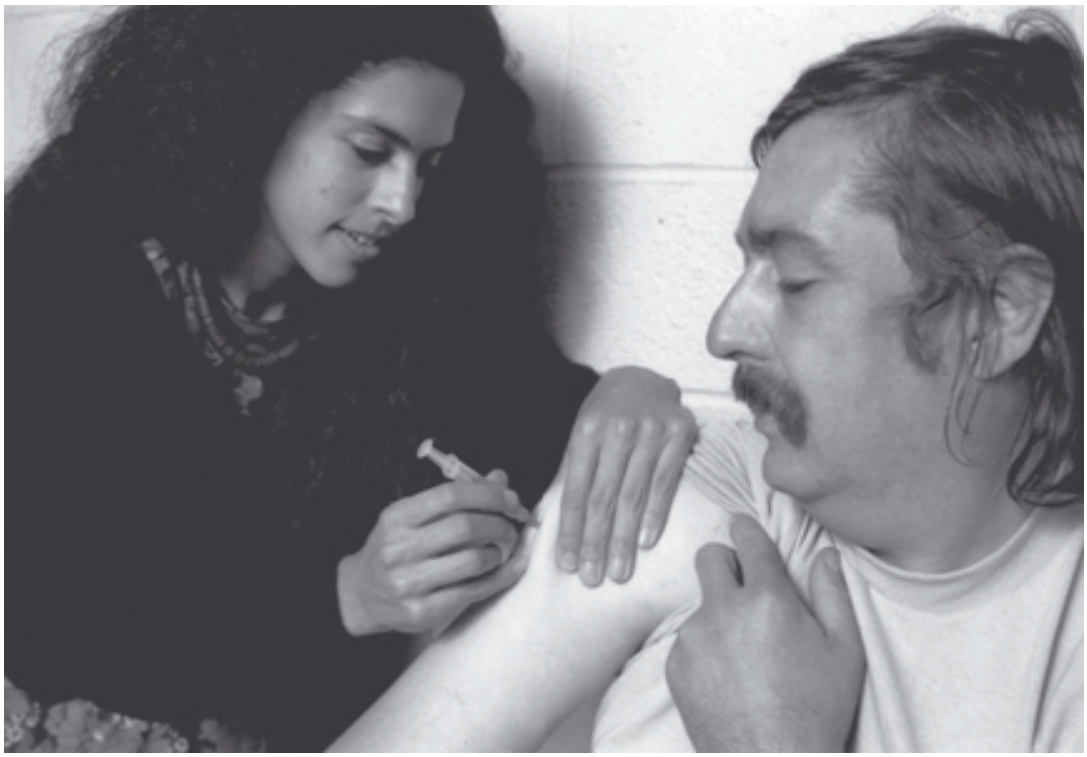

Adult Immunizations

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Routine vaccination has dramatically reduced the prevalence of diphtheria, tetanus, pertussis, polio, measles, mumps, rubella, and *Haemophilus influenza* type b (Hib) in the USA. Nonetheless, with the exception of polio, these diseases still occur in the USA, and polio continues to occur in other parts of the world. With international travel now commonplace, the fact that these vaccine-preventable diseases occur anywhere in the world means that outbreaks can occur in the USA if our immunization rates fall.

This section reviews the less commonly seen vaccine-preventable diseases, the immunizations to prevent these diseases, and the immunization schedules recommended in the USA, as of 2004.

"Uncommon" Vaccine-Preventable Diseases

Diphtheria, mumps, rubella, polio, and tetanus, illnesses once epidemic in the USA, are now relatively rare because of widespread immunization programs. However, aggressive immunization programs and prompt reporting of suspect cases are critical to prevent the recurrence of large outbreaks of diseases in this group. In Massachusetts and many other states, the law requires that documented or suspected cases of these diseases be promptly reported to the local board of health or the appropriate health agency.

