2016 Pink Book Webinar Series

Measles, Mumps, and Rubella

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Communications and Education Branch
MMR—also known as...

Measles
(rubeola, red measles, 9 day measles)

Mumps
(epidemic parotitis)

Rubella
(German measles or 3 day measles)
Measles

- **Considered – the most contagious VPD**
  - Infectious agent-- a paramyxovirus
  - Nasopharynx is primary site of infection

- **Incubation period: 10-12 days**

- **Prodrome: 2-4 days**
  - 3 C’s -- Cough, coryza, conjunctivitis
  - Koplik spots
  - Stepwise increase in fever up to 103°F-105°F

- **Rash**
  - 2-4 days after prodrome and 14 days after exposure
  - Begins on face and upper neck
    - Maculopapular rash becomes confluent
    - Fades in order of appearance
  - Persists 5-6 days
# Measles Complications

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhea</td>
<td>8%</td>
</tr>
<tr>
<td>Otitis media</td>
<td>7%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>6%</td>
</tr>
<tr>
<td>Encephalitis</td>
<td>0.1%</td>
</tr>
<tr>
<td>Seizures</td>
<td>0.6-0.7%</td>
</tr>
<tr>
<td>Death</td>
<td>0.2%</td>
</tr>
</tbody>
</table>

Based on 1985-1992 surveillance data
Mumps

- **Infectious agent: paramyxovirus**
  - Nasopharynx and regional lymph nodes are primary sites of infection; then can spread to meninges and glands (salivary, pancreas, testes, ovaries)

- **Incubation period:** 12-25 days

- **Prodrome—nonspecific:** myalgia, anorexia, malaise, headache, and low-grade fever

- **Parotitis in 9%-94%, typically occurs within 16-18 days**

- **Pre-vaccine era:** 15%-27% of infections were asymptomatic
## Mumps Complications

<table>
<thead>
<tr>
<th>Condition</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orchitis</td>
<td>12%-66% in postpubertal males (prevaccine)</td>
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<tr>
<td></td>
<td>3%-10% (postvaccine)</td>
</tr>
<tr>
<td>Pancreatitis</td>
<td>3.5% (prevaccine)</td>
</tr>
<tr>
<td>Unilateral deafness</td>
<td>1/20,000 (prevaccine)</td>
</tr>
<tr>
<td>Death</td>
<td>2/10,000 from 1966-1971</td>
</tr>
<tr>
<td></td>
<td>No deaths in recent U.S. outbreaks</td>
</tr>
</tbody>
</table>
Rubella

- **Infectious agent:** togavirus
- **Incubation period:** 14 days (range 12-23 days)

- **Prodrome**
  - Rare in children
  - Low-grade fever in adults

- **Maculopapular rash 14-17 days after exposure**

- **Lymphadenopathy** occurs before rash and lasts for several weeks
Rubella Complications

- **Arthralgia or arthritis**
  - Adult female – up to 70%
  - Children—rare

- **Encephalitis**
  - 1/6,000 cases

- **Hemorrhagic manifestations** (e.g., thrombocytopenic purpura)
  - 1/3,000 cases

- **Orchitis, neuritis, progressive panencephalitis**
  - Rare

No deaths in recent U.S. outbreaks
Congenital Rubella Syndrome

- Infection may affect all organs
  - Deafness
  - Eye defects
  - Cardiac defects
  - Microcephaly
  - Mental retardation
  - Bone alterations
  - Liver and spleen damage

- May lead to fetal death or preterm delivery
- Severity of damage to fetus depends on gestational age
- Up to 85% of infants affected if infected during first trimester
## Epidemiology

<table>
<thead>
<tr>
<th></th>
<th>Measles</th>
<th>Mumps</th>
<th>Rubella</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reservoir</strong></td>
<td>Human</td>
<td>Human</td>
<td>Human</td>
</tr>
<tr>
<td><strong>Transmission</strong></td>
<td>Respiratory Airborne</td>
<td>Airborne Direct contact with droplet or saliva</td>
<td>Respiratory</td>
</tr>
<tr>
<td><strong>Temporal Pattern</strong></td>
<td>Peaks in late winter/spring</td>
<td>Peaks in late winter/spring</td>
<td>Peaks in late winter/spring</td>
</tr>
<tr>
<td><strong>Communicability</strong></td>
<td>4 days before to 4 days after rash onset</td>
<td>Several days before and after onset of parotitis</td>
<td>7 days before to 5 to 7 days after rash onset</td>
</tr>
</tbody>
</table>
Reported Number of Measles Cases—United States, 1962-2015

