Note to Educator:

Vaccines are an important part of adolescent health. They help protect everyone against serious, sometimes life-threatening illnesses. The National Meningitis Association (NMA) has developed this guide to help you present information about infectious diseases and vaccines to students and discuss with them the importance of vaccination to protect both individuals and communities.

NMA is a nonprofit organization founded by parents whose children have died or been severely affected by meningococcal disease, a vaccine-preventable infection that can kill or disable an otherwise healthy person within hours. Preteens, teens and young adults are at higher risk than others for the disease. NMA’s mission is to educate families, medical professionals and others about meningococcal disease and its prevention.

Because adolescents are at increased risk for meningococcal disease, health officials recommend meningococcal vaccination at age 11-12 with a booster dose in at age 16. Yet, despite these recommendations, national vaccination rates among adolescents are low.

Rates are also low for other recommended preteen/teen vaccines, such as Tdap (tetanus, diphtheria, pertussis), HPV and influenza. The impact of this is showing; several U.S. states have experienced outbreaks of pertussis (whooping cough), which can sicken adolescents for weeks or months and keep them out of school for several days. Prevention during teen years is particularly important because adolescents and adults, who usually have a milder form of the disease, are the most common transmitters of the disease to infants, who are at highest risk of death. Twenty-five infants younger than one year of age died nationally from pertussis in 2010.

This discussion guide is designed to help students understand how vaccines work and why they are important. In addition, it can help make them aware that there are vaccines recommended for them. Examples of recommended adolescent vaccines are included. A class handout is provided for students to read and take home to their parents. The Resources list below includes places to go for additional information.

Grade Level:
■ 7-9

Estimated Time:
■ One class period

Objectives:
■ Educate students about what vaccines are and what they do.
■ Provide students with an understanding of why vaccines are important for their health and for community health.

Sequence Recommendations:
■ Consider covering the circulatory and immune systems with the class before this discussion. This discussion could also be incorporated into an educational unit focused on the immune system.
Class Materials:
- Suggested discussion points and class questions (provided below)
- Educational flier (enclosed)

Resources:
- Adolescent Vaccines:
  - National Meningitis Association’s website: [www.preteenvaccines.org](http://www.preteenvaccines.org)
- Infectious Diseases, Vaccine Principles and Immunology
  - Centers for Disease Control and Prevention (CDC): [www.cdc.gov/vaccines](http://www.cdc.gov/vaccines)
  - The College of Physicians of Philadelphia’s website, History of Vaccines: [http://www.historyofvaccines.org/content/how-vaccines-work](http://www.historyofvaccines.org/content/how-vaccines-work) (content on how vaccines work, their history, community impact, etc.; includes animations)
- Stories from those affected by vaccine-preventable diseases

Suggested Discussion Points and Class Questions:

What are infectious diseases?
- Infectious diseases are illnesses caused by a variety of microscopic organisms, including bacteria, viruses, fungi and parasites. These organisms can break through the body’s natural defenses and multiply, making people sick.¹

- Some infections, like measles and influenza, affect the entire body while others affect only one organ or system, like when you have a cold and your nose is stuffy and your head hurts, but the other parts of your body feel fine.¹

What does the immune system do?
- The body’s immune system works like an army that has many different types of soldiers. Their job is to find and destroy intruders like bacteria and viruses.

- A healthy body can usually fight off many illnesses on its own, but some infections can be more serious, and in some cases, even deadly.

- The common cold, which is caused by a virus, is one example of a minor illness. Although you might not feel well for a week or so, you gradually get better as your body’s immune system eliminates the intruding virus.

- Examples of potentially more serious infections include influenza, meningitis, tetanus (lockjaw) and pertussis (whooping cough).

How do vaccines work?
- Centuries ago, scientists discovered the basic principles that make immunization possible. They learned they could help the body prepare to fight deadly infections by training the immune system to recognize and defeat germs.
Like any soldier, the more immune cells know about their ‘enemy’ the more equipped they are to protect against attack. When the body’s immune system has fought off an invader, it develops a memory that helps it react if it’s attacked again by the same enemy in the future.
- This is a natural process known as acquiring “active immunity.” It can happen after people become sick and survive an infection, or it can happen in response to a vaccine, which achieves the same goal without making someone sick.
- Sometimes this immunity will last a lifetime, but other times it only lasts for a certain period of time, such as five or 10 years.

Vaccines help teach the body how to fight an infection. Vaccines introduce an “unarmed” version of a specific germ into the body. It doesn’t make the body sick, but it looks and acts like the bacterium or virus. The immune system reacts, and over a period of days or weeks, it learns how to fight the enemy and develops a memory. This is the goal of providing a vaccine. If the real bug enters the body later, the immune system will recognize it and remember how to react.

