team (corrections and health department).
		a. Identify team leader; identify roles and responsibilities of team members. **b. Develop plan for managing contact investigation data.** **c. Develop investigational priorities.**
		4. Stop movement of potential inmate contacts pending "evidence of immunity."
		• Stop movement of inmates who may have been contacts to the varicella case, pending contact identification and determination of "evidence of immunity" (see *Step #6 below*). • Inmates who were exposed to varicella will require medical clearance prior to transfer. In general, unless the inmate has "evidence of immunity", varicella contacts should not be transferred until 21 days after their exposure ended.
		5. Identify and prioritize inmate and staff contacts.
		When identifying contacts, "exposure" to varicella is defined as follows: ***Chicken pox:*** Exposure is generally defined as at least *one hour of contact* with nasopharyngeal secretions or lesions, face-to-face interaction, or sharing indoor airspace (usually within 3 feet, e.g., occupying the same 2–4 bed ward, or adjacent beds in a large ward) during the infectious period (2 days before rash onset until all lesions are crusted). ***Shingles:*** Exposure to *uncomplicated shingles* is defined as direct contact with lesions. Exposure to *disseminated shingles,* or exposure to *an immunocompromised person with localized or disseminated shingles* is defined as: 1) contact with lesions; or 2) sharing indoor airspace (e.g., occupying same 2–4 bed ward or adjacent beds in a large ward). (California Dept. of Health, 2007) Depending on the circumstances of each facility and the unique characteristics of the varicella case, it may or may not be possible to identify a confined circle of exposed "contacts." It may be necessary to consider all inmates in a facility to be "contacts."
		a. Obtain inmate traffic history* to obtain housing, work, and school locations during infectious period. Tour exposure sites to evaluate transmission potential. ** Pull rosters including date of birth ("dob") & citizenship ("citz").* Facility/Housing _____ Date toured: ___/___/___ Work _____ Date toured: ___/___/___ School _____ Date toured: ___/___/___
		b. Interview index case for close contacts, recent visitors, and activities.
		c. Develop list of inmate and staff contacts *(Appendix 4).*
		d. Identify staff and inmate contacts who are "high risk".
		Obtain IgG for the following categories of "high risk" inmate contacts: (1) pregnant; (2) primary and acquired immunodeficiency—including HIV; (3) neoplastic diseases; and (4) receiving immunosuppressive treatments. VariZIG® within 96 hours is recommended for most high risk, IgG negative contacts. HIV-infected inmates with CD4 200–1000 mg/dL should be administered varicella vaccine within 3-5 days of exposure. Closely observe high risk contacts. If varicella symptoms develop, start antiviral therapy without delay. Immediately refer pregnant or immunocompromised staff contacts for evaluation for VariZIG®.
		e. Identify inmate contacts who have been transferred to another BOP facility.
		Immediately notify the Clinical Director/HSA of the receiving institutions to facilitate appropriate evaluation and housing of these inmates. Report this information to the Central Office.

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Appendix 3b. Varicella Contact Investigation Checklist *(continued)*

6. Check if contacts have varicella symptoms or "evidence of immunity."

Assess each identified contact for symptoms of chicken pox.

Assess each identified contact to determine if they have "evidence of immunity."

- ☐ **1) History of varicella vaccine** (documentation of 2 vaccine doses)
- ☐ **2) History of chicken pox or shingles** (documented by health care provider—page 12)
- ☐ **3) Laboratory evidence of immunity (IgG positive) or confirmation of disease**
- ☐ **4) *All* of the following:**
  - U.S. born before 1980 ***and***
  - *Not* pregnant ***and***
  - *Not* immunocompromised (if HIV-infected--CD4 <1000 mg/dL) ***and***
  - *Not* a health care worker

If any of the above 4 conditions are met, then contacts are considered to be immune. No follow-up is needed. Staff can serve in usual positions. Inmates can be housed in general population. If contacts do not have "evidence of immunity," then an IgG can be obtained to determine varicella immunity (*see Step # 7 below*).

7. Consider STAT IgG for contacts *without* "evidence of immunity."

Depending upon the number of staff and inmate contacts identified, a decision will be made whether or not to obtain IgG tests on those contacts without "evidence of immunity."

- **IgG Positive:** means contact is immune to varicella. No follow-up is required. Staff assignments can remain unchanged. Inmates can be housed in general population.
- **IgG Negative:** means that the contact is susceptible to varicella and is at risk for developing chicken pox during 10–21 days following exposure (>28 days if VZIG was administered).

All health care staff lacking "evidence of immunity" should be IgG tested (regardless of exposure to the case). Varicella vaccination is recommended if they are IgG negative.

