Immunization: Protection Against Childhood Disease

Vaccination is the best protection against 16 major diseases and among the greatest gifts a parent can give a child. Getting your child immunized should start when she's very young, and continue through adolescence.

By Sam Gaines

Measles is making a comeback. Whooping cough keeps hanging around. Increasingly, diseases once thought nearly eradicated are returning. Why? Because not all parents are getting their children vaccinated.

Vaccines are much more than a good idea. They've made the difference in saving children's lives throughout the last century, and still do today. Indeed, some of the most devastating diseases that affect children have been greatly reduced or eradicated completely thanks to vaccination. "Vaccines are one of the single most important things you can do to protect your child from deadly and debilitating diseases," says Ari Brown, M.D., FAAP, a practicing pediatrician in Austin, Texas, and member of the American Academy of Pediatrics (AAP) Council on Communications and Media. "Many of the diseases we protect against with vaccines are not treatable once you get the disease."

Consider this pre- and post-vaccination information:

- **Smallpox:** This terrible disease once killed nearly 1,000 children per year. It was completely eradicated in 1977 thanks to the smallpox vaccine.
- **Diphtheria:** In 1920, nearly 150,000 cases were reported in the United States, with more than 13,000 deaths. By 2002, only one case was reported nationwide.
- **Pertussis (whooping cough):** More than 107,000 cases were reported in 1922, with nearly 5,100 deaths. In 2002, only 9,771 cases were reported nationwide.
- **Polio:** In the years 1951-54, more than 16,000 cases of paralytic polio were reported, leading to nearly 1,900 deaths. The wild-type virus-caused type of paralytic polio was eliminated from the Western Hemisphere in 1991, thanks to the vaccine.
- **Measles:** An average of 450 Americans died from measles each year between 1953 and1963. But because of the vaccine, measles cases have been reduced by more than 99 percent compared with the pre-vaccine era.

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Vaccine Safety

Are vaccines safe? That's a very important concern all parents have about anything that goes into their children's bodies, and vaccines are no exception.

The good news is that the U.S. immunization program is among the safest in the world. Vaccines are tested for years before they are approved for use in the general population. These tests include all eligible age groups and combinations of all appropriate vaccines, to be sure that each is safe when given with the others.

In rare, unpredictable circumstances, a vaccine can cause health problems for a child. When this happens, the U.S. has a Vaccine Injury Compensation Program. This tiny risk must be weighed, however, against the far greater risk of contracting a serious disease that could threaten a child's life. In 2007, vaccines are estimated to have prevented 14 million infections and saved 33,000 lives.

"Your pediatrician has devoted his or her life to protecting children and keeping them healthy," Dr. Brown explains. "If they had any concerns about shots, they would be the first to stop or change what they recommend. Remember, most of us pediatricians are parents!"

Don't Forget to Vaccinate Adolescents!

While it's easy to think of vaccines as an early childhood necessity, the truth is that immunization is just as important for older children and adolescents. The AAP recommends the following vaccinations for children between the ages of 11 and 19 if they haven't received the full dosages:

- **Meningococcal disease:** Recommended for all teens age 11 through 18 for protection against this devastating illness. It's also recommended for all college freshmen living in dorms regardless of age.
- **Human Papillomavirus (HPV):** This series of three vaccines provides immunity against several types of the virus that cause cervical cancer.
- **Tetanus, diphtheria, pertussis (whooping cough) (Tdap, Td):** Children 11 or 12 years of age need a Tdap booster at this time, and will need another booster every 10 years.
- **Hepatitis B (HepB)**
- **Measles, Mumps, Rubella (MMR)**
- **Polio**
- **Varicella:** If the child hasn't had chickenpox and hasn't been vaccinated, the two-dose vaccination is necessary. A teen who only received one dose of the vaccine as a child should get the second dose now, as well.
- **Polio**
- **Influenza**
- **Pneumococcal disease:** Some adolescents with chronic health problems should receive this vaccine. Your pediatrician can guide you as to whether this is recommended for your child.
- **Hepatitis A:** While anyone can get hepatitis A, certain teens are at greater risk. Talk to your pediatrician about your child's risks and the benefits of this two-dose vaccine.

