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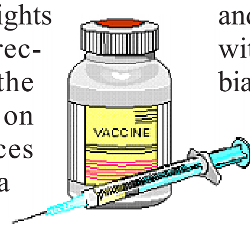
Vaccine Updates

Introduction

Vaccines have led to significant reductions in morbidity and mortality in the U.S. and worldwide, and remain important public health tools for disease prevention. However, resurgences of varicella and pertussis nationwide, the recent large outbreak of mumps in Midwestern states, the outbreak of measles in Europe, and sporadic cases of polio in developing countries are just a few examples that demonstrate the importance of continued, aggressive vaccination programs.

Unfortunately, healthcare professionals face challenges in keeping track of the evolving vaccine recommendations. This article highlights some of the newest recommendations from the Advisory Committee on Immunization Practices (ACIP) and the Virginia Department of Health (VDH) on the most effective means to reduce vaccine-preventable diseases (Table 1). Healthcare professionals who would like to review general recommendations for vaccines available in the U.S. should visit the Centers for Disease Control and Prevention's (CDC) National Immunization Program (NIP) website at www.cdc.gov/nip/default.htm.



In This Issue:

Meningococcal Vaccine

Invasive meningococcal disease occurs as meningitis (49% of cases), septicemia (33%), and pneumonia (9%); other forms account for the remainder (9%) of the cases. Onset can be abrupt and the course of disease rapid. Even with timely and appropriate antimicrobial therapy, the case fatality rate may be 10%-14%, with 11%-19% of survivors suffering serious sequelae including deafness, neurologic deficit, or limb loss.[1]

Tetravalent meningococcal polysaccharide vaccine [(MPSV4) Menomune®-A, C, Y, W-135, manufactured by Sanofi Pasteur] has been available since 1981 for protection against invasive meningococcal infection. However, polysaccharide vaccines do not confer long-lasting immunity and have poor immunogenicity in young children. This significantly limits the protection provided by MPSV4.[2]

The conjugation (i.e., covalent coupling) of polysaccharide to a protein carrier substantially improves the response among infants and enables a strong anamnestic response at re-exposure.

Table 1: Summary of Recent Vaccine Recommendations

Vaccine	Recommendations
MCV4	Universal vaccination of 11-12 & 14-15 year olds
Tdap	Substitute Tdap for Td in adolescents and adults
Varicella	Second dose at five years of age
Zoster	Possible universal vaccination of older adults—under development
MMRV	Combines MMR and varicella vaccine
Rotavirus	Universal vaccination of infants
HPV	Universal vaccination of adolescent females
Hepatitis A	Universal vaccination of all children in U.S. by two years of age
Hepatitis B	1. Increased focus on newborn vaccination in hospital 2. Expansion of use in high risk adults
Influenza	Expansion to include children 24-59 months of age

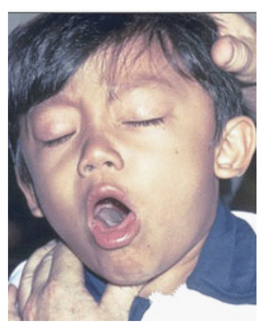
Tetravalent meningococcal polysaccharide-protein conjugate vaccine (MCV4; Menactra®, manufactured by Sanofi Pasteur), was licensed in January, 2005, for use among persons aged 11-55 years (approval for use in persons aged 2-10 years is under review). In May, 2005, the ACIP recommended routine vaccination with MCV4 of persons aged 11-12 years, of adolescents at high school entry (i.e., at approximately age 15 years) if not previously vaccinated with MCV4, and of college freshmen living in dormitories. Vaccination also is recommended for other persons at increased risk for meningococcal disease (e.g., military recruits, travelers to areas where meningococcal disease is hyperendemic or epidemic, microbiologists who are routinely exposed to isolates of *Neisseria meningitidis*, persons with anatomic or functional asplenia, and persons with terminal complement deficiency).[2]

Of note, it is expected that the anticipated demand for MCV4 will outpace supply at least through summer 2006. As a result, current recommendations are that healthcare professionals continue to vaccinate adolescents at high school entry, college freshmen living in dormitories, and other persons at increased risk for meningococcal disease who have not previously received MCV4; administration of MCV4 to persons aged 11-12 years should be deferred. If possible, providers should track persons aged 11-12 years for whom MCV4 has been deferred and recall them for vaccination when supply improves.[2]