8. Develop containment plan for inmate contacts.

The goal of the containment plan is to limit and control a potential varicella outbreak. Susceptible contacts should be considered potentially contagious for the 21 days after their exposure ended (and for 28 days or longer if VZIG is administered).

a. Develop a housing plan for inmate contacts as follows:

High risk, susceptible contacts: pregnant, or immunocompromised *and* IgG negative)	Either house separately or transfer to a facility where they can be housed separately to prevent their exposure to subsequent, secondary varicella cases. They can be cohorted. Another option is to strategically house with inmates who have "evidence of immunity."
Closest contacts with significant, sustained exposure (e.g., cell-mates who lack "evidence of immunity")	These contacts should be housed separately from other inmates (or cohorted) and observed closely. These are the inmates who are most likely to develop chicken pox and become "secondary" cases.
Other contacts with significant exposure who lack "evidence of immunity"	These contacts should be restricted to their unit, if feasible. Depending on the configuration of the space in the facility, all inmates in the facility may have to be considered contacts. As feasible, contact between known susceptible contacts should be limited. To the extent possible, house susceptible inmates in close proximity to contacts who have "evidence of immunity".
"Evidence of Immunity"	No housing restrictions.

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Appendix 3b. Varicella Contact Investigation Checklist *(continued)*

b. Give consideration to vaccination of inmate contacts.

Varicella vaccination post-exposure can prevent varicella if it is administered within 5 days of exposure. It also can interrupt transmission during an ongoing outbreak even if administered more than 5 days after the initial exposure. Varicella vaccination should be prioritized for inmate contacts as follows:

(1) HIV-infected with CD4 200-1000 (*definitely indicated* within 3-5 days of exposure);

(2) In context of a varicella outbreak (2 or more related cases) as an outbreak containment measure;

(3) On a case-by-case basis as a containment strategy.

c. Develop plan for managing staff contacts.

For recommendations about medical management of exposed staff see recommendations in Table 4 on page 10.

Make decisions about staff work assignments based on immune status, as follows:

Exposure Type	Immune Status	Work Assignment
*Significant exposure** ► Continuous contact ► Same room space for one hour or more	*High risk condition – pregnant or immunocompromised* (refer for VariZIG)	Administrative duties with no inmate contact for 28 days or extent of outbreak. Monitor for signs & symptoms (S&S).
	Vaccinated previously (with 2nd dose given either prior to exposure or within 3–5 days of exposure).	No work restrictions. Monitor for S&S.
	No prior vaccine (with 1st dose of vaccine administered within 3–5 days of exposure)	In general, no work restrictions. Monitor for S&S. Health care providers resume patient care, but no contact with immunocompromised patients x 21 days.
	No prior vaccine or single dose only and - vaccine not administered *or* - vaccine given >5 days after exposure to rash	Administrative duties. No work with varicella cases or where exposed contacts are housed. Health care providers can only provide patient care to inmates with "evidence of immunity" (x 21 days or extent of outbreak).
Short-term exposure ► Brief encounters with case ► Entry into affected area, possible or uncertain exposure	*High risk condition – pregnant or immunocompromised* (refer for evaluation)	No work with varicella cases or where varicella contacts are housed. Monitor for S&S.
	All others (no intervention necessary)	
No known exposure	*High-risk condition* (consider referral for evaluation)	No work with varicella cases or where varicella contacts are housed.
	All others – (no intervention necessary)	

*See page 6 for more complete definition of significant exposure.

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Appendix 3b. Varicella Contact Investigation Checklist *(continued)*

		9. Observe for new cases of chicken pox among staff and inmates.
		a. Consider laboratory confirmation for the first three to five cases (*see Appendix 1*), particularly if presentation is atypical.
		b. The following data should be collected on each case:
		• Date of onset of rash; date all blisters scabbed over (or if lesions did not scab—the date that no new lesions appeared in a 24-hour period) • Date isolated • Known exposure to varicella case (where/when) • Traffic history (housing, work, and school) • Interview for close contacts, visitors, activities • Current medical conditions & medications • Laboratory testing for varicella • Treatment for varicella and varicella complications • Hospitalization
		10. Summarize outbreak
		• # cases, # treated, # hospitalized, # staff & inmate contacts, # vaccinated, factors which contributed to the outbreak, how to prevent future outbreaks, recommendations for response to future outbreaks.

Appendix 4. Varicella Contact Line List

€**Evidence of Immunity** (one of the following):
1) History of varicella vaccine (documentation of 2 vaccine doses)
2) History of chicken pox or shingles (documented by a health care provider—see page 12)
3) Laboratory evidence of immunity (IgG positive) or confirmation of disease
4) All of the following: **(a)** US. born before 1980 *and* **(b)** not pregnant *and* **(c)** not immuno-compromised (if HIV-infected, thenCD4 <1000 mg/dL) *and* **(d)** not a health care worker

Exposure: Location/ Type	Contact Name (Last, First)	Reg #	Date Exposure Ended	Date Incubation Period Ends* (+21 days)	High Risk:¶ Pregnant or Immuno-compromised	Evidence of Immunity€ (see above) Indicate 1, 2, 3, or 4	IgG: Pos, Neg, Not Done	Summary: Immune₱ or Susceptible	Varicella Vaccine or VariZIG?	Date	Comments

* Until the last day of the incubation period, contacts are at risk for developing varicella.

