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Update on Adult Immunization

Recommendations of the Immunization Practices Advisory Committee (ACIP)*

This statement on adult immunization is a supplement to the "General Recommendations on Immunization" of the Immunization Practices Advisory Committee (ACIP)[1] and updates the previous supplement published in September 1984. This statement presents an overview on immunization for adults and makes specific immunization recommendations. It also gives immunization recommendations for adults in specific age groups and for those who have special immunization requirements because of occupation, life-style, travel, environmental situations, and health status.

General Considerations

Immunization policies have primarily been directed towards vaccinating infants, children, and adolescents. Although vaccination is routine in pediatric practice, it is not commonplace in the practice of physicians who treat adults.

The widespread implementation of childhood vaccination programs has substantially reduced the occurrence of many vaccine-preventable diseases. However, successful childhood vaccination alone will not eliminate specific disease problems. A substantial proportion of the remaining morbidity and mortality from vaccine preventable diseases presently occurs among older adolescents and adults. Persons who escaped natural infection or were not vaccinated with toxoids or vaccines against diphtheria, tetanus, measles, mumps, rubella, and poliomyelitis may be at risk of these diseases and their complications.

To reduce further the unnecessary occurrence of these vaccine-preventable diseases, health-care providers for older adolescents and adults should provide vaccinations as a routine part of their practice. In addition, the epidemiology of other vaccine-preventable diseases (e.g., hepatitis B, rabies, influenza, and pneumococcal disease) indicates that persons in certain age, occupational, environmental, and lifestyle groups and those with special health problems are at increased risk of these illnesses and should be vaccinated. Travelers to some countries may also be at increased risk of exposure to vaccine-preventable illnesses. Finally, foreign students, immigrants, and refugees may be susceptible to these diseases.

Attention to factors such as military service and age may help to determine whether vaccines or toxoids are advisable for an individual. Persons who have served in the military can be considered to have been vaccinated against measles, rubella, tetanus, diphtheria, and polio. However, the practitioner should be aware that policies of the different branches of the military have varied over time and among the branches.

General vaccination considerations and recommendations are found in the ACIP statement "General Recommendations on Immunization."[1] The following recommendations apply to persons in the indicated groups. For more detailed information on immunobiologics—including indications, side effects, adverse reactions, precautions, contraindications, dosages, and routes of administration, providers

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should refer to ACIP recommendations for those immunobiologics.

Reference can also be made to the *Guide for Adult Immunization*,[2] published by the American College of Physicians, and to the recommendations of the U.S. Preventive Services Task Force.[3]

Age Groups

The following text summarizes the vaccines and toxoids recommended for most adults, by specific age groups.

Adults 18-24 Years Old. All young adults should complete a primary series of diphtheria and tetanus toxoids if they have not done so during childhood. A primary series for adults is three doses of preparations containing diphtheria and tetanus toxoids; the first two doses should be given at least 4 weeks apart and the third dose, 6-12 months after the second. Those who have completed a primary series should receive a booster dose every 10 years. Doses need not be repeated when the series schedule is delayed. The combined tetanus and diphtheria toxoids, adsorbed (for adult use) (Td), should be used. Persons with unknown or uncertain histories of receiving diphtheria or tetanus toxoids should be considered unvaccinated and should receive a full three-dose primary series of Td.

Young adults should be immune to measles, rubella, and mumps. In 1989, as a result of outbreaks of measles in school and college settings, new recommendations were made to implement a routine two-dose schedule for measles-mumps-rubella vaccine, live (MMR). The schedule will usually be implemented gradually, one age group at a time, beginning with entry into kindergarten or first grade. Some areas of the country may implement the second dose of MMR at an older age (e.g., entry into middle school or junior high school). Young adults who are attending college (or other post-high school educational institutions) or who are newly employed in situations that place them at high risk of measles transmission (e.g., health-care facilities) should have documentation of having received two doses of live MMR on or after their first birthday or other evidence of immunity. Persons born after 1956 who are traveling to areas endemic with measles should be given two doses of live MMR. All other young adults in this age group should have documentation of a single dose of live MMR on or after their first birthday, documentation of physician-diagnosed disease, or laboratory evidence of immunity. Eventually, all persons in this age group will require two doses of measles vaccine. However, until the new recommendations are fully implemented, a single dose on or after the first birthday will be sufficient evidence of immunity for most persons.

During outbreaks of measles, all persons at risk should have evidence of immunity to measles. Acceptable evidence of measles immunity consists of documentation of two doses of a live measles vaccine (preferably MMR), given at least 1 month apart after the first birthday; documentation of physician-diagnosed measles; or laboratory evidence of immunity to measles. During outbreaks of mumps and rubella, all persons at risk should have evidence of immunity to mumps and rubella. Acceptable evidence of mumps/rubella immunity consists of documentation of at least one dose of live mumps- and/or rubella-containing vaccine (preferably MMR), laboratory evidence of immunity, or physician-diagnosed mumps. Physician diagnosis is not adequate evidence of immunity against rubella.