- 1963 Vaccine Licensed
- 1989 2nd Dose Recommended
- 1989-1991 Resurgence
- 1993 Vaccines for Children Program
- 2000 Elimination
### Measles Cases by Year, 2010 - July 2016

<table>
<thead>
<tr>
<th>Year</th>
<th>Cases</th>
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</thead>
<tbody>
<tr>
<td>2010</td>
<td>63</td>
</tr>
<tr>
<td>2011</td>
<td>220</td>
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<tr>
<td>2012</td>
<td>55</td>
</tr>
<tr>
<td>2013</td>
<td>187</td>
</tr>
<tr>
<td>2014</td>
<td>667</td>
</tr>
<tr>
<td>2015*</td>
<td>189</td>
</tr>
<tr>
<td>2016**</td>
<td>48</td>
</tr>
</tbody>
</table>

- **2014**
  - 667 cases from 27 states
- **2015**
  - 189 people from 24 states and the District of Columbia
- **2016**
  - 48 people from 13 states (Alabama, Arizona, California, Colorado, Florida, Georgia, Hawaii, Illinois, Massachusetts, Minnesota, Tennessee, Texas, and Utah)

Cases as of: *
Jan 2, 2016, **July 22, 2016
### U.S. Economic Burden of Measles*

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Number of cases (outbreaks)</th>
<th>Estimated public health cost$^\text{a}</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>US</td>
<td>107 (16)</td>
<td>$2.7-5.3 million</td>
</tr>
<tr>
<td>2011</td>
<td>Utah</td>
<td>13 (2)</td>
<td>&gt;$330,000</td>
</tr>
<tr>
<td>2008</td>
<td>California</td>
<td>12 (1)</td>
<td>$125,000</td>
</tr>
<tr>
<td>2008</td>
<td>Arizona</td>
<td>14 (1)</td>
<td>$800,000 (limited to cost for 2 hospitals to respond to 7 cases in their facilities)</td>
</tr>
<tr>
<td>2005</td>
<td>Indiana</td>
<td>34 (1)</td>
<td>$168,000</td>
</tr>
<tr>
<td>2004</td>
<td>Iowa</td>
<td>1</td>
<td>$142,000</td>
</tr>
</tbody>
</table>

Measles Importation Infographic

Get Vaccinated: Prevent and Stop Measles Outbreaks

When measles happens anywhere in the world...

It can travel here and spread

Since measles is still common in many countries, unvaccinated travelers will continue to bring the disease into the U.S., and it can spread to other people.

Make sure you and your family members are up-to-date on your measles-mumps-rubella (MMR) vaccine, including before traveling internationally. Ask your doctor if everyone has received all recommended doses of MMR for best protection against measles.

www.cdc.gov/measles/importation-infographic.html
Guidance for Healthcare Personnel

- Be vigilant about measles
- Ensure all patients are up-to-date on measles-mumps-rubella vaccination
- Consider measles in patients with febrile rash illness and clinically compatible measles symptoms (cough, coryza, and conjunctivitis)

Ask patients about:
- Recent travel internationally
- Recent travel to domestic venues frequented by international travelers
- Recent contact with international travelers
- History of measles in the community

- Promptly isolate patients with suspected measles

www.cdc.gov/measles/hcp/index.html
Mumps Cases, United States, 1983-2016*

*2015 cases as of Jan 2, 2016. 2016 case count preliminary as of June 6, 2016 and subject to change.
Number of Mumps Cases by Year since 2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>2,612</td>
</tr>
<tr>
<td>2011</td>
<td>370</td>
</tr>
<tr>
<td>2012</td>
<td>229</td>
</tr>
<tr>
<td>2013</td>
<td>584</td>
</tr>
<tr>
<td>2014</td>
<td>1223</td>
</tr>
<tr>
<td>2015*</td>
<td>1057</td>
</tr>
<tr>
<td>2016**</td>
<td>1661</td>
</tr>
</tbody>
</table>

