

A close-up portrait of Senator Arlen Specter, smiling, wearing a dark suit, white shirt, and a patterned tie. The background is blurred.

# NIIH MedlinePlus<sup>®</sup>

Trusted Health Information  
from the National  
Institutes of Health

Summer 2008

the magazine

## It Hurts When I Walk!

Could peripheral  
arterial disease be  
your problem?

## 3 Ways to Keep Your Sight for Life

## An Athlete's Nightmare

Tears to the ACL

## 7 Steps to Food Safety

## Making Progress on

# Leukemia & Lymphoma

Medical research  
champion Senator  
Arlen Specter is  
beating his own  
lymphoma

# Health News for You & Yours

**O**n behalf of the Friends of the National Library of Medicine (FNLM), welcome to the Summer 2008 *NIH MedlinePlus* magazine. This issue, we focus on two common cancers, leukemia and lymphoma, including a personal interview with U.S. Senator Arlen Specter on his battle with lymphoma.

You will also find out how to protect your eyesight for life, learn about a little-known but dangerous circulatory condition called P.A.D. (peripheral arterial disease), and read the latest on understanding and avoiding the knee condition called anterior cruciate ligament (ACL) tear (what Tiger Woods has). And we offer a practical guide to clinical trials: what they are, what to expect, and how to participate.

In a special photo feature, you will meet some of the people who are working to improve health care across the United States, including U.S. Senator Tom Harkin. For more than 20 years, Sen. Harkin, an Iowa Democrat, and Sen. Specter, a Pennsylvania Republican, have worked together to spearhead support for the National Institutes of Health (NIH).

We take pride in bringing you the most up-to-date, trustworthy information to keep you and your loved ones healthy. And we invite you to help us make sure that this magazine reaches as many other Americans as possible.

To "help out for health," please contact the FNLM at the address below.

Sincerely,  
Paul G. Rogers, Chairman  
Friends of the National Library of Medicine



## Help Out for Health!

You can be a part of the Friends' mission to help educate the health, corporate, and public communities about NIH's many vital research initiatives.

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For more information, please visit [www.fnlm.org](http://www.fnlm.org) or call (202) 719-8094. Written correspondence may be sent to FNLM, 2801 M Street NW, Washington, DC 20007.

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Photo: Christopher Klose

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Photo: Ross Kinnaird/Getty Images

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# The Value of Medical Research



Photo: NIH

Get involved in good health, whether donating much-needed blood, as NIH Director Dr. Elias Zerhouni demonstrates here, with help from phlebotomist La'Tesha Harris, or participating in clinical trials to advance medical research.

**As director of the National Institutes of Health, Elias Zerhouni oversees the activities of the world's leading medical research organization.** He spoke with *NIH MedlinePlus'* Christopher Klose about the value of medical research and clinical trials.

## What does medical research mean to the average person?

**Dr. Zerhouni:** Medical research is the search for cures to illness and disease. It has been one of the most important human activities throughout history. But it is important to note that modern medical science, based on molecular biology, only began in earnest with the discovery of the structure of DNA in 1953.

## What was so important about the discovery of DNA?

**Dr. Zerhouni:** Until then, diseases were understood to be caused by external factors, such as germs. DNA told us we had to go in a completely different direction and understand the structure and function of biological molecules and the information they conveyed; to deal with the intrinsic biological pathways of human disease.

## Could you give an example of disease that is caused by internal factors?

**Dr. Zerhouni:** For more than a century, there was the theory that viruses cause cancer. Some, such as cervical cancer, are triggered or aggravated by viruses. But a great many others do not seem to be. What is clear is that "cancer" is a disease that expresses itself, always, by a tumor that grows and invades. With more than 200 types and subtypes known today, the research challenge is to understand and block all the pathways to cancer so that people don't end up in its irretrievable late stages.

## Where does medical research stand today?

**Dr. Zerhouni:** We are in the infancy of medical research. After 50 years of molecular biology and genetic research, we realize that you don't get to a disease through just one cause or abnormality. There may be multiple, interacting ones.

For example, when I became NIH Director (in 2002), I would receive a few reports each year that a certain gene or protein was involved in a particular disease. That happens every week now. The Cancer Genome Project just reported three new DNA abnormalities in glioblastoma, the brain cancer Senator Kennedy is fighting.

Discoveries like these are very important clues. Medical research is like a detective story, always searching for new leads to follow. It is very important to sustain medical research.

“Without scientific knowledge, it is hard to have a public health policy that makes sense.”

Most of us have heard about “clinical trials,” but don’t really understand them and where they fit into the research picture. Could you explain, please?

**Dr. Zerhouni:** Clinical trials involve the testing of new ideas with people. There are essentially two kinds, observational and interventional. Observational trials are designed to teach us something about why people get sick, especially to uncover the biomarkers of illness. The best example of this is the Framingham Heart Study, which has tracked four generations of families since 1948. It established the correlation between cholesterol—from a high-fat diet of milk, cheese, and meat (thought to be good for you)—and heart disease.

Back in the lab, to understand and try to prevent damage from cholesterol, researchers discovered an enzyme that is critical to its formation. They developed drugs to block the enzyme. Then they tested the drugs in interventional trials, which are meant to determine whether an experimental drug, treatment, or procedure works.

How trustworthy are clinical trials?

**Dr. Zerhouni:** The trials have to be very rigorous, very objective. That is why in the 1940s and 1950s, NIH implemented the double-blind, randomized, prospective trial. It remains the gold standard today. When you can demonstrate, in a statistically valid way, through a randomized trial, that the mortality rate from heart disease for X thousand people (treated with an experimental drug, for example) is Y percent lower than that of X thousand people who have not been treated with the drug, but with a placebo, you have conclusive medical proof.

As a public health institution, we want things to be based on strong scientific evidence. That is why we sometimes retest the validity of existing treatments, as we did with estrogen replacement therapy in post-menopausal women. It was believed to be a sort of cure-all to reduce heart disease, promote bone health, and keep women young. People weren’t happy with NIH for questioning such a long-held practice, but the results proved it was detrimental and has changed medical practice!

That is why we believe that when something is recommended to millions of people, it must be based on solid evidence.

Where does science enter into the debate over health care?

**Dr. Zerhouni:** Without scientific knowledge, it is hard to have a public health policy that makes sense. Fortunately, there is solid backing in Congress for science-based policy. It is a real tribute to Senator Specter and other champions in the House and Senate that they strongly support medical research, despite the fact there is no immediate political reward for doing so.

What’s been the payoff for the American taxpayer?

**Dr. Zerhouni:** With cardiovascular disease, the results have been extraordinary. Since 1970, we have reduced the mortality rate from cardiovascular disease by 70 percent, at an average cost of \$4 per person a year for cardiovascular research.

That’s quite a buy ...

**Dr. Zerhouni:** It’s a huge buy!

Have you ever participated in a research trial?

**Dr. Zerhouni:** I am part of an observational study with the NIH blood bank. They’re testing the metabolism of iron in both men and women, over time.

What is it like?

**Dr. Zerhouni:** There is something very altruistic about clinical trials. We tell people not to expect anything and that the trials could be risky, but the hope is that the results will be beneficial. And you know what? The great majority of people participate anyway. They say, “Even if it doesn’t help me, maybe it will benefit my children or grandchildren.”

A new law is about to require that the results of clinical trials be posted on the Internet. What impact will releasing this kind of information have?

**Dr. Zerhouni:** What you’re talking about is an information bank that’s going to be wider and more public in a way, but be more effective for researchers and the public. And there is a sacred trust here—the trust between scientists, patients and their doctors, industry, the public, and lawmakers—everyone involved. I think it’s important to have a very open, transparent world where that happens, to build the evidence that supports the trust.

So NIH is really a good place to come for results, isn’t it?

**Dr. Zerhouni:** I don’t know of any better. Thousands of years ago, people had sorcerers and witchcraft. Today, you have this marvelous institution.



# Clinical Trials Key to Medical Progress

## To Find Out More

To find out more about clinical trials and how to participate, go to:

- [www.clinicaltrials.gov](http://www.clinicaltrials.gov)
- [www.cancer.gov/search/clinicaltrials](http://www.cancer.gov/search/clinicaltrials) (Cancer studies)
- [www.childrenandclinicalstudies.nhlbi.nih.gov](http://www.childrenandclinicalstudies.nhlbi.nih.gov)  
(A Web site devoted to information about children and clinical trials, sponsored by the National Heart, Lung, and Blood Institute)

**Clinical trials are research studies** that test how well new medical approaches work in people. Each study answers scientific questions and tries to find better ways to prevent, screen for, diagnose, or treat a disease. Clinical trials may also compare a new treatment to a treatment that is already available.

**T**here are two basic kinds of trials: observational and interventional. An observational study is done to find out what causes a human health condition or disease. A famous example is the Framingham Heart Study. Since 1948, researchers have followed four generations of family members in Framingham, Massachusetts, to see what affects their hearts. Some of the key findings, which we now take for granted, are that high blood pressure, high-fat diets, and smoking are not good for the heart. An interventional study tries to find ways to treat or prevent a specific condition or disease. For example, researchers may test different drugs to control high blood pressure. There are clinical trials going on all the time in nearly every area of medical research.

People who take part in clinical trials hope to benefit in some way. They may welcome the chance to play a more active role in their own health care. They may gain access to new treatments before they are widely available, or help others by contributing to medical research.

The latest, most complete information about clinical trials is available at the ClinicalTrials.gov Web site. This is a free, confidential online resource from the National Institutes of Health (NIH). Anyone with a computer and Web browser can use the site to find complete listings of clinical studies in the United States and abroad.

### Using ClinicalTrials.gov

After you enter the ClinicalTrials.gov Web site, you can search for a trial by the name of the disease, the location of the study, the type of treatment, or the sponsoring institution. The results show you what studies are under way and whether a trial is seeking volunteers. They also tell you the purpose of the study, where and when it will take place, and whom to contact for more information.

“From the very beginning, ClinicalTrials.gov has been designed for use by patients,” says Donald Lindberg, M.D., director of the National Library of Medicine (NLM), which manages the Web site. “With patients taking an increasingly active role in their own health care, they now have a chance to learn more about clinical studies on everything from Alzheimer’s disease to zinc supplements. Without question, it has helped medical investigators with their research recruiting efforts, too.”

Launched in February 2000, ClinicalTrials.gov currently contains information on more than 27,000 trials. The site is very popular with the public. Over 20,000 people visit the site each

day, and there are about 8 million page views monthly. The site is updated daily with new information.

ClinicalTrials.gov has many helpful consumer features. If you are interested in breast cancer trials, for example, the site also links you to NLM’s MedlinePlus ([www.medlineplus.gov](http://www.medlineplus.gov)), where you will find in-depth information, including recent news articles and an interactive tutorial on the topic. It also links to NLM’s Genetics Home Reference site ([www.ghr.nlm.nih.gov](http://www.ghr.nlm.nih.gov)) to help you understand genetic factors that can increase the incidence of breast cancer. Also, it lets you search medical journal references via NLM’s PubMed ([www.pubmed.gov](http://www.pubmed.gov)), and it links to the National Cancer Institute ([www.cancer.gov](http://www.cancer.gov)), the lead NIH institute on this particular topic.