Diphtheria

Widespread immunization has made diphtheria very rare in the USA. From 1980 through 2000, an average of 2-3 cases were reported each year. However, diphtheria continues to occur in other parts of the world. A major epidemic of diphtheria occurred in countries of the former Soviet Union beginning in 1990. By 1994, more than 157,000 cases and more than 5000 deaths were reported in all of the 15 newly independent states. One cause of the outbreak was the lack of routine immunizations of adults in these countries.

A person with diphtheria is infectious as long as the bacteria are present, usually about 2 weeks but as long as 4 weeks. A person is usually not infectious 48 hours after receiving the appropriate antibiotics; however, elimination of the bacteria needs to be documented by two consecutive negative cultures after the antibiotics are completed. Once a person has been exposed to diphtheria, symptoms can occur 1-10 days later.

Diphtheria, a bacterial infection that most

BHCHP nurse practitioner Maya Mundkur Greer administers a tetanus shot to a guest at St. Francis House. Photo by David Comb

Recommended Adult Immunization Schedule

UNITED STATES • 2002-2003

For all persons in this group | Catch-up on childhood vaccinations | For persons with medical/exposure indications

VACCINE / AGE	19-49 YEARS	50-64 YEARS	65 YEARS & OLDER
Tetanus, Diphtheria (Td)*	1 dose booster every 10 years		
Influenza	1 dose annually for persons with medical or occupational indications, or household contacts of persons with indications	1 annual dose	
Pneumococcal (polysaccharide)	1 dose for persons with medical or other indications. (1 dose revaccination for immunosuppressive conditions)		1 dose for unvaccinated persons 1 dose revaccination
Hepatitis B*	3 doses *(0, 1–2, 4–6 months)* for persons with medical, behavioral, occupational, or other indications		
Hepatitis A	2 doses *(0, 6–12 months)* for persons with medical, behavioral, occupational, or other indications		
Measles, Mumps, Rubella (MMR)*	1 dose if measles, mumps or rubella vaccination history is unreliable; 2 doses for persons with occupational or other indications		
Varicella*	2 doses *(0, 4–8 weeks)* for persons who are susceptible		
Meningococcal (polysaccharide)	1 dose for persons with medical or other indications		

Recommended Immunizations for Adults with Medical Conditions

UNITED STATES • 2002-2003

For all persons in this group | Catch-up on childhood vaccinations | For persons with medical/exposure indications | Contraindicated

Medical Conditions / Vaccine	Tetanus-Diphtheria (Td)*	Influenza	Pneumococcal (polysaccharide)	Hepatitis B*	Hepatitis A	Measles, Mumps, Rubella (MMR)*	Varicella*
Pregnancy		A					
Diabetes, Heart Disease, Chronic Pulmonary Disease, Chronic Liver Disease, including Chronic Alcoholism		B	C		D		
Congenital Immunodeficiency, Leukemia, Lymphoma, Generalized Malignancy, Therapy with Alkylating Agents, Antimetabolites, Radiation or Large Amounts of Corticosteroids			E				F
Renal Failure/End Stage Renal Disease, Recipients of Hemodialysis or Clotting Factor Concentrates			E	G			
Asplenia, including Elective Splenectomy and Terminal Complement Component Deficiencies			E, H, I				
HIV Infection			E, J			K	

* Covered by the Vaccine Injury Compensation Program.

A. If pregnancy is at second or third trimester during influenza season.

B. Although chronic liver disease and alcoholism are not indicator conditions for influenza vaccination, give one dose annually if the patient is 50 years or older, has other indications for influenza vaccine, or if patient requests vaccination.

C. Asthma is an indicator condition for influenza but not for pneumococcal vaccination.

D. For all persons with chronic liver disease.

E. Revaccinate once after five years or more have elapsed since initial vaccination.

F. Persons with impaired humoral but not cellular immunity may be vaccinated. *MMWR* 1999;48 (RR-06):1-5.

G. Hemodialysis patients: Use special formulation of vaccine (40 µg/mL) or two 1.0 mL 20 µg doses given at one site. Vaccinate early in the course of renal disease. Assess antibody titers to hep B surface antigen (anti-HBs) levels annually. Administer additional doses if anti-HBs levels decline to <10 milliinternational units (mIU)/mL.