Among the newer shots is the meningococcal vaccine, which protects young people against an aggressive, potentially lethal condition. This rapidly developing disease kills 10 percent of those it strikes and leaves about 15 percent of survivors with brain damage, hearing loss, or amputated limbs. Approximately 15 to 20 percent of the population are carriers of the bacterium and never show symptoms. The CDC reports that only 12 percent of those eligible had received the vaccine by 2006, leaving far too many at risk. The vaccine prevents four of the five strains of meningococcal meningitis, which cause about 70 percent of cases in the U.S. Most insurers cover the vaccination.

Another critically important vaccine that was recently licensed is the HPV vaccine, which prevents two of the most common types of virus linked to cervical cancer, as well as two of the most common types of genital warts. Cervical cancer is the second-most prolific type of cancer among American women. "I think this is a very important vaccine for older girls," says David Tayloe, M.D, FAAP. "Many women have contracted some form of HPV by the time they reach their 50s, and they are at increased risk of developing cervical cancer as a result. This vaccine means a 90 percent reduction in the likelihood of a girl developing cervical cancer."

Renée Jenkins, M.D, FAAP, says the key to helping parents remember these important vaccines is the "protection visit" with a pediatrician, which the CDC and AAP recommend for all pre-adolescents at 11 or 12 years old. This visit with a pediatrician is a chance for the child and doctor to discuss the many things that can put a teen's health at risk. "We have to talk about injuries, smoking, sexuality, and drugs and alcohol, among other things," Dr. Jenkins says. "We talk about managing those risks from a health perspective, to help the child prepare for what he or she will face growing up and maturing."

And that's a great time to get adolescent vaccines taken care of, too.

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These are just a few examples of the profound impact vaccines have made in saving children's lives and preventing serious consequences of conditions like bacterial meningitis. In recent years, newer vaccines have made dramatic inroads in fighting even more diseases. "Immunization has been the most successful public health program of the 20th century," says Renée Jenkins, M.D., FAAP, president of the AAP. "The diseases that we used to see that killed and permanently disabled children, we just don't see those any more."

Indeed, vaccination may be a victim of its own success. "I think our problem is that many parents never saw those diseases or heard of someone who had polio or diphtheria," Dr. Jenkins says. "So they don't have a sense of what life is like without immunity. And now we're seeing these diseases making a comeback." Jenkins points out that there were more than 20,000 cases of pertussis (whooping cough) in 2005, and eight infants died from it. "There have been multiple outbreaks of measles in three states, too," she adds, "all coming from other countries and exposing vulnerable children."

Not every nation has access to an up-to-date vaccination program. At a time when the world is "smaller" than ever, thanks to the ease of international travel and global trade, the importance of protecting your children with a full schedule of vaccines cannot be understated. Sick people — carriers of many of the diseases we vaccinate against — can bring exposure to these diseases from other parts of the world, or unvaccinated U.S. travelers returning from other countries can unwittingly bring (import) diseases to the U.S., exposing schoolmates, family, and friends. "Basically, you're just a plane ride away from potentially fatal diseases," says David Tayloe, M.D., FAAP, president-elect of the AAP.

Stay on Schedule

Vaccines are given according to a schedule that has been created based on extensive study and analysis. Some vaccines protect against a single disease, while others — called combo vaccines — offer protection against several diseases with a single injection.

The vaccination schedule (see page 28) is designed to give immunized children the maximum protection as soon as safely possible. It may be tempting, but creating your own vaccine timetable, rather than following the recommended schedule, is not a good idea. "Basically, if you make up

your own schedule, you're choosing to give shots at time intervals and combinations that have not been studied," Dr. Brown says. "We don't know how that will impact your child's immune response. What we do know is that it is like playing Russian roulette. It may leave your child unprotected from potentially deadly diseases."