**“ClinicalTrials.gov is a powerful tool for the health care consumer, and it has untold benefits for the public health, too.”**

— National Library of Medicine Director Donald A. B. Lindberg, M.D.

“It’s really one-stop shopping,” says Dr. Lindberg. “It lets people dig deeper for information on their disease or

condition. ClinicalTrials.gov is a powerful tool for the health care consumer, and it has untold benefits for the public health, too.”

### How to Participate

A variety of federal agencies sponsor clinical trials, including the NIH, the Department of Defense (DOD), and the Department of Veterans Affairs (VA). In addition, medical institutions and pharmaceutical companies also conduct trials.

## No More Hand-Me-Downs: Research Designed for Children

Children are not “little adults” when it comes to treating their health problems. They need medicines, devices, and treatments designed especially for their developing brains and bodies. And clinical research is the best way to find out which therapies work best for children.



Have you ever questioned why research is done in children? A new NIH Web site discusses why research in children is important, what happens during a study, safety measures, and other important information. Join experts, parents, and children themselves as they talk about their experiences with clinical research at [www.ChildrenandClinicalStudies.nhlbi.nih.gov](http://www.ChildrenandClinicalStudies.nhlbi.nih.gov)

# Senator Arlen Specter: Backing Medical Research and Battling Lymphoma

## Fast Facts

- Leukemia is a cancer of the white blood cells that develops in the bone marrow.
- Acute Lymphoblastic Leukemia (ALL) is a cancer of the white blood cells. It is the most common cancer in children, representing 23 percent of all cancers among those 15 or younger. Today, up to 90 percent of children in the United States with ALL are cured.
- Lymphoma is a cancer of the white blood cells, especially the lymph nodes and spleen. It is the most common type of blood cancer in the United States.
- There are at least 60 different types of lymphoma.

While Sen. Arlen Specter was receiving chemotherapy treatments during the summer, he began using an elbow bump, instead of a handshake, since his immune system was weakened. Here, Sen. Elizabeth Dole, R-N.C., holds up her elbow to receive an incoming elbow bump.



Photo: Roll/Call/Newscom

Since first being elected to the United States Senate in 1980, Arlen Specter has served five terms, making him the longest-serving U.S. Senator in Pennsylvania's history. Sen. Specter has also been a long-time supporter and proponent of medical research. Recently, he underwent his second round of chemotherapy to stop the recurrence of a form of lymphoma. But he hasn't let cancer slow him down. He recently spoke to *NIH MedlinePlus* magazine about the importance of medical research and his own experience in fighting cancer.

**MedlinePlus:** You have been a champion for medical research and NIH for decades. Why have you made this such a priority?

**Specter:** Health is our nation's number one asset. Without your health, you can't do anything. I believe medical research should be pursued with all possible haste to cure the diseases and maladies affecting Americans. I have said many times that the NIH is the crown jewel of the federal government—perhaps the only jewel of the federal government.

**MedlinePlus:** Is there an accomplishment you are most proud of in this area of your public service?

**Specter:** When I came to the Senate in 1981, NIH spending totaled \$3.6 billion. Senator Tom Harkin, a Democrat, and I, a Republican, have worked very hard to increase funding to the National Institutes of Health. Now NIH receives \$29 billion to fund its life-saving research. The investment in NIH has spawned revolutionary advances in our knowledge and treatment for cancer, Alzheimer's disease, Parkinson's disease, mental illnesses, diabetes, osteoporosis, heart disease, ALS, and many diseases. It is clear that Congress' commitment to the NIH is paying off. It is also clear to me that we need to do more.

**MedlinePlus:** Does medical research have a role to play in health care reform efforts by Congress?

**Specter:** In 1970, President Nixon declared war on cancer. Had that war been prosecuted with the same diligence as other wars, my former chief of staff, Carey Lackman, a beautiful lady of 48, would not have died of breast cancer. One of my very best friends, a distinguished federal judge, Chief Judge Edward R. Becker,



would not have died of prostate cancer. All of us know people who have been stricken by cancer or other maladies.

This is the time to seize the scientific opportunities that lie before us, and to ensure that all avenues of research toward cures—including stem cell research—are open for investigation.

**MedlinePlus:** What were your first thoughts when you were told you had Hodgkin's? How did this compare to when you learned that it was back?

**Specter:** It was a tremendous shock. I wondered if I would survive, if I'd be able to do my job. I immediately told my constituents, and I tried to be upbeat. I said that I'd beaten two brain tumors, a double bypass surgery, a lot of tough political opponents, and I was going to beat this, too.

The second time I was surprised by the PET scan findings because I had been feeling so good, maintaining a rigorous Senate schedule, and playing my daily squash game. I chose to consider it just another bump on the road to a successful recovery from Hodgkin's, from which I'd been symptom free for three years—and I have good shock absorbers.

It was very, very tough. Chemotherapy is a very debilitating formula, but I just made up my mind. I had to drag myself out of bed and go to work.

**MedlinePlus:** You have a terrific new book out, *Never Give In: Battling Cancer in the Senate*. What is your advice to others diagnosed with serious illness?

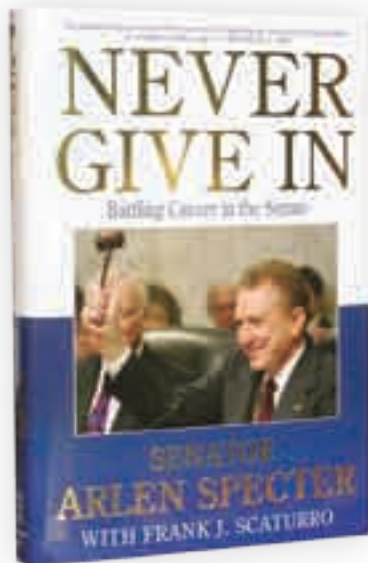
**Specter:** I wrote the book because I want people to know that they can fight serious illness. There are some limits as to what people can do physically, but when it comes to determination, to a mind-set, I think a lot can be done if you just are determined to do it. Mental attitude is critical. Having said that, the practical advice I would give is to:

- acknowledge your illness and move on
- organize and focus your psychological strength to face your medical issue
- as much as possible, maintain regular work and exercise
- supplement your doctor's advice by learning as much as you can about your medical condition
- listen to your body
- keep busy and never give in!

**MedlinePlus:** Do you have any other thoughts for our readers?

**Specter:** Doctor's orders prohibit me from shaking hands while my immune system is down. It's kind of tough for a guy in my line of work not to shake hands so I do the elbow-bump so that I don't violate doctor's orders. It keeps me away from something possibly contagious. It's not quite the same as shaking hands, but people understand.

Now I find there's more interest in my hairdo than in my public policy. For example, I get letters saying I ought to wear a wig. I have people saying I ought to shave my head and become a sex symbol, but I don't do that for two reasons: one, my wife objects, and secondly, I'm not qualified.



In his recent memoir, Sen. Arlen Specter offers encouragement to those faced with serious illness.

# Leukemia & Lymphoma

**M**ost cancers are named for where they start. For example, lung cancer starts in the lung, and breast cancer starts in the breast. Leukemia and lymphoma are named for parts of your blood and lymphatic systems.

## Leukemia

Leukemia is a cancer of the white blood cells. White blood cells help your body fight infection. Your blood cells form in your bone marrow. In leukemia, however, the bone marrow produces abnormal white blood cells. These cells crowd out the healthy blood cells, making it hard for blood to do its work.

Leukemia can develop quickly or slowly. Chronic leukemia grows slowly. In acute leukemia, the cells are very abnormal and their number increases rapidly. Adult acute leukemia can often be cured. Treatments may include chemotherapy, radiation, and stem cell transplantation. Even if symptoms disappear, you might need therapy to prevent a relapse.

## Lymphoma

Lymphoma is a cancer of the white blood cells, especially in the lymph nodes and spleen. There are many types of lymphoma. One type is called Hodgkin's disease, which is marked by the presence of a special type of cell called the Reed-Sternberg cell. The rest are called non-Hodgkin's lymphoma. Non-Hodgkin's lymphomas begin when a type of white blood cell, called a T cell or B cell, becomes abnormal. The cell divides again and again, making more and more abnormal cells. These abnormal cells can spread to almost any other part of the body.

Non-Hodgkin lymphomas can have an indolent (slow-growing) course or an aggressive (fast-growing) course. These subtypes behave and respond to treatment differently. Both Hodgkin and non-Hodgkin lymphomas can occur in children and adults, and treatment and outcome depend on the stage and the type of cancer.

## Cancer Strikes Out!



Photo: Getty Images

**Boston Red Sox pitcher Jon Lester came back from successful treatment for lymphoma in 2006 to pitch a no-hitter against the Kansas City Royals on May 19, 2008. Lester had been diagnosed in 2006 with a form of non-Hodgkin's lymphoma called anaplastic large cell lymphoma (ALCL). After undergoing four rounds of chemotherapy at Massachusetts General Hospital, the pitcher was found to be cancer-free and reported to Major League Baseball spring training in 2007.**

## Leukemia-Lymphoma Glossary

**B-cell:** A white blood cell that comes from bone marrow. As part of the immune system, B cells make antibodies and help fight infections. Also called B lymphocyte.

**T-cell:** One type of white blood cell that attacks virus-infected cells, foreign cells, and cancer cells. T cells also produce a number of substances that regulate the immune response. Also called T lymphocyte.

**Hodgkin's lymphoma:** A cancer of the immune system that is marked by the presence of a type of cell called the Reed-Sternberg cell. In 2007, more than 8,000 new cases of Hodgkin's lymphoma were diagnosed and 1,350 adults died from the cancer.

**Non-Hodgkin's lymphoma:** Any of a large group of cancers of the immune system. There are many different types of non-Hodgkin's lymphoma, which can be divided into aggressive (fast-growing) and indolent (slow-growing) types and can be classified as either B-cell or T-cell non-Hodgkin's lymphoma. More than 66,000 adults were diagnosed with non-Hodgkin's lymphoma in 2007. During the same time, 19,160 adults died from the disease.

**Leukemia:** Cancer that starts in blood-forming tissue such as the bone marrow and causes large numbers of blood cells to be produced and enter the bloodstream. In 2007, there were 44,270 new adult cases of leukemia and more than 21,500 leukemia patients died.

## The 4 Common Types of Leukemia:

- **Chronic lymphocytic leukemia** (or chronic lymphoblastic leukemia, CLL) accounts for about 7,000 new cases of leukemia each year. Most often, people diagnosed with the disease are over age 55. It almost never affects children.
- **Acute lymphocytic leukemia** (or acute lymphoblastic leukemia, ALL) accounts for about 3,800 new cases of leukemia each year. It is the most common type of leukemia in young children. It also affects adults.
- **Chronic myeloid leukemia** (or chronic myelogenous leukemia, CML) accounts for about 4,400 new cases of leukemia each year. It affects mainly adults.
- **Acute myeloid leukemia** (or acute myelogenous leukemia, AML) accounts for about 10,600 new cases of leukemia each year. It occurs in both adults and children.

