

Trusted Health Information
from the National
Institutes of Health

NIH MedlinePlus®

SPRING 2009

the magazine

Understanding Headaches

From mild to migraines

The Dangers of Hepatitis

What you should know,
from A to E

Healthy Joints for a Lifetime

Caring for, treating,
and replacing those
all-important joints

Preventing, Detecting, and Treating

Colorectal Cancer

*A Conversation
with Katie Couric:
"Never lose hope..."*

The Future Is Coming: Electronic Health Records

Welcome to this issue of *NIH MedlinePlus* magazine—created and made available to help you and your family get the very best, most helpful healthcare information. No matter what the topic we cover, you can trust that it has been reviewed and approved by the experts at the National Library of Medicine as well as the other National Institutes of Health institutes and centers.

For example, if you've ever suffered from a bad back or aching joints—and who hasn't!—turn to this issue's section on healthy joints and bones, starting on page 10, for explanations and answers. Cancer is also something that has touched many of us, and you will find CBS News journalist Katie Couric's courageous story about her husband's colorectal cancer, beginning on page 2. There is also more good information in this issue on headaches (especially migraines), the dangers of hepatitis, and much more.

In addition to this issue of the magazine, we are also excited to let you know that the Friends of the National Library of Medicine is hosting a very special conference on the cutting-edge topic of electronic health records (EHR) on May 20-21, 2009, on the NIH campus in Bethesda, Maryland. Titled ***Personal Electronic Health Records: From Biomedical Research to People's Health***, the conference will bring together some of the world's most creative minds in research, government, and health care.

The goal? To discuss and help shape how the newly passed American Recovery and Reinvestment Act's \$19.5 billion investment in health information technology can best save money, improve patient care, and make our health care system more efficient. Guiding the discussion will be leading government healthcare officials.

As Dr. David Blumenthal, appointed by President Obama to be National Coordinator for Health Information Technology, has noted, "As a primary care physician who has used an electronic record to care for patients every day for 10 years, I understand the enormous potential of this technology."

This is a future that all Americans will be living, and now is the time to make sure EHRs get off to a strong start. Find out more at www.fnlm.org.

From the smallest health tips to the biggest pocketbook issues, we look forward to bringing you good health news you can use in *NIH MedlinePlus* magazine. On behalf of the Friends of the National Library of Medicine, thank you for your interest and support.

Sincerely,
Donald West King, M.D., Chairman
Friends of the National Library of Medicine



Photo: NLM

Donald West King, M.D.
FNLN Chairman

“Now is the time to
get off to a strong start.”

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medical library, www.medlineplus.gov.

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

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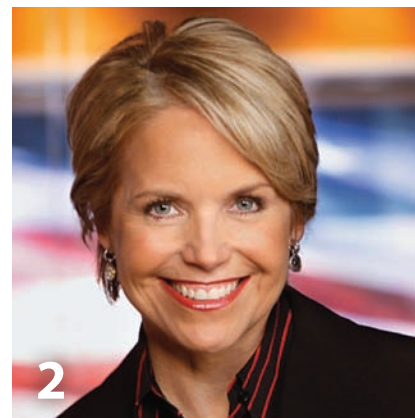
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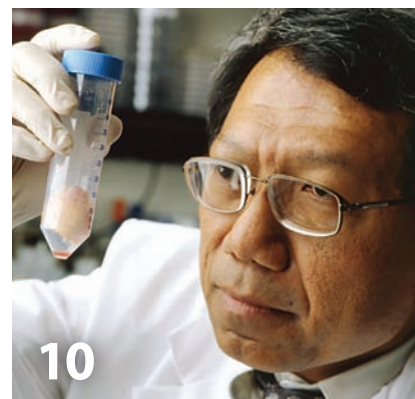
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Photos: (top of page) CBS News;
(center) NIAMS;
(bottom) Fairman Studios, LLC;
(cover) CBS News

Preventing, Detecting, and Treating Colorectal Cancer

In 1997, Katie Couric and husband Jay Monahan first learned that he had colon cancer. Monahan died nine months after that, at age 42. Since that time, Couric has become a tireless advocate for colon cancer screening, early detection, and prevention to try to spare other families the loss her family has suffered.