It should be remembered that, for some situations, MPSV4 remains an acceptable alternative to MCV4 (e.g., where persons may have brief elevations in their risk for meningococcal disease, such as travelers to areas where meningococcal disease is hyperendemic or epidemic); however, availability of MPSV4 also is limited.[2]

Tdap

Pertussis, an acute, infectious cough illness, remains endemic in the United States despite routine childhood pertussis vaccination and high coverage levels in children. This is partly due to the natural waning of immunity that occurs 5-10 years after completion of childhood pertussis vaccination.[3]



Until recently, only three vaccine formulations against tetanus and diphtheria have been available for use in the United States:

- Pediatric diphtheria, tetanus, and acellular pertussis (DTaP) vaccine routinely provided to children aged <7 years;
- Pediatric diphtheria and tetanus toxoids vaccine (DT) for children aged <7 years with contraindications or precautions for pertussis components; and,
- Adult tetanus and diphtheria toxoids vaccine (Td) routinely provided to persons aged ≥7 years.

Now, to provide protection from pertussis to older individuals, two tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap) products have been formulated: BOOSTRIX®, (GlaxoSmithKline Biologicals, licensed May 3, 2005, for use in persons aged 10-18 years), and ADACEL™ (Sanofi Pasteur, licensed June 10, 2005, for use in persons aged 11-64 years).[3]

Tdap Recommendations for Adolescents

The ACIP published recommendations for the use of Tdap in February, 2006. These recommendations state that adolescents (persons aged 11-18 years) should receive a single dose of Tdap instead of Td if they have not received Td or Tdap. The preferred age for Tdap vaccination is 11-12 years. Therefore, depending on vaccine supply, it is convenient to administer Tdap and meningococcal vaccine (MCV4) during the same visit (see above). Tdap is also preferred for use when tetanus prophylaxis is indicated for wound management.[3]

Persons aged 11-18 years who received Td, but not Tdap, are encouraged to receive a single dose of Tdap to provide protection against pertussis. An interval of at least five years between Td and Tdap is suggested to reduce the risk of local and systemic reactions after Tdap vaccination. However, an interval less than five years can be used in settings with increased risk for pertussis or its complications, since the benefit of using Tdap at a shorter interval to protect against pertussis generally outweighs the risk for local and systemic reactions after vaccination.[3]

If Tdap is indicated but not on hand, vaccine providers should administer Td or temporarily defer Tdap/Td vaccination. If the vaccine provider defers Td in order to administer Tdap when it becomes available, a system to recall the adolescent should be maintained. The adolescent could also be referred to another facility for Tdap administration.[3]

Of note, effective July 1, 2006, Tdap will be required for 6th grade entry in Virginia.

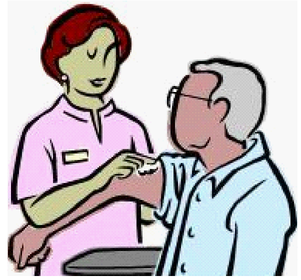
Tdap Recommendations for Adults

The safety and efficacy of Tdap (ADACEL™) as a single dose booster immunization against tetanus, diphtheria, and pertussis has been demonstrated for persons aged 19-64 years. In October, 2005, the ACIP recommended a single dose of Tdap for adults aged 19-64 years who have not received Tdap. The recommendations suggest that adults receive a single dose of Tdap to replace a single dose of Td if they received the last dose of tetanus toxoid-containing vaccine (e.g., Td) greater than 10 years earlier. Adult contacts of children less than 12 months of age should also receive a single dose of Tdap—an interval of two years or more since the last dose of tetanus toxoid-containing vaccine is suggested but a shorter interval may be used. Healthcare professionals who work in hospitals or ambulatory care settings and who have direct patient contact should also receive a single dose of Tdap as soon as feasible, at an interval as short as two years from the last dose of Td. Tdap is also preferred for tetanus prophylaxis in wound management in adults. Although only a single lifetime dose of Tdap is currently recommended, future recommendations will address the use of Tdap as the routine dose. These recommendations remain provisional pending final endorsement by the CDC.[3]

Of note, administering pertussis vaccines to persons with a history of pertussis presents no theoretical safety concern.[3]

Varicella

Varicella (chickenpox) is a common, highly infectious vaccine-preventable disease. Before the introduction of the live attenuated varicella vaccine in 1995, approximately four million cases of varicella occurred annually in the United States, resulting in approximately 13,500 hospitalizations and 150 deaths. The availability of a safe and effective varicella vaccine has reduced the impact of the disease substantially.[4]



However, in recent years varicella outbreaks have continued to occur among school children. During these outbreaks, 11-17% of vaccinated children developed varicella. Although varicella in vaccinated children is usually mild, the children are contagious and can transmit the virus to others who are at high risk of severe disease.