—Source: NIH

(For latest developments in treatment, see page 11.)

# “This is an exciting time in the treatment of lymphoma.”

The National Cancer Institute's Dr. Wyndham Wilson and a team of colleagues are discovering complexities of lymphoma that may help lead to cures.

**W**yndham Wilson, M.D., Ph.D., has seen a lot in the war on cancer. For 25 years, the lymphoma specialist at the National Cancer Institute (NCI) has cared for lymphoma sufferers, tailoring treatments to each patient's cancer. He also served as a consultant for Sen. Arlen Specter in his fight against lymphoma. (See interview with Sen. Specter on page 6.)

A decade ago, he teamed with two other NCI scientists to advance the treatments, strategies, and therapies used to combat the devastating disease. He is head of the Lymphoma Therapeutics Section of the Center for Cancer Research (CCR) Metabolism Branch. His NCI research partners are Elaine S. Jaffe, M.D., and Louis Staudt, M.D., Ph.D.

“The partnership is very strong because we're very different,” says Dr. Staudt. “I'm a dyed-in-the-wool molecular biologist. A decade ago, I started reading about lymphoma. It seemed to be crying out for some molecular insights.”

## Classifying the Danger

First described by Thomas Hodgkin in 1832, lymphoma is the most common type of blood cancer in the United States. The disease forms when infection-fighting cells in blood grow out of control. These diseased cells spread through vessels called lymph nodes. For decades, the scientific community believed there were only a few types of lymphoma. They appeared to differ by the size of the cells and if the cells clumped together. Doctors were baffled why patients who seemed to have the same type of cancer under the microscope responded differently to similar treatments.

## “We have to be very creative and careful to prioritize drugs and to test them to see which works best where.”

The genius of the three NCI colleagues combined to solve the mystery and create a new way to classify lymphomas. Now, the medical world has a much clearer understanding of the complexity of lymphoma.

“We now know that there are many different types of lymphoma,” says Dr. Wilson. “Currently, we have identified about 60 different types. Putting lymphomas into reasonable groups has been at the core of diagnosis and optimal treatment. On a global level, the classification system has been our most important

Dear Dr. Wilson,

*I am writing to express our family's deepest and heartfelt appreciation for the life-saving care you and your team provided for our son, Patrick ...*

*I don't know how widely it is known that you save lives at the National Cancer Institute—offering hope and treatment to people like Patrick who have run out of options. I will never forget what it was like to have you and Dr. Jaffe respond with such compassionate expertise to our desperate call for help. Were it not for the quick action you took in diagnosing and then treating his PCNS Lymphoma, Patrick would not now be rebuilding his life with a healthy future ahead of him.*

*With heartfelt thanksgiving,  
Tim*

advance in lymphoma research.”

Lymphomas are now classified by the way abnormal molecules within cancer cells control their survival and the way they multiply. This helps determine the kind of treatment a patient will receive and provides insight into how the patient is responding to therapy.

## Knowledge is the Best Medicine

To decide the best course of action for a patient, Dr. Wilson continues to rely on his colleagues in the lab. He sends samples of diseased cells to the CCR lab to be analyzed. This helps him choose the best medication for each patient, indicates the best time for treatments, and sheds light on the patient's response.

According to Dr. Wilson, this type of medical research bridges the gap between medical professionals and basic scientific research conducted in a lab. “These types of ‘translational studies’ help us to select very thoughtfully chosen, targeted, designer drugs. We have to be very creative and careful to prioritize drugs and to test them to see which works best where,” he says. “This is an exciting time in the treatment of lymphoma.”

# Curing Children's Cancer

Story and photos by Christopher Klose

**M**adelen Hernandez-Garcia is four years old. Her smile is irresistible. She loves Doritos, strawberry yogurt, and all things pink. And she misses her 7-year old brother Hendrid, back home in Guatemala.

Since last December, she's been treated for Acute Lymphoblastic Leukemia (ALL) at the NIH Clinical Center. ALL is a cancer of the white blood cells, which fight infection. It is the most common



Dr. Alan S. Wayne and Madelen test the friendly waters of an NIH fountain.

cancer in children, representing 23 percent of all cancers among those 15 or younger.

Forty years ago, ALL was incurable. Today, in the United States, its cure rate is a major success story—as many as 90 percent of the kids who have it are cured. But worldwide, ALL remains the leading cancer-killer of children.

“Madelen has the riskiest type of ALL. She needed more aggressive therapy than she could get at home,” explains her doctor, Alan S. Wayne, M.D. He heads the Hematologic Diseases Section of the Pediatric Oncology Branch of the National Cancer Institute (NCI).

In January, Dr. Wayne transplanted bone marrow donated by Hendrid into Madelen, after chemotherapy. Her parents, father José and mother Julia, say, “Nobody wants to be in this situation. She’s suffered a lot but everything’s going well.”

But Dr. Wayne calls transplants a blunt, toxic tool for fragile young children. “They represent a cutting edge treatment for

high-risk leukemias, like Madelen’s. But developments have not been fast enough to rescue all the kids who need it. They are not available in most of the world and, for people without medical insurance, are too expensive.”

Son of a Cincinnati doctor, Dr. Wayne “inherited the family business”—“a passion for people and medicine.” His ultimate goal: “To develop a targeted, less damaging therapy that harnesses the immune system of healthy siblings.” In lay terms? To make transplants safer and more successful through tumor vaccines.

## Madelen's Song of Help

Madelen makes friends easily, even with the shyest kids. They love to play together at The Children's Inn at NIH, where they stay when being treated.

Often the kids are in pain. Madelen made up a little song to help.

“Kids should sing this song when they’re sick,” she whispers softly...

“God is with me.

Remember,

If your eyes hurt, or your feet hurt,

Don't worry,

God is with you.”



Madelen and friend share a quiet moment at The Children's Inn at NIH.

# Symptoms, Diagnosis & Treatment

## Leukemia

### Symptoms

- Frequent infections
- Fever and chills
- Anemia
- Easy bleeding or bruising
- Weakness and fatigue
- Weight loss
- Swollen or tender lymph nodes
- Petechiae, tiny red spots under the skin caused by abnormal bleeding
- Swollen or bleeding gums
- Sweating, especially at night
- Bone or joint pain

### Diagnosis

Your doctor will perform blood tests to see if you have leukemia. Examining the bone marrow under a microscope will tell what type of leukemia a patient has. Bone marrow is collected with a needle.

### Treatment

There are three types of standard treatment for leukemia: chemotherapy, radiation, and stem cell transplant.

- Chemotherapy uses drugs to stop the growth of cancer cells, either by killing the cells or by stopping them from dividing.
- Radiation therapy uses high-energy X-rays or other types of radiation to kill cancer cells or keep them from growing.
- Stem cell transplant replaces blood-forming cells destroyed by cancer treatment. Before treatment, stem cells (immature blood cells) are removed from the blood or bone marrow of the patient or a donor and are frozen and stored. After the chemotherapy is completed, the stored stem cells are thawed and given back to the patient. The stem cells grow into (and restore) the body's blood cells.

## Hodgkin's Lymphoma

### Symptoms

- Painless, swollen lymph nodes in the neck, underarm, or groin
- Fever for no known reason
- Drenching night sweats
- Weight loss for no known reason
- Itchy skin
- Feeling very tired

### Diagnosis

Your doctor will perform blood tests to determine if you have Hodgkin's lymphoma. You may also need a lymph node biopsy. This is the removal of all or part of a lymph node.

### Treatment

There are three types of standard treatment for leukemia: chemotherapy, radiation, and stem cell transplant.

## Non-Hodgkin's Lymphoma

### Symptoms

- Swollen, painless lymph nodes in the neck, armpits, or groin
- Unexplained weight loss
- Fever
- Soaking night sweats
- Coughing, trouble breathing or chest pain
- Weakness and tiredness that don't go away
- Pain, swelling, or a feeling of fullness in the abdomen

### Diagnosis

A lymph node biopsy is used to diagnose non-Hodgkin's lymphoma. Sometimes the diagnosis may be delayed because enlarged lymph nodes are more often caused by infections. Your doctor may wait a few weeks to see if the lymph nodes stay large. You may also get antibiotics to see if they cause the nodes to shrink.

### Treatment

Four types of treatment are standard for non-Hodgkin's lymphoma: radiation therapy, chemotherapy, biologic therapy, and watchful waiting. Biologic therapy uses the patient's immune system to fight cancer. This type of cancer treatment is also called biotherapy or immunotherapy.

- Watchful waiting is closely monitoring a patient's condition without giving any treatment until symptoms appear or change.

## Latest Treatment

Over the past 10 years, scientists have made major progress in treating leukemia and lymphoma. These advances include:

- Use of a single drug, Gleevec (imatinib mesylate), for treatment of chronic myeloid leukemia (CML). This drug is now the first choice for patients with newly diagnosed CML. It works by blocking an enzyme that causes development of more white blood cells than the body needs.
- Autologous stem cell infusion. This therapy uses cells from the patient's own bone marrow instead of from a related donor, such as a brother or sister, or a matched unrelated donor. This helps reduce adverse reactions.

## To Find Out More

For more information on leukemia and lymphoma, visit

- [www.cancer.gov](http://www.cancer.gov)
- [www.medlineplus.gov](http://www.medlineplus.gov)  
(type "leukemia" or "lymphoma" in the search box)

# How to Keep Your Sight for Life

**Most of us take our eyesight for granted—until it's threatened.** But there are steps you can take to make sure that your own eyes—and those of your loved ones—last a lifetime.

**M**ost Americans report that, of all disabilities, loss of eyesight would have the greatest impact on their daily life, according to a recent survey by the NIH's National Eye Institute (NEI). Vision loss ranks ahead of loss of memory, speech, arm or leg, and hearing. After all, 80 percent of the sensory information the brain receives comes from our eyes.

Still, it may be surprising to learn that losing eyesight is not a normal part of aging. What's more, the NEI reports that most cases of blindness can be prevented through early detection and treatment of eye diseases.

This year marks the 40th anniversary of the National Eye Institute (NEI). Its research and funding have helped prevent and treat eye diseases and vision disorders and enabled great strides in the understanding of eye health. Still, tens of millions of people of all ages suffer vision loss from very common, correctable conditions because they don't understand their own eyes.

Blindness or low vision affects 3.3 million Americans age 40 and over. That's one person in 28, according to one recent NEI-funded study. This figure is projected to reach 5.5 million by the year 2020. Low vision and blindness increase significantly with age, particularly in people over age 65. People 80 years of age and older currently make up 8 percent of the population, but account for 69 percent of blindness.

"As vision research advances, we are finding newer and better ways to detect and treat eye diseases," says NEI Director Paul A. Sieving, M.D., Ph.D. "Programs that educate people about early detection and treatment will become even more important."