Persons vaccinated with killed-measles-virus vaccine (available in the United States from 1963 until 1967) or with a measles vaccine of unknown type should receive two doses of live-measles-virus vaccine at least 1 month apart to prevent measles disease or atypical measles syndrome, if exposed to wild measles virus. Persons are considered immune to rubella only if they have a record of vaccination with rubella vaccine on or after their first birthday or laboratory evidence of immunity. MMR is the vaccine of choice if recipients are likely to be susceptible to more than one of the three diseases. Persons lacking adequate documentation should be vaccinated.

Adults 25-64 Years Old. All adults 25-64 years of age should have completed a primary series of diphtheria and tetanus toxoids. If needed, a primary series for adults is three doses of preparations containing diphtheria and tetanus toxoids, the first two doses given at least 4 weeks apart and the third dose given 6-12 months after the second. Those who have completed a primary series should receive a booster dose every 10 years. To enhance protection against both diseases, Td should be used. Persons with unknown or uncertain histories of receiving diphtheria or tetanus toxoids should be considered unvaccinated and should receive a full three-dose primary series of Td.

All adults born in 1957 or later who do not have a medical contraindication should receive one dose of measles vaccine unless they have a dated record of vaccination with at least one dose of live measles vaccine on or after their first birthday, documentation of physician-diagnosed disease, or laboratory evidence of immunity. Serologic studies of hospital workers indicate that up to 9.3% of persons born before 1957 were not immune to measles.[4,5] In addition, of all measles cases reported to the CDC from 1985 through 1990, 3.7% occurred among persons born before 1957. These data suggest that most persons born before 1957 can be considered immune to measles and do not need to be vaccinated. However, 97 (29%) of 341 health-care workers who had measles in the period 1985-1989 were born before 1957.[6] Therefore, because health-care workers are at particularly high risk of measles and a small proportion born before 1957 will be susceptible, vaccine should be offered to such persons if there is reason to believe that they may be susceptible.

Some adults, such as college students, persons working in health-care facilities, and international travelers, are at increased risk of measles. Such persons should have evidence of two doses of live measles vaccine or other evidence of measles immunity, if born in 1957 or later.

Although most adults are likely to have been infected naturally with mumps, mumps vaccine should be given to adults who are considered susceptible. Persons born in 1957 or later can be considered immune if they have evidence of one dose of live mumps vaccine or other evidence of mumps immunity.

Unless proof of vaccination with rubella vaccine or laboratory evidence of immunity is available, rubella vaccine is recommended for adults, especially women of childbearing age. The vaccine of choice is MMR if recipients are likely to be susceptible to more than one of these three diseases.

Adults ≥65 Years Old. All older adults should have completed a primary series of diphtheria and tetanus toxoids. If needed, a primary series for adults is three doses of preparations containing diphtheria and tetanus toxoids; the first two doses should be given at least 4 weeks apart and the third dose 6-12 months after the second. Those who have completed a primary series should receive a booster dose every 10 years. Td should be used to provide protection against both diseases. Persons with unknown or uncertain histories of receiving diphtheria or tetanus toxoids should be considered unvaccinated and should receive a full three-dose primary series of Td.

All older adults should receive influenza vaccine annually. They should also receive a single dose of pneumococcal polysaccharide vaccine. Revaccination should be strongly considered ≥6 years after the first dose for those at highest risk of a) fatal pneumococcal disease (such as asplenic patients) or b) rapid decline in antibody levels (e.g., transplant recipients

or those with chronic renal failure or nephrotic syndrome).

Special Occupations

Persons in specific occupations may be at increased risk of exposure to certain vaccine-preventable illnesses. Such persons may need selected vaccines and toxoids in addition to those routinely recommended for their age group.

Health- and Public-Safety-Related Occupations. Because of their contact with patients or infectious material from patients, many health-care workers (e.g., physicians, nurses, dental professionals, medical and nursing students, laboratory technicians, and administrative staff) and public-safety workers (e.g., police, emergency medical personnel, firefighters) are at risk for exposure to and possible transmission of vaccine-preventable diseases. Optimal use of immunizing agents will not only safeguard the health of workers but also will protect patients from becoming infected. A consistent program of vaccinations could eliminate the problem of having susceptible health-care workers in hospitals and health departments (with the attendant risks to other workers and patients). The CDC publication *Immunization Recommendations for Health-Care Workers* and the section below discuss this subject in detail.[7]

Hepatitis B virus (HBV) infection is a major occupational hazard for health-care and public-safety workers. The risk of acquiring HBV infection from occupational exposures depends on the frequency of percutaneous and permucosal exposures to blood or blood products. Any health-care or public-safety worker may be at risk for HBV exposure, depending on the tasks that he or she performs. If those tasks involve contact with blood or blood-contaminated body fluids, workers should be vaccinated. Vaccination should be considered for other workers, depending on their exposure to blood and/or bodily fluids. Selected staff of institutions for the developmentally disabled may be at increased risk of HBV infection because of exposure to human bites and contact with skin lesions, saliva, and other potentially infected secretions in addition to blood. The Occupational Safety and Health Administration, Department of Labor, has developed regulations that requires employers who have employees at risk of occupational exposure to hepatitis B to offer these employees hepatitis B (HB) vaccine at the employer's expense.