In June, 2005, the ACIP expanded recommendations for varicella vaccine to promote wider use of the vaccine for adolescents and adults, HIV-infected children, and the use of a second dose for outbreak control.[5] In June, 2006, the ACIP broadened those recommendations to include the universal use of a second dose to be administered at four to six years of age. Older children, adolescents, and adults who previously received one dose should receive a second dose as well.[4] These recommendations remain provisional pending final endorsement by the CDC.

Chickenpox

Herpes Zoster

Approximately one million individuals each year in the U.S. experience a reactivation of the varicella-zoster virus (VZV) and develop herpes zoster (shingles). Overall, approximately 15-30% of individuals infected with VZV develop shingles during their life, with the risk greatest in immunosuppressed and elderly persons. This can lead to post-herpetic neuralgia and chronic pain.

Zostavax™ (Merck & Co.) was licensed in May, 2006, for the prevention of shingles in individuals 60 years of age and over. This live attenuated Oka/Merck VZV is identical to varicella vaccine [Varivax™, Merck & Co.], but with a potency 14 times that of Varivax™. Overall, the use of the vaccine reduces the risk of shingles by 51%, and the risk of post-herpetic neuralgia by 39%.[6] Recommendations for use by the ACIP are under development.

MMRV

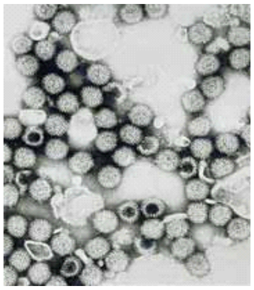
In September, 2005, the Food and Drug Administration (FDA) licensed a combined live attenuated measles, mumps, rubella, and varicella (MMRV) vaccine (ProQuad®, Merck & Co.) for use in children aged 12 months-12 years; MMRV is not indicated for persons outside of this age group. The indications and contraindications for the individual components of combination vaccines apply. However, MMRV vaccine can decrease the number of injections received by children when all of the component antigens are indicated for administration.[7]

One dose of MMRV vaccine should be administered on or after the first birthday, and preferably as soon as the child becomes eligible for vaccination. At least one month should elapse between a dose of measles-containing vaccine, such as MMR vaccine, and a dose of MMRV vaccine; at least three months should elapse between administration of any two doses of varicella-containing vaccine, including single antigen varicella vaccine or MMRV vaccine. At the present time, MMRV should not be administered as a substitute for individual MMR and varicella vaccines to children with HIV until further consideration by ACIP.[7]

Rotavirus

Rotavirus is a leading cause of severe diarrhea, vomiting, fever, and dehydration in infants and young children, with nearly all children infected by five years of age. Worldwide, rotavirus infection causes approximately 500,000 deaths and millions of hospitalizations in children under five years of age. In the U.S., winter epidemics cause approximately 20-60 deaths, more than 50,000 hospitalizations, more than 550,000 health care visits, and over $1 billion in lost-productivity and healthcare costs.[8]

In February, 2006, a live, oral vaccine, RotaTeq™ (Merck & Co.) was licensed. A pentavalent bovine human reassortment vaccine, RotaTeq™ protects against serotypes G1, G2, G3, G4 (the four most common in the U.S.) and P1. Note that this vaccine differs significantly from RotaShield®, a rotavirus vaccine withdrawn from the market in 1999 after it was found to be associated with intussusception. A large scale trial in over 70,000 children has found no association between RotaTeq™ and an increased risk of intussusception. The efficacy of RotaTeq™ was 74% against any rotavirus disease and 98% against severe disease.[8]



Electron micrograph of rotavirus. Dr. Albert Z. Kapikian, NIAID/NIH

RotaTeq™ is provided as a three dose schedule (administered at 2, 4, and 6 months of age). It is administered directly from the tube; the dose does not need to be repeated if it is spit out by the infant. There are no restrictions on an infant's consumption of food or liquid before or after vaccination.[8]

The first dose of RotaTeq™ can be administered no later than 12 weeks of age. Subsequent doses follow at 4-10 week intervals, but the third dose may be administered no later than age 32 weeks. Precautions to vaccination include acute gastroenteritis, moderate to severe illness, preexisting chronic gastrointestinal disease, intussusception, and altered immune status.[8]

Human Papillomavirus (HPV)