## Understanding Your Vision: The "Imperfect Eye"



All photos and illustration: National Eye Institute, NIH

### Fast Facts

- **Most blindness is preventable through timely treatment.**
- **Protect your eyesight through regular eye exams, maintaining a healthy diet, and protecting your eyes at all ages.**
- **20/20 vision does not necessarily mean perfect vision. Overall visual ability also includes peripheral awareness (side vision), eye coordination, depth perception, focusing ability, and color vision.**
- **Common impairments to vision include near-sightedness, far-sightedness, age-related blurriness, and astigmatism.**
- **The leading causes of blindness are cataracts, glaucoma, macular degeneration, and diabetic retinopathy.**

Everyone's eyes are different and so are the types of vision that we have. Understanding how some of us see differently and how the eyes change over time, will help protect your vision.

### "Normal"

Normal vision, often called "20/20" vision, means that you can see clearly objects that are 20 feet away. However, 20/20 does not necessarily mean perfect vision. There are other important vision skills, including peripheral awareness (side vision), eye coordination, depth perception, focusing ability, and color vision that make up your overall visual ability.

### Nearsighted

If you are nearsighted—also called myopia—you can clearly see close objects, but distant ones are blurry. The more nearsighted, the blurrier your distance vision and the closer objects need to be to be seen clearly.

**Treatment** helps to focus light on the retina through the use of corrective lenses or "refractive" surgery.

- **Corrective lenses** include eyeglasses

**AMBLYOPIA:** Sometimes known as “lazy eye,” amblyopia is the most common cause of visual impairment among children. The condition affects about two-to-three out of every 100 children. Unless it is successfully treated in early childhood, amblyopia usually continues into adulthood, and is the most common cause of monocular (one-eye) visual impairment among children and young and middle-aged adults.

Helping kids overcome serious vision impairment is at the heart of the Pediatric Eye Disease Investigator Group (PEDIG), a collaborative multi-center network begun in 1997 and funded by NEI. It includes 120 researchers at 60 sites in the United States and Canada who clinically study amblyopia and other eye disorders of children.

Treating amblyopia involves making the child use the weaker of the two eyes by patching the stronger eye or using an eye drop called atropine to temporarily blur the vision in the stronger eye. Treatment, which may take weeks or months, stimulates vision in the weaker eye and helps the part of the brain that manages vision develop more completely. Nationwide studies conducted by PEDIG doctors have helped find ways to make amblyopia treatment as successful as possible and shown that many children ages 7 through 17 with amblyopia may benefit from treatments that are more commonly used on younger children.



and contact lenses, both of which come in a variety of styles and can correct a number of problems at once.

- **Refractive surgery** reshapes the curvature of the cornea and includes several types of laser surgery (such as LASIK) and regular surgery, including an implanted set of lenses.

“Keeping your eyes healthy means learning about them and the conditions for which you may be at risk.”

—Dr. Emily Chew,  
National Eye Institute

### Farsighted

If you are farsighted—have hyperopia—you can see distant objects clearly, but close ones are blurry. Farsightedness occurs when the eyeball is too short for light rays to focus clearly on the retina.

**Treatment** helps to focus the light through the use of corrective lenses or refractive surgery, as with nearsightedness. Most young people’s eyes are flexible enough to focus on nearby objects, so they don’t need corrective lenses. But by middle age, the natural lenses become less flexible. Corrective lenses, either eyeglasses or contacts, are necessary to improve vision at this point. Refractive surgery reshapes the curvature of the cornea with the same methods used for correcting nearsightedness. Conductive keratoplasty (CK), which uses radio-frequency energy to apply heat to tiny spots around the cornea, is an additional treatment.

### Astigmatism

If you have astigmatism, the cornea is more oval than round. This doesn’t allow the eye to focus clearly. Astigmatism is usually

accompanied by nearsightedness or farsightedness.

**Treatment** addresses the cornea’s uneven curvature through corrective lenses or refractive surgery. Orthokeratology, or Ortho-K, is also used to correct astigmatism. In this procedure, you wear rigid contacts for several hours a day until the curvature of the eye improves. After that, you wear the lenses less frequently to maintain the new shape. If you stop treatment, the eyes return to their former shape.

### Age-related Blurriness

Beginning at about age 40, most people have to begin holding the newspaper or their favorite book at arm’s length in order to see clearly. At the same time, they may still clearly see far away objects. This is a common age-related blurriness called presbyopia. This process actually begins around age 10, but vision changes aren’t noticeable until many years later.

**Treatment** is through corrective lenses or several of the refractive surgical procedures mentioned for nearsightedness and farsightedness.

## To Find Out More

**For more information on eye diseases and disorders and vision eye care resources, visit:**

- [www.nei.nih.gov](http://www.nei.nih.gov)
- [www.medlineplus.gov](http://www.medlineplus.gov) (type “eye” in the Search box)
- [www.nihseniorhealth.gov](http://www.nihseniorhealth.gov) (click on “Vision and Hearing”)

# Leading Causes of Blindness



### Cataracts

Cataracts are a clouding of the lenses in your eyes. They affect vision and are very common in older people. More than 22 million Americans have cataracts. They are the leading cause of blindness in the world. By age 80, more than half of all people in the United States either will have a cataract or have had cataract surgery.

Common symptoms are:

- Blurry vision
- Colors that seem faded
- Glare
- Not being able to see well at night
- Double vision
- Frequent prescription changes in your eye wear

**Treatment** with new glasses, brighter lighting, anti-glare sunglasses, or magnifying lenses can help at first. Surgery is also an option. It involves removing the cloudy lens and replacing it with an artificial lens. Wearing sunglasses and a hat with a brim to block ultraviolet sunlight may help to delay cataracts.

### Glaucoma

Glaucoma damages the eye's optic nerve and is a leading cause of blindness. It usually happens when the fluid pressure inside the eyes slowly rises, damaging the optic nerve. Often there are no symptoms at first, but a comprehensive eye exam can detect it. About 2.3 million Americans suffer from glaucoma. It is estimated

that an additional 2 million have the disease but don't know it.

Glaucoma is a leading cause of blindness among African Americans and Hispanics. African Americans experience glaucoma at a rate three times that of whites. They suffer blindness four times more frequently. Between the ages of 45 and 64, glaucoma is 15 times more likely to cause blindness in African Americans than in whites.

People at risk should get eye exams at least every two years, especially:

- African Americans over age 40
- People over age 60, especially Hispanics
- People with a family history of glaucoma

**Treatment** usually includes prescription eye drops and/or surgery. There is no "cure" for glaucoma. Early diagnosis and treatment can control glaucoma before vision loss or blindness occurs. New research is focusing not only on lowering pressure inside the eye, but also exploring medications to protect and preserve the optic nerve from the damage that causes vision loss. There has been progress in understanding the genetics of glaucoma in the last few years, including the discovery of genes found to be associated with many forms of glaucoma.



### Macular degeneration

Macular degeneration, often called age-related macular degeneration (AMD), is a leading cause of vision loss in Americans 60 and older. It is a disease that destroys the sharp, central vision needed to see objects clearly. This affects the ability to read, drive, watch television, and do routine daily tasks.

AMD affects the macula, the part of the eye that allows you to



see fine detail. It does not hurt, but causes cells in the macula to die. In some cases, AMD advances so slowly that people notice little change in vision. In others, the disease progresses faster and may lead to vision loss in both eyes. There are two kinds of AMD—wet and dry. Wet AMD occurs when abnormal blood vessels behind the retina start to grow under the macula. Dry AMD occurs when the light-sensitive cells in the macula slowly break down, gradually blurring central vision in the affected eye.

**Treatment:** Although there is no cure for AMD at this time, regular eye exams can detect the disease so treatment can be most effective. Findings from the NEI-supported Age-Related Eye Disease Study (AREDS) show that a specific combination of vitamins and minerals can help slow the progression of advanced AMD. Treatments for wet AMD include laser surgery, photodynamic therapy, and drugs injected into the eye. The



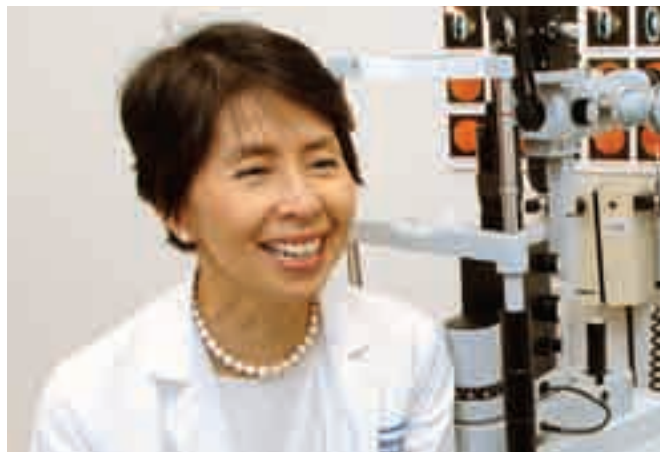
NEI recently started a clinical trial to compare the relative safety and effectiveness of two drugs currently used to treat wet AMD. The two drugs, which are injected into the eye, are Lucentis (ranibizumab) and Avastin (bevacizumab). NEI is also supporting AREDS2 to learn whether a modified combination of vitamins and minerals can further help people with AMD.

### Diabetic Retinopathy

Diabetic retinopathy is caused by diabetes. It affects the retina, the light-sensitive tissue at the back of the eye, and causes the most blindness in U.S. adults. It affects the vision of more than half of the 18 million people diagnosed with diabetes age 18 or older.

People with diabetes should have a complete eye exam through dilated pupils at least once a year.

**Treatment:** Diabetic retinopathy is treated with surgery or laser surgery. With timely treatment; adequate control of blood sugar, blood pressure, and cholesterol levels; and regular follow up, 90 percent of all cases of blindness from diabetes can be prevented.



## Eye Expert Dr. Emily Chew: 3 Ways to Keep Your Sight

“Keeping your eyes healthy means learning about them and the conditions for which you may be at risk,” says Emily Chew, M.D., deputy director of NEI’s Division of Epidemiology and Clinical Research. “Early detection and treatment are the keys to preventing vision loss. Remember, poor vision is not a normal part of aging.”

### *Get regular eye exams.*

One of the easiest ways to keep your eyes healthy is by getting a regular eye exam. Early detection and treatment are the keys to preventing vision loss. In fact, the eyes often show signs of other conditions, such as diabetes and high blood pressure, when no other symptoms are present. An eye care professional may be the first to identify one of these problems. If you are at higher risk for an eye disease, it is important to make sure you get an eye exam through dilated pupils. This allows your eye care provider to see more of the inside of your eyes to check for early signs of the disease. After the exam, your close-up vision may remain blurred for several hours.

### *Eat a healthy diet.*

New research shows that omega-3 fatty acids may protect the retina from wear. The retina is a layer of tissue in the back of your eye that senses light and sends images to your brain. It has one of the highest concentrations of omega-3 fatty acids in the body. Your mother may have told you to eat carrots, and she was right. These orange veggies are high in vitamin A, a key ingredient to good sight.

