

## Preventing a Pandemic

### Preparing for the Next Deadly Flu Outbreak

Researchers are racing to prevent the next deadly flu outbreak. Outbreaks in 1918, 1957 and 1968 killed millions worldwide. No one knows how fatal the next one could be, so researchers are taking as many different approaches as they can to prepare us to fight it if it comes.

Seasonal flu, or influenza, viruses change slightly over time, allowing the virus to evade our **immune systems**. That's why there's a new sea-

Every so often, a flu virus emerges that's so different, human immune systems aren't at all prepared to fight it. Historically, they've infected people by "jumping" from animals, most commonly birds. People can become infected when they're in close contact with infected birds, such as while slaughtering or preparing poultry, drinking water contaminated with droppings of infected birds or when they allow infected birds to roam freely in their living areas. Animal and human viruses can also mix in the body when someone's infected with both to produce other new viruses.

You've probably heard about a class of bird, or avian, flu viruses called H5N1. "H" and "N" stand for particular proteins on the surface of the influenza virus that change frequently. H5N1 viruses have infected birds throughout Southeast Asia and are now spreading into Central Asia, Africa and Europe. When people

have become infected, the results have often been fatal. By December 2006, the World Health Organization confirmed over 250 human cases of H5N1 and more than 150 deaths.

So far, these viruses haven't been able to move easily between people, but that could change. Dr. Jeffery Taubenberger of the Laboratory of Infectious Diseases at NIH warned at a recent talk, "If this virus were to



### Definitions

#### Immune System

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

#### Pandemic

An outbreak of disease that spreads to people in many different parts of the world.

acquire the ability to become human-adapted and efficiently transmissible, it would very likely cause a big **pandemic**."

Since we can't predict when the next influenza pandemic will occur or which strain of the virus will cause it, NIH's National Institute of Allergy and Infectious Diseases (NIAID) is funding many different approaches to get us ready.

If health officials could quickly figure out which flu virus they're dealing with, they would have a better chance of preventing a pandemic. A good diagnostic test would allow a doctor to distinguish between a routine case of seasonal flu and avian flu. That's why researchers have been working hard to develop a test that would allow labs across the country to rapidly diagnose flu infections.

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sonal flu shot every year: to protect you from the newest strains, or varieties, of virus. Healthy people, even if they don't get a flu shot, aren't usually seriously threatened by seasonal flu. But it can be severe for the very young, the elderly and those with a weakened immune system. Seasonal flu causes 36,000 deaths and more than 200,000 hospitalizations every year in the U.S.

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[www3.niaid.nih.gov/news/focuson/flu](http://www3.niaid.nih.gov/news/focuson/flu)

[www.PandemicFlu.gov](http://www.PandemicFlu.gov)

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This summer, NIAID-funded scientists from the University of Colorado worked with the Centers for Disease Control and Prevention to develop a test called the FluChip. It can distinguish among several seasonal and avian flu strains in less than 12 hours. More recently, the same team developed the MChip, a simplified test that distinguishes among flu strains by focusing on the "M" virus protein, which doesn't change as often as the H and N proteins. Plans are now under way to commercialize the MChip.

When it comes to fighting a pandemic, the first thing that may come to mind is a vaccine. Results from earlier this year show that researchers may be on the path to developing a vaccine to protect people.

Researchers supported by NIAID designed an experimental vaccine based on an H5N1 virus originally isolated in Southeast Asia in 2004. In a series of studies, they gave people different doses of the vaccine and tested to see how much **antibody**, a virus-fighting molecule, their bodies made. They found that the higher the dose of vaccine people received, the more antibodies they produced. Researchers are continuing to improve on this vaccine and are now testing it in children and the elderly.

Several ways to make more effective avian flu vaccines are being tested. One method is to use immune-boosting compounds called adjuvants. Back in 2004, NIAID asked Novartis Vaccines and Diagnostics to use an adjuvant to produce a vaccine



## Definitions

### Antibody

A virus-fighting molecule made by the immune system.

against H9N2, an avian flu that infected two children in Hong Kong in 1999. In a preliminary trial, the vaccine with adjuvant raised antibody levels to ranges that may be able to protect people against infection.

Researchers are also making progress using animals to test new strategies. In a study done under an agreement between NIAID's Laboratory of Infectious Diseases and Med-Immune Inc., researchers showed that a vaccine based on one strain of H5N1 could protect mice and ferrets from infection by several naturally occurring H5N1 viruses. That's promising news for researchers hoping to develop a vaccine against unforeseen H5N1 strains. A preliminary trial was launched last June to start testing a similar vaccine in humans.