H. Also administer meningococcal vaccine.

I. Elective splenectomy: vaccinate at least two weeks before surgery.

J. Vaccinate as close to diagnosis as possible when CD4 cell counts are highest.

K. Withhold MMR or other measles-containing vaccines from HIV-infected persons with evidence of severe immunosuppression. *MMWR* 1996;45:603-606, *MMWR* 1992;41 (RR-17):1-19.

often involves the upper respiratory passages, causes a sore throat, a slight fever, chills, and often a thick covering (membrane) that forms in the back of the throat. The membrane, which varies in color from bluish-green to grayish-green or black if there has been bleeding, can impair breathing and swallowing. If diphtheria is not properly diagnosed and treated, it can also produce a powerful toxin (poison) that spreads throughout the body causing serious complications, such as paralysis or heart failure. About 1 person in every 10 who contract diphtheria will die from this infection.

Diphtheria vaccine protects people by creating immunity to the toxin that causes symptoms of illness, rather than immunity to the diphtheria bacteria itself. The vaccine acts on the toxin and not the bacteria, and is thus called a toxoid. Diphtheria toxoid is made from inactivated toxins and cannot

cause disease. Since diphtheria disease may not give the person immunity, persons recovering from diphtheria should be evaluated for immunization with diphtheria toxoid.

Children under 7 years of age normally receive 5 doses of diphtheria toxoid in early childhood. Doses begin as early as 6 weeks of age. To assure continued immunity, booster injections of diphtheria toxoid (given with tetanus toxoid as Td) are recommended every 10 years following the primary series. The first booster dose may be given at 11-12 years of age if at least 5 years have elapsed since the last dose of DTaP, DTP, DT or Td.

Diphtheria toxoid comes in several forms:

- **DTaP** (diphtheria and tetanus toxoids and acellular pertussis vaccine) is the vaccine of choice for children 6 weeks through 6 years of age;
- **DT** (diphtheria and tetanus toxoids) is for children under the age of 7 for whom pertussis immunization is contraindicated; and
- **Td** (tetanus and diphtheria toxoids) is the vaccine of choice for children 7 years old and older and for adults. Td contains a lower dose of diphtheria toxoid than does DTaP or DT, diminishing the risk of adverse reaction in this older age group.

Adults working in shelters should show evidence of immunity to diphtheria. To prove immunity, they should have one of the following:

- documentation of a primary series with Td within the past 10 years; or
- documentation of a primary series in childhood and a booster within the preceding 10 years.

Those without proof of immunity are candidates for immunization with the appropriate diphtheria vaccine preparation (usually Td).

Mumps

Prior to mumps vaccine licensure in 1967, mumps was a common childhood disease. The number of reported cases in the USA has dropped from over 150,000 in 1968 to only 231 in 2001. Since 1990 in the USA, persons age 15 years and older have accounted for 30-40% of the cases. Cases of mumps are more common in the winter and spring; however, cases can occur at any time of the year.

Mumps spreads from an infected person to others who are susceptible (never had the disease mumps or have not had two doses of the mumps vaccine) through direct contact with infected respiratory secretions (sneezing, coughing, contact with mucous or saliva). A person is infectious from 3 days before until about 9 days after the onset of gland swelling. Once a susceptible person is exposed, symptoms usually appear within 14-25 days of exposure.

Mumps is a viral infection that causes the salivary glands to become inflamed, resulting in swollen cheeks and jaw, the classic symptom of the disease. The swelling of the cheek and jaw may occur on both sides of the face or only on one side and may be first noted as earache and jaw tenderness. Symptoms that may occur 1-2 days before the swelling of the cheek and jaw include fever, headache, tiredness, muscle aches, and decreased appetite. Mumps is usually a mild disease with symptoms resolving after 10 days. However, mumps can cause serious complications such as deafness, meningitis (infection of the brain and spinal cord coverings), painful swelling of the testicles or ovaries, and rarely, death.