### *Protect your eyes at all ages.*

Eye injuries are the leading cause of blindness in children in the United States. Most injuries are sports-related. Outfit your child with goggles or helmet shields for sports. Protect your own eyes when working with lawn mowers and other tools. Be sure to wear sunglasses to limit the impact of ultraviolet rays from the sun on your eyes.

# Ernest Borgnine Lays it on the Line

## Hollywood Hero Focuses on Macular Degeneration

**Actor Ernest Borgnine stars in an NEI video** that informs Americans about the dangers of age-related macular degeneration and offers advice on getting your eyes examined regularly.

**A**t 91, Hollywood legend Ernest Borgnine is still going strong, making movies, and enjoying his role as grandfather to soon-to-be 3-year-old grandson, Anthony, whom he fondly calls “a real cooker.”

He has also become a spokesman for the National Eye Institute’s Age-Related Macular Degeneration Study (AREDS2). AREDS2 is a nationwide study to determine whether a modified combination of vitamins and minerals can further slow vision loss from age-related macular degeneration (AMD), the leading cause of vision loss in the United States for people over age 60. AMD doesn’t slow the Oscar winner and longtime star of television’s “McHale’s Navy,” as he recently told *NIH MedlinePlus*.

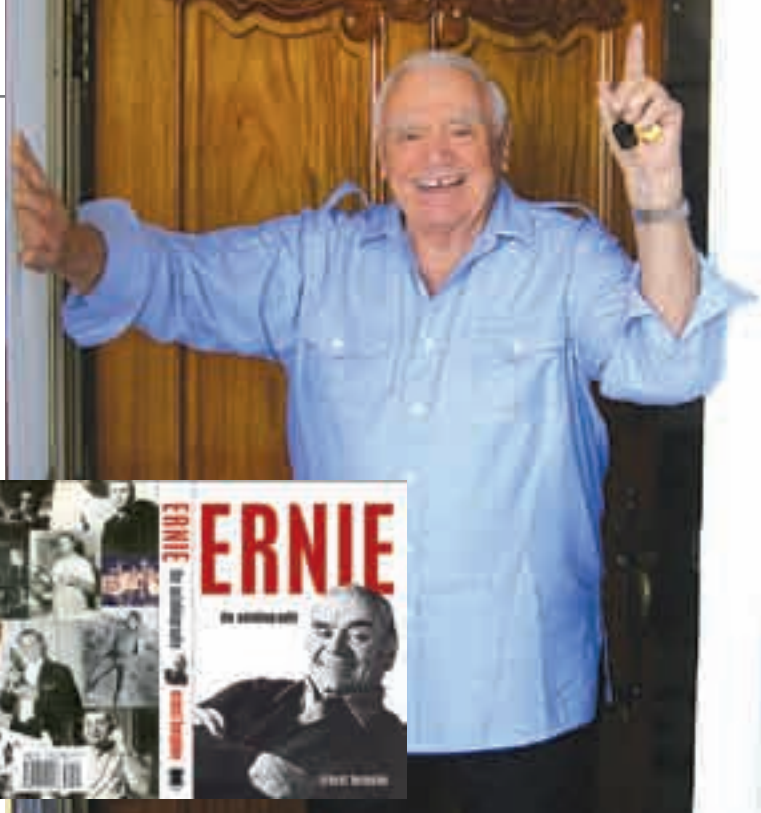
### **What’s new for you these days?**

I just finished my autobiography *Ernie*, and am very proud of my age. I always feel if you do things, don’t rush it; you’ll be surprised how long you can last. I expect to make it to 113.

### **We know that you take care of yourself and stay on top of your health.**

If things bother me, I see my doctor. When I first saw Dr. Trotter, at UCLA (William L. Trotter, M.D., a leading cataract specialist), I couldn’t see, even with my glasses. He said, “You’ve got cataracts.” I asked, “What do we do?” He said, “Oh, we’ll take care of them.” And he did!

One eye was first, the other the next day. But he noticed a little



**Academy Award-winning actor Ernest Borgnine is going strong at 91, and speaking out on macular degeneration for the National Eye Institute.**

something in the back that looked like macular degeneration. I asked what do we do, he said, “Wait and see.”

### **What’s become of the macular degeneration?**

I have it, but not badly. I take a vitamin supplement and have my eyes checked regularly. I can still read my scripts without glasses, if the light is good. For a lot of people, however, it’s so sad. That’s why I tell people, if your eyes bother you, go to an eye doctor. Don’t put it off.

### **What does having macular degeneration mean to you?**

It’s frightening. Something in the back of the eyes is going to affect them to the point where you can’t see anymore except from the sides. Being an actor, naturally, I need my eyesight. To read the script, see what I’m doing and everything that is going on.

You have to have good eyes, that’s all there is to it. What would you miss out on, otherwise? Your work. Television. Newspapers. Your wife’s wonderful smile. That’s what I would miss. We are happily married, going on 34 years. It’s wonderful to see that smile. You miss out on those things if you don’t pay attention to your eyes.

### **What do you think of the NIH AREDS 2 study?**

I tell people to check it out. There are things going on in this world in eyesight research that are brilliant. The sooner people can get diagnosed [with macular degeneration], the more that can be done.

# Latest Research: Genetic Links

**O**f the nearly 2,000 genes discovered to date, approximately 500 of them affect the eye. Through a program called the National Ophthalmic Disease Genotyping Network (eyeGENE), the NEI is expanding genetic testing of eye disease. The eyeGENE program is a network of research labs that offers testing for affected individuals. EyeGENE will also create more data from which investigators can identify additional genetic risk factors. The network will also explore the relationship between a genetic disease and its clinical manifestations. Understanding the genetic link will help researchers develop tailored therapies to halt a disease or reduce its impact.

Recently, a gene therapy trial supported by NEI showed great promise in treating a form of childhood blindness. The condition, called Leber congenital amaurosis, is caused by a single malfunctioning gene. Symptoms usually occur in early infancy and include loss of vision, reduced sensitivity to light, and wobbly eye movement (nystagmus). The gene transfer surgery involves inserting a hollow needle into the space between the eye's retinal layers and transferring genetic material via a fluid from the needle. The first three patients were treated in October and December 2007 and January 2008 and so far have experienced no adverse effects. "These are heroic young people," says Samuel Jacobson, a University of Pennsylvania researcher involved with the study. "[The treatment] causes changes that they notice." Although no one can predict the future, Jacobson's hope is that in three to five years the patients' gain in vision will be maintained.



**The National Ophthalmic Disease Genotyping Network (eyeGENE) of research laboratories is one way the NEI is expanding genetic testing of eye diseases.**

## Eye Exams Throughout Your Life

### Complete Eye Examination

**What:** To examine your vision and health of your eyes, your eye care professional will:

1. Ask about your overall health and family medical history, including whether you have any eye problems;
2. Check your visual acuity using a chart of random letters of different sizes;
3. Examine the cornea and other parts of the eye. Look inside your eye with a lighted magnifying glass to see the retina, back of the eye, retinal blood vessels, and head of the optic nerve (optic disc). You may be given eye drops so the doctor can better view the back of the eye. This is called eye dilation;
4. Test your eye's reaction to light, eye movement, and side (peripheral) vision;
5. Determine if you need glasses by placing several lenses in front of your eyes, one at a time, and asking you when the letters on the eye chart are easier to see;
6. Test for color blindness using multicolored dots that form numbers; and
7. Measure the pressure inside the eye using a tonometer. Pressure inside the eye is a risk factor for glaucoma.

# “It Hurts When I Walk!”

That pain could mean you have Peripheral Arterial Disease (P.A.D.)



## Fast Facts

- Peripheral arterial disease (P.A.D.) occurs when a fatty material called plaque (pronounced *plak*) builds up on the inside walls of the arteries that carry blood from the heart to the head, internal organs, and limbs.
- One in every 20 Americans over the age of 50 has P.A.D.
- Signs of PAD include: pain, numbness, aching, and heaviness in the muscles; weak or absent pulse in the legs or feet; sores or wounds on toes, feet, or legs that heal slowly, poorly, or not at all; color changes in skin, paleness, or blueness.

While P.A.D. nearly crippled Rita Smith of Lorton, Va., timely treatment helped her get back on her feet.

Photo: Rita Smith

**Could you or a loved one have peripheral arterial disease (P.A.D.)?** P.A.D. is a problem with blood flow in the arteries—usually the legs. The condition affects an estimated 8 million to 12 million Americans, many of whom may not be aware of the disease or how to treat it.

**A**bout four years ago, Rita Smith’s right leg and calf muscle started to hurt. “It felt like shin splints, and it got worse,” she says. “I dealt with it on my own for about a month, thinking it was from exercise.”

But then it got even more severe. “It was crippling pain; it felt like a vise around my leg. I couldn’t even walk to my mailbox,” she says. Smith, who lives in Lorton, Va., had seen her doctor about it originally, but now went back in tears. It wasn’t getting better.

That’s when a radiologist found she had a clogged artery just below her right knee. As a result, blood was not flowing through her leg properly. A balloon angioplasty operation to open up the artery collapsed within two weeks, and the pain came back. At that point, Smith’s vascular surgeon started her on two drugs—

one to prevent clots, the other to increase blood flow, and both to ease the pain.

Smith’s surgeon also suggested that she look into a clinical trial being conducted at the NIH on P.A.D. Clinical trials help medical researchers try new treatments and find new cures for many different conditions. Smith was accepted into the clinical trial at the NIH, and today feels that what she experienced and what she—and her doctors—learned has helped her deal with P.A.D. (*For more information on clinical trials, see pages 4 and 5 in this issue.*)

“I’m doing so well today because of NIH,” she says. Now, at age 59, Smith is able to take part in exercise and yoga classes and has returned to teaching.

# Peripheral Arterial Disease Can Be a Killer

Know the risk factors, signs, treatments, and ways to prevent P.A.D.

**P**eripheral arterial disease (P.A.D.) is a condition that causes the buildup of a fatty material called plaque (pronounced *plak*) on the inside walls of the arteries that carry blood from the heart to the head, internal organs, and limbs. One in every 20 Americans over the age of 50 has P.A.D.

The buildup of plaque on the artery walls is called atherosclerosis, or hardening of the arteries. This buildup causes the arteries to narrow or become blocked, which can reduce or block blood flow. P.A.D. most commonly affects blood flow to the legs. P.A.D. is a warning sign that other arteries, including those in the heart and brain, may also be blocked—increasing the risk of a heart attack or stroke.

Blocked blood flow can cause pain and numbness. It also can increase chances of infection and make it difficult for the body to fight infection. If severe enough, blocked blood flow can cause tissue death (gangrene). As a result, P.A.D. is the leading cause of leg amputation.

Both men and women can develop the disease. P.A.D. can impair physical health and diminish the ability to walk.

The good news is that you can lower your risk for P.A.D. Taking steps to learn about P.A.D., including asking your health care provider to check your risk, can help save your life.

## Signs of P.A.D.

At least half the people with P.A.D. don't exhibit any symptoms.

