Varicella and Varicella Vaccine

Epidemiology and Prevention of Vaccine-Preventable Diseases

National Immunization Program
Centers for Disease Control and Prevention

Revised January 2006

Varicella

• Acute viral illness
• Zoster described in premedieval times
• Varicella not differentiated from smallpox until end of 19th century
• Infectious nature demonstrated in 1875

Varicella Zoster Virus

• Herpesvirus (DNA)
• Primary infection results in varicella (chickenpox)
• Recurrent infection results in herpes zoster (shingles)
• Short survival in environment

Varicella Pathogenesis

• Respiratory transmission of virus
• Replication in nasopharynx and regional lymph nodes
• Repeated episodes of viremia
• Multiple tissues, including sensory ganglia, infected during viremia

Varicella Clinical Features

• Incubation period 14-16 days (range 10-21 days)
• Mild prodrome for 1-2 days
• Generally appear first on head; most concentrated on trunk
• Successive crops (2-4 days) of pruritic vesicles

Note to presenters:
Images of vaccine-preventable diseases are available from the Immunization Action Coalition website at http://www.vaccineinformation.org/photos/index.asp
Herpes Zoster

- Reactivation of varicella zoster virus
- Associated with:
  - aging
  - immunosuppression
  - intrauterine exposure
  - varicella at <18 months of age

Varicella Complications

- Bacterial infection of lesions
- CNS manifestations
- Pneumonia (rare in children)
- Hospitalization ~3 per 1,000 cases
- Death ~1 per 60,000 cases

Groups at Increased Risk of Complications of Varicella

- Healthy adults
- Immunocompromised persons
- Newborns of mothers with rash onset within 5 days before to 48 hours after delivery

Varicella Fatality Rate in Healthy Persons

- Rate of deaths per 100,000 cases

    - <1
    - 1-14
    - 15-19
    - 20-29
    - 30+

    *Deaths per 100,000 cases

Congenital Varicella Syndrome

- Results from maternal infection during pregnancy
- Period of risk may extend through first 20 weeks of pregnancy
- Low birth weight, atrophy of extremity with skin scarring, eye and neurologic abnormalities
- Risk appears to be small (< 2%)

Varicella Laboratory Diagnosis

- Isolation of varicella virus from clinical specimen
- Rapid varicella virus identification using PCR (preferred, if available) or DFA
- Significant rise in varicella IgG by any standard serologic assay (e.g., enzyme immunoassay)
**Varicella Epidemiology**

- **Reservoir**: Human
- **Transmission**: Airborne droplet
  - Direct contact with lesions
- **Temporal pattern**: Peak in winter and early spring (U.S.)
- **Communicability**: 1-2 days before to 4-5 days after onset of rash
  - May be longer in immunocompromised

**Varicella Age-Specific Incidence United States, 1990-1994**

<table>
<thead>
<tr>
<th>Age group (yrs)</th>
<th>Rate*</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>60</td>
</tr>
<tr>
<td>1-4</td>
<td>120</td>
</tr>
<tr>
<td>5-9</td>
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<td>10-14</td>
<td>20</td>
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<tr>
<td>15-19</td>
<td>5</td>
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<tr>
<td>20+</td>
<td>2</td>
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*Rate per 100,000 population. National Health Interview Survey data

**Varicella Cases by Month -- Antelope Valley, CA, 1995–2004**

**Varicella Cases by Month -- Antelope Valley, CA, 1995–2004**

**Varicella Vaccine**

- **Composition**: Live virus (Oka/Merck strain)
- **Efficacy**: 95% (Range, 65%-100%)
- **Duration of Immunity**: >7 years
- **Schedule**: 1 Dose (<13 years of age)

May be administered simultaneously with measles, mumps, and rubella (MMR) vaccine

**MMRV (ProQuad)**

- **Combination measles, mumps, rubella and varicella vaccine**
- **Approved children 12 months through 12 years of age (up to age 13 years)**
- **Titer of varicella vaccine virus in MMRV is more than 7 times higher than standard varicella vaccine**

**Reduction in Age-Specific Varicella Incidence Rate**

Varicella Active Surveillance Project Sites, 1995 to 2004

<table>
<thead>
<tr>
<th>Age group</th>
<th>Antelope Valley, CA* (%)</th>
<th>West Philadelphia (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>83</td>
<td>77</td>
</tr>
<tr>
<td>1-4</td>
<td>94</td>
<td>89</td>
</tr>
<tr>
<td>5-9</td>
<td>83</td>
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<tr>
<td>15-19</td>
<td>65</td>
<td>78</td>
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<tr>
<td>20+</td>
<td>81</td>
<td>67</td>
</tr>
<tr>
<td>Total</td>
<td>83</td>
<td>93</td>
</tr>
</tbody>
</table>