Vaccination for Life

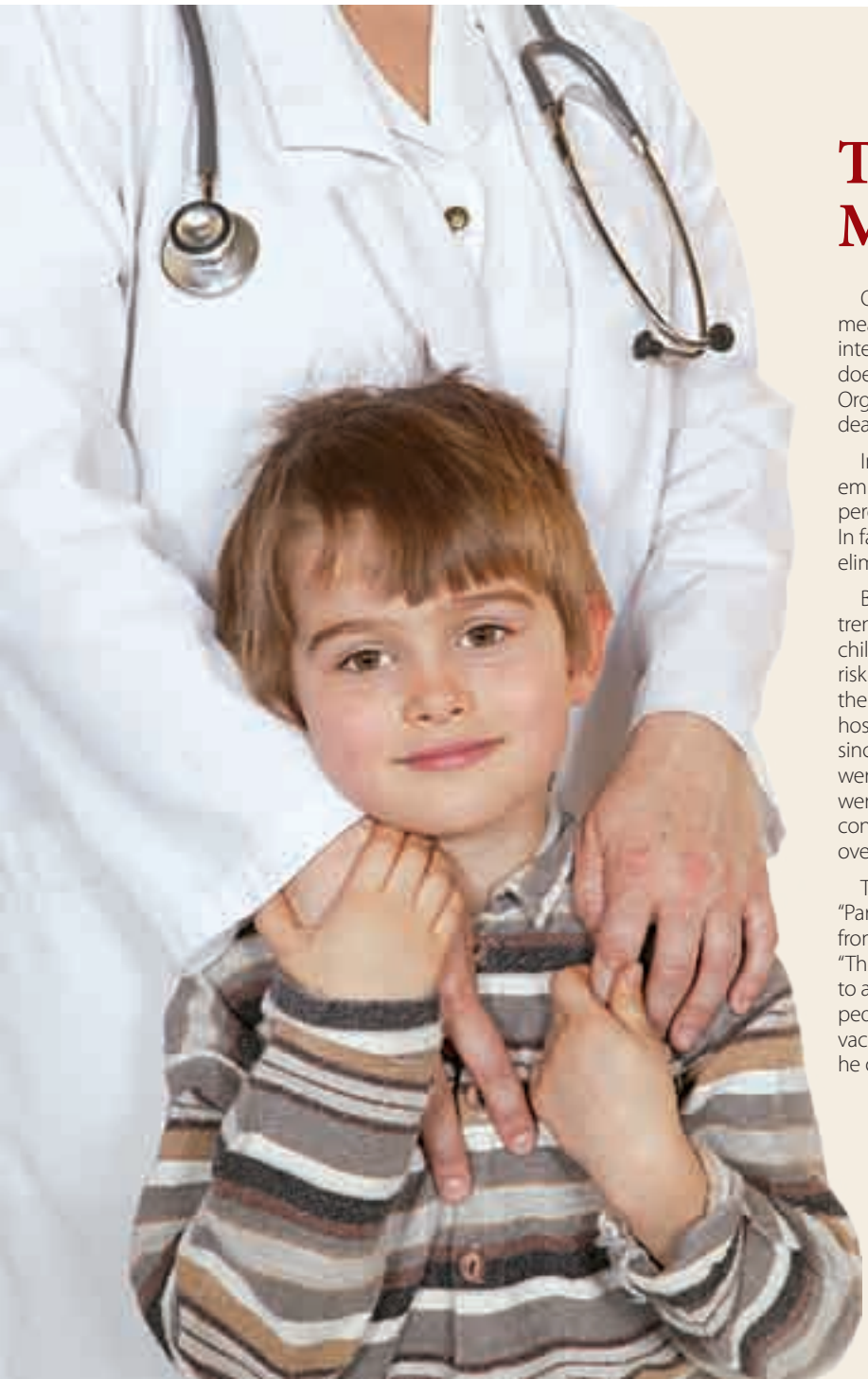
Many of us think of vaccination as something that applies only to early childhood. But getting immunized against contagious disease is a lifelong need. In fact, vaccination should continue throughout the life of a child, including in the adolescent years. (See "Shots for Teens" sidebar for more information.) Even for adults, the annual flu shot is a scheduled part of keeping healthy — all the more so, the older we get.

Just as important as the initial vaccinations are the booster shots, which are designed to build on the previous vaccines' effectiveness to continue immunity.

Protection for Everyone

Unfortunately, some parents forget or skip the vaccines, which undercuts the effectiveness of a very important concept in vaccination: herd immunity.

Herd immunity is the benefit everyone receives from a vaccinated population once immunization reaches a critical level. When enough people are vaccinated, everyone — including those who are too young or too sick to be immunized — receives some protection from the spread of diseases. ●



The Recent Measles Outbreak

One of the most infectious diseases in the world, measles frequently finds its way into the U.S. via international visitors from nations where the vaccine doesn't exist or isn't widely used. The World Health Organization reported that nearly 1 million measles-related deaths occurred in developing countries in 1999.