In March 2000, Couric helped raise public awareness of colorectal cancer by undergoing a colonoscopy that was taped and shown on NBC's *The Today Show*. The event was part of a week-long series to promote colon and rectal (colorectal) cancer awareness and screening. Following that, research showed that the number of colonoscopies increased by almost 20 percent nationwide. This scientifically documented response has been dubbed the "Couric effect." Cancer struck Couric's family again, when her older sister, Emily, a Virginia Democratic state senator, died of pancreatic cancer in October 2001.

Today, despite the busy life of the *CBS Evening News* anchor and managing editor, Couric finds time to speak out to increase colorectal cancer education, screening, and research. She co-founded the Entertainment Industry Foundation's National Colorectal Cancer Research Alliance in 2000 and helped to launch The Jay Monahan Center for Gastrointestinal Health at New York-Presbyterian Hospital/Weill Cornell Medical Center in 2004. Couric has helped to raise millions of dollars for cancer research and awareness programs.

FASTFACTS

- **Cancers of the colon and rectum are often referred to together, as colorectal cancer.**
- **In the United States, colorectal cancer is the second-leading cause of cancer death.**
- **When detected early, colorectal cancer is often curable. When pre-cancerous growths or polyps are detected and removed through screening, colorectal cancer can often be prevented.**
- **Colorectal cancer occurs most commonly in individuals age 50 and older; however, younger people can also develop this disease. Screening for colorectal cancer is recommended for men and women beginning at age 50. Those with certain risk factors—such as a family history of colorectal polyps or cancer—need to talk with their doctor about getting screened at a younger age.**



Katie Couric,

CBS Evening News anchor and managing editor, has become a strong spokesperson for cancer education and screening since losing her husband, Jay Monahan, to colorectal cancer.



Photo: Katie Couric

Katie Couric sought counsel from nonprofit CancerCare on how to help daughters Ellie (left) and Carrie deal with the loss of Katie's husband and their father, Jay Monahan.

A Conversation with Katie Couric

What are the most important messages you have for Americans about how they can protect themselves and their loved ones from colorectal cancer?

Katie Couric: Colorectal cancer claims the lives of almost 50,000 Americans each year; it's still our second-leading cancer killer, and that just shouldn't be! With appropriate screening and early detection, this is one cancer that is not only highly curable but also highly preventable. If pre-cancerous growths in the colon—polyps—are found during screening, they can be removed before they become malignant.

Everyone should begin testing when they turn 50, and those with risk factors—such as a family history of the

disease—may need to start earlier. You need to know your family medical history, but also be aware that most people who are diagnosed with colorectal cancer, about 75 percent, have no family history of it. And in its early stage, colorectal cancer usually causes no symptoms at all.

Maintaining a healthy diet, exercising regularly, and quitting smoking—or never starting—can lower one's cancer risk.

What advice do you have for people who have recently been diagnosed with cancer?

Katie Couric: In my mind, the most important thing is to never lose hope—never let anyone take it away from you.

You and your loved ones really need to

be there for one another. If you have young children, keep a close eye on how the experience is affecting them. During Jay's illness, I asked CancerCare, a wonderful non-profit organization, how I could help my then-six-year-old daughter Ellie at school, and they suggested an exercise for her class called the worry cup. Each child puts a penny in a cup and talks about what they're worried about. It seems a lot of the girls in first grade were worried about something. As a result, I think Ellie felt less alone. Her teacher later told me it was one of the most moving experiences of her career.

Patients and caregivers should utilize the skills and resources of their whole healthcare team, including nurses and

social workers who can help provide and identify sources of support. Also, be sure to involve your extended family and friends—ask them for help, specifically

We also conduct public awareness campaigns, including a very effective one done with the Centers for Disease Control and Prevention (CDC). Morgan Freeman,

colonoscopy and our other awareness efforts was a welcome surprise.

I've received thousands of letters from people saying I helped motivate them to get screened. It is profoundly gratifying and humbling to have one person tell you that you helped save his or her life, and we have received many, many letters saying just that.

“The most important thing is to never lose hope—never let anyone take it away from you.”

telling them what they can do. So often, family and friends want to help, but are completely at a loss about how to do that.

You are the co-founder of the Entertainment Industry Foundation's National Colorectal Cancer Research Alliance. What is the NCCRA?