Among health-care personnel with frequent exposure to blood, the prevalence of serologic evidence of HBV infection ranges between approximately 15% and 30%. In contrast, the prevalence in the general population averages 5%. The cost-effectiveness of serologic screening to detect susceptible individuals among health-care personnel depends on the prevalence of infection and the costs of testing and of the HB vaccine. Each institution must decide whether serologic screening is cost effective. Vaccination of persons who already have antibodies to HBV has not been shown to cause adverse effects. HB vaccine provides protection against HBV for ≥7 years after vaccination; booster doses are not recommended during this interval. The need for later booster doses will be assessed as additional information becomes available.

Influenza vaccination is recommended yearly for physicians, nurses, and other personnel in hospital, chronic-care, and outpatient-care settings who have contact with high-risk patients in all age groups. Those who provide essential community services (e.g., public-safety workers) may consider receiving the vaccine also. Vaccination should reduce the possibility of transmitting influenza from health-care workers to patients and reduce health-care workers' risk of illness and absenteeism due to influenza.

Transmission of rubella in health facilities (e.g., hospitals, physicians' or dentists' offices, and clinics) can disrupt hospital or office routines and cause considerable expense. Although no cases of congenital rubella syndrome (CRS) have been reported in association with rubella transmission in health facilities, therapeutic abortions have been sought by pregnant staff members after rubella infection.[8] To prevent such situations, all medical, dental, laboratory, and other support health personnel, both male and female, who might be at risk of exposure to patients infected with rubella or who might have contact with pregnant patients should be vaccinated. Rubella vaccine is recommended for all such personnel unless they have either proof of vaccination with rubella vaccine on or after their first birthday or laboratory evidence of immunity. The vaccine of choice is MMR if recipients are likely to be susceptible to measles and/or mumps as well as to rubella.

Measles and mumps transmission in health facilities can also be disruptive and costly. To prevent such situations, all new employees in health-care facilities who were born in 1957 or later who may have direct patient contact should be vaccinated. Such persons can be considered immune only if they have documentation of having received two doses of live measles vaccine and at least one dose of live mumps vaccine on or after their first birthday, a record of physician-diagnosed measles or mumps, or laboratory evidence of immunity. Institutions may wish to extend this requirement to all employees, not only beginning ones. If recipients are likely to be susceptible to rubella as well as to measles and mumps, MMR is the vaccine of choice. Adults born before 1957 can be considered immune to both measles and mumps because these infections were virtually universal before the availability of measles and mumps vaccines. However, because serologic studies of hospital workers indicate that up to 9.3% of those born before 1957 were not immune to measles[4,5] and because 97 (29%) of 341 health-care workers who had measles in the period 1985-1989 in medical facilities were born before 1957,[6] health facilities should consider requiring at least one dose of measles vaccine for older employees who are at risk of occupational exposure to measles and do not have proof of immunity to this disease.

Poliovirus vaccine is not routinely recommended for persons older than high school age (≥18 years old). However, hospital personnel who have close contact with patients who may be excreting wild polioviruses and laboratory personnel who handle specimens that may contain wild polioviruses should have completed a primary series of poliovirus vaccine. For personnel who do not have proof of having completed a primary series, completion with enhanced potency inactivated poliovirus vaccine (eIPV) is recommended. This vaccine is preferred because adults have a slightly increased risk of vaccine-associated paralysis after receiving OPV. In addition, because vaccine polioviruses may be excreted by OPV recipients for ≥30 days, the use of OPV increases the risk of acquiring vaccine-associated paralytic poliomyelitis among susceptible immunocompromised OPV recipients and/or their close contacts.

Smallpox (vaccinia) vaccination is indicated only for laboratory workers involved with orthopox viruses and certain health-care workers involved in clinical trials of vaccinia recombinant vaccines. When in-

dicated, smallpox (vaccinia) vaccination should be given at least every 10 years.

Plague vaccine is indicated for laboratory personnel working with *Yersinia pestis* possibly resistant to antimicrobial agents and for persons performing aerosol experiments with *Y. pestis*.

Anthrax vaccine is indicated for laboratory personnel working with *Bacillus anthracis*.

Preexposure rabies vaccination is indicated for laboratory workers directly involved with testing or isolating rabies virus.