*2003 population used for rate calculations
Breakthrough Infection

• Immunity appears to be long-lasting for most recipients
• Breakthrough disease much milder than in unvaccinated persons
• No consistent evidence that risk of breakthrough infection increases with time since vaccination

Breakthrough Infection

• Retrospective cohort study of 115,000 children vaccinated in 2 HMOs during January 1995 through December 1999
• Risk of breakthrough varicella 2.5 times higher if varicella vaccine administered less than 30 days following MMR
• No increased risk if varicella vaccine given simultaneously or more than 30 days after MMR

MMWR 2001;50(47):1058-61

Nonsimultaneous Administration of Live Vaccines

• Varicella vaccine not administered simultaneously with MMR or LAIV should be separated by 4 weeks
• If separated by <4 weeks the vaccine given second should be repeated

Varicella Vaccine Recommendations Children

• Routine vaccination at 12-18 months of age
• Recommended for all children without evidence of varicella immunity by the 13th birthday

Varicella Vaccine Recommendations Adolescents and Adults

• All persons >13 years of age without evidence of varicella immunity
• Two doses separated by 4-8 weeks
• Do not repeat first dose because of extended interval between doses

Vaccination of Healthcare Workers

• Recommended for all susceptible healthcare workers
• Prevaccination serologic screening probably cost-effective
• Postvaccination testing not necessary or recommended
Varicella Immunity

- Written documentation of age-appropriate vaccination
- Born in the U.S. before 1966
- History of typical varicella disease among:
  - non-U.S. born persons born before 1966
  - all persons born during 1966-1997
- History of herpes zoster based on healthcare provider diagnosis
- Laboratory evidence of immunity or laboratory confirmation of disease

Varicella Vaccine Postexposure Prophylaxis

- Varicella vaccine is recommended for use in persons without evidence of varicella immunity after exposure to varicella
  - 70%-100% effective if given within 72 hours of exposure
  - not effective if >5 days but will produce immunity if not infected

Varicella Vaccine Adverse Reactions

- Injection site complaints
  - 19% (children)
  - 24% (adolescents and adults)
- Rash – 3%-4%
  - may be maculopapular rather than vesicular
  - average 5 lesions
- Systemic reactions not common

Zoster Following Vaccination

- Most cases in children
- Risk from vaccine virus less than from wild virus
- Usually a mild illness without complications

Varicella Vaccine Contraindications and Precautions

- Severe allergic reaction to vaccine component or following a prior dose
- Immunosuppression
- Pregnancy
- Moderate or severe acute illness
- Recent blood product

Varicella Vaccination in Pregnancy Registry

800.986.8999
**Varicella Vaccine Use in Immunocompromised Persons**

- Most immunocompromised persons should not be vaccinated
- Vaccinate persons with isolated humoral immunodeficiency
- Consider varicella vaccination for asymptomatic HIV-infected children with CD4% ≥15% (CDC class A1 and N1)
- MMRV not approved for use in persons with HIV infection

**Transmission of Varicella Vaccine Virus**

- Transmission of vaccine virus not common
- Asymptomatic seroconversion may occur in contacts without evidence of varicella immunity
- Risk of transmission increased if vaccinee develops rash

**Vaccine Storage and Handling Varicella Vaccine**

- Store frozen at 5°F (-15°C ) or lower
- Store diluent at room temperature or refrigerate
- Discard if not used within 30 minutes of reconstitution

**Vaccine Storage and Handling MMRV**

- Must be shipped to maintain a temperature of < -4°F (-20°C ) at all times
- Must be stored at an average temperature of ≤5°F (-15°C ) at all times
- May NOT be stored at refrigerator temperature at any time
- Must be administered within 30 minutes of reconstitution

**Varicella Vaccine Information**

800-9VARIVAX

**Varicella Zoster Immune Globulin (VZIG)**

- May modify or prevent disease if given within 96 hours after exposure
- Indications
  - Immunocompromised persons
  - Newborn of mothers with onset 5 days before to 48 hours after delivery
  - Premature infants with postnatal exposure
  - Susceptible adults and pregnant women
- Supply of VZIG limited – may use IVIG or acyclovir (see NIP website for details)
Varicella Antiviral Therapy

- Not recommended for routine use among otherwise healthy infants and children with varicella
- Consider for persons age >13 years
- Consider for persons with chronic cutaneous or pulmonary disorders, long-term salicylate therapy, or steroid therapy
- IV in immunocompromised children and adults with viral-mediated complications
- Not recommended for postexposure prophylaxis

2003 AAP Red Book

National Immunization Program
Contact Information

- Telephone 800.CDC.INFO
- Email nipinfo@cdc.gov
- Website www.cdc.gov/nip