Sometimes, people have a mild reaction to being vaccinated such as fever or a sore arm where they were injected. This is a sign that the immune system is fighting the intruder and that the vaccine is working.

How have vaccines helped change individual and community health through disease reduction/eradication?
- Vaccination and similar, earlier practices have been around for a long time. America’s founding fathers were threatened by scourges of small pox. Scientists at that time discovered they could protect people through inoculation. This method is slightly different and riskier than vaccination is today.
  - Thomas Jefferson, John Adams and Ben Franklin were just a few historical figures who were inoculated against this disease. Ben Franklin became a strong advocate for inoculation after losing a young son to smallpox.

You might have heard about small pox, but chances are, you don’t know what diphtheria is. And, though you may recognize the names of diseases like whooping cough, measles or mumps, you probably don’t think much about them. But just 100-200 years ago in the U.S., almost everyone knew the names of these diseases, and they were afraid of them. Hundreds of thousands of people got them each year and tens of thousands died as a result.

There have been other frightening diseases in more recent U.S. history. When your grandparents were very young, there were devastating outbreaks of poliomyelitus virus, or polio. In the late 1940s and early 1950s, the average number of reported cases was 35,000 per year. Many children died or were permanently paralyzed as a result.
  - The American public was terrified of polio and communities and parents went to great lengths to protect their children. During the summer when the virus spread most easily, community pools were closed, and parents kept their children inside (at a time when air conditioning was much less common).

These diseases are no longer household names primarily, because of vaccines. Vaccines are one of the safest, most effective ways we have of preventing disease. They can help protect both individuals and communities.
Vaccination of babies and infants in the U.S. saves 42,000 lives and prevents 20 million cases of disease each year.⁵ (Note to teachers: The birth cohort is approximately four million annually, so the number of lives saved is approximately one percent. Consider providing students with a figure to make this point clear, e.g., if there are 1,000 students in the school, 10 of them would most likely not be there if the vaccination practices we have today did not exist.)

Before vaccines, the only way to become immune to a disease was to get it and survive (see active immunity above). This was risky, though because you could die or become very ill.

- Optional: Early smallpox inoculation involved a process called variolation. Doctors took a tiny part of a smallpox sore from one person and placed it into a cut on the skin of a healthy person to induce immunity. Generally, the inoculated person would have only a mild reaction, but there was a risk of severe infection and death. The safer smallpox vaccine eventually replaced this method.²,³

Today the U.S. has the safest, most effective vaccines in history. Vaccines are held to the highest standard of safety and are tested for many years before being used. Once in use, they are continually monitored for safety and effectiveness.⁶

The routine and widespread use of vaccines led to major reductions, and near elimination, of some of the most feared diseases in the U.S.

- Smallpox has actually been eradicated due to vaccination. The last case of smallpox in the U.S. was in 1949. The last naturally occurring case in the world was in Somalia in 1977. Smallpox vaccines are no longer given routinely as a result.⁷
- Most of the diseases that struck fear in the hearts of Americans in the 19th and early 20th century are much rarer. There are now vaccines for diphtheria, whooping cough, measles, mumps and many other diseases.
- And, in 1955, Jonas Salk developed a vaccine that led to the near elimination of polio. There have been no cases reported in the U.S. for over 20 years.
- You probably received all of these vaccines as babies and young children. They are now required before starting school.
- Unlike smallpox, most vaccine-preventable diseases don’t just disappear. Even though doctors no longer see many cases, they occur in places where not enough people are vaccinated routinely.
- This is why continuing to vaccinate is so important. (More discussion on this topic is included under the What happens in a community when not enough people are vaccinated? section.)

Optional section to address the vaccines-autism “controversy” if needed:

- In the late 1990s, a London doctor claimed that the measles-mumps-rubella vaccine that is used routinely in babies was a cause of autism. This study was published in a medical journal called the Lancet, but it was later discredited. The journal retracted it because it was fraudulent and the claims were false.

- No valid scientific study has ever shown a link between vaccines and autism.

- At the time the fraudulent study was published, it received massive amounts of attention from the media. Over the next several years, there was a lot of false information about the vaccine in the press. In addition, several celebrities and many parents of autistic children, who believed the study, started a movement against childhood vaccination.

- The result of this is that vaccination rates, particularly for the measles-mumps-rubella vaccine, dropped significantly in the UK which led to outbreaks of measles and deaths in children.
Vaccination also decreased in some communities in the U.S. which has led to recent disease outbreaks. (See the section, What happens in a community when not enough people are vaccinated? for additional information.)

- There are still small groups of vocal parents who believe there is a connection between vaccines and autism, but there is no medical or scientific proof. No study has ever shown a link between the two.

- (Teacher’s note: More information about vaccine safety can be found at: http://www.chop.edu/service/vaccine-education-center/vaccine-safety/. In addition, media coverage about the Lancet’s retraction can be found online dating from February, 2010.)

