

Arm Yourself for Good Health Stay Up-to-Date on Vaccines

As summer winds down, students from kindergarten to college are heading off to new schools, with lots of new people to meet—and new germs to catch. It's a perfect time to start planning to protect your health. One of the best ways to guard you and your family against infectious disease is to stay up-to-date with your vaccines.

Thanks to medical research, many of us have never known the terrible diseases that immunization keeps at bay. Before vaccines, polio paralyzed thousands of children nationwide every year, and measles infected millions. At the turn of the 20th century, diphtheria was one of the most common causes of death in school-age children. Today, these are best known as the names of shots our kids get at the pediatrician's office. Cases of vaccine-preventable diseases have reached an all-

time low, according to a recent report from the U.S. Centers for Disease Control and Prevention.

But because we rarely, if ever, see childhood diseases like diphtheria and whooping cough, some people question whether the vaccines are necessary. Others worry about possible links between vaccines and illness. The scientific evidence to date doesn't support such concerns, however, and public health officials agree that the benefits of vaccination far outweigh the risks.

Vaccines prime the body to defend itself against **pathogens**. Early vaccines contained weakened live pathogens, but most now consist of a part of a pathogen or a crippled pathogen. When you get a vaccine, the **immune system** goes into action, ramping up production of specialized cells and **antibodies** to fight what the body sees as an invading pathogen.



Definitions

Antibodies

Pathogen-fighting molecules made by the immune system.

Immune System

The system that protects your body from invading viruses, bacteria and other microscopic threats.

Pathogens

Microscopic organisms that cause disease.

If the body later encounters the real pathogen, it “remembers” it and quickly gets rid of it.

Staying up-to-date on vaccines doesn't just help you. When more people are vaccinated in a population, it's harder for pathogens to spread. Scientists call this the “herd-immunity” effect.

Many vaccines protect us against viruses. Viruses need a host—like the body of a human, animal or plant—to make copies of themselves. Viruses have their own genetic material but use the host's cells to multiply. Some viruses constantly change their genetic material, allowing them to evade immune system attack. That's why researchers who create vaccines for seasonal influenza, or “flu,” have to

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Wise Choices Get Immunized

Getting recommended vaccines is important at any age:

- **Got kids?** Your pediatrician can tell you more about childhood and teen vaccines.
- **Off to school?** Check with a doctor about what immunizations teens need before heading off to school. Students living in dormitories, for example, should get the meningococcal vaccine.
- **Traveling abroad?** Schedule a visit with your doctor at least 4-6 weeks in advance to find out if you need any vaccines.
- **Step on a nail?** Tetanus shots can protect you from serious infection.

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make a new flu vaccine each year.

To make effective flu vaccines, researchers pay close attention to how and when the flu virus changes. Dr. Derek J. Smith, an NIH-funded researcher from the University of Cambridge in England, recently developed a new technique, called antigenic cartography, that will help guide vaccine development. It involves testing how strongly thousands of flu strains attach to various human antibodies. This information

is then compared to a world map to trace how flu viruses evolve and spread throughout the year.

Smith's team has learned that the most common type of flu starts a predictable, yearly journey in East and Southeast Asia, then travels around the world and ends up in South America. In addition to improving the effectiveness of the flu vaccine, Smith says his method may help scientists develop vaccines against some of the world's craftiest and deadliest viruses. "Antigenic cartography should be applicable to other infectious diseases caused by pathogens that change over time, such as hepatitis C, HIV and malaria," he says.

Along with improving current vaccines, scientists are also working hard to develop new ones. In 2006, the vaccine Zostavax was approved by the U.S. Food and Drug Administration to protect older adults against shingles, an illness caused by the same virus that causes chickenpox. The virus can lay dormant in nerve cells for many years, only to re-emerge years later as a painful, blistering rash. Because shingles pain can be severe and long-lasting, most doctors recommend that older adults get the vaccine. It's not 100% effective at preventing shingles, but can prevent most cases of severe pain.

Vaccines may one day help protect us against cancer as well. Scientists know that about 1 in 5 cancers are caused by infectious agents, says



Web Links

For links to more information about vaccines, see this story online:

- <http://newsinhealth.nih.gov/2008/August/feature1.htm>

Dr. Douglas Lowy of NIH's National Cancer Institute (NCI). "Identifying these infectious agents can, in principle, lead to the prevention of these cancers if vaccines can be developed against them," Lowy says.

After scientists linked a virus called HPV with virtually all cases of cervical cancer in women, Lowy took part in an international effort whose findings led to an HPV vaccine. This vaccine, Gardasil, protects against the types of HPV that cause 70% of all cervical cancers and 90% of genital warts. A second HPV vaccine in development, Cervarix, also targets the main cancer-causing HPVs.

Viruses and bacteria have been linked to stomach and liver cancers as well. For example, hepatitis viruses, which can cause liver scarring and failure, can also lead to liver cancer. There's currently an FDA-approved vaccine against the hepatitis B virus, but not one against hepatitis C, another important cause of liver cancer.

Researchers are hoping one day to be able to use vaccines to treat disease after it has already struck. Still experimental, these so-called therapeutic vaccines work by stimulating the immune system to recognize and attack diseased cells without harming healthy ones. Researchers are now testing these types of vaccines against several different cancers.

"These vaccines enhance a patient's own immune system to fight his or her tumor," says Dr. Jeffrey Schlom, who is currently developing and testing cancer vaccines at NCI.

History has already shown us that immunization is a very successful and cost-effective public health strategy. While new vaccines are in the pipeline, make sure to arm yourself and your children with the ones we already have. ■

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Matching Genes and Vitamins

A Personalized Plan May Be in Your Future

You may be one of the many people who take vitamin and mineral supplements as a kind of insurance plan, to make sure your body's getting enough of all the nutrients you need. New research suggests that doctors may one day be able to design a personalized supplement plan that's best for your particular body.