Human papillomavirus (HPV) is the most common sexually-transmitted infection in the U.S., with 6.2 million persons newly infected each year. Over half of all sexually active men and women will acquire one or more genital HPV types, and persistent infection with certain types can cause cervical and anogenital cancers, and genital warts. Cervical cancer alone causes an estimated 3,710 deaths per year in the U.S.[9]

In June, 2006, Gardasil® (Merck & Co.) was licensed by the FDA. It is a quadrivalent vaccine containing virus-like particles (VLPs) to HPV types 6, 11, 16, and 18. However, infection prior to vaccination with an HPV type covered by the vaccine does not provide protection from disease caused by that HPV type. The vaccine, given as three injections over a six-month period, is approved for use in females 9-26 years of age.[9]

Cervarix™ (GlaxoSmithKline) contains VLPs to HPV types 16 and 18, and currently targets infection in females. It is in final stages of clinical testing and consideration for FDA licensure is in process.

The ACIP voted on recommendations for the use of Gardasil® in June, 2006. The vaccine should be routinely given to females at age 11 or 12 years, but it may be given as early as nine years of age. Females currently 13-26 years of age should be vaccinated as well. The vaccine should be administered before onset of sexual activity (i.e., before exposure to the viruses), but females who are sexually active should still be vaccinated.

Hepatitis A (HAV)

Since the licensure of hepatitis A vaccine (HAV) in 1996, and particularly since ACIP's 1999 recommendations for the routine vaccination of children living in areas with consistently elevated hepatitis A rates, national hepatitis A rates have declined sharply. HAVRIX® (GlaxoSmithKline), VAQTA® (Merck & Co.) and the combination vaccine TWINRIX® (containing both HAV and HBV antigens; GlaxoSmithKline) are all vaccines licensed for use in the U.S.[10]

Due to the effectiveness of the vaccine, the majority of HAV cases during recent years have been reported from states with historically low rates of HAV and where HAV vaccination of children has not been widely implemented. Therefore, in May, 2006, the ACIP recommended that all children in the U.S. should receive hepatitis A at one year of age as part of the effort to further reduce the impact of HAV, and with the goal of eliminating indigenous HAV transmission.[10] Catch-up vaccination of unvaccinated persons aged 2-18 years can be considered.

Hepatitis B

The ACIP published the first part of its updated recommendations for hepatitis B vaccination in December, 2005. These recommendations address improving prevention of perinatal and early childhood hepatitis B virus (HBV) transmission, and improving coverage of children and adolescents who were not previously vaccinated. Strategies to enhance coverage include:

1) establishing standing orders for administration of hepatitis B vaccination beginning at birth;
2) instituting hospital policies and procedures, and case management programs, to improve the administration of immunoprophylaxis to infants born to mothers who are hepatitis B surface antigen (HBsAg) positive and to mothers with unknown HBsAg status at the time of delivery;
3) implementing vaccination record reviews for all children aged 11-12 years and children and adolescents aged <19 years who were born in countries with intermediate and high levels of HBV endemicity;
4) adopting hepatitis B vaccine requirements for school entry; and,
5) integrating hepatitis B vaccination services into settings that serve adolescents.[11]

While the second part of the recommendations that address adult HBV immunization were approved by ACIP in October, 2005, they remain provisional. The general recommendations for adults will be to vaccinate all unvaccinated adults at risk for HBV infection and all adults seeking protection from HBV infection.

Influenza

ACIP recommendations for influenza vaccination for the 2006-2007 influenza season were published in June 2006.[12] Due to the significant impact of influenza, these recommendations will be covered in more detail in an upcoming *Virginia Epidemiology Bulletin*.

Of note, for the 2006-2007 season, vaccination recommendations have been expanded to include vaccination of children aged 24-59 months and their household contacts and out-of-home care givers.[12]

Conclusions

Immunization is among the most successful and cost-effective public health interventions available. Immunization programs have led to the eradication of smallpox, elimination of measles and poliomyelitis in some regions of the world, and substantial reductions in the morbidity and mortality attributed to diphtheria, tetanus, and pertussis. The World Health Organization (WHO) estimates that two million child deaths were prevented by vaccinations in 2003.[13]

Vaccine development and implementation continue to evolve. Innovations under development include:

- New vaccines for diseases (e.g., influenza A/H5N1);
- Improved methods for production (e.g., cell culture for influenza vaccine) and formulations (e.g., thimerosal-free);
- Expanding the scope of organisms covered (e.g., pneumococcal conjugate vaccine – PCV 13);
- New methods for administration (e.g., intradermal, intranasal);
- Expanding eligible populations (e.g., MCV4 for ages 2-10 years; HPV for males); and,
- Combinations to reduce the number of injections (e.g., Hib/DTaP/IPV).