The mumps vaccine used today is made from a live, attenuated (weakened) mumps virus. In the USA mumps virus is usually given together with measles and rubella vaccine, in an immunization called MMR vaccine.

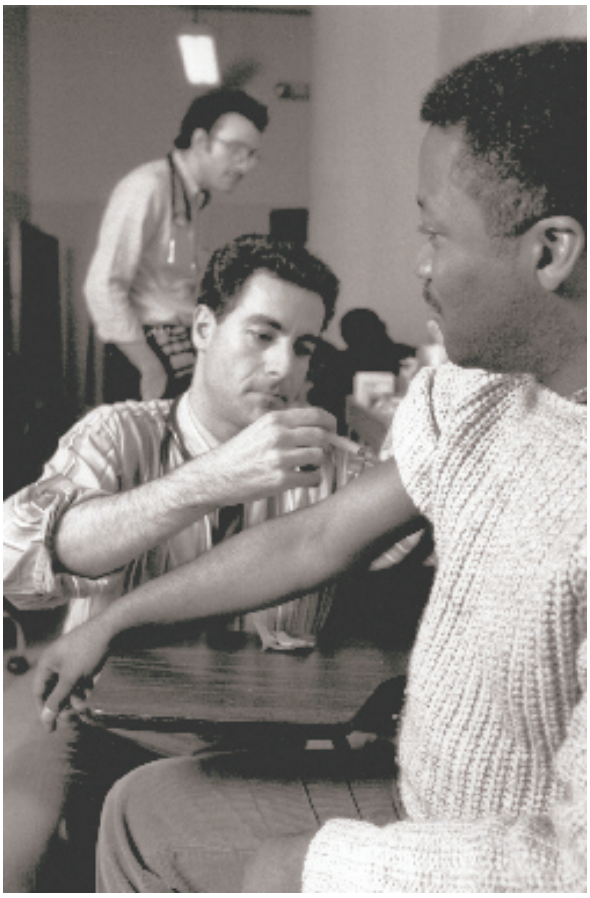
Two doses of mumps vaccine are routinely recommended for all children, with the two doses separated by at least 4 weeks. In the USA the first dose is given on or after 12 months of age, and the second dose is given at age 4-6 years before the child enters kindergarten. Any mumps-containing vaccine given before 12 months of age does not count as a valid dose and needs to be repeated when the child is at least 12 months of age.

Adults working in shelters should show evidence of immunity to mumps by having one of the following:

- documentation of at least one dose of mumps vaccine given at or after 12 months of age; or
- a blood test result showing immunity to mumps virus; or
- documentation of birth in the USA before 1957 (probably had the disease mumps and now has immunity).

Rubella

The largest number of rubella cases in the USA occurred in 1969, when 57,686 cases were reported. The rubella vaccine was licensed in 1969, and the number of cases fell rapidly. By 1983, fewer than 1000 cases per year were reported. A moderate



Late BHCHP physician Tom Bennett with a relieved guest at the shelter clinic in 1988 after administering a flu shot during the annual citywide immunization effort in November in Boston's shelters. Photo by David Comb

resurgence occurred in 1990 - 1991 due to outbreaks in California and within the Amish community in Pennsylvania. Since the mid-1990's, most reported rubella cases in the USA have occurred among Hispanic adults who were born in other countries where rubella vaccine is not routinely given. Recent outbreaks have occurred in workplaces in which many employees were born outside the USA.

Congenital rubella syndrome (CRS) surveillance is maintained through the National Congenital Rubella Registry. Infants with CRS are born to mothers who contracted rubella disease during the pregnancy; CRS includes defects of the eyes, ears, heart, brain, and bones. The largest yearly number of reported CRS cases to the registry was 67 cases in 1970. Two cases were reported in 2001. Rubella outbreaks are almost always followed by an increase in CRS.