Veterinarians and Animal Handlers. Veterinarians and animal handlers are at risk of rabies exposure because of occupational contact with domestic and wild animals. They should receive preexposure prophylaxis with human diploid cell rabies vaccine (HDCV). Preexposure vaccination against rabies does not eliminate the need for additional therapy after exposure to rabies. Preexposure vaccination does, however, simplify postexposure therapy by eliminating the need for human rabies immune globulin (HRIG) and by decreasing the number of postexposure doses of vaccine needed. Persons at continued risk of frequent exposure should receive a booster dose of HDCV every 2 years or have their serum tested for rabies antibody every 2 years; if the titer is inadequate (<5 by the rapid fluorescent-focus inhibition test), they should receive a booster dose.

Plague vaccine should be considered in the western United States for veterinarians and their assistants who may be exposed to bubonic or pneumonic infection in animals, particularly domestic cats.

Selected Field Personnel. Plague vaccine is indicated for field personnel who cannot avoid regular exposure to potentially plague-infected wild rodents and rabbits and their fleas.

Preexposure rabies vaccine prophylaxis should be considered for field personnel who are likely to have contact with potentially rabid dogs, cats, skunks, raccoons, bats, or other wildlife species.

Selected Occupations. Anthrax vaccine is indicated for individuals who come in contact in the workplace with imported animal hides, furs, bonemeal, wool, animal hair (especially goat hair), and bristles.

Sewage workers, as all other adults, should be adequately vaccinated against diphtheria and tetanus. Sewage workers are not at increased risk of polio, typhoid fever, or hepatitis A; poliovirus and typhoid vaccines and immune globulin (IG) are not routinely recommended for them.

Life-Styles

Various life-styles may increase the risk of exposure to certain vaccine-preventable illnesses. Persons with these life-styles may require vaccines in addition to those routinely recommended for their age group.

Homosexually Active Males. Homosexually active males are at high risk of HBV as well as human immunodeficiency virus (HIV) infection. Between 35% and 80% have serologic evidence of HBV infection. Susceptible homosexual males should be vaccinated with HB vaccine as early as possible after they begin homosexual activity because 10%-20% can be expected to acquire HBV infection each year. Because of the high prevalence of infection, serologic screening of homosexual males before vaccination may be cost effective regardless of age or length of homosexual activity. Homosexual men known to have HIV infection should be tested for antibody to hepatitis B surface antigen (HBsAg) 1-6 months after completing the vaccine series (HB vaccine is less effective among HIV-infected persons than among similar persons without HIV infection). Revaccination with one or more doses should be considered if the level of antibody to HBsAg (anti-HBs) is <10 milli-international units [mIU] per milliliter (mL).

Heterosexually Active Persons. Heterosexually active persons with multiple sex partners are at increased risk of HBV infection. Vaccination is recommended for persons who are diagnosed to have other sexually transmitted diseases, for male or female prostitutes, and for persons who have had sexual activity with multiple partners during the previous 6 months.

Injecting Drug Users. Injecting drug users are at high risk of HBV as well as HIV infection. Serologic evidence of HBV infection has been found in 60%-80% of these individuals. Efforts should be made to vaccinate susceptible users with HB vaccine as early as possible after their drug use begins, because 10%-20% can be expected to acquire HBV infection each year. Because of the high prevalence of infection, serologic screening of injecting drug users before vaccination to avoid unnecessary vaccination is cost effective. Injecting drug users with known HIV infection should be tested for antibody to HBsAg 1-6

months after completion of the vaccine series; revaccination with one or more doses should be considered if their anti-HBs level is <10 mIU/mL.

Drug users are also at increased risk of tetanus; their tetanus vaccination status should therefore be kept up to date with Td.

Environmental Situations

Certain environments may place an individual at increased risk of vaccine preventable diseases.

Inmates of Long-Term Correctional Facilities. Serologic evidence of HBV infection has been found among 10%-80% of male prisoners. Although the frequency of transmission during imprisonment has not been clearly documented, the environment of long-term correctional facilities may be associated with a high risk of transmission of HBV infection because of the likelihood of homosexual behavior and of injecting drug use. In selected long-term institutional settings, prison officials may elect to undertake serologic HBV screening and vaccination programs.

Measles and rubella outbreaks have been documented in long-term correctional facilities. All inmates of such facilities should be vaccinated against measles and rubella. If recipients are likely to be susceptible to mumps as well as to measles and rubella, MMR is the vaccine of choice.

All inmates of such facilities ≥65 years of age and those with high-risk conditions, including HIV infection, should receive yearly influenza vaccination. Pneumococcal vaccination within the past 6 years should also be documented.

Residents of Institutions for the Developmentally Disabled. Institutions for the developmentally disabled provide a setting conducive to the transmission of HBV infection through human bites and contact with residents' blood, skin lesions, saliva, and other potentially infectious secretions. Serologic evidence of HBV infection has been found among 35%-80% of residents of such institutions. Persons newly admitted to these institutions should be vaccinated as soon as possible. For current residents, screening and vaccination of susceptible residents is recommended. Because of the high prevalence of infection, serologic screening before vaccina-

tion of those already institutionalized may be cost effective; however, screening of new admissions very likely will not be. Residents of group homes, foster homes, and similar settings who have household contact with an HBV carrier should also be vaccinated.