In the U.S., the measles vaccine has been so widely embraced that we have seen a reduction of more than 99 percent in measles cases, compared to the pre-vaccine era. In fact, the CDC announced in 2000 that measles had been eliminated, thanks to the measles vaccine.

But a recent outbreak of measles points to a dangerous trend among some parents who are not immunizing their children against measles or other diseases. This poses a real risk to the health of all unvaccinated children. In August, the CDC announced that 15 children under 20 had been hospitalized with the disease, and 131 had been diagnosed since the beginning of 2008. Many of the children who were diagnosed had not been vaccinated by choice, or were too young. It is believed that the sick children contracted measles from children who had traveled overseas.

To Dr. Tayloe, one important point must be made. "Parents should not get their immunization information from TV stars or other non-scientific advocates," he says. "The right person to ask is your pediatrician. Don't be afraid to ask any question you have about vaccination. Your pediatrician is there to help you understand why vaccination is so important, and above all to do everything he or she can to safeguard your child's health."

Recommended Immunization Schedule for Persons Aged 0–6 Years

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For those who fall behind or start late, see the catch-up schedule

Vaccine ▼ Age ▶	Birth	1 month	2 months	4 months	6 months	12 months	15 months	18 months	19-23 months	2-3 years	4-6 years
Hepatitis B	HepB	HepB			HepB						
Rotavirus			Rota	Rota	Rota						
Diphtheria, Tetanus, Pertussis			DTaP	DTaP	DTaP		DTaP				DTaP
Haemophilus influenzae type b			Hib	Hib	Hib	Hib					
Pneumococcal			PCV	PCV	PCV	PCV				PCV	
Inactivated Poliovirus			IPV	IPV	IPV						IPV
Influenza					Influenza (Yearly)						
Measles, Mumps, Rubella						MMR					MMR
Varicella						Varicella					Varicella
Hepatitis A						HepA (2 doses)				HepA Series	
Meningococcal										MCV4	

Range of recommended ages

Certain high-risk groups

This schedule indicates the recommended ages for routine administration of currently licensed childhood vaccines, as of December 1, 2007, for children aged 0 through 6 years. Additional information is available at www.cdc.gov/vaccines/recs/schedules. Any dose not administered at the recommended age should be administered at any subsequent visit, when indicated and feasible. Additional vaccines may be licensed and recommended during the year. Licensed combination vaccines may be used whenever any components of the combination are indicated and other components of the vaccine are not contraindicated and if approved by the Food and Drug Administration for that dose of the series. Providers should consult the respective Advisory Committee on Immunization Practices statement for detailed recommendations, including for high risk conditions: http://www.cdc.gov/vaccines/pubs/ACIP-list.htm. Clinically significant adverse events that follow immunization should be reported to the Vaccine Adverse Event Reporting System (VAERS). Guidance about how to obtain and complete VAERS form is available at www.vaers.hhs.gov or by telephone, 800-822-7967.

The Recommended Immunization Schedules for Persons Aged 0–18 Years are approved by the Advisory Committee on Immunization Practices (**www.cdc.gov/vaccines/recs/acip**), the American Academy of Pediatrics (**http://www.aap.org**), and the American Academy of Family Physicians (**http://www.aafp.org**).

Recommended Immunization Schedule for Persons Aged 7–18 Years

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For those who fall behind or start late, see the green bars and the catch-up schedule

Vaccine ▼ Age ▶	7-10 years	11-12 years	13-18 years
Diphtheria, Tetanus, Pertussis		Tdap	Tdap
Human Papillomavirus		HPV (3 doses)	HPV Series
Meningococcal	MCV4	MCV4	MCV4
Pneumococcal	PPV		
Influenza	Influenza (Yearly)		
Hepatitis A	HepA Series		
Hepatitis B	HepB Series		
Inactivated Poliovirus	IPV Series		
Measles, Mumps, Rubella	MMR Series		
Varicella	Varicella Series		

Range of recommended ages

Catch-up immunization

Certain high-risk groups

This schedule indicates the recommended ages for routine administration of currently licensed childhood vaccines, as of December 1, 2007, for children aged 7–18 years. Additional information is available at www.cdc.gov/vaccines/recs/schedules. Any dose not administered at the recommended age should be administered at any subsequent visit, when indicated and feasible. Additional vaccines may be licensed and recommended during the year. Licensed combination vaccines may be used whenever any components of the combination are indicated and other components of the vaccine are not contraindicated and if approved by the Food and Drug Administration for that dose of the series. Providers should consult the respective Advisory Committee on Immunization Practices statement for detailed recommendations, including for high risk conditions: http://www.cdc.gov/vaccines/pubs/ACIP-list.htm. Clinically significant adverse events that follow immunization should be reported to the Vaccine Adverse Event Reporting System (VAERS). Guidance about how to obtain and complete VAERS form is available at www.vaers.hhs.gov or by telephone, 800-822-7967.