While the number and variety of vaccines can be difficult to manage, resources for healthcare professionals and the public are available on the National Immunization Program website at www.cdc.gov/nip/default.htm. Detailed information on vaccines, including dosage, administration, indications, and contraindications, may also be found in the product inserts.

Healthcare professionals should remember that all clinically significant adverse events following vaccination should be reported to the Vaccine Adverse Event Reporting System (VAERS), even if a causal relationship to vaccination is uncertain. VAERS reporting forms and information are available electronically at www.vaers.hhs.gov/ or by calling (800) 822-7967. Providers are encouraged to report electronically at https://secure.vaers.org/VaersDataEntryintro.htm. This system is important for detecting potential problems with vaccines that may need to be addressed to maximize the effectiveness of this public health resource.

Submitted by: Laura Ann Nicolai,
Division of Immunization

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Special Thanks to Virginia's Influenza Sentinel Providers

Every influenza season, select sentinel healthcare professionals from across the Commonwealth volunteer to report basic data on influenza-like illness (ILI) being observed in Virginia. This helps the Virginia Department of Health (VDH) monitor influenza activity throughout the season to determine when and where influenza-like activity is taking place.

Actually, Virginia physicians participate in one of two sentinel surveillance systems for influenza:

- The Virginia sentinel system; and,
- The Centers for Disease Control and Prevention (CDC) sentinel system.

With the emergence and spread of avian influenza and the potential for an influenza pandemic, a system for tracking influenza has become even more important. Therefore, VDH would like to sincerely thank all of those healthcare professionals and practices listed below who participated in the Sentinel ILI Surveillance Program during the 2005-2006 influenza season.

Dr. Cooperstein - Medical Associates of Big Stone Gap

Ashburn Pediatrics

Dr. Karen Herst - Petersburg Health Care Alliance

Mary McLear - Valley Ridge Family Medicine

Dr. Sabra Bellovin

Dr. David Powers - South Hill Family Medicine

Sherry Overstreet, RN - Lewis Gale Pediatric Clinic

Dr. Ken Sosnowski - VA Hospital

Dr. David Chesler - Charlottesville Family Medicine

Crozet Family Medicine

Dr. Mark C. Flemmer - Sentara Ambulatory Care Center

Dr. Charles Sparrow - New Market Medical Center

Family Medicine of Albemarle

Dr. Anthony Maher - Hague Medical Associates

Dr. David Neff - Hopewell/Prince George Health Care Alliance

Dr. Leila Youssef - Beauregard Medical Center

Dr. Roger Chinery - Alexandria Neighborhood Health Services, Inc.

Dr. Ambrish K. Gupta - Medical Associates of Northern Virginia

Arlington Internal Medicine

Drs. P. Saleena Dakin, Susan K. Khandelwal, David A. Granger - Arlington Pediatric Center