Other ways to combat flu viruses are being explored, too. Researchers are testing many compounds designed to slow the spread of avian flu viruses within the body once a person's been infected.

A better understanding of a virus that caused a past pandemic has recently given researchers ideas about another possible way to fight flu. A study of mice infected by the virus that caused the 1918 pandemic showed that the virus provoked their immune systems to overreact. That may be why the virus was so fatal to humans. So, in addition to developing methods to target the viruses themselves, researchers may be able to develop ways to dampen the human immune system's response to an infection.

Researchers continue to work on these and other approaches to fighting influenza. Experts don't know when or where a deadly new flu might emerge, but they hope the tools being developed now will prevent another pandemic and help us fight one if it does occur. ■



## Wise Choices Avoid the Flu

- Get a yearly flu vaccine if your doctor recommends it. But keep in mind that the vaccines currently available don't protect you from bird (avian) flu.
- Stay home when you're sick and avoid contact with others who appear to be sick.
- Wash your hands before eating and before touching your eyes, nose or mouth.
- If you travel anywhere that bird flu has been found, use caution when handling and cooking poultry, as it may be infected. If you interact with any birds while in these countries, wash your hands and clean the bottom of your shoes or any other items that may have been in contact with birds or bird droppings.

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# Learn the AIDS Link

## Drugs Can Give You More Than a High

Most people know that drug abuse is linked to AIDS. Less understood is why they're linked. The "high" that people get from drugs may alter their judgment and lead them to take risks they normally would not take—including having unprotected sex.

HIV, or human immunodeficiency virus, attacks the body's disease-fighting (immune) system. If the virus overwhelms the immune system, you can no longer fight off disease. When this happens, it's called acquired immune deficiency syndrome, or AIDS. The only sure way to prevent AIDS is to avoid becoming infected with HIV.

A large body of drug abuse research shows that drugs of abuse, including marijuana, cocaine, methamphetamine and "ecstasy," affect areas of the brain that control decision-making. Engaging in risky behavior puts young people in real danger of becoming infected with HIV.

"In recent years, the number of young people in the U.S. diagnosed with AIDS rose substantially," said Dr. Nora Volkow, director of NIH's National Institute on Drug Abuse (NIDA). "And because drug use encourages risky behaviors that can promote HIV transmission, NIDA views drug abuse treatment as essential HIV prevention."

Thousands of teenagers now have AIDS, according to the Centers for Disease Control and Prevention. And while in earlier years, most reported adolescent AIDS cases were in males, the number of female



AIDS cases is now nearly equal with males. Among women diagnosed in 2004, roughly 7 out of 10 got the disease from having sex with infected male partners.

Minority populations are also at risk for drug abuse and HIV. For example, black and Hispanic women made up only 25% of all U.S. women in 2004, yet they accounted for around 80% of AIDS cases diagnosed in women that year. In fact, African Americans, who make up just 13% of the population, accounted for approximately half of the total AIDS cases diagnosed in 2004.

That's why NIDA, together with its partners, is working to get teens, women and young adults to understand the link between drug abuse and HIV/AIDS. Learn the link and, if you have teenagers, talk to them about the link.

Seeking medical treatment as soon as possible after becoming infected with HIV is critical. If you think you may be at risk for HIV, through drug use or sexual behavior, get tested for the virus. ■



[hiv.drugabuse.gov](http://hiv.drugabuse.gov), or 1-800-729-6686

[www.niaid.nih.gov/factsheets/hivinf.htm](http://www.niaid.nih.gov/factsheets/hivinf.htm)



### Wise Choices Protect Yourself From HIV

- Don't share needles, syringes or other equipment used to inject drugs, steroids, vitamins or for tattooing or body piercing.
  - Abstain from sexual intercourse or stay in a long-term relationship with a partner who has been tested and you know is not infected. The more sex partners you have, the greater your chances are of getting HIV or other diseases passed through sex.
  - Correct and consistent use of the male latex condom can
- reduce the risk of disease transmission through sex. However, no protective method is 100% effective. Condom use cannot guarantee protection against sexually transmitted disease.
  - Don't share razors or toothbrushes because of the possibility of contact with blood.
  - If you are pregnant or think you might be soon, talk to a doctor or your local health department about being tested for HIV. If you have the virus, drug treatments are available to help you reduce the chance of passing HIV to your baby.