- **2009-2010 – 2 large outbreaks**
  - NYC – HS students in close-knit religious community; started with student returning from UK
  - Guam – mostly school-aged children

- **2011-2013 – several small outbreaks**
  - College campuses
    - California, Virginia, Maryland

- **2014 - several outbreaks**
  - National Hockey League
  - Ohio State University
  - Fordham University in NY

- **2015–16 – several outbreaks**
  - Hundreds of university students
  - Iowa, Illinois

Cases as of: *Jan 2, 2016; **July 22, 2016
### Number of Rubella and Congenital Rubella Syndrome (CRS) Cases by Year since 2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Rubella</th>
<th>CRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>2011</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td>2013</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>2014</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>2015*</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

- Median of 11 rubella cases annually 2005-2011
- 60% of rubella cases in U.S. in persons 20-49 years of age since 2004

*Cases as of August 28, 2015
### Acceptable Presumptive Evidence of Immunity

<table>
<thead>
<tr>
<th>Routine</th>
<th>Students (college/post-high school)</th>
<th>Healthcare personnel</th>
<th>International travelers</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Documented age-appropriate vaccination with live measles, mumps, rubella virus-containing vaccines, or</td>
<td>(1) Documented 2 doses of live measles and mumps virus-containing vaccines; 1 dose rubella virus-containing vaccine, or</td>
<td>(1) Documented 2 doses of live measles and mumps virus-containing vaccines; 1 dose rubella virus-containing vaccine, or</td>
<td>(1) Documented age-appropriate vaccination with live measles, mumps, rubella virus-containing vaccines, or</td>
</tr>
<tr>
<td>(2) Laboratory evidence of immunity, or</td>
<td>(2) Laboratory evidence of immunity, or</td>
<td>(2) Laboratory evidence of immunity, or</td>
<td>(2) Laboratory evidence of immunity, or</td>
</tr>
<tr>
<td>(3) Laboratory confirmation of disease, or</td>
<td>(3) Laboratory confirmation of disease, or</td>
<td>(3) Laboratory confirmation of disease, or</td>
<td>(3) Laboratory confirmation of disease, or</td>
</tr>
<tr>
<td>(4) Born before 1957 (except rubella for women of childbearing age who could become pregnant)</td>
<td>(4) Born before 1957 (except rubella for women of childbearing age who could become pregnant)</td>
<td>(4) Born before 1957 (except rubella for women of childbearing age who could become pregnant)</td>
<td>(4) Born before 1957 (except rubella for women of childbearing age who could become pregnant)</td>
</tr>
</tbody>
</table>
MMR Vaccine

**Composition**
Live attenuated viruses

**Efficacy**
- Measles: 95% at 12 months
- 98% at 15 months
- Mumps: 88% (range 66%-95%) (2 doses)
- Rubella: 95% or more (1 dose)

**Duration of immunity**
Lifelong

**Schedule**
2 doses given SQ
MMRV (ProQuad) Vaccine

- Combined measles, mumps, rubella, and varicella vaccine
- 7 to 8 times as much varicella vaccine virus as monovalent varicella vaccine
- Approved only for children 12 months through 12 years of age
MMR Vaccine

- First dose of MMR at 12-15 months
- 12 months is the minimum age
- MMR given before 12 months should not be counted as a valid dose
  - Infants as young as 6 months should receive MMR before international travel*
  - Revaccinate at 12 months of age or older

*ACIP off-label recommendation. *MMWR* 2013;62(RR-4)
MMR Vaccine (Second Dose)

- Second dose of MMR at 4-6 years
- Second dose may be given at any time at least 4 weeks after the first dose
  - Children older than 12 months of age can receive a second dose of MMR before international travel (minimum interval between doses is 4 weeks)
- Intended to produce measles immunity in persons who failed to respond to the first dose (primary vaccine failure)
- May boost antibody titers in some persons
- People who received 2 doses of MMR vaccine as children according to the U.S. vaccination schedule are considered protected for life
MMRV Recommendations