Katie Couric: Once I picked myself up after Jay died, I wanted to help spare other families the terrible heartbreak mine had endured. My friend Lilly Tartikoff introduced me to the Entertainment Industry Foundation, the collective philanthropy for the television and film businesses, and together we launched the NCCRA in March 2000 to raise money for cutting-edge research and promote awareness about the importance of screening.

To date, we've raised more than \$30 million. That money provides critical funding to nine scientists at leading institutions around the country, who have made some significant breakthroughs in record time. In my book, they and all the other cancer researchers who work 24/7 to try to end this insidious disease are our society's unsung heroes. A portion of the funds served as seed capital for The Jay Monahan Center for Gastrointestinal Health, a GI cancer and wellness center at New York-Presbyterian Hospital/Weill Cornell Medical Center that provides seamless, compassionate care for individuals who have—or are at risk for developing—gastrointestinal cancers.



Katie Couric and the staff of The Jay Monahan Center for Gastrointestinal Health, named for her late husband, who died from colon cancer.

Diane Keaton, and Jimmy Smits and I have all done PSAs encouraging people to get screened. And our newest ambassador is actor Terrence Howard, who lost his 56-year-old mom to colon cancer last fall.

When you had your colonoscopy taped and shown on morning television, you really helped to educate Americans about the procedure, its importance, and to reduce its stigma. Did you expect such a big reaction?

Katie Couric: Since nothing like that had ever been done before, we didn't know what to expect. That the number of people having this test rose by 20 percent after *The Today Show* broadcast of my

We've seen reductions in colorectal cancer rates recently. Do you credit increased public awareness and screening?

Katie Couric: Certainly the awareness efforts of the whole colorectal cancer advocacy community have had an impact. Screening rates are up, and the colorectal cancer death rate fell by almost 10 percent from 2003 through 2005. Another key factor in the declining death rate is that new treatments have been introduced in the last few years.

While there has been good progress, something like 40 percent of the U.S. population has still not been appropriately tested. We have to keep up a relentless



Katie Couric, CBS News anchor, was joined by fellow anchors, ABC's Charlie Gibson (left) and NBC's Brian Williams, when the three networks collaborated last year on a fund-raising campaign, *Stand Up To Cancer*, to support all areas of cancer research.

Photo: Stand Up to Cancer

drumbeat of messages urging people to “talk to your doctor and get screened.”

You also played a key role in establishing *Stand Up To Cancer*. Can you tell us a little about that?

Katie Couric: With advances in technology and other areas, researchers are closer than ever to the kinds of discoveries that can end cancer. But they need more money and easier ways to collaborate on specific research projects with colleagues at other institutions—to work as part of “Dream Teams”—so new treatments get to patients as quickly as possible. That’s what *Stand Up To Cancer* is all about.

We launched last year, with the three networks collaborating on a simultaneously broadcast fundraising special. We want to make every American aware that they can make a difference in this fight by helping these

“We want to make every American aware that they can make a difference in this fight by helping these scientists.”

scientists. Whatever one individual can do in these tough economic times, every contribution—of any size—helps.

The first “Dream Teams” funded by *Stand Up To Cancer* will begin their work this year.

The goal of this magazine, *NIH MedlinePlus*, is to give people access to trusted, easily understood information about dealing with disease, staying healthy, and the latest research. Do you often hear from people seeking such reliable information?

Katie Couric: I do, and I empathize with how bewildering a cancer diagnosis can be. You are already emotionally shell-shocked hearing this terrible news, and you’re thrust into a situation where

people are speaking a language you don’t understand. We have to make scientifically based information readily accessible for the general public, and it has to be communicated in a way the average person can understand. So, bravo for *NIH MedlinePlus* for addressing this need!

What does the future hold for Katie Couric?

Katie Couric: We’ll have to wait and see! I’m focused on three things above all else: my job as anchor of the *CBS Evening News*; my cancer work; and, most importantly, my family: being the best mother I can to my two wonderful daughters, and the best daughter I can to my wonderful parents.

NIH Research to Results

The NIH's National Cancer Institute (NCI) is the world's largest organization solely dedicated to cancer research. NCI supports researchers at universities and hospitals across the United States. It also supports NCI-Designated Cancer Centers, a network of facilities that not only study cancer in laboratories but also conduct research on the best ways to rapidly bring the fruits of scientific discovery to cancer patients.