The rubella virus lives in the nose and throat of an infected person and is sprayed into the air when the person sneezes, coughs, or talks. Having direct contact to the infected droplets or articles that are contaminated with infected droplets (such as cups, utensils, mouthed toys, or tissues) can expose others to the virus. It takes about 12-23 days from the time of exposure for people to start showing signs of the disease. A person with the disease is contagious 7 days before to about 7 days after the onset of the rash. A person who is infected with the rubella virus but has a very mild case or no rash (about 20-50% of all rubella infections) is still able to spread the virus. An infant born with CRS can shed the virus for a year or more.

Rubella, also called German measles, is a moderately contagious disease that is caused by a virus. In children, a rash is usually the first sign of illness. Older children and adults often have a low-grade fever, feel tired, have swollen lymph nodes (especially those behind the ears and at the back of the neck), and may have cold-like symptoms 1-5 days before the rash. The flat, pink rash of rubella usually begins on the face and then spreads over the entire body within 24 hours. The rash lasts about 3 days and is sometimes itchy. Some adults, especially women, will also have swollen and painful joints for as long as one month.

Rubella is often a mild disease, and 20-50% of cases may not have a rash. Complications of rubella are rare but can include encephalitis (swelling of the brain) and thrombocytopenia (a decrease in platelets, which are cells in the blood which help clot formation). Rubella that occurs during pregnancy, especially in the first trimester, can cause miscarriage or lead to very severe problems in the unborn child called congenital rubella syndrome (CRS).

Rubella vaccine was first licensed in the USA in 1969, and the vaccine we use today was licensed in 1979 and is a live, attenuated (weakened) vaccine. While rubella vaccine can be given by itself, in the USA it is usually given together with measles and mumps vaccine in an immunization called MMR. Two doses of rubella vaccine, as combined MMR vaccine, separated by at least 4 weeks, are routinely recommended for all children in the USA. The first dose is given at or after 12 months of age and the second dose upon entering kindergarten at 4-6 years of age.

Adults working in shelters should show evidence of immunity to rubella by having one of the following:

- documentation of at least one dose of rubella vaccine given at or after 12 months of age; or
- a blood test result showing immunity to the rubella virus; or
- documentation of birth in the USA before 1957; however, birth before 1957 is not accepted evidence of rubella immunity for women who might become pregnant.

Polio

Following widespread use of the polio virus vaccine in the mid-1950's, the number of polio cases declined rapidly in many industrialized countries. In the USA the annual number of reported cases of paralytic polio decreased from more than 20,000 in 1952 to less than 100 in the mid-1960's. The last case of paralytic polio caused by a person being exposed in the USA to the wild polio virus was in 1979. However, from 1980 through 1999, an average of 8 cases of paralytic polio were reported annually in the USA. Six of these cases were acquired outside this country, but the vast majority (95%) were vaccine associated paralytic polio (VAPP) caused by the live oral polio vaccine (OPV). After being vaccinated with OPV, people can excrete virus for 2 weeks in the throat and for as long as 2 months in the feces. In order to eliminate VAPP from the USA, the recommended vaccine for polio since 2000 has been the inactivated polio vaccine (IPV).

The polio virus lives in the throat and intestinal tract of an infected person. This virus is spread by direct contact with the feces of an infected person (changing a diaper) or by indirect contact (eating foods/drinks prepared by an infected person who did not wash their hands well after using the toilet or after coughing). The infected person is contagious 7-10 days before the symptoms start until about 6 weeks afterwards. Infected persons without symptoms (asymptomatic group) shed the virus in their stool and are able to spread the virus to others. Once exposed, a person develops symptoms in 3-35 days, usually in 1-3 weeks.