Those who do may have pain when walking, climbing stairs, or exercising. This pain may be relieved by resting. During exercise, your muscles need more blood flow to get more oxygen to the muscles. If there is a blockage in the blood vessels, the muscles won't get enough oxygen. Exercising will not make P.A.D. worse and studies show that a regular exercise program can improve symptoms. When you rest, the muscles require less blood flow and the pain goes away.

Other Signs of P.A.D. include:

- Pain, aching, and heaviness in the muscles
- Cramping in the legs, thighs, and calves
- A weak or absent pulse in the legs or feet

## Risk Factors for P.A.D.

Some conditions and habits raise your chance of developing P.A.D. Your risk increases if you:

- **Are over the age of 50.**
- **Smoke or used to smoke.** Those who smoke or have a history of smoking have up to four times greater risk of developing P.A.D.
- **Have diabetes.** One in every three people over the age of 50 with diabetes is likely to have P.A.D.
- **Have high blood pressure.** Also called hypertension, high blood pressure raises the risk of developing plaque in the arteries.
- **Have high blood cholesterol.** Excess cholesterol and fat in your blood contribute to the formation of plaque in the arteries, reducing or blocking blood flow to your heart, brain, or limbs.
- **Have a personal history of vascular disease, heart attack, or stroke.** If you have heart disease, you have a one in three chance of also having P.A.D.
- **Are African American.** African Americans are more than twice as likely to have P.A.D. as their white counterparts.

— NHLBI

- Sores or wounds on toes, feet, or legs that heal slowly, poorly, or not at all
- Color changes in skin, paleness, or blueness
- Lower temperature in one leg compared to the other leg
- Poor nail growth and decreased hair growth on toes and legs

# Treating P.A.D.

**T**reatment for P.A.D. is designed to reduce a patient's symptoms, prevent complications and improve quality of life. It may include lifestyle changes, medicines, or surgery.

## Lifestyle Changes

P.A.D. treatment often includes making long-lasting lifestyle changes. If you have P.A.D., or are aiming to lower your risk, your health care provider may prescribe one or more of the following:

- Quit smoking. Don't smoke, and if you do, quit. Consult with your health care provider to develop an effective cessation plan and stick to it.
- Lower your numbers. Work with your health care provider to correct any high blood pressure, cholesterol, and blood glucose levels.
- Follow a healthy eating plan. Choose foods that are low in saturated fat, trans fat, and cholesterol. Be sure to include whole grains, vegetables, and fruits.
- Get moving. Make a commitment to be more physically active. Aim for 30 minutes of moderate-intensity activity on most, preferably all, days of the week.
- Aim for a healthy weight. If you are overweight or obese, work with your health care provider to develop a supervised weight loss plan.

## Medicines

In addition to lifestyle changes, your health care provider may prescribe one or more medications. These medications are used to:

- Lower high blood pressure and cholesterol levels and treat diabetes;
- Prevent the formation of blood clots that could cause a heart attack or stroke; and
- Help reduce leg pain while walking or climbing stairs.

## Surgeries or Special Procedures

If the blood flow in one of your limbs is completely or almost completely blocked, you may benefit from having a procedure or surgery in addition to medications and lifestyle changes. Procedures such as angioplasty and bypass graft surgery will not

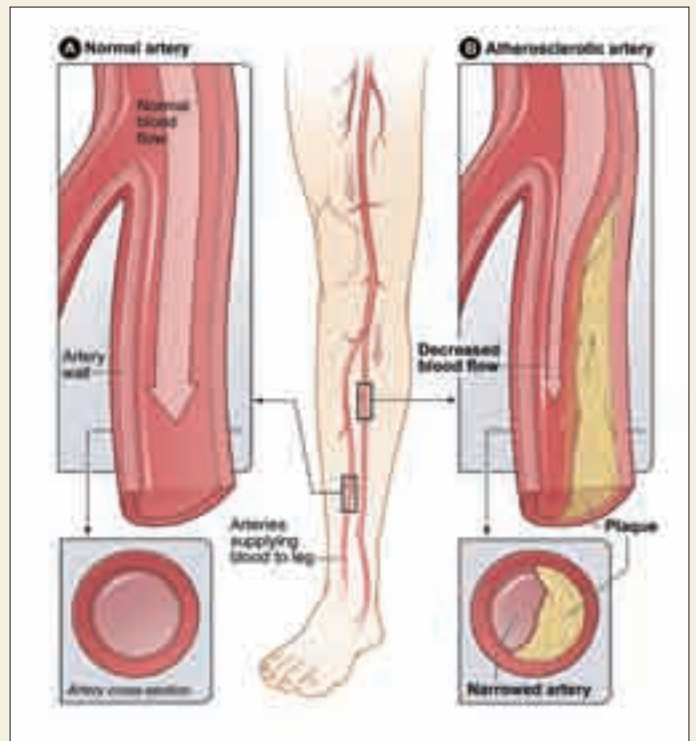


Illustration: Courtesy NHLBI

**As plaque builds up, a normal artery (A) becomes partially blocked (B), and blood flow is diminished**

cure P.A.D., but they can improve the blood circulation to your legs and your ability to walk.

## Clinical Trials for P.A.D.

The National Heart, Lung, and Blood Institute (NHLBI) is currently recruiting for several clinical trials, including ones on reducing P.A.D. risk factors, improving limb function for people with P.A.D., and catheter-based treatments of arterial disease, among others. For more information, visit [www.nhlbi.nih.gov](http://www.nhlbi.nih.gov). Search for P.A.D. and clinical trials.

## P.A.D. Glossary

- **Ankle-brachial index (ABI)**  
A simple test that can be used to diagnose P.A.D. The ABI compares blood pressure in the ankle with blood pressure in the arm to see how well blood is flowing.
- **Atherosclerosis (ath-er-o-skler-O-sis)**  
The buildup of plaque on the artery walls, also referred to as hardening of the arteries.
- **Critical limb ischemia (CLI)**  
When blood flow is completely or mostly blocked to one or both legs in the advanced stages of P.A.D.
- **Intermittent claudication (klaw-de-KA-shen)**  
Cramping pain and weakness in the legs and especially the calves on walking that disappears after rest and is usually associated with inadequate blood supply to the muscles.

# Other Causes of Leg Pain

Leg pain can come from a variety of causes. Your health care professional has specific ways to discover if the cause is P.A.D. Other non-P.A.D. common causes of leg pain may include:

- **A muscle cramp** (also called a charley horse), frequently caused by the following:
  - Dehydration or low amounts of potassium, sodium, calcium, or magnesium in the blood
  - Medications, such as diuretics, which can cause you to lose too much fluid or minerals
  - Muscle fatigue or strain from overuse, too much exercise, or holding a muscle in the same position for a long time
- **Injuries** caused by:
  - A torn or overstretched muscle (strain)
  - Hairline crack in the bone (stress fracture)
  - Inflamed tendon (tendinitis)
  - Shin splints—pain in the front of your leg related to overuse or repetitive pounding
- **Deep vein thrombosis (DVT)**, which occurs when a blood clot (thrombus) forms in the larger veins of the area. This clot can interfere with blood flow, and it may break off and travel through the bloodstream (embolize). The traveling blood clot (embolus) can lodge in the brain, lungs, heart, or other area, severely damaging that organ.

DVT was in the news with the death of NBC correspondent David Bloom in April 2003. The 39-year-old co-anchor of *Weekend Today* died from a pulmonary embolism—a blood clot that moved from the leg to the lung—caused by DVT.

Bloom was reporting from Iraq where he was spending long hours in a tank allowing him limited mobility. In addition, he had recently been on several long plane flights from New York to Kuwait, and had a genetic pre-disposition to blood clots.
- **Infection** of the bone (osteomyelitis) or skin and soft tissue (cellulitis)
- **Inflammation** of the leg joints by arthritis or gout
- **Nerve damage**—common in diabetics, smokers, and alcoholics (symptoms include numbness, tingling, or a sensation of pins-and-needles)
- **Varicose veins**—swollen and twisted veins that are visible just under the surface of the skin
- **Spinal stenosis**—narrowing in the spine, causing pressure on the nerves and spine, with resulting numbness and pain
- **Lumbar disease**
- **Osteoarthritis**



## QUESTIONS TO ASK YOUR HEALTH CARE PROVIDER

1. Does my medical history raise my risk for P.A.D.?
2. Do I need to do anything about my blood glucose, blood pressure, or cholesterol?
3. Which screening tests or exams are right for me?
4. If I have P.A.D., what steps should I take to treat it?
5. What steps can I take to reduce my risk for heart attack and stroke?
6. What can I do to quit smoking?

## To Find Out More

For more information about P.A.D. and to download free education materials, visit:

- **MedlinePlus:** [www.nlm.nih.gov/medlineplus/peripheralarterialdisease.html](http://www.nlm.nih.gov/medlineplus/peripheralarterialdisease.html)
- **Stay in Circulation: Take Steps to Learn About P.A.D.,** [www.aboutpad.org](http://www.aboutpad.org)
- **NHLBI Diseases and Conditions Index:** [www.nhlbi.nih.gov/health/dci/Diseases/pad/pad\\_what.html](http://www.nhlbi.nih.gov/health/dci/Diseases/pad/pad_what.html)
- **P.A.D. Coalition:** [www.padcoalition.org](http://www.padcoalition.org)

# Prevent P.A.D.: Know Your Numbers

By Mary Best

“Know your numbers” is the message highlighted in “Stay in Circulation: Take Steps to Learn about P.A.D.” This public awareness campaign, launched by NIH’s National Heart, Lung, and Blood Institute (NHLBI), is intended to educate people about peripheral arterial disease (P.A.D.).

P.A.D. clogs the arteries in a person’s legs. It is a slow process with minimal symptoms. The signs that do exist—such as cramps in your legs and fatigue—are often associated with aging. According to the NIH, one in every 20 Americans older than 50 has P.A.D. If left untreated, it can lead to amputation and death.

“The information in this campaign is intended to save lives,” says Patrice Desvigne-Nickens, M.D. She directs the NHLBI’s Cardiovascular Medicine Scientific Research Group in the Division of Heart and Vascular Disease. “P.A.D. has been underestimated and undervalued. But it is the same process that results in coronary artery disease. P.A.D. puts people at risk for stroke or heart attack. P.A.D. isn’t new. It’s just that, today, we are better able to identify the problem early and prevent its complications.”

## Prevention Is Key

The best treatment for P.A.D. is education and awareness. And this is where the numbers come in: Smoking, high cholesterol, and diabetes are three critical factors in determining the risk of P.A.D. The only way to know if these critical measurements are normal is to be tested by a health care professional.

“Timely detection and treatment are critical to improving a person’s quality of life. Being aware of the things that put you at risk can help you develop a healthy lifestyle early,” says Dr. Desvigne-Nickens.

She also says people should be aware of other risk factors. They are being over the age of 50, smoking, a history of heart attack or stroke, obesity, and lack of exercise. “There are ‘heart healthy’ things to do that will help prevent the progression of P.A.D.,” she adds.