—Adapted from material from the U.S. Centers for Disease Control and Prevention

## Health Capsules

### Late Angioplasty After a Heart Attack

Doctors recommend that people who have heart attacks receive treatment to open their blocked **arteries** within 12 hours after an attack. Even past those 12 hours, though, a procedure to open blocked arteries called **angioplasty** was thought to prevent future heart problems. A new study, however, found that stable patients getting late angioplasty did no better than patients on drug therapy alone.

Each year, about a million people in the U.S. have a heart attack and half of them die. The NIH-funded Occluded Artery Trial sought to find out whether it really helped stable patients to perform angioplasty 3-28 days after a heart attack in a totally blocked coronary artery related to the heart attack.

A total of 2,166 patients were randomly assigned to receive drug therapy or routine angioplasty with

stenting (placing a metal mesh tube in the artery to keep it open) along with drug therapy. The trial found no significant difference between the groups over an average of 3 years and up to 5. There was a trend toward more heart attacks in the angioplasty group but it was not statistically significant. The patients will need to be followed for longer to see if any significant trends emerge.

"These results challenge the long-standing belief that opening a blocked artery is always good," said NHLBI director Dr. Elizabeth G. Nabel. The late opening of a coronary artery involved in a heart attack should be reserved only for certain patients, the researchers say, such as those



[www.nhlbi.nih.gov/actintime/index.htm](http://www.nhlbi.nih.gov/actintime/index.htm)

who are unstable or continue to have chest pain after a heart attack.

If you think you're having a heart attack, this study shows how important it is to seek care as soon as possible. But don't forget that controlling the risk factors for heart disease—such as high cholesterol and high blood pressure—is your first line of defense against heart attacks. ■



#### Definitions

##### Angioplasty

Procedure in which a thin tube with a balloon or other device on the end is threaded through a blood vessel to the site of a narrow or blocked artery. The balloon is then inflated to widen the artery and restore the flow of blood.

##### Arteries

The tubes that carry blood from the heart throughout the body.

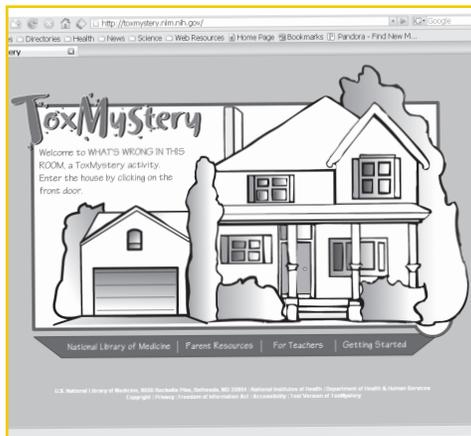


#### Featured Web Site ToxMystery

[toxmystery.nlm.nih.gov](http://toxmystery.nlm.nih.gov)

ToxMystery is an interactive learning site for kids in the 7- to 10-year old range. Using a fun, game-like experience, it gives kids an introduction to some of the potential environmental health hazards in the home.

*From NIH's National Library of Medicine*



### Longer Life, for Mice

Resveratrol, a compound found in grapes, wines and nuts, was all over the news recently. Overweight aged male mice whose high-calorie diet was supplemented with resveratrol were healthier and lived longer than mice eating the same diet without the supplement. As with many promising compounds researchers have studied in the past, however, it's best to be cautious about what resveratrol will be able to do for people.

Resveratrol is a small molecule produced by some plants in response to stress. Studies over the last few years have found that it can extend the lifespan of yeast, worms, flies and fish. Researchers funded partly by NIH set out to study the compound in mice, which are often used for experiments before testing in people.

The researchers placed year-old

mice (considered middle-aged) on three different diets: a standard mouse diet, a high-fat, high-calorie diet and a high-fat, high-calorie diet supplemented with resveratrol. By 114 weeks (old age for a mouse), 58% of the high-calorie mice had died. However, only 42% of the mice eating the same high-calorie diet with resveratrol had died, similar to that of the mice eating the standard diet.

Resveratrol didn't cause a significant reduction in body weight, but it still produced several changes linked with better health and longer life, such as lower blood levels of several factors that, in humans, predict the onset of diabetes. There weren't any noticeable toxic effects.

However, it's important to keep in mind that this is a study of male mice. We still have much to learn about resveratrol's safety and effectiveness in humans. ■



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