¶ Evaluate first persons who are high risk: (1) pregnant; (2) primary and acquired immunodeficiency—including HIV; (3) neoplastic diseases; and (4) receiving immunosuppressive treatments. Obtain IgG. VariZIG® within 96 hours is recommended for most high risk, IgG negative contacts. HIV-infected inmates with CD4 200–1000 mg/dL should be administered varicella vaccine within 3-5 days of exposure. Closely observe high-risk contacts. If varicella symptoms develop, start antiviral therapy without delay. Staff who are high-risk contacts should be referred to their primary care provider for consideration for VariZIG®.

₱ If person has "evidence of immunity" they are considered immune. Otherwise, the contact should be considered susceptible.

Appendix 5. Varicella Post-Exposure Prophylaxis

Varicella Vaccine Prophylaxis

Indication

Post-exposure prophylaxis with varicella vaccine should be considered for susceptible inmate and staff contacts, since vaccination may prevent varicella or reduce disease severity. The determination to administer varicella vaccine prophylactically should be based on epidemiological and patient-specific factors.

Contraindications

Varicella vaccine is a live vaccine and should *not* be administered to pregnant women or HIV-infected persons with CD4 <200 mg/dL. ***Note:*** *Screening for HIV infection and pregnancy is necessary prior to vaccine administration if clinical status is unknown.*

Administration, dosing and timing

- The vaccine should be administered within 3 days and ordinarily no more than 5 days after varicella exposure to be maximally effective. Administration after 5 days exposure may be indicated in an outbreak situation with ongoing exposure.
- Varicella vaccine should be administered in accordance with the manufacturer's instructions after informing the inmate of the vaccine's benefits and risks. The varicella vaccine (VARIVAX) is administered subcutaneously to adults in a 0.5 mL dose, repeated at the same dose 4 to 8 weeks later (12 weeks later if HIV-infected).

  Note: *Varicella vaccine must be stored in a frost-free freezer with an average temperature of -15^{o}C (5^{o}F) or colder. The vaccine is reconstituted at room temperature with a diluent and must then be administered within 30 minutes.*

Precautions

- Varicella vaccine should not be administered concurrently with VZIG or other immunoglobulins.
- Vaccinated persons may develop a rash that is potentially contagious. They should be monitored closely following vaccination and should be restricted from close contact with others who are pregnant or immunocompromised.
- If vaccinated inmates develop a rash they should be isolated in either in an airborne infection isolation room or in a single room, as if they had wild-type varicella, until the lesions have crusted.
- Any health care providers who have been vaccinated should carefully observe for the occurrence of vaccination-related rash. Health care providers, in whom a vaccine related rash has occurred, should avoid contact with patients who lack "evidence of immunity" and who are at risk for severe disease and complications. Contact should be restricted until all lesions are crusted over or fade away or after no new lesions appear within a 24-hour period.

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Appendix 5. Varicella Post-Exposure Prophylaxis *(continued)*

Varicella Zoster Immunoglobulin (VariZIG®) Prophylaxis

VariZIG® is a purified human immune globulin made from plasma containing high levels of anti-varicella antibodies. CDC recommends that VariZIG be administered post-exposure for high risk contacts. VariZIG is currently available only as an investigational drug as part of a research protocol.

Indication

VZIG is recommended for individuals who have been exposed to a case of varicella, *and* who are at high risk for severe disease and complications *and* are IgG negative. These include:

- Immunocompromised patients (primary and acquired immunodeficiency (including HIV with CD4 <200mg/dL), neoplastic diseases and those receiving immunosuppressive treatments)
- Pregnant women. *Note:* In pregnant women, VZIG does not prevent congenital varicella syndrome or neonatal varicella, but limits the potentially severe complications of chickenpox in the mother.

Administration, dosing and timing

VZIG should be administered intramuscularly *within 96 hours* of the exposure. VariZIG is supplied in 125-U vials. The recommended dose is 125 units/**10** kg (maximum: 625 units). In situations where administration of VZIG is not possible within 96 hours, an alternative is immune globulin intravenous (IGIV), dosed at 400 mg/kg and administered once.

In the context of an extended varicella outbreak, where ongoing protection is necessary, VZIG should be readministered 3 weeks following the initial dose.

Antiviral therapy

Any patient who receives VZIG should be observed closely for signs or symptoms of varicella for 28 days or more after exposure ended because VariZIG may prolong the incubation period of chickenpox by more than a week. Antiviral therapy should be instituted immediately if signs or symptoms of varicella disease occur.

Interval between administration of VZIG and varicella vaccine

Unless varicella vaccine is contraindicated, inmates who receive VZIG subsequently should receive varicella vaccine. However, varicella vaccine should be delayed until *5 months after* VZIG administration.

How to obtain investigational VariZIG®

Providers who identify a patient for whom VariZIG® is indicated should contact FFF enterprises (24-hour telephone, 800-843-7477). Complete a release form which can be obtained at: http://www.fda.gov/cber/infosheets/mphvzig020806form.pdf. FAX to: 951-296-2570.