The Recommended Immunization Schedules for Persons Aged 0–18 Years are approved by the Advisory Committee on Immunization Practices (**www.cdc.gov/vaccines/recs/acip**), the American Academy of Pediatrics (**http://www.aap.org**), and the American Academy of Family Physicians (**http://www.aafp.org**).

Catch-up Immunization Schedule
for Persons Aged 4 Months–18 Years Who Start Late or Who Are More Than 1 Month Behind

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The table below provides catch-up schedules and minimum intervals between doses for children whose vaccinations have been delayed. A vaccine series does not need to be restarted, regardless of the time that has elapsed between doses. Use the section appropriate for the child's age.

Vaccine	Minimum Age for Dose 1	Minimum Interval Between Doses			
		Dose 1 to Dose 2	Dose 2 to Dose 3	Dose 3 to Dose 4	Dose 4 to Dose 5
CATCH-UP SCHEDULE FOR PERSONS AGED 4 MONTHS–6 YEARS					
Hepatitis B	Birth	4 weeks	8 weeks (and 16 weeks after first dose)		
Rotavirus	6 wks	4 weeks	4 weeks		
Diphtheria, Tetanus, Pertussis	6 wks	4 weeks	4 weeks	6 months	6 months
Haemophilus influenzae type b	6 wks	4 weeks if first dose administered at younger than12 months of age 8 weeks (as final dose) if first dose administered at age 12-14 months No further doses needed if first dose administered at 15 months of age or older	4 weeks if current age is younger than 12 months 8 weeks (as final dose) if current age is 12 months or older and second dose administered at younger than 15 months of age No further doses needed if previous dose administered at age 15 months or older	8 weeks (as final dose) This dose only necessary for children aged 12 months–5 years who received 3 doses before age 12 months	
Pneumococcal	6 wks	4 weeks if first dose administered at younger than 12 months of age 8 weeks (as final dose) if first dose administered at age 12 months or older or current age 24–59 months No further doses needed for healthy children if first dose administered at age 24 months or older	4 weeks if current age is younger than 12 months 8 weeks (as final dose) if current age is 12 months or older No further doses needed for healthy children if previous dose administered at age 24 months or older	8 weeks (as final dose) This dose only necessary for children aged 12 months–5 years who received 3 doses before age 12 months	
Inactivated Poliovirus	6 wks	4 weeks	4 weeks	4 weeks	
Measles, Mumps, Rubella	12 mos	4 weeks			
Varicella	12 mos	3 months			
Hepatitis A	12 mos	6 months			
CATCH-UP SCHEDULE FOR PERSONS AGED 7–18 YEARS					
Tetanus, Diphtheria/ Tetanus, Diphtheria, Pertussis	7 yrs	4 weeks	4 weeks if first dose administered at younger than 12 months of age 6 months if first dose administered at age 12 months or older	6 months if first dose administered at younger than 12 months of age	
Human Papillomavirus	9 yrs	4 weeks	12 weeks		
Hepatitis A	12 mos	6 months			
Hepatitis B	Birth	4 weeks	8 weeks (and 16 weeks after first dose)		
Inactivated Poliovirus	6 wks	4 weeks	4 weeks	4 weeks	
Measles, Mumps, Rubella	12 mos	4 weeks			
Varicella	12 mos	4 weeks if first dose administered at age 13 years or older 3 months if first dose administered at younger than 13 years of age			

Information about reporting reactions after immunization is available online at **http://www.vaers.hhs.gov** or by telephone via the 24-hour national toll-free information line 800-822-7967. Suspected cases of vaccine-preventable diseases should be reported to the state or local health department. Additional information, including precautions and contraindications for immunization, is available from the National Center for Immunization and Respiratory Diseases at **http://www.cdc.gov/vaccines** or telephone, **800-CDC-INFO (800-232-4636)**.