Lisa Kennedy - Greenbrier Family Practice

Patient First - Battlefield

Dr. Glenn B. Wolffe - Island Medical Center

Clinch Valley Physicians

Hampton Health Department

Surry Clinic

Dr. June R. Tunstall - Hopewell Medical Group

Dr. David M Wodicka - Piedmont Family Practice

Dr. Pamela McClure-Smith - Centra Health Medical Center-Gretna

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Dr. Stephen L. Green

Patient First - Cedar Road

Dr. Randall T. Bashore - Central Virginia Community Health Center

Carilion Family Medicine- Blacksburg

Drs. Hemphill and Dums - Carilion Family Medicine-Shawsville

Dr. Boerth - Medical Associates of Southwest Virginia

Dr. Susan Pillsbury

Dr. Dean Havron

Winchester Pediatric Clinic

Dr. Thomas A Shapcott

Anup Gokli, Dennis Thomas - Providence Forge MedCare

Gloucester Convenient Care

Frank Sasser

Family Care of Blacksburg

Dr. Teresita C. Dionisio - Southside Pediatrics

Dr. John Cary

Family Medicine of Clifton-Centreville

Virginia Medical Alliance

Advanced Pediatrics

Fairfax Pediatrics Associates

Catoctin Family Practice

Dr. Sherry Sandlin - Village Green Family Medicine

Frank Sasser - Montpelier Family Practice

Dr. Asma Afzal - Health Centers of the Piedmont

Dr. Bowles

King and Queen Family Practice

Donna Denson - Williamsburg Medical Arts-Family Practice

Pediactrics of Kempsville

Doctors on Call

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Family Medicine Associates

Dr. Wesley Eastridge - Mountain Region Family Medicine

Virginia Tech Schiffert Health Center

Linda Bledsoe, FNP - Carilion Medical

New River Valley Pediatrics

Faye Sedwick, RN, MSN - Memorial Hospital Martinsville

Nicholas T Kipreos, MD, LLC

Carilion Family Medicine

Dr. Phillip Sprinkle

Jackie Batterson - Riverside Family Practice

Dr. Kuiken - Primary Care Associates

Radford University Student Health Center

New River Internal Medicine

Prompt Care

Dr. Marissa Vito Cruz - St.Charles Health Clinic

Alexandria Primary Care

Drs. Mathew W. Marchal and Brett Law - Altius Family and Sports Medicine*

Coliseum Medical Associates

Dr. Gayle Moses - College of William and Mary Health Center

Dr. Thomas O'Neill - Danville Pulmonary Clinic

University of Virginia Student Health Center

Dr. Pankaj Kumar - Health Care in the Square

Holland Road Familly Practice-Tidewater Physician Multispecialty Group

Kevin P. Murray, M.D., F.A.C.P.

Dr. Kimberly A. Smith-Griffin - Lakeview Medical

Dr. Joycelyn Sabino-Akins - Lebanon Pediatrics

Dr. Richard A Lane - Light Medical

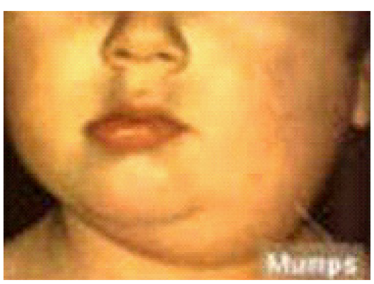
Selma Medical Associates

Dr. Denise William - Southern Albemarle Family Practice

Ashburn Pediatrics*

*Extra recognition for performing surveillance during the Summer 2006.

Mumps (Infectious Parotitis) Outbreak in the Midwest



Mumps is a viral illness characterized by acute onset of unilateral or bilateral tender, self-limited swelling of the parotid or other salivary glands, lasting two or more days, and without other apparent cause. To prevent mumps, the Advisory Committee on Immunization Practices (ACIP) recommends a two-dose measles, mumps, and rubella (MMR) vaccination series for all children, with the first dose administered at ages 12-15 months and the second dose at ages 4-6 years. Two doses of MMR vaccine are recommended for school and college entry unless the student has other evidence of immunity.[1] However, even with good vaccination coverage in the U.S., healthcare professionals should be aware that cases of mumps occur sporadically (Virginia averaged approximately 10 cases per year from 1996-2005).[2]

The continued risk from this vaccine-preventable disease was highlighted recently by a large mumps outbreak that began on a college campus in Iowa in December, 2005. Transmission continued, and eventually involved at least 10 additional states (Virginia has one case suspected to be linked to the outbreak; confirmation is pending. There has been no subsequent spread). From January 1-May 2, 2006, the 11 involved states reported 2,597 cases of mumps; eight states reported mumps outbreaks with ongoing local transmission or clusters of cases. Complications have included orchitis, meningitis, encephalitis, deafness, oophoritis, mastitis, and pancreatitis. No deaths have been reported.[1]

In Iowa, preliminary vaccination data showed that among 1,192 patients, 69 (6%) were unvaccinated, 141 (12%) had received one dose of measles, mumps, and rubella (MMR) vaccine, and 607 (51%) had received two doses of MMR vaccine; the vaccination status of 375 (31%) patients, the majority of whom were adults who did not have vaccination records, was unknown.[1]

Delayed recognition and diagnosis of mumps cases might have contributed to the spread in this outbreak; younger physicians in the United States are less likely to have seen mumps, and physicians might not consider the diagnosis in vaccinated persons.[1]

It should also be recognized that even two doses of MMR vaccine are not 100% effective in preventing disease. Studies

Understanding Mumps Vaccine Effectiveness and Outbreaks

Assume that mumps vaccine has an effectiveness of approximately 90%. In a community of 100, assume 98% have been vaccinated (a similar rate to what is being seen today in many K-12 schools and some colleges). Thus, 98 people are vaccinated and 2 people are not. Assume that everyone is exposed to mumps, and that viral transmission occurs 100% of the time. What happens?