Many of the residents of these institutions have chronic medical conditions that put them at risk for complications from influenza illness; therefore, all residents should receive influenza vaccine yearly.

Household Contacts of HBV Carriers. Household contacts of HBV carriers are at high risk of infection. When HBV carriers are identified through routine screening of donated blood, prenatal screening, or other screening programs, the carriers should be notified of their status. All household contacts should be tested and susceptible contacts vaccinated.

Homeless Persons. There are limited data on vaccine-preventable diseases among the homeless. However, such persons will need completed vaccinations for tetanus, diphtheria, measles, mumps, rubella, influenza, and pneumococcal disease. Also, some will be at risk for HBV infection and some will require tuberculin skin testing. The vaccination status of homeless persons should be assessed whenever they are seen in any medical setting.

Travel

The risk of acquiring illness during international travel depends on the areas to be visited and the extent to which the traveler is likely to be exposed to diseases. When considering travel, people often seek advice regarding vaccination from health-care personnel. This provides a good opportunity to review the person's vaccination status and to administer primary series or booster doses, if needed.

In most countries, measles, mumps, and rubella remain uncontrolled. Therefore, the risk of acquiring these diseases while traveling outside the United States is greater than the risk incurred within the United States. Approximately 61% of imported measles cases reported for 1985-1989 occurred among citizens returning to the United States (CDC, unpublished data). To minimize diseases imported by U.S. citizens, all persons traveling abroad should be immune to measles. Consideration should be given to providing a dose of measles vaccine to persons born in or after 1957 who travel abroad, who have not previously received two doses of measles vaccine, and who do not have other evidence of measles immunity (e.g., physician diagnosed measles or laboratory evidence of measles immunity). If recipients are likely to be susceptible to mumps or rubella in addition to measles, MMR is the vaccine of choice. Travelers, particularly women of childbearing ages, should be immune to rubella before leaving the United States.

In developed countries such as Japan, Canada, Australia, New Zealand, and European countries, the risk of acquiring other vaccine-preventable diseases such as poliomyelitis, diphtheria, and tetanus is usually no greater than the risk incurred while traveling in the United States. In contrast, travelers to developing countries are at increased risk of exposure to many infections, including wild polioviruses and diphtheria. Accordingly, such travelers should be immune to poliomyelitis and diphtheria in particular.

For protection against poliomyelitis, unvaccinated adults should receive at least two doses of elPV 1 month apart, preferably a complete primary series, before traveling to a developing country or any country with endemic polio; elPV is preferred because the risk of vaccine-associated paralysis is slightly higher for adults than for children. If travel plans do not permit this interval, a single dose of either OPV or elPV is recommended. For adults previously incompletely vaccinated with OPV or inactivated poliovirus vaccine (IPV), the remaining doses of either vaccine required for completion of the primary series should be given, regardless of the interval since the last dose or the type of vaccine previously received. Travelers to developing countries who have previously completed a primary series of OPV should receive a single supplementary dose of OPV. Those who have previously received a primary series of IPV should receive a single supplementary dose of either OPV or elPV. The need for further doses of either vaccine has not been established.

Persons whose age or health status places them at increased risk of complications from influenza illness and who are planning travel to the tropics at any time of year or the southern hemisphere during April through September should review their influenza vaccination history. If not vaccinated during the previous fall or winter, such persons should consider influenza vaccination before travel. Persons in the high-risk categories should be especially encouraged to receive the most currently available vaccine. Persons at high risk given the previous season's vaccine in preparation for travel should be revaccinated in the fall or winter with the current vaccine and therefore may receive two doses of influenza vaccine within 1 year.

Selective vaccination of travelers with vaccines against yellow fever, cholera, typhoid, plague, meningococcal disease, rabies, or HBV infection, or administration of IG to prevent hepatitis A, is recommended on the basis of known or perceived disease-specific risks in the country or countries to be visited and the type and duration of travel within a country. For cholera and yellow fever, vaccination requirements may have been established by the country to be visited. Countries currently reporting yellow fever, cholera, and plague are identified biweekly in the *Summary of Health Information for International Travel.*† Information on known or possibly infected areas is published annually in *Health Information for International Travel,*† which also lists specific requirements for cholera and yellow fever vaccinations for each country. All state health departments and many county and city health departments receive both publications. They may also be obtained by calling CDC Information Services at (404)639-1819. For entry into countries requiring yellow fever or cholera vaccination, travelers must have an International Certificate of Vaccination validated by an appropriate authority. State or local health departments can provide the addresses of persons or centers able to validate certificates.

Foreign Students, Immigrants, and Refugees

In many countries, children and adolescents are not routinely vaccinated against diphtheria, tetanus, measles, mumps, rubella, and poliomyelitis. As a result, persons entering the United States as college or postgraduate students, immigrants, or refugees may be susceptible to one or more of these diseases.