Are there vaccines for adolescents and adults or are they just for babies?

- Vaccines used to be primarily for babies and very young children, but in recent years they became available and recommended by health officials for preteens, teens and adults, too.

- There are several reasons why preteens and teens should receive vaccines:

1. **Boosting**: Some vaccines are recommended for adolescents to give your immune system a boost and help it continue protecting you from diseases you were immunized for as a baby. Because so much time has passed since the initial vaccine, the immune “memories” start to fade. Therefore, your body needs a reminder.
   - **Example**: Tetanus and diphtheria. Babies receive vaccines for these diseases, but boosters are needed for preteens, teens and adults every ten years.

2. **Booster + Herd Immunity**: Certain vaccines do more than just provide a booster, they help keep others in the community healthy too, an effect that is called herd immunity.
   - **Example**: Pertussis, or whooping cough, is a very contagious infection that causes severe, uncontrollable coughing spells. Teens and adults usually have a milder form of pertussis, though it could make you sick for several weeks. Even if you don’t become very ill, you can easily spread germs to babies and infants, who can become very sick or die from the disease. This is why it’s so important for teens and adults to receive a pertussis booster. If enough people in the community are vaccinated, it’s less likely that infants, who can’t be vaccinated until they are two months old, will become ill. If anyone in your family has had a baby in the last few years, your family doctor may have told your parents to have you vaccinated to help keep your younger brother, sister, or cousin healthy.
     - In 2010 and 2011 several states experienced a rise in pertussis or whooping cough cases. During this time, more people had whooping cough in California than in the last 50 years total. Twenty-five babies younger than one year old died in the U.S. in 2010.

3. **Protection against new disease risks**: Some vaccines are recommended for adolescents because they help protect against infections that you are more at risk for because of your age.
   - **Example**: Meningococcal disease, which is sometimes called bacterial meningitis, is one of these infections. Although it’s rare, it can be fatal or disabling. One in seven adolescents who get this infection will die and about one in five who survive suffer serious consequences such as amputations of arms or legs.
• Health officials recommend the meningococcal vaccine for 11-12 year olds with a booster shot at age 16. Some of you may have received one dose already. The booster is a new recommendation that your parents may not know about yet.

✓ Example: Influenza is a serious, potentially deadly illness. Flu severity changes from year to year. Some years it’s very mild and other years it can be more deadly. Everyone is at risk for the flu every year, including teens, so it’s important to be vaccinated annually.

4. Protection against future disease risks: Finally, there are vaccines that have been developed in recent years that can be given to preteens and teens to help prevent serious illnesses later in life.

✓ Example: When given in adolescence, HPV vaccine helps prevent infection by the human papillomavirus which is a major cause of cervical cancer in women later in life.

What happens in a community when not enough people are vaccinated?

- Outbreaks can occur when not enough people in a community are vaccinated against infections. An outbreak is when more cases of a disease occur than would be expected for a particular area.

Question: Has anyone heard or read about recent outbreaks of measles in some U.S. states?

- Examples of measles outbreaks in the U.S.:
  o Due to misinformation about the vaccine for measles, mumps and rubella (German measles), vaccination rates began to decline. As a result, an outbreak of measles occurred in March 2011 and was still ongoing as of July 2011. An unvaccinated toddler from the U.S. picked up the virus while traveling outside the country. When the child returned, the infection spread, first in Minnesota and then to other states. As of July 2011, at least 156 people in the U.S. had measles and about half of them had to be hospitalized for treatment.
  o Another example of a U.S. measles outbreak occurred in 1989 because vaccination rates for measles fell so low. More than 55,000 people got sick with measles and 136 died. As a result, health officials temporarily recommended a second dose of the measles vaccine for infants and revaccination for older children and some adults. After major efforts to increase vaccination rates, the number of cases declined significantly by the 1990s.

Question: Based on everything we talked about, can anyone guess why these measles outbreaks happened?

- Low Vaccination Rates: In order for vaccination to protect a community, most people in the community need to be vaccinated. This is because some people can’t receive vaccines because of health conditions and because vaccines don’t work in 100% of the people who receive them. When most people are vaccinated, it’s harder for the disease to spread. This is known as herd immunity because it helps protect the whole community, even those who can’t be vaccinated. The percentage of the population that needs to be vaccinated for herd immunity to be achieved varies depending on the disease, but in some cases it’s as high as 95%.

- World Travel: Although germs can’t cross oceans on their own, we can take them with us. People travel more now, and in greater numbers, than they ever have before. We can bring germs back with us if we travel to other parts of the world, and visitors to our country can bring them here as well. So, even diseases that are “gone” from the U.S. can come back making it critical to maintain vaccination efforts.
Resources