- 88 people (90% of the 98 who are vaccinated) in the community are protected by the vaccine and do not get mumps.
- 10 people (10% of the 98 who are vaccinated) become ill with mumps because the vaccine did not "take".
- 2 people who have never been vaccinated get ill because they have no immunity to the disease.

Of the 12 (10 vaccinated + 2 unvaccinated) people who get mumps, 83% (10/12) were vaccinated. This is similar to what was observed in Iowa recently.

Thus, while the vaccine prevented a significant amount of illness, a large percent of the people who developed mumps had been vaccinated. This is expected in a highly vaccinated population when dealing with a vaccine that is less than 100% effective and a contagious disease like mumps. This does not mean that the vaccine is not working; in fact the mumps vaccine is working as predicted.[3]

suggest that one dose of MMR is 75%-91% effective in preventing mumps with parotitis that lasts two or more days; two doses is approximately 88% effective. Therefore, according to the Centers for Disease Control and Prevention (CDC) the mumps vaccine is working as expected, and high vaccination coverage with two doses of MMR vaccine, especially in school-aged populations in the United States, likely prevented thousands of additional cases of mumps in this outbreak (see box above).[3] The vaccine may also be less effective in preventing asymptomatic infection or atypical mumps than in preventing parotitis, and persons with asymptomatic infection or mild disease might contribute to transmission. Finally, waning immunity in some groups has been postulated as a contributing factor in this outbreak.[1]

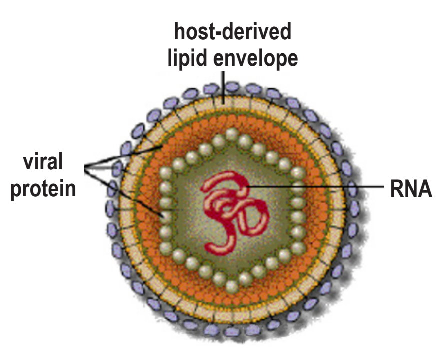
Vaccination Recommendations

On May 17, 2006, ACIP redefined evidence of immunity to mumps as:

- One dose of a live mumps virus vaccine for preschool children and adults not at high risk;
    - Combined MMR vaccine generally should be used whenever any of its component vaccines are indicated;
    - For children aged 1-12 years, MMRV vaccine can be considered if varicella vaccine is indicated.
- Two doses of a live mumps virus vaccine for children in grades K-12 and adults at high risk (i.e., persons who work in healthcare facilities, international travelers, and students at post-high school educational institutions);
- Birth before 1957;
- Documentation of physician-diagnosed mumps; or,
- Laboratory evidence of immunity (i.e., positive IgG serology).

However, healthcare facilities should consider recommending one dose of MMR vaccine to unvaccinated healthcare workers born before 1957 who do not have a history of physician-diagnosed mumps or laboratory evidence of mumps immunity.[1]

In addition, during an outbreak and depending on the epidemiology of the outbreak, a second dose of vaccine should be considered for adults and for children aged 1-4 years who have received one dose. The second dose should be administered as early as 28 days after the first dose (the minimum recommended interval between two MMR vaccine doses). In addition, during an outbreak, healthcare facilities should strongly consider recommending two doses of MMR vaccine to unvaccinated workers born before 1957 who do not have other evidence of mumps immunity.[1]



Mumps Virus

Exclusion, Isolation, and Quarantine

The incubation period following mumps exposure is usually 16 to 18 days (range 12-25 days). The infectious period for mumps is from three days before symptoms appear to about nine days after the symptoms appear.[4]

Students who acquire mumps illness should be excluded from school until nine days after the onset of parotitis. Similarly, healthcare workers with mumps illness should be excluded from work until nine days after the onset of parotitis.[1]

Additional means to decrease transmission in outbreak settings include exclusion of persons without evidence of immunity to mumps from facilities affected by the outbreak (students and staff can be readmitted immediately following vaccination). The period of exclusion for those who remain unvaccinated is 26 days after the onset of parotitis in the last person in the affected institution(s).[1]

After an exposure to mumps, unvaccinated healthcare workers without evidence of immunity should be vaccinated and excluded from duty from the 12th day after the first exposure through the 26th day after the last exposure.[1]

Laboratory Testing of Suspected Cases

Acute mumps infection can be confirmed by the presence of serum mumps IgM, a significant rise in IgG antibody titer in acute and convalescent serum specimens, or positive mumps virus culture. However, several different mumps IgM antibody tests are in use, and the sensitivities and specificities of these tests when used with serum specimens from unvaccinated or vaccinated persons are unclear. As a result, interpretation of these