Refugees from areas of high HBV endemicity (e.g., Southeast Asia) should be screened for HBsAg and anti-HBs. Susceptible household and sexual contacts of HBsAg carriers should receive HB vaccine.

Unless foreign students, immigrants, and refugees can provide a vaccination record documenting the receipt of recommended vaccines or toxoids at appropriate ages and intervals or laboratory evidence of immunity, they should receive the ap-

propriate vaccines for their age, as noted in the "Age Groups" section.

Special Health Status

Some vaccines may be contraindicated for persons with certain health problems; other vaccines may be indicated because of an underlying health condition.

Pregnancy. When any vaccine or toxoid is to be given during pregnancy, delaying until the second or third trimester, when possible, is a reasonable precaution to minimize concern about possible teratogenicity.

Pregnant women not vaccinated previously against tetanus and diphtheria should receive two doses of Td, properly spaced. Those who have previously received one or two doses of tetanus or diphtheria toxoid should complete their primary series during pregnancy. A primary series is three doses of preparations containing diphtheria and tetanus toxoids, with the first two doses given at least 4 weeks apart and the third dose given 6-12 months after the second. Pregnant women who have completed a primary series should receive a booster dose of Td if ≥10 years have elapsed since their last dose.

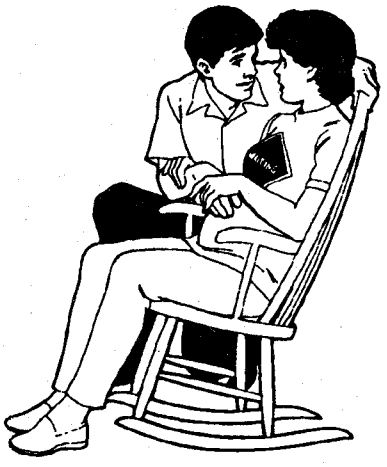
Because of a theoretical risk to the developing fetus, live-virus vaccines usually should not be given to pregnant women or to those likely to become pregnant within 3 months. If, however, immediate protection against poliomyelitis or yellow fever is needed because of imminent exposure, OPV or yellow fever vaccine may be given. If the only reason to vaccinate a pregnant woman with yellow fever vaccine is an international travel requirement, efforts should be made to obtain a waiver letter. The ACIP strongly recommends that rubella vaccine be administered in the postpartum period to women not known to be immune, preferably before discharge from the hospital.

Data are not available on the safety of HB vaccines for the developing fetus. Because the vaccines contain only noninfectious HBsAg particles, the fetus should not be at risk. In contrast, HBV infection in a pregnant woman may result in severe disease for the mother and chronic infection of the newborn. Therefore, pregnancy or lactation should not be considered a contraindication to the use of this vaccine for persons who are otherwise eligible. Prenatal screening of all pregnant women for HBsAg is recommended. Such screening identifies those who are HBsAg positive and allows treatment of their newborns with hepatitis B immune globulin (HBIG) and HB vaccine, a regimen that is 85%-95% effective in preventing the development of chronic carriage of the HBV.

Pregnant women who have other medical conditions that increase their risks for complications from influenza should be vaccinated; the vaccine is considered safe for pregnant women. Administering the vaccine after the first trimester is a reasonable precaution to minimize any concern over the theoretical risk of teratogenicity. However, it is undesirable to delay vaccinating pregnant women who have high-risk conditions and who will still be in the first trimester of pregnancy when the influenza season begins.

The safety of pneumococcal vaccine for pregnant women has not been evaluated. Ideally, women at high risk of pneumococcal disease should be vaccinated before pregnancy.

Conditions that Compromise the Immune System. Persons receiving immunosuppressive therapies or with conditions



that compromise their immune responses (e.g., leukemia, lymphoma, generalized malignancy, and HIV infection) should receive annual influenza vaccinations with the currently formulated vaccine. Persons with these conditions have been associated with increased risk of pneumococcal disease or its complications and should receive a single dose of pneumococcal polysaccharide vaccine; revaccination should be considered 6 years after the first dose. *Haemophilus influenzae* type b (Hib) conjugate vaccine (HbCV) is of unproven benefit in immunocompromised persons but may be considered for those with anatomic or functional asplenia or HIV infection. The effectiveness of these vaccines among such persons may be limited, but the risk of disease is substantial and adverse reactions are minimal.

Bacille Calmette-Guerin (BCG), oral typhoid vaccine, or live-virus vaccines should not be given to persons who are immunocompromised as a result of immune deficiency diseases, leukemia, lymphoma, or generalized malignancy or who are immunosuppressed as a result of therapy with corticosteroids, alkylating drugs, antimetabolites, or radiation. However, susceptible patients with leukemia in remission who have not had chemotherapy for at least 3 months may receive live-virus vaccines. The exact interval between discontinuing immunosuppressives and regaining the ability to respond to individual vaccines is not known. Estimates of experts vary from 3 months to 1 year.[9] In addition, persons with asymptomatic HIV infection should be vaccinated against measles, mumps, and rubella. Such vaccination should be considered for persons with symptomatic HIV infection because of the danger of serious or fatal measles and the accumulating evidence of the safety of administering MMR to these patients.