Polio (poliomyelitis) is a very contagious disease caused by three types of enteroviruses. Polio infection may present in one of the following four forms:

- *asymptomatic infection*: up to 95% of all polio infections are asymptomatic. Estimates state that for every one case of paralytic illness there are 200 asymptomatic cases;
- *minor nonspecific illness*: about 4-8% of polio infections fall into this group. The person may have an upper respiratory infection (sore throat and fever), gastrointestinal symptoms (nausea, vomiting, abdominal pain, constipation, or diarrhea), or flu-like illness. The person recovers completely in less than 1 week;
- *aseptic meningitis*: in about 1-2% of polio infections, the person presents with symptoms of stiffness of the neck, back, and/or legs. Usually these patients report a history of symptoms similar to those listed in the minor nonspecific illness group and lasting several days before the stiffness appears. The stiffness may last 2-10 days, and the person completely recovers;
- *paralytic disease*: in less than 1% of all polio infections, the person becomes paralyzed. The paralysis usually follows a minor nonspecific illness of 1-10 days. Most often the paralysis affects the leg muscles but can affect other muscles, including those that control breathing. Some people with paralytic polio recover completely, some recover but have a permanent muscle weakness or paralysis, and some die.

There are 2 kinds of polio vaccine: inactivated polio vaccine (IPV) and live, oral polio vaccine (OPV). IPV, the first polio vaccine, was licensed in 1955 and was used extensively from that time until the early 1960's. OPV was then licensed and became the vaccine of choice in the USA and most other countries. Both IPV and OPV protect against polio. OPV is better at controlling polio disease in outbreaks; however, OPV can actually cause vaccine associated paralytic polio (VAPP) in a small number of those who receive this vaccine. Because the risk of getting polio in the USA is now extremely low, using OPV is no longer worth the risk and only IPV is now used in this country. In other parts of the world where outbreaks of polio still occur, OPV continues to be widely used. Aggressive efforts are being made to eradicate the poliovirus worldwide by 2005.

In the USA children usually receive 3 doses of IPV by 2 years of age and a fourth dose upon school entry. A fourth dose is not needed if the third dose was given on or after the child's fourth birthday. Routine vaccination of adults who live in the USA is not recommended unless they travel to countries where polio still occurs or work in selected laboratories.

Tetanus

Before tetanus toxoid vaccine became part of the routine childhood immunization schedule in the late 1940's, 500-600 tetanus cases were reported yearly in the USA. Since the mid-1970's, an average of 50-100 cases have been reported each year. A low of 27 cases were reported in 2001. Tetanus in newborns is very rare in the USA but common in some developing countries.

People with tetanus are not contagious. People get tetanus from the environment and not from other people. The bacteria enter the body through a major or minor wound or cut. Tetanus may follow severe burns, splinters, ear or dental infections, animal bites, abortion, surgery, deep puncture or crush wounds, frostbite, and self-performed body piercing and tattooing. Injection drug users are at particular risk for tetanus, especially those who inject drugs subcutaneously ("skin pop"). The elderly are also more susceptible because of declining immunity or because they never received a primary series of tetanus immunizations as children and/or boosters every 10 years as adults. Once the tetanus bacteria enter the body, symptoms of tetanus develop in 3-21 days.

Tetanus, also known as "lockjaw", is caused by a bacteria usually found in soil, dust, animal feces, and manure. Illness from tetanus happens when the bacteria enter the body through a wound or cut in the skin. Once inside the skin, the bacteria release a toxin that leads to a persistent contraction of muscles in one area or, more commonly, muscle contractions with a descending distribution pattern. With this descending pattern, the first contractions or spasms are with the jaw muscles, followed by stiffness of the neck, difficulty swallowing, and rigidity of the abdominal muscles. The spasms may occur frequently and last for several minutes. Spasms may continue for 3-4 weeks, while complete recovery may take months. Complications of tetanus include fractures of the spine or long bones, and death results in 11% of reported cases.