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Cases of Selected Notifiable Diseases Reported in Virginia*

Disease	Total Cases Reported, May 2006						Total Cases Reported Statewide, January - May		
		Regions							
	State	NW	N	SW	C	E	This Year	Last Year	5 Yr Avg
AIDS	56	4	33	1	15	3	206	256	279
Campylobacteriosis	51	3	13	12	6	17	162	149	111
Chickenpox	199	32	57	33	7	70	812	208	283
***E. coli*, Shiga toxin-producing**	8	2	6	0	0	0	38	16	11
Giardiasis	26	5	7	4	4	6	162	212	137
Gonorrhea	374	22	20	65	95	172	2,512	3,330	3,710
Group A Strep, Invasive	17	5	5	0	1	6	67	43	46
Hepatitis, Viral									
A	1	1	0	0	0	0	22	37	39
B, acute	2	0	0	2	0	0	14	75	71
C, acute	0	0	0	0	0	0	1	6	3
HIV Infection	75	3	20	4	26	22	366	307	340
Lead in Children†	36	3	5	10	7	11	195	164	217
Legionellosis	1	0	0	0	1	0	15	10	7
Lyme Disease	11	0	7	1	1	2	18	33	19
Measles	0	0	0	0	0	0	0	0	0
Meningococcal Infection	1	0	0	1	0	0	11	14	11
Pertussis	35	6	11	4	8	6	88	74	49
Rabies in Animals	63	18	10	14	6	15	259	215	200
Rocky Mountain Spotted Fever	9	1	1	3	1	3	15	6	1
Rubella	0	0	0	0	0	0	0	0	0
Salmonellosis	67	9	21	11	12	14	249	299	294
Shigellosis	4	0	1	1	1	1	21	36	122
Syphilis, Early§	19	1	6	1	3	8	125	98	83
Tuberculosis	12	1	8	0	1	2	86	107	94

Localities Reporting Animal Rabies This Month: Accomack 1 raccoon; Albemarle 3 raccoons; Arlington raccoon; Augusta 2 raccoons; Bedford 1 fox; Brunswick 2 raccoons; Campbell 1 skunk; Clarke 1 skunk; Culpeper 1 skunk; Fairfax 1 bat, 3 raccoons, 1 skunk; Fauquier 1 raccoon; Floyd 1 raccoon; Franklin 1 cow; Fredericksburg 1 fox; Giles 1 fox; Gloucester 1 raccoon; Grayson 1 bobcat, 1 raccoon, 1 skunk; Hanover 2 raccoons; Henrico 1 bat; Isle of Wight 2 raccoons, 1 skunk; James City 1 skunk; King and Queen 1 dog; Loudoun 1 fox, 1 raccoon; Lynchburg 1 raccoon, 1 skunk; Mathews 1 fox; Nelson 1 raccoon; Newport News 1 raccoon; Northampton 2 raccoons; Orange 1 raccoon; Patrick 1 fox; Prince William 1 fox, 1 raccoon; Rockbridge 1 fox, 1 raccoon; Shenandoah 1 raccoon, 1 skunk; Smyth 2 raccoons; Spotsylvania 1 raccoon; Stafford 1 raccoon; Suffolk 1 raccoon; Sussex 1 raccoon; Virginia Beach 1 fox, 2 raccoons; Warren 1 raccoon; Wythe 1 fox.
Toxic Substance-related Illnesses: Adult Lead Exposure 9; Mercury Exposure 1; Methemoglobin 1; Pneumoconiosis 2.

*Data for 2006 are provisional. †Elevated blood lead levels ≥10µg/dL. §Includes primary, secondary, and early latent.

(Continued from page 7)

antibody test results is difficult, especially in previously vaccinated persons.[1]

Therefore, if a case of mumps is suspected and testing is indicated, contact the Virginia Department of Health Division of Immunization (804-864-8055). The Division of Consolidated Laboratory Services (State Laboratory) can perform mumps virus culture and will send serology specimens to the CDC. Current laboratory methods provide results within days to weeks after specimen receipt. There is no rapid test available for diagnosing mumps at the present time.[1]

For serological testing, collect serum (acute: draw within five days of onset of parotitis; convalescent: draw two weeks later). A parotid gland/buccal swab is the preferred specimen for mumps virus culture and should be collected as close to symptom onset as possible.[1]

Additional information on mumps can be obtained from the VDH Division of Immunization (804-864-8055), or on the CDC website: www.cdc.gov/nip/diseases/mumps/default.htm.

References:

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