Short-term (<2-week) corticosteroid therapy, topical steroid therapy (e.g., nasal or skin), and intra-articular, bursal, or tendon injections with corticosteroids should not be immunosuppressive and do not contraindicate vaccination with live-virus vaccines. Vaccination should be avoided if systemic immunosuppressive levels are achieved by topical application.

Vaccines given to immunocompromised patients cannot be assumed to be as effective as when given to normal individuals. When available, postvaccination antibody titrations can be done, but, in the absence of specific antibody information, appropriate immune globulins should be considered for exposures to vaccine preventable diseases.

Hemodialysis and Transplantation. Persons receiving hemodialysis have been at high risk of infection with HBV, although environmental control measures have reduced this risk during the past decade. Nationwide, an estimated 15% of hemodialysis patients have serologic evidence of HBV infection, and routine serologic screening of hemodialysis patients is currently recommended. Susceptible patients who will soon require or are currently receiving long-term hemodialysis should receive three doses of HB vaccine as soon as possible. Larger doses (two to four times those for healthy adults) and/or increased numbers of doses are recommended for these patients because of lower vaccine immunogenicity. The individual manufacturer's vaccine package inserts should be inspected to learn the proper dosages of each vaccine. Postvaccination screening to demonstrate antibody to HBsAg is recommended in this group. Approximately 60% of hemodialysis patients who receive recommended doses of HB vaccine develop protective antibodies

against HBV. Revaccination with one or more additional doses should be considered for persons who do not respond to vaccination. In hemodialysis patients, protection lasts only as long as anti-HBs levels remain >10 mIU/mL. Such patients should be tested for anti-HBs annually and revaccinated when anti-HBs declines below this level.

Because renal transplant recipients and persons with chronic renal disease are at increased risk of adverse consequences (including transplant rejection) from infections of the lower respiratory tract, these persons should receive annual influenza vaccination with the current formulated vaccine. Because these patients are also at increased risk of developing pneumococcal infection and experiencing more severe pneumococcal disease, they should receive pneumococcal polysaccharide vaccine.

Splenic Dysfunction or Anatomic Asplenia. Persons with splenic dysfunction or anatomic asplenia are at increased risk of contracting fatal pneumococcal bacteremia and should receive pneumococcal polysaccharide vaccine. They are also at risk for meningococcal bacteremia and should receive meningococcal polysaccharide vaccine. The theoretical increased risk for invasive Hib disease suggests that such persons may be considered for HbCV. Persons scheduled for elective splenectomy should receive both pneumococcal and meningococcal polysaccharide vaccines at least 2 weeks before the operation.

Factor VIII and IX Deficiencies. Patients with clotting disorders who receive factor VIII or IX concentrates have an increased risk of HBV infection. Such patients without serologic markers for hepatitis B should be vaccinated against hepatitis B before receiving any blood products. To avoid hemorrhagic complications, vaccination should be given subcutaneously (SC), rather than intramuscularly (IM) as in the nonhemophilic patient. Prevaccination serologic screening for HBV markers is recommended for patients who have already received multiple infusions of these products.

Chronic Alcoholism. Persons with chronic alcoholism may be at increased risk of contracting a pneumococcal infection or having a more severe pneumococcal illness. Such persons, especially those with cirrhosis, should receive pneumococcal polysaccharide vaccine.

High-Risk Diseases. Persons with disease conditions that increase the risk of adverse consequences from lower-respiratory-tract infections should receive annual influenza vaccination with the current formulated vaccine.

Some chronic illnesses (e.g., chronic pulmonary disease, congestive heart failure, diabetes mellitus) predispose individuals to an increased risk of pneumococcal illness or its complications. Such persons should receive pneumococcal polysaccharide vaccine.

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** Adapted from: Centers for Disease Control. Update on adult immunization: recommendations of the Immunization Practices Advisory Committee (ACIP). MMWR 1991;40(No. RR-12):1-15.*

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Rabid Ferret Reported from Loudoun County

A rabid ferret was reported from Loudoun County in August of 1992. The ferret was an unvaccinated pet that developed ascending paralysis and twitching approximately one month after escaping from the house and being attacked by an unknown animal. Although no one was bitten or scratched by the ferret a number of people who had close contact with it are undergoing rabies post-exposure prophylaxis. This is the second reported rabid ferret in Virginia. The first was reported from Fairfax County in 1982 and had a history of having fought with a raccoon. Ferrets are in the same family as skunks and should be considered to have the same high potential for contracting and transmitting rabies as skunks.