- **First dose at 12–47 months**
  - Either MMR and VAR or MMRV
  - Providers considering MMRV—discuss benefits/risks of both options with parents or caregivers
  - Unless parent or caregiver expresses preference for MMRV, CDC recommends MMR and varicella vaccines

- **Second dose at 15 months–12 years or first dose at 48 months and older**
  - MMRV generally preferred
Minimum Intervals

- **MMR**—2 doses of MMR can be separated by 4 weeks

- **MMRV**—2 doses of varicella vaccine must be separated by at least 3 months for children younger than 13 years of age
MMR Vaccine Failure

- Some recipients do not respond to the first dose
- Failure rate varies by component
- Caused by antibody, damaged vaccine, recording errors
- Most persons with vaccine failure will respond to second dose
Figure 1. Recommended immunization schedule for persons aged 0 through 18 years - United States, 2016.

(FOR THOSE WHO FALL BEHIND OR START LATE, SEE THE CATCH-UP SCHEDULE [FIGURE 2].)

These recommendations must be read with the footnotes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars in Figure 1. To determine minimum intervals between doses, see the catch-up schedule (Figure 2). School entry and adolescent vaccine age groups are shaded.

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Birth</th>
<th>1 mo</th>
<th>2 mos</th>
<th>4 mos</th>
<th>6 mos</th>
<th>8 mos</th>
<th>12 mos</th>
<th>15 mos</th>
<th>18 mos</th>
<th>2-3 yrs</th>
<th>4-6 yrs</th>
<th>7-10 yrs</th>
<th>11-12 yrs</th>
<th>13-15 yrs</th>
<th>16-18 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemophilus B (Hib)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td>2nd dose</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Rotavirus (RV) RV1 (2-dose series; RV5 (3-dose series)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td>See footnote 3</td>
<td>3rd dose</td>
<td></td>
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<tr>
<td>Diphtheria, tetanus, &amp; acellular pertussis (DTaP)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td>3rd dose</td>
<td>4th dose</td>
<td></td>
<td>See footnote 4</td>
<td>5th dose</td>
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</tr>
<tr>
<td>Haemophilus influenzae type b (HiB)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td>See footnote 5</td>
<td>3rd dose</td>
<td></td>
<td>See footnote 6</td>
<td>4th dose</td>
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<tr>
<td>Pneumococcal conjugate (PCV13)</td>
<td>1st dose</td>
<td>2nd dose</td>
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<tr>
<td>Inactivated poliovirus (IPV)</td>
<td>1st dose</td>
<td>2nd dose</td>
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<tr>
<td>Influenza (IIV-3)</td>
<td>Annual vaccination (IIV) or 1 or 2 doses</td>
<td>Annual vaccination (IIV) or 1 or 2 doses</td>
<td>Annual vaccination (IIV) or 1 or 2 doses</td>
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<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td>See footnote 8</td>
<td>1st dose</td>
<td></td>
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<td></td>
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<tr>
<td>Varicella (VAR)</td>
<td>1st dose</td>
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<tr>
<td>Hepatitis A (HepA)</td>
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<tr>
<td>Meninogcoccal ( Hib-Meningitis C)</td>
<td>1st dose</td>
<td>2nd dose</td>
<td>See footnote 10</td>
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<td></td>
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<tr>
<td>Tetanus, diphtheria, &amp; acellular pertussis (Tdap)</td>
<td>1st dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Human papillomavirus (HPV)</td>
<td>HPV: females only, 4th IPV, 5th IPV: males and females</td>
<td>1st dose</td>
<td></td>
<td></td>
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<tr>
<td>Meningococcal (ACWY)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Haemophilus influenzae type b (HiB)</td>
<td></td>
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<tr>
<td>Pneumococcal polysaccharide (PPS23)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

**NOTE:** The above recommendations must be read along with the footnotes of this schedule.
MMR Recommendations for Adults

- Adults born in 1957 or later should receive 1 or more doses at least 28 days apart unless they have other evidence of immunity.