- The drug fluorouracil (5-FU) has been part of chemotherapy treatment for stage II and III colon cancer for several decades. Studies have shown that this treatment improves overall survival, but not the risk of the cancer occurring again.
- Results from a phase III clinical trial indicate that low doses of two chemopreventive agents—an anti-inflammatory and an experimental compound—are very effective at preventing the recurrence of the lesions that are often a sign of colorectal cancer. The results showed that the treatment was most effective in preventing the recurrence of the highest-risk polyps, showing a 92 percent reduction.
- The American College of Radiology Imaging Network (ACRIN) National CT Colonography Trial has found that computerized tomographic (CT) colonography, also known as virtual colonoscopy, is comparable to standard colonoscopy. The ACRIN trial, sponsored by NCI, is the largest multi-center study to compare the accuracy of state-of-the-art CT colonography to the gold standard of conventional colonoscopy.



Photos: David Nash

Questions to Ask Your Doctor

- **When do I need to have a colonoscopy?**
- **How often should I get a colonoscopy?**
- **What are my risk factors for colon cancer?**
- **What can I do to reduce my risk of getting colon cancer?**

To Find Out More

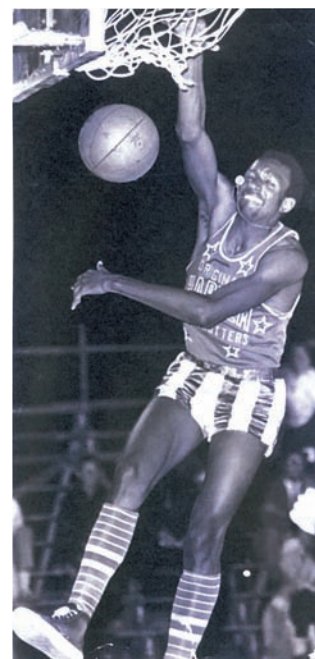
- **National Library of Medicine:** www.medlineplus.gov; search on "cancer" and "colorectal"
- **The National Cancer Institute:** www.cancer.gov
- **The National Institutes of Diabetes and Digestive and Kidney Diseases:** www.niddk.nih.gov
- **The American Cancer Society:** www.cancer.org
- **The American Society of Colon & Rectal Surgeons:** www.fascrs.org

Former Globetrotter Star Recommends Early Screening

Former Harlem Globetrotter David Nash, currently a staff member at the National Library of Medicine, was recently diagnosed with early-stage colon cancer, after a timely colonoscopy.

Nash is pictured with U.S. Sen. Daniel Inouye of Hawaii, chair of the Senate Appropriations Committee and a long-time champion of medical research.

Because Nash caught the colon cancer early, chances for recovery are excellent.



Symptoms

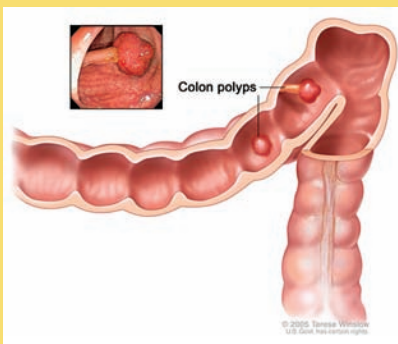
Check with your healthcare provider if you have any of the following symptoms:

- A change in bowel habits, such as diarrhea, constipation, or narrowing of the stool, that lasts for more than a few days
- A feeling that you need to have a bowel movement that is not relieved by doing so
- Rectal bleeding, dark stools, or blood in the stool
- Cramping or abdominal (belly) pain
- Weakness and fatigue

Most of these symptoms are more likely to be caused by conditions other than colorectal cancer, such as infection, hemorrhoids, or inflammatory bowel disease. Still, if you have any of these problems, it's important to see your healthcare provider right away so the cause can be found and treated, if needed.

Colorectal cancer is a disease

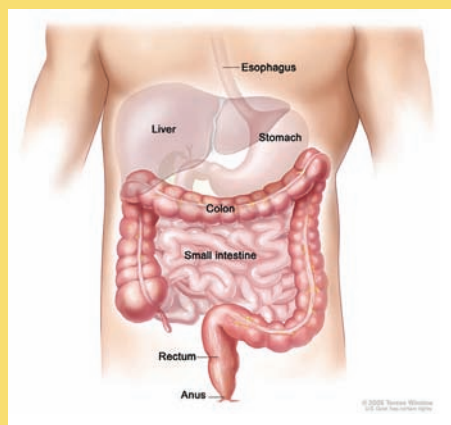
in which malignant (cancer) cells form in the tissues of the colon or the rectum. The colon is part of the body's digestive system.