Unexplained CD4+ T-Lymphocytopenia in Persons Without Evident HIV Infection

On July 31, 1992 the Centers for Disease Control (CDC) reported clinical and laboratory findings in five persons with persistently low CD4+ T-cell levels but without laboratory evidence of HIV infection.* In some of these patients, infections were diagnosed which are frequently seen in persons with acquired immunodeficiency syndrome (AIDS). These five patients are part of an ongoing investigation being conducted by CDC into the etiology of these illnesses. The CDC report also summarized findings in an additional 21 similar cases described in the medical literature since 1989.

Review of available data on these 26 cases does not indicate an epidemiologic linkage among the cases. Five had received transfusions before onset of illness, five were homosexual men, and the remaining 16 had no known risk factors for HIV infection. The cause of the low CD4+ T-cell counts in these patients is unknown and may not be the same for each patient.

As of August 5, 1992, CDC had received nine additional reports meeting the current case definition.

A case of CD4+ T-lymphocytopenia without evident HIV infection is defined as any illness meeting all of the following criteria: 1) low CD4+ T-cell levels (documented absolute CD4+ T-cell level <300 cells/μL, or <20% on more than one determination); 2) no serologic evidence of HIV infection, and 3) no defined immunodeficiency or therapy associated with depressed CD4+ T-cell levels.

The CDC and the NIH are collaborating with physicians, scientists, and public health officials to identify other cases and conduct epidemiologic and laboratory investigations. Health care providers are requested to report cases that meet the criteria for CD4+ T-lymphocytopenia.

To report cases, please contact Suzanne Keller, Surveillance Coordinator or Theresa Coleman, Assistant Director for Epidemiology and Serosurveillance, Bureau of STD/AIDS, Office of Epidemiology, at (804) 786-6267.

** Centers for Disease Control. Unexplained CD4+ T-Lymphocyte Depletion in Persons Without Evident HIV Infection — United States. MMWR 1992;41:541-545.*

Cases of Selected Notifiable Diseases, Virginia, August 1 through August 31, 1992.

Disease	Total Cases Reported This Month						Total Cases Reported to Date in Virginia		
	State	Regions NW	N	SW	C	E	This Yr	Last Yr	5 Yr Avg
AIDS	29	2	7	7	9	4	424	496	315
Campylobacter	77	21	19	14	16	7	429	388	408
Gonorrhea*	815	-	-	-	-	-	11129	11903	10513
Hepatitis A	14	0	8	4	1	1	75	120	190
Hepatitis B	27	1	6	5	1	14	135	145	207
Hepatitis NANB	1	0	0	0	0	1	26	23	40
Influenza	0	0	0	0	0	0	122	689	1398
Kawasaki Syndrome	4	0	3	0	0	1	16	22	17
Legionellosis	1	0	0	0	0	1	11	10	8
Lyme Disease	20	2	8	1	4	5	80	85	49
Measles	0	0	0	0	0	0	14	29	54
Meningitis, Aseptic	42	2	18	6	4	12	157	235	156
Meningitis, Bacterial~	8	0	1	3	0	4	84	90	109
Meningococcal Infections	8	1	0	1	1	5	47	28	42
Mumps	8	1	2	1	0	4	46	49	82
Pertussis	4	1	1	0	0	2	10	18	24
Rabies in Animals	44	15	12	7	5	5	222	177	201
Reye Syndrome	0	0	0	0	0	0	0	2	1
Rocky Mountain Spotted Fever	7	2	1	1	2	1	12	10	12
Rubella	0	0	0	0	0	0	0	0	3
Salmonellosis	140	20	35	19	32	34	613	856	937
Shigellosis	43	7	25	3	7	1	154	278	228
Syphilis (1° & 2°)*	46	1	3	9	11	22	522	642	426
Tuberculosis	84	10	46	7	11	10	248	226	253

Localities Reporting Animal Rabies: Alexandria 3 raccoons; Appomatox 1 fox; Augusta 2 raccoons, 1 skunk; Brunswick 1 skunk; Caroline 1 raccoon; Culpeper 1 cow, 1 skunk; Fairfax 2 foxes; Franklin 1 raccoon; Hanover 1 cat; King and Queen 2 raccoons; Loudoun 3 raccoons, 1 ferret; Louisa 1 raccoon; Montgomery 1 raccoon; Nelson 1 bat; Orange 1 raccoon; Pittsylvania 1 fox; Prince William 1 raccoon, 2 skunks; Richmond City 1 raccoon; Roanoke 1 cat, 1 skunk; Shenandoah 1 raccoon; Stafford 2 bats, 1 raccoon, 1 skunk; Suffolk 1 raccoon; Surry 1 cat; Sussex 1 bat; Virginia Beach 1 raccoon; Warren 1 raccoon; Wythe 1 fox; York 1 raccoon.

Occupational Illnesses: Asbestosis 10; Carpal Tunnel Syndrome 121; Coal Workers' Pneumoconiosis 30; Loss of Hearing 12, Repetitive Motion Disorder 3.

*Total now includes military cases to make the data consistent with reports of the other diseases.

~Other than meningococcal

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