- A routine second dose of MMR vaccine at least 28 days after the first dose is recommended for adults who are:
  - College and post-high school students
  - Persons working in medical facilities
  - International travelers

- Adults born before 1957 are generally presumed immune to measles, mumps, and rubella (except rubella for women of childbearing age who could become pregnant).
All persons who work in medical facilities should be immune to measles, mumps, and rubella.
Evidence of MMR Immunity for Healthcare Personnel Born in 1957 or After

- **Appropriate vaccination**
  - 2 doses of live measles- and mumps-containing vaccines (preferably MMR)
  - 1 dose of live rubella-containing vaccine (preferably MMR), or
- **Laboratory evidence of immunity**, or
- **Laboratory confirmation of disease**

### Recommended Adult Immunization Schedule—United States - 2016

Note: These recommendations must be read with the footnotes that follow containing number of doses, intervals between doses, and other important information.

#### Figure 1. Recommended Immunization schedule for adults aged 19 years or older, by vaccine and age group

<table>
<thead>
<tr>
<th>VACCINE</th>
<th>AGE GROUP</th>
<th>19-21 years</th>
<th>22-26 years</th>
<th>27-49 years</th>
<th>50-59 years</th>
<th>60-64 years</th>
<th>≥ 65 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza</td>
<td>1 dose annually</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap)</td>
<td>Substitute Tdap for Td once, then Td booster every 10 yrs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varicella</td>
<td>2 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Female</td>
<td>3 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Male</td>
<td>3 doses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zoster</td>
<td>1 dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td>1 or 2 doses depending on indication</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal 13-valent conjugate (PCV13)</td>
<td>1 dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 2. Vaccines that might be indicated for adults aged 19 years or older based on medical and other indications

<table>
<thead>
<tr>
<th>VACCINE ▼</th>
<th>INDICATION ▲</th>
<th>Pregnancy</th>
<th>Immuno-compromising conditions (excluding HIV infection)</th>
<th>HIV infection CD4+ count (cells/μL)</th>
<th>Men who have sex with men (MSM)</th>
<th>Kidney failure, end-stage renal disease, on hemodialysis</th>
<th>Heart disease, chronic lung disease, chronic alcoholism</th>
<th>Asplenia and persistent complement component deficiencies</th>
<th>Chronic liver disease</th>
<th>Diabetes</th>
<th>Healthcare personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza</td>
<td></td>
<td></td>
<td>1 dose annually</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Tetanus, diphtheria, pertussis (Td/Tdap)</td>
<td>1 dose Tdap each pregnancy</td>
<td>Substitute Tdap for Td once, then Td booster every 10 yrs</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varicella</td>
<td></td>
<td>Contraindicated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Female</td>
<td>3 doses through age 26 yrs</td>
<td>3 doses through age 26 yrs</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Human papillomavirus (HPV) Male</td>
<td>3 doses through age 26 yrs</td>
<td>3 doses through age 21 yrs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zoster</td>
<td></td>
<td>Contraindicated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measles, mumps, rubella (MMR)</td>
<td>Contraindicated</td>
<td>1 or 2 doses depending on indication</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumococcal 13-valent conjugate (PCV13)</td>
<td>1 dose</td>
<td>1 dose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Measles, mumps, rubella (MMR) Contraindicated 1 or 2 doses
MMR Serologic Testing

- Serologic screening for measles, mumps, or rubella immunity before vaccination is not necessary and not recommended if a person has other acceptable evidence of immunity to these diseases.

- Postvaccination serologic testing to verify an immune response is not recommended.

- Documented age-appropriate vaccination supersedes the results of subsequent serologic testing.
MMR Serologic Testing (2)

- If a person with 2 documented doses of measles- or mumps-containing vaccines is tested and determined to have negative or equivocal measles or mumps titer results, additional MMR vaccination is not recommended.

- Such persons should be considered to have presumptive evidence of immunity.
If a person with 1 dose of rubella-containing vaccine is tested and determined to have negative or equivocal rubella titer results, additional MMR vaccination is not recommended, except for women of childbearing age.

Women of childbearing age with 1 or 2 documented doses of rubella-containing vaccine and rubella-specific IgG levels that are not clearly positive should receive 1 additional dose of MMR vaccine (maximum of 3 doses) and do not need retesting.
Postexposure Prophylaxis with MMR Vaccine

- If given within 72 hours of exposure, MMR vaccine might protect or modify clinical course of measles (preferable to IG for persons ≥12 months if given within 72 hours of exposure)

- If administered within 6 days of exposure, IG can prevent or modify measles in persons who are nonimmune
  - Not indicated for persons who have received 1 dose of measles-containing vaccine at age ≥12 months, unless they are severely immunocompromised
Postexposure Prophylaxis with MMR Vaccine (2cont.)