Diagnosis

Health care providers may suggest one or more of the following tests for colorectal cancer screening:

- **Fecal occult blood test (FOBT)**—This test checks for hidden blood in fecal material (stool).
- **Sigmoidoscopy**—In this test, the rectum and lower colon are examined using a lighted instrument called a sigmoidoscope. During sigmoidoscopy, precancerous and cancerous growths in the rectum and lower colon can be found and either removed or tested.
- **Colonoscopy**—In this test, the rectum and entire colon are examined using a lighted instrument called a colonoscope. During colonoscopy, precancerous and cancerous growths throughout the colon can be found and either removed or tested.
- **Virtual colonoscopy (also called computerized tomographic colonography)**—In this test, special x-ray equipment is used to produce 3-D pictures of the colon and rectum. A computer then assembles these pictures into detailed images that can show polyps and other abnormalities. (see page 9)



Treatment

Different types of treatment are available for patients with colon cancer. Three types of standard treatment are used: surgery, chemotherapy and radiation therapy.

- **Surgery** (removing the cancer in an operation) is the most common treatment for all stages of colon cancer.
- **Chemotherapy** is a cancer treatment that uses drugs to stop the growth of cancer cells, either by killing the cells or by stopping them from dividing. When chemotherapy is taken by mouth or injected into a vein or muscle, the drugs enter the bloodstream and can reach cancer cells throughout the body (systemic chemotherapy). When chemotherapy is placed directly into the spinal column, an organ, or a body cavity such as the abdomen, the drugs mainly affect cancer cells in those areas (regional chemotherapy).
- **Radiation therapy** is a cancer treatment that uses high-energy x-rays or other types of radiation to kill cancer cells or keep them from growing. There are two types of radiation therapy. External radiation therapy uses a machine outside the body to send radiation toward the cancer. Internal radiation therapy uses a radioactive substance sealed in needles, seeds, wires, or catheters that are placed directly into or near the cancer.

Illustrations: National Cancer Institute

New Ways to Detect Colon Cancer

3-D virtual screening now being used

Photo: Stony Brook University



Dr. Arie Kaufman showcases a 3-D image generated by the virtual colonoscopy software he invented with a team of computer scientists and radiologists at Stony Brook University.

What if your physician could take a walk, or fly, through one of your internal organs to see if it's healthy? That's possible now with the colon. The result is a "virtual colonoscopy," which doesn't require a tube-camera to be placed inside your body.

By Christopher Klose

“Walking through the hall one day, it suddenly dawned on me that you could actually ‘fly’ through organs of the body. So we put two-plus-two together,” recalls Arie Kaufman, chairman of the computer science department at New York’s Stony Brook University. Dr. Kaufman is one of the world’s leading researchers in the high-tech medical fields of biomedical visualization, computer graphics, virtual reality, and multimedia.

The year was 1994. Kaufman’s “two-plus-two” was a respirator pipe—like a garden hose with tiny holes in the sides—eraser, pair of scissors, tank of water, and spiral CT (computed tomography) scanner.

“We cut the eraser into three pieces, to simulate polyps, glued them inside the respirator pipe and submersed the pipe in water, scanned it, looked at the results—and ‘Bingo!’ We had proved you could scan a tubular structure—such as a human organ, like the colon—and view it in virtual reality.”

Later, he and his team used it with anatomically detailed, three-dimensional representations of a cadaver (dead body) from the National Library of Medicine’s Visible Human project (www.nlm.nih.gov).

By 1996, Kaufman and his colleagues had patented a pioneering

computer software system and techniques for 3-D virtual colonoscopy for colon cancer screening.

“Things click in the life of an inventor,” says Kaufman. “You use your life experience; that’s what I like.”

First approved by the U.S. Food and Drug Administration in 2000, thanks to continuing improvements, Kaufman’s system today is able to “map” the colon wall, forming the basis for an electronic biopsy (medical test) of the entire colon surface.