## African Americans at Risk

African Americans have a particularly high prevalence of



Photo: Christopher Klöse

**“Timely detection and treatment of P.A.D. are critical,” says Dr. Patrice Desvigne-Nickens of the National Heart, Lung, and Blood Institute.**

risk factors for P.A.D., notes Dr. Desvigne-Nickens. They are more likely to have high blood pressure, hypertension, and diabetes. Further, African Americans, especially women, tend toward obesity and inactivity.

The scientific community doesn’t fully understand why P.A.D. is so prevalent among African Americans. “Regardless of other risk factors, being African American means you are twice as likely to have P.A.D.,” Dr. Desvigne-Nickens says.

According to her, genetics further underscore the message of Stay in Circulation. “P.A.D. is a silent disease, so it is important to know your risks, know your numbers, have regular checkups, manage your weight, exercise, and adopt healthy habits.”

## Activities and Events

To raise awareness about P.A.D., NHLBI, in cooperation with the P.A.D. Coalition, is sponsoring the Stay in Circulation: Take Steps to Learn About P.A.D. campaign during September. September is P.A.D. Awareness Month. A special week of activities—Stay in Circulation Week—is planned for September 15-19. Ongoing activities to support the campaign are aimed at increasing awareness of P.A.D. and include:

- **National and Local Partnership Development.** Stay in Circulation has partnered with national, nonprofit, community-based, and private sector organizations to raise awareness about P.A.D. Many of these partners, such as the African Methodist Episcopal Church and the National Council on Aging, have hosted P.A.D. awareness seminars and distributed Stay in Circulation materials to their members. During Stay in Circulation Week in the month of September, a number of local partners hold screening events in their communities.
- **Education and Outreach to Health Care Providers.** Through the P.A.D. Coalition, the Stay in Circulation campaign helps ensure that health care providers have the materials and resources needed to talk to their patients about P.A.D. and what steps they can take to lower their risk.





# YOUR P.A.D. CHECKLIST

Together, you and your health care professional can form a plan to keep your cholesterol within limits and reduce your risk of peripheral arterial disease (P.A.D.). That can start by making sure you “know your numbers” related to cholesterol, blood glucose, and blood pressure. Your health care professional will help with that and can use the ankle-brachial index (ABI) test to assist, as well.

## TOTAL CHOLESTEROL

**Desirable:** less than 200 mg/dL  
**Borderline High:** 200 – 239 mg/dL  
**High:** 240 mg/dL and above

## HDL CHOLESTEROL

HDL cholesterol less than 40 mg/dL is a major risk factor for cardiovascular disease.

## LDL CHOLESTEROL

**Optimal:** less than 100 mg/dL  
**Near Optimal:** 100 – 129 mg/dL  
**Borderline High:** 130 – 159 mg/dL  
**High:** 160 – 189 mg/dL  
**Very High:** 190 mg/dL and above

## BLOOD GLUCOSE (fasting)

**Normal:** 99 mg/dL and below  
**Prediabetes:** 100 – 125 mg/dL  
**Diabetes:** 126 mg/dL and above

## BLOOD PRESSURE

**Normal:** less than 120/80 mmHg  
**Prehypertension:** 120/80 to 139/89 mmHg  
**Hypertension:** 140/90 mmHg or higher

## ANKLE-BRACHIAL INDEX (ABI)

A test that compares the blood pressure readings in your ankles and arms to help determine whether you have P.A.D.  
**Normal:** 1.0 – 1.3  
**Possible P.A.D.:** 0.91 – .99 or greater than 1.3  
**P.A.D.:** 0.90 or less

## TOTAL CHOLESTEROL

Date

## HDL CHOLESTEROL

Date

## LDL CHOLESTEROL

Date

## BLOOD GLUCOSE

Date

## BLOOD PRESSURE

Date

## ABI

Date

Source: NHLBI

CLIP AND SAVE





Almost two years after successful surgery to repair a torn ACL, Michelle Backus of Gaithersburg, Md., is once again playing soccer and running track.

## Fast Facts

- An anterior cruciate ligament (ACL) injury is usually caused by a sudden twisting motion in the knee when an athlete lands or steps.
- Young women are two to eight times more likely than young men to injure the ACL.
- Landing on the balls of your feet, rather than flat-footed, may help prevent ACL injuries.

# An Athlete's Nightmare: Tearing the ACL

**T**wo years ago, then-15-year-old Michelle Backus was out-maneuvering a teammate during soccer practice when she heard “a pop” coming from her left knee. The pain was instantaneous. “It felt like glass breaking,” she says, “I fell over, and I knew it wasn’t good.”

Michelle had just torn a part of her knee called the anterior cruciate ligament, or ACL. All too common among athletes, an ACL injury is usually caused by a sudden deceleration or landing maneuver with the leg in a vulnerable position. Although ACL injuries are most often seen in team sports, 70 percent are incurred with little or no contact with another athlete. As with Michelle, the athlete often reacts to a nearby player, and the sudden movement causes the ACL tear.

Recent studies have shown that young female athletes sustain more ACL injuries than young males. In fact, young women are two to eight times more likely than their male counterparts to injure that ligament, according to Dr. Barry Boden of the Orthopedic Center in Rockville, Md. Michelle was one of Dr. Boden’s ACL patients.

There are many different theories as to why young women suffer a higher rate of ACL injuries. “One thought is that women have more of a knock-knee alignment,” says Dr. Boden, who is conducting research on the injury with funding from the National Institutes of Health. “The alignment of women’s knees tends to bend inward when women land.” Some researchers believe

# Glossary

## Ligament

A band of fibrous tissue that connects two or more bones at a joint.

## Tendon

Fibrous cords of tissue that connect muscle to bone.

## Meniscus

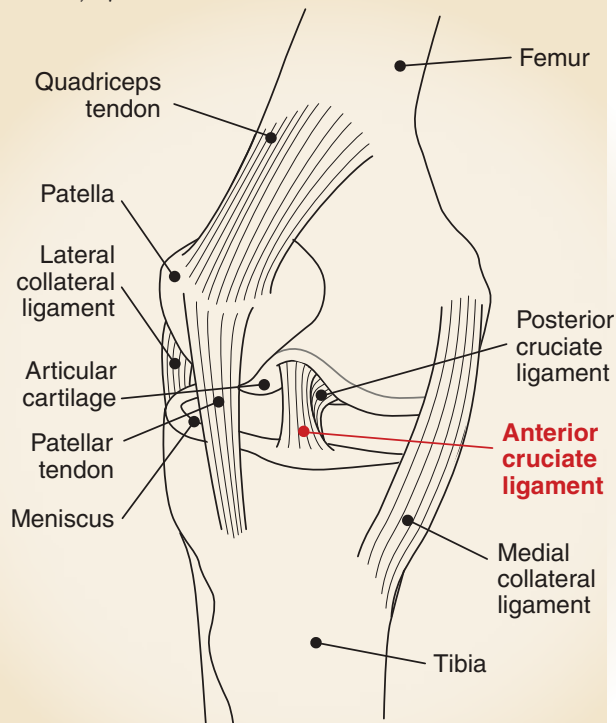
A C-shaped piece of cartilage that acts like a pad between the femur (thigh bone) and tibia (shin bone).

## Sprain

A stretch and/or tear of a ligament.

## Strain

An injury to either a muscle or a tendon.



Side View of the Knee

that this inward bend may predispose women to ACL injuries. Dr. Boden says there are other theories based on how estrogen affects the ligament, as well as the idea that women are “ligament dominant” rather than “muscle dominant.”



Photo: Ross Kimura/Getty Images

**Golf great Tiger Woods will miss the remainder of the 2008 season due to an ACL injury and a double stress fracture in his left leg.**

Dr. Boden believes that one of the major reasons any athlete suffers ACL damage is because they land in a flat-footed position, as opposed to landing on the balls of their feet. “If the calf muscles are not absorbing the force, and if the knee is not in the proper position, the knee buckles and tears the ACL,” explains Dr. Boden.

After her initial diagnosis and a round of physical therapy, Michelle had her ACL surgery. The procedure took longer than anticipated because Dr. Boden discovered that Michelle also had a meniscal (cartilage) tear. Three days after the surgery, she was back at physical therapy. During her six months of therapy, Michelle learned how to jump and land properly to minimize the chances of re-injuring her ACL.

Almost two years later, Michelle is still playing soccer, as well as running track. She has found that the physical therapy has even helped her with track. “I run hurdles, and now I use my left leg as my lead leg because it is more flexible.” The physical therapy had an even greater impact on Michelle—it helped her decide on her future career. The rising senior wants to study physical therapy in college. ■

## Preventing and Treating Cruciate Ligament Injuries

- **Prevention:** The anterior cruciate ligament is most often stretched or torn (or both) by a sudden twisting motion (for example, when the feet are planted one way and the knees are turned another). Although ACL tears are usually difficult to predict, their occurrence may be made less likely by thoroughly warming up before sports, learning to land on the balls of the feet (not flat-footed), and using strength training to make the muscles firmer.
- **Symptoms:** You may hear a popping sound, and the leg may buckle when you try to stand on it. After the initial painful rupture, the knee develops swelling, which typically lasts three to four weeks. Once the swelling subsides, the athletes usually don’t experience discomfort or giving-way with activities of daily living. However, with return to sports, the knee often buckles, causing more damage to the knee.
- **Diagnosis:** The doctor may perform several tests to see whether the parts of the knee stay in proper position when pressure is applied in different directions. A thorough examination is essential. An MRI is accurate in detecting a complete tear, but the only reliable means of detecting a partial one is arthroscopy (a small surgical incision through which a surgeon can use a tiny lens to see the tear).
- **Treatment:** Surgery to repair the ACL tear is usually followed by physical therapy over a period of from six to 12 months, depending on the tear.

To Find Out More

Visit [www.niams.nih.gov](http://www.niams.nih.gov) and [www.medlineplus.gov](http://www.medlineplus.gov).

# In Praise of Progress

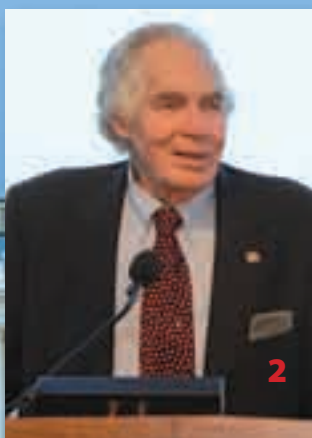
**F**or more than 20 years, the Friends of the National Library of Medicine (FNLM) has worked to support and promote the NIH National Library of Medicine (NLM), the world's largest medical library.

On May 18 of this year, the FNLM hosted its 2008 Annual Dinner, in conjunction with the meeting of the NLM Board of Regents. The awards dinner celebrated advancements in children's health research and treatment. Awards for excellence that were handed out at the dinner included those for public leadership, distinguished medical service, public service, and outstanding service to rural or underserved communities.

All Photos: NIH



**1** U.S. Senator Tom Harkin of Iowa, a longtime supporter of the medical research carried out at the National Institutes of Health, received the Excellence in Public Leadership Award.



**2** National Library of Medicine Director Donald Lindberg, M.D., expressed his own thanks to the award recipients and to the assembled Friends' supporters and leaders.