- Postexposure MMR vaccination or IG not shown to prevent or alter the clinical severity of rubella or mumps and is not recommended

www.cdc.gov/mmwr/pdf/rr/rr6204.pdf
MMR Vaccine
Contraindications and Precautions

- History of anaphylactic reaction to neomycin
- History of severe allergic reaction to any component of the vaccine
- Pregnancy
- Immunosuppression
- Moderate or severe acute illness
- Recent blood product
- Personal or family (i.e., sibling or parent) history of seizures of any etiology (MMRV only)
Vaccination of Women of Childbearing Age

- Ask if pregnant or likely to become so in next 4 weeks*
- Exclude those who say "yes"
- For others
  - Explain theoretical risks
  - Vaccinate

*ACIP off-label recommendation; Vaccine package insert states 3 months
MMR Vaccine and HIV Infection

- MMR recommended for persons who do not have evidence of current severe immunosuppression

- Revaccination recommended for persons with perinatal HIV infection who were vaccinated before establishment of effective antiretroviral therapy (ART) with 2 appropriately spaced doses of MMR vaccine once effective ART has been established

- Prevaccination HIV testing not recommended

- MMRV not for use in persons with HIV infection
MMR Vaccine and Immunosuppressive Therapy

- **Low-dose steroids**
  - Vaccinate anytime

- **Leukemia in remission without chemotherapy for 3 months**
  - Vaccinate

- **Hematopoietic cell transplant (HCT) recipient who is immunocompetent**
  - Vaccinate 24 months after transplant
Tuberculin Skin Testing (TST)* or Tuberculosis Interferon-gamma Release Assay (IGRAs) and MMR or MMRV Vaccines

- Apply TST or IGRA testing at same visit as MMR or MMRV
- Delay TST or IGRA at least 4 weeks if MMR or MMRV given first
- Apply TST first and administer MMR or MMRV when skin test read (least favored option because receipt of MMR or MMRV is delayed)

*Previously called PPD
<table>
<thead>
<tr>
<th>Adverse Reaction</th>
<th>Frequency/Incidence</th>
<th>Associated Disease(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>5%-15% (Measles)</td>
<td></td>
</tr>
<tr>
<td>Rash, pruritis, purpura</td>
<td>5% (Measles)</td>
<td></td>
</tr>
<tr>
<td>Joint symptoms (susceptible women)</td>
<td>25% (Rubella)</td>
<td></td>
</tr>
<tr>
<td>Thrombocytopenia</td>
<td>1/30,000–40,000 doses (Measles)</td>
<td></td>
</tr>
<tr>
<td>Lymphadenopathy</td>
<td>Rare</td>
<td></td>
</tr>
<tr>
<td>Allergic reactions (rash, pruritis, purpura)</td>
<td>Rare</td>
<td></td>
</tr>
<tr>
<td>Parotitis</td>
<td>Rare (Mumps)</td>
<td></td>
</tr>
<tr>
<td>Deafness</td>
<td>Rare (Mumps)</td>
<td></td>
</tr>
<tr>
<td>Encephalopathy</td>
<td>&lt;1/1,000,000,000 doses (Measles)</td>
<td></td>
</tr>
</tbody>
</table>
MMRV Adverse Reactions

- Similar to MMR

- Higher risk for fever and febrile seizures 5-12 days after the first dose among children 12-23 months of age
  - 1 additional febrile seizure occurred 5-12 days after vaccination per 2,300-2,600 children compared to children who received first dose as MMR and varicella vaccine separately

- Fever of 102°F or higher
  - 22% of MMRV recipients
  - 15% with separate injections

- Increased risk of febrile seizures has not been observed following use of MMRV as the second dose in the MMR and varicella series
MMRV Vaccine Precaution

- Children who have a personal or family history of febrile seizures or family history of epilepsy are at increased risk for febrile seizures
  - The risk for such seizures is approximately 1 case for every 3,000-4,000 doses of MMR vaccine administered

- Children with a personal or family history of seizures generally should be vaccinated with separate MMR and varicella vaccines
Rubella Vaccine Arthropathy

- Acute joint symptoms in about 25% of vaccinated, susceptible adult women
- Frank arthritis-like signs and symptoms occur in about 10% of recipients
- Rare reports of chronic or persistent symptoms
- Population-based studies have not confirmed association
MMR Vaccine and Autism

“The evidence favors a rejection of a causal relationship at the population level between MMR vaccine and autism spectrum disorders (ASD).”