We all carry around little glitches, called **mutations**, in the DNA sequences that make up our **genes**. These changes can occur naturally. Since our DNA sequences are made of billions of smaller pieces strung together, it would be impossible for us not to carry some mutations. Most are completely harmless, but others can cause diseases and disorders.

A new study suggests that some of these genetic flaws could be "fixed" by taking vitamin and mineral supplements. Professor Jasper Rine at the University of California, Berkeley and his colleagues looked at a gene that contains the code for an **enzyme** called MTHFR. Among other things, this enzyme plays an important role in processing amino acids, the building blocks of proteins.

The researchers collected DNA samples from over 500 people from different ethnic backgrounds and found several variants of the en-

zyme. They inserted the genes for these variants into yeast cells to test their function and found that several mutations affected how well MTHFR did its work. Even slight variations in the enzyme affected its activity. That means these variations can also affect the metabolism of the people who carry them.

But the researchers figured out a way to compensate. Enzymes often need to bind vitamins and minerals to work properly. MTHFR needs the vitamin folate. The researchers were able to get 4 of the 5 mutant enzymes to work normally again by adding extra folate.

Rine and his colleagues estimate that most people have several mutations in their enzymes. But there's no reason to panic, Rine believes, because vitamin and mineral supplements can be used to fix up some of these defective enzymes. By adding vitamins and minerals to your body, you could be stabilizing the mutant enzymes in your body.

Of course, everyone is different, and the generic vitamins at the grocery store might not be tailored to your body's specific needs. Most experts believe that if you eat a healthy diet in the first place, you probably don't need to supplement it with extra nutrients.

Doctors do often advise women of child-bearing age to take folic acid (a form of folate), and many people don't get enough calcium. Rine looks to a future where you can be tested for your specific mutations and given the proper vitamins and minerals to fix your problems.



Rine says his research gives people the "good news in their personal **genome**." One day, your doctor may be able to tell you what extra nutrients you need to tune up your body before something goes wrong. ■

Definitions

Enzyme

A type of protein that does work around the cell.

Genes

Stretches of DNA, a substance you inherit from your parents, that define characteristics like height and eye color, along with how likely you are to get certain diseases.

Genome

The set of all the genes in a person.

Mutation

A change in a DNA sequence.

Web Links

For links about personalized medicine, see this story online:

- <http://newsinhealth.nih.gov/2008/August/feature2.htm>



Wise Choices Healthy Eating Plan

Doctors may one day be able to tell you exactly what vitamins and minerals your body needs. Until then, it's best to eat a variety of nutrient-packed foods every day. According to the latest expert recommendations, a healthy eating plan is one that:

- Emphasizes fruits, vegetables, whole grains, and fat-free or low-fat milk and milk products.
- Includes lean meats, poultry, fish, beans, eggs and nuts.
- Is low in saturated fats, trans fats, cholesterol, salt (sodium) and added sugars.

Health Capsules

Wide Waists Boost Risk of Death

If you carry excess weight, you're more likely to have health problems. But even if your weight is in the normal range, your risk of death is still higher if your waist is wide, according to a new study.

Excess belly fat has been tied to medical troubles before. But it hadn't been entirely clear if extra weight, rather than waist size, was the main culprit.

To take a closer look, NIH researchers studied a large group of people. They looked at weight, height and waist measurements from almost 155,000 men and over 90,000 women who were 51–72 years old at the beginning of the study.

During the 9-year study, the

scientists found that people with the largest waist measurements had a significantly greater risk of dying than those with smaller waists. This was true whether or not the people were smokers or had a long-term illness, and regardless of their ethnic or racial groups.



Web Links

For links about the topics in these stories, visit this Health Capsules page online:

- <http://newsinhealth.nih.gov/2008/August/capsules.htm>

The researchers were also able to tease apart the effects of weight vs. waist size. When they looked at people who had normal weights for their heights, those with large waist measurements—40 inches or more for men; 35 inches or more for women—had about a 20% greater risk of dying than those whose waists were in the normal-size range.

“People not only should look at their weight but also consider their waist,” said lead researcher Dr. Annemarie Koster of NIH’s National Institute on Aging. If you have a large waist, health experts recommend that you talk to your doctor about losing weight and increasing your physical activity. ■

Online Care Helps Control Blood Pressure

Patients with high blood pressure, or hypertension, could better control their condition when they interacted twice a month with an online pharmacist. The new research suggests that Web-based tools may help people take a more active role in their own medical care.

Doctors and many patients know that better blood pressure control can reduce the risk of heart disease, stroke and kidney disease. But only about 1 in 3 patients with hypertension keep their blood pressure readings below target levels.

NIH-funded researchers tested whether Web-based tools might help patients control their hypertension. The team looked at over 700 patients, ages 27–75, whose blood pressure stayed high even though they received medications.

The patients were randomly assigned to 3 different groups. One received standard medical care. Another received a home blood

pressure monitor and instructions for using a health Web site. The third group received the same as the other 2, plus private Web interactions with a clinical pharmacist every 2 weeks. The pharmacists could adjust the patients’ medications and doses.

After 1 year of treatment, more than half of the patients interacting with the online pharmacist achieved their target blood pressure readings. By comparison, about one-third of those in the other 2 groups reached that level of blood pressure control.

The scientists say that regular communications with a medical expert and fine-tuning of medications seemed to be key to the success of the online pharmacist. Web-based care might be especially helpful to patients who have difficulty traveling for clinic visits.

The researchers now plan to explore whether the strategy might prove helpful for treating other long-term diseases. ■



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