Tetanus vaccine is made from the toxins produced by the bacteria and is inactivated so it cannot cause disease. This vaccine protects people by creating immunity to the toxins produced by the tetanus bacteria. As with diphtheria vaccine, this is called a "toxoid" because it acts on the toxins rather than the bacteria. Tetanus toxoid is available as a single antigen preparation, combined with diphtheria as pediatric DT or adult Td, and with both diphtheria toxoid and acellular pertussis vaccine as DTaP. Pediatric formulations (DT and DTaP) contain a similar amount of tetanus toxoid to adult Td.

Primary tetanus immunization, usually combined with diphtheria toxoid and acellular pertussis vaccine (DTaP), is recommended for all children at least 6 weeks of age and less than 7 years of age. Four doses of DTaP are usually given by 24 months of age (2, 4, 6, and 15-18 months of age), with a fifth dose of DTaP at 4-6 years of age. If the fourth dose of DTaP is not given until on or after the fourth birthday, a fifth dose is not needed at 4-6 years of age. To assure continued immunity, booster injections of tetanus toxoid given with diphtheria toxoid as Td are recommended every 10 years following the primary series. The first booster dose may be given at 11-12 years of age if at least 5 years have elapsed since the last dose of DTaP, DTP, DT, or Td. Health care providers should always evaluate a person who had the disease tetanus for immunization against tetanus. Diseases caused by exotoxins do not always render a person immune.

Adults working in shelters should show evidence of immunity to tetanus. To prove immunity, they should have documentation of one of the following:

- a primary series with Td within the past 10 years; or
- a primary series in childhood and a booster within the preceding 10 years.

Those without proof of immunity are candidates for immunization with the appropriate tetanus vaccine preparation (usually Td).

All wounds should be thoroughly cleaned as soon as possible to prevent multiplication of the tetanus bacteria. The decision to give tetanus toxoid is dependent upon the person's vaccine history and the condition of the wound.

For clean, minor wounds:

- people with a history of receiving 3 or more immunizations, with the last dose given within the preceding 5 years, do not require a booster dose;
- those who received 3 or more immunizations, with the last dose more than 10 years ago, should be given a booster dose (Td); and
- persons with uncertain histories require a dose of tetanus toxoid (DTaP/DT if the person is less than 7 years; Td if the person is 7 years or older). Arrangements should be made for completion of the primary series of immunization.

For wounds that are neither clean nor minor:

- those with a history of 3 or more doses of tetanus toxoid need a booster dose only if the last dose was more than 5 years ago;
- those with an uncertain immunization history or those who have received less than 3 doses of tetanus toxoid require a booster dose of tetanus toxoid and tetanus immune globulin (TIG). TIG gives immediate, temporary immunity to tetanus.

Arrangements should be made as appropriate for completion of the primary series.

Special Considerations for Homeless Populations

As soon as a shelter learns of a guest or staff member having a communicable disease, the shelter should immediately contact the local health department. The local health department will work with shelter staff to institute appropriate control measures in order to minimize spread of the infection.

When a shelter guest or staff member contracts a vaccine preventable disease, a determination must be made as to who may have been exposed. The next step is then to identify those susceptible to the disease from among those who may have been exposed. A person is susceptible if they have no immunity to the disease. A person becomes immune by receiving the appropriate immunizations or, for some of the diseases, by having had the disease in the past.

A cornerstone of prevention of communicable diseases in shelters is the establishment of the immunization status of each staff member and, when possible, each guest. An immunization history should be taken at the time of hiring for each shelter employee, and any uncertainties may be resolved with past medical records or an appointment with a primary care provider. The vaccine history for shelter guests is often unknown or unclear. In family shelters, upon admittance, the available immunization histories and the children's primary health care providers should be documented. Participating in a state or local immunization registry can be another method for obtaining immunization histories. Even though obtaining immunization histories for staff and guests is a difficult task, when these diseases occur, it will be invaluable.

Immunization Schedules

The schedules in the beginning of this chapter are based on the 2003 recommendations of the Advisory Council on Immunization Practices (ACIP), the American Academy of Pediatrics, and the American Academy of Family Physicians (AAFP). ■

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