- Institute of Medicine, April 2001
Vaccine Storage and Handling

MMR Vaccine

- Store 36°F-46°F (2°C-8°C) (may be stored in the freezer)
- Store diluent at room temperature or refrigerate
- Protect vaccine from light
- Discard if not used within 8 hours after reconstitution
  - Do not fill syringe with reconstituted vaccine until ready to administer
Vaccine Storage and Handling
MMRV Vaccine

- Store frozen between -58°F and +5°F (-50°C and -15°C)
  - Use of dry ice may subject MMRV to temps colder than recommended
- Store diluent at room temperature or refrigerate
- Vaccine may be stored at refrigerator temperature (between 36°F and 46°F, 2°C and 8°C) for up to 72 continuous hours after removal from freezer
- Protect vaccine from light at all times
- If not used immediately, the reconstituted vaccine may be stored at room temperature, protected from light, for up to 30 minutes
- Discard reconstituted vaccine if it is not used within 30 minutes
- Do not freeze reconstituted vaccine
(August 2016) Resources for Measles, Mumps, Rubella

- ACIP Recommendations
  - [www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mmr.html](http://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mmr.html)
  - [www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mmrv.html](http://www.cdc.gov/vaccines/hcp/acip-recs/vacc-specific/mmrv.html)

- CDC Pink Book (Epidemiology and Prevention of Vaccine-Preventable Diseases (13th edition)—
  - [www.cdc.gov/vaccines/pubs/pinkbook/meas.html](http://www.cdc.gov/vaccines/pubs/pinkbook/meas.html)
  - [www.cdc.gov/vaccines/pubs/pinkbook/mumps.html](http://www.cdc.gov/vaccines/pubs/pinkbook/mumps.html)
  - [www.cdc.gov/vaccines/pubs/pinkbook/rubella.html](http://www.cdc.gov/vaccines/pubs/pinkbook/rubella.html)

- FDA Vaccine Package Inserts
  - [www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM123793.pdf](http://www.fda.gov/downloads/BiologicsBloodVaccines/Vaccines/ApprovedProducts/UCM123793.pdf)
• MMR Infection/Disease
  Manual for Surveillance of Vaccine-Preventable Diseases
  www.cdc.gov/vaccines/pubs/surv-manual/index.html,
  www.cdc.gov/measles/index.html
  www.cdc.gov/mumps/index.html
  www.cdc.gov/vaccines/vpd-vac/rubella/default.htm#disease

• MMR Vaccination
  www.cdc.gov/vaccines/vpd-vac/measles/default.htm
  www.cdc.gov/vaccines/vpd-vac/mumps/default.htm
  www.cdc.gov/vaccines/vpd-vac/rubella/default.htm

Additional Resources:
• Acceptable evidence of MMR immunity (Table 3, page 19)
  www.cdc.gov/mmwr/pdf/rr/rr6204.pdf

• MMR dosing intervals (CDC Pink Book):
  Recommended intervals between administration of immune globulin preparations
  and measles-or varicella-containing vaccine
• **2013 Infectious Disease Society of America Guidelines:**
  [http://cid.oxfordjournals.org/content/58/3/e44.full.pdf+html](http://cid.oxfordjournals.org/content/58/3/e44.full.pdf+html)


• **Immunization Action Coalition**
  [www.immunize.org/measles/](http://www.immunize.org/measles/)
  [www.immunize.org/mumps/](http://www.immunize.org/mumps/)
  [www.immunize.org/rubella/](http://www.immunize.org/rubella/)

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  - Donna Weaver
  - Dr. Ray Strikas
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