**3** Legendary country singer Randy Owen, formerly lead singer of the band Alabama, (with his wife Kelly) received the Paul G. Rogers Public Service Award. The founder of the fundraising effort known as "Country Cares" has personally helped raise more than \$350 million for St. Jude Children's Research Hospital.



**4** NIH Director Elias Zerhouni's, M.D., comments at the awards dinner focused on the vital role medical research plays in improving health care for all Americans.



**5** Julie Louise Gerberding, M.D., Director of the Centers for Disease Control and Prevention (CDC), presented the Distinguished Medical Service Award to Adel Mahmoud, M.D., Senior Molecular Biologist at the Woodrow Wilson School of Public and International Affairs at Princeton University.



**6** Ellen Howard, M.L.S., received the Michael DeBakey Outreach Librarian award. As founding director of Onsite Library Service at the Harborview Medical Center, she spearheaded development of the EthnoMed Web site which provides medical and cultural information for immigrant and refugee groups in the Seattle, Wash., area.

## 7 Simple Steps

*to Keep Your Food—  
and Family—  
Safe in Every Season*



- 1. Check for Cleanliness**—Does your supermarket, grocery store, or quick mart pass the “sight and sniff” test? Does it look and smell clean?
- 2. Separate Certain Foods**—Put raw meat, poultry, and seafood in separate plastic bags to keep their juices from dripping onto other foods.
- 3. Inspect Cans, Bottles, and Jars**—Don’t buy foods in dented or bulging cans, or bottles and jars with broken seals or bulging lids. Damaged containers may mean the food inside is contaminated and no longer safe to eat.
- 4. Examine Frozen Food Packaging**—Avoid frozen food packages that are open, torn or crushed on the edges. Watch out for frost or ice crystals, signs that the food has either been stored for a long time or thawed and been refrozen.
- 5. Pick Out Fresh Eggs Carefully**—Buy refrigerated eggs only, making sure they’re clean and none are cracked; follow “safe handling instructions” on the carton.
- 6. Select Frozen Items and Perishables Last**—Meat, poultry, fish, and eggs go in your shopping cart last, all in separate bags to keep their drippings from contaminating other foods.
- 7. Mind Time and Temperature**—Refrigerate perishable products as soon as possible after shopping. Don’t leave them at room temperature longer than two hours (or one hour when it’s above 90°F). During warm weather or if it takes more than an hour to get home, pack frozen and perishable foods cold in an ice chest, keep groceries in your vehicle’s air conditioned passenger compartment.

### To Find Out More

Gateway to Government Food Safety Information  
[www.foodsafety.gov](http://www.foodsafety.gov)

MedlinePlus  
[www.nlm.nih.gov/medlineplus/foodsafety.html](http://www.nlm.nih.gov/medlineplus/foodsafety.html)

Information for Consumers and Health Educators  
[www.cfsan.fda.gov/~lrd/advice2.html](http://www.cfsan.fda.gov/~lrd/advice2.html)

Foodborne Illness  
[www.cfsan.fda.gov/~dms/qa-topfd.html](http://www.cfsan.fda.gov/~dms/qa-topfd.html)

USDA Food Safety and Inspection Service:  
Reporting Problems with Food Products  
[www.fsis.usda.gov/  
Fsis\\_Recalls/Problems\\_With\\_Food\\_Products/index.asp](http://www.fsis.usda.gov/Fsis_Recalls/Problems_With_Food_Products/index.asp)

# NIH Quickfinder

For more information or to contact any of the following NIH institutes, centers, and offices directly, please call or go online as noted below:

## Institutes

- **National Library of Medicine (NLM)**  
www.nlm.nih.gov 1-888-FIND-NLM
- **National Cancer Institute (NCI)** www.cancer.gov  
1-800-4-CANCER (1-800-422-6237)
- **National Eye Institute (NEI)** www.nei.nih.gov  
(301) 496-5248
- **National Heart, Lung, and Blood Institute (NHLBI)**  
www.nhlbi.nih.gov (301) 592-8573
- **National Human Genome Research Institute (NHGRI)** www.genome.gov (301) 402-0911
- **National Institute on Aging (NIA)** www.nia.nih.gov  
Aging information 1-800-222-2225  
Alzheimer's information 1-800-438-4380
- **National Institute on Alcohol Abuse and Alcoholism (NIAAA)** www.niaaa.nih.gov  
(301) 443-3860
- **National Institute of Allergy and Infectious Diseases (NIAID)** www.niaid.nih.gov  
(301) 496-5717
- **National Institute of Arthritis and Musculoskeletal and Skin Diseases** www.niams.nih.gov  
1-877-22NIAMS (1-877-226-4267)
- **National Institute of Biological Imaging and Bioengineering (NIBIB)** www.nibib.nih.gov  
(301) 451-6772
- **Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD)**  
www.nichd.nih.gov 1-800-370-2943
- **National Institute on Deafness and Other Communication Disorders (NIDCD)**  
www.nidcd.nih.gov 1-800-241-1044 (voice)  
1-800-241-1055 (TTY)
- **National Institute of Dental and Craniofacial Research (NIDCR)** www.nidcr.nih.gov  
(301) 480-4098
- **National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)** www.niddk.nih.gov  
Diabetes 1-800-860-8747  
Digestive disorders 1-800-891-5389
- Overweight and obesity 1-877-946-4627  
Kidney and urologic diseases 1-800-891-5390
- **National Institute on Drug Abuse (NIDA)**  
www.nida.nih.gov (301) 443-1124
- **National Institute of Environmental Health Sciences (NIEHS)** www.niehs.nih.gov  
(919) 541-3345
- **National Institute of General Medical Sciences (NIGMS)** www.nigms.nih.gov  
(301) 496-7301
- **National Institute of Mental Health (NIMH)**  
www.nimh.nih.gov niminfo@nih.gov  
1-866-615-6464
- **National Institute of Neurological Disorders and Stroke (NINDS)** www.ninds.nih.gov  
braininfo@ninds.nih.gov 1-800-352-9424
- **National Institute of Nursing Research (NINR)**  
www.ninr.nih.gov (301) 496-0207

## Centers & Offices

- **Center for Information Technology (CIT)**  
www.cit.nih.gov (301) 594-6248
- **Center for Scientific Review (CSR)**  
www.csr.nih.gov (301) 435-1115
- **Fogarty International Center (FIC)**  
www.fic.nih.gov
- **National Center for Complementary and Alternative Medicine (NCCAM)**  
www.nccam.nih.gov 1-888-644-6226
- **National Center on Minority Health and Health Disparities (NCMHD)** www.ncmhd.nih.gov  
(301) 402-1366
- **National Center for Research Resources (NCRR)**  
www.ncrr.nih.gov (301) 435-0888
- **NIH Clinical Center (CC)**  
www.cc.nih.gov (301) 496-2563
- **Office of Research on Women's Health (ORWH)**  
http://orwh.od.nih.gov (301) 402-1770

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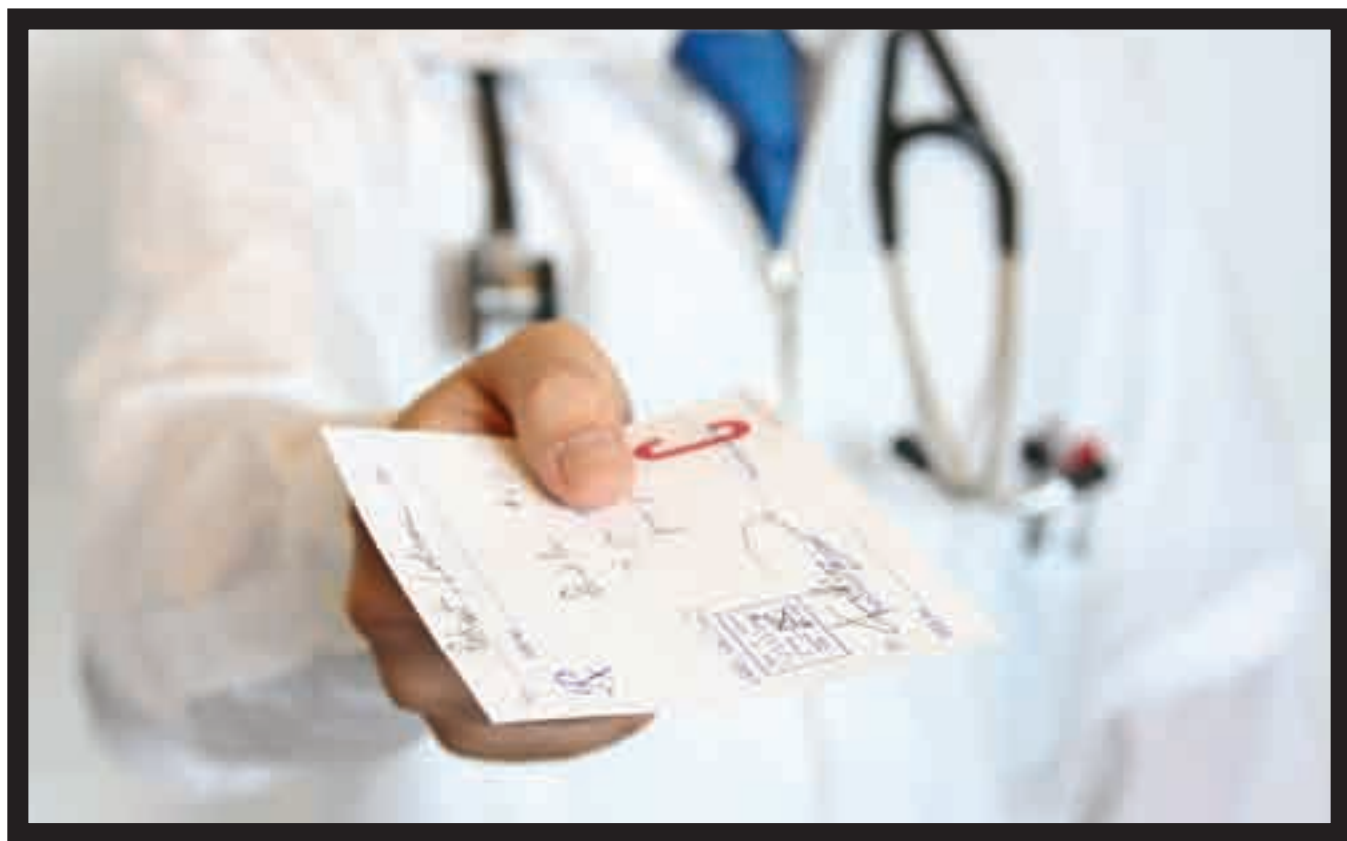
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# The Web site your doctor prescribes.



MedlinePlus.gov® is a free, comprehensive, up-to-date Web site with health information from the world's largest medical library, the National Library of Medicine of the National Institutes of Health. The Library is working with physician groups to encourage their members to "prescribe" MedlinePlus for their patients who need information. Physicians who wish to participate in "InfoRx" can order their MedlinePlus prescription pads and other promotional materials at [www.informationrx.org](http://www.informationrx.org).



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