“It doesn’t replace a real biopsy,” Kaufman says. “But it gives an initial indication of the medical significance of the abnormalities and can automatically detect and visualize masses and abnormalities, just like a mammogram for the colon.”

Among its advantages, virtual colonoscopies are quicker and cheaper than standard colonoscopies. Dr. Kaufman’s newest system, although not widely available, even makes it possible to see colon walls without having to physically evacuate the bowels. So people don’t need to do the dreaded “complete bowel preparation.”

“It’s been very exciting to help save lives,” Dr. Kaufman says of his work. “But most important, everyone over 50 needs to get screened. Most colorectal cancer can be prevented. Detect early, remove polyps, and the cancer is gone!”

Dr. Kaufman is now working on a similar system for the prostate.

Healthy Joints for a Lifetime

Remarkable advances are being made every day in the world of orthopedic health and disease treatment—our bones, muscles, tendons, ligaments, and related connective tissues. From reducing the crippling pain of arthritis to the miracle of knee and hip replacements, “musculoskeletal” research is changing how well—and how long—we can live an active, healthy life.

From reducing the crippling pain of arthritis to the miracle of knee and hip replacements, “musculoskeletal” research is changing how well—and how long—we can live an active, healthy life.

Most people take their bones and joints for granted—until something goes wrong with one or more of them. The human body has more than 200 bones and more than 200 joints that connect the bones.

“Almost every household in America is affected in some way by diseases of bones, joints, muscles, and skin,” says Stephen I. Katz, M.D., Ph.D., director of the National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS). It is NIAMS that is the nation’s research arm on these challenging conditions.

“Joint damage can happen to anyone at any age,” says Dr. Katz. “In fact, many of the diseases related to joints and bone problems affect women and minorities more severely. But there are steps you can take to help prevent or lessen the effects of joint damage.”

One of the most amazing options now is surgery to replace damaged joints. Almost half a million such hip or knee replacements occur in the United States each year. Here is an overview of the most common challenges and treatments.

FASTFACTS

- **The most common joint problems come from arthritis and injuries. Arthritis literally means joint inflammation. Although joint inflammation describes a symptom or sign rather than a specific diagnosis, the term “arthritis” often refers to any disorder affecting the joints. These disorders fall within the broader category known as rheumatic diseases, of which there are more than 100 kinds, and are characterized by inflammation as well as loss of function of one or more connecting or supporting structures of the body.**
- **More than 46 million people in the United States have arthritis or other rheumatic conditions. By the year 2020, this number is expected to reach 60 million. These diseases more frequently limit activity than do heart disease, cancer, or diabetes.**
- **The most common form of arthritis is osteoarthritis. It is seen especially among older people and is sometimes called degenerative joint disease. In osteoarthritis, the surface layer of cartilage (the hard but slippery tissue that covers the ends of bones) breaks down and wears away, causing pain, swelling, and loss of joint motion.**
- **About 435,000 Americans have a hip or knee replaced each year. Because of its structure and weight-bearing capacity, the knee is the most commonly injured joint. In the case of hip joint damage, osteoarthritis is the most common cause.**
- **Young adults who have had a previous joint injury are more likely to develop osteoarthritis. Researchers are looking for ways to prevent cartilage breakdown after injury.**

Keep Your *Moving* Parts *Moving*

Neck

Common problems: Osteoarthritis, rheumatoid arthritis, herniated disk, injury.

Shoulder

Common problems: Dislocation, separation, rotator cuff injuries, frozen shoulder, fracture (break), arthritis, sprains and strains, bursitis.

Spine

Common problems: Back pain from injuries, herniated disks, spinal stenosis.

Elbow

Common problems: Bursitis, tendinitis (including "tennis elbow"), overuse, traumatic or repetitive injuries.

Wrist

Common problems: Arthritis (osteoarthritis, rheumatoid arthritis), bursitis, osteoporosis, fracture, tendinitis, sprains, carpal tunnel syndrome.

Knee

Common problems: Osteoarthritis, sprains and strains, rheumatoid arthritis, sports injuries (ligaments and tendons), bursitis.

Hip

Common problems: Osteoporosis, fracture, osteoarthritis, rheumatoid arthritis, bursitis.

Ankle

Common problems: Sprains, strains, bursitis, tendonitis (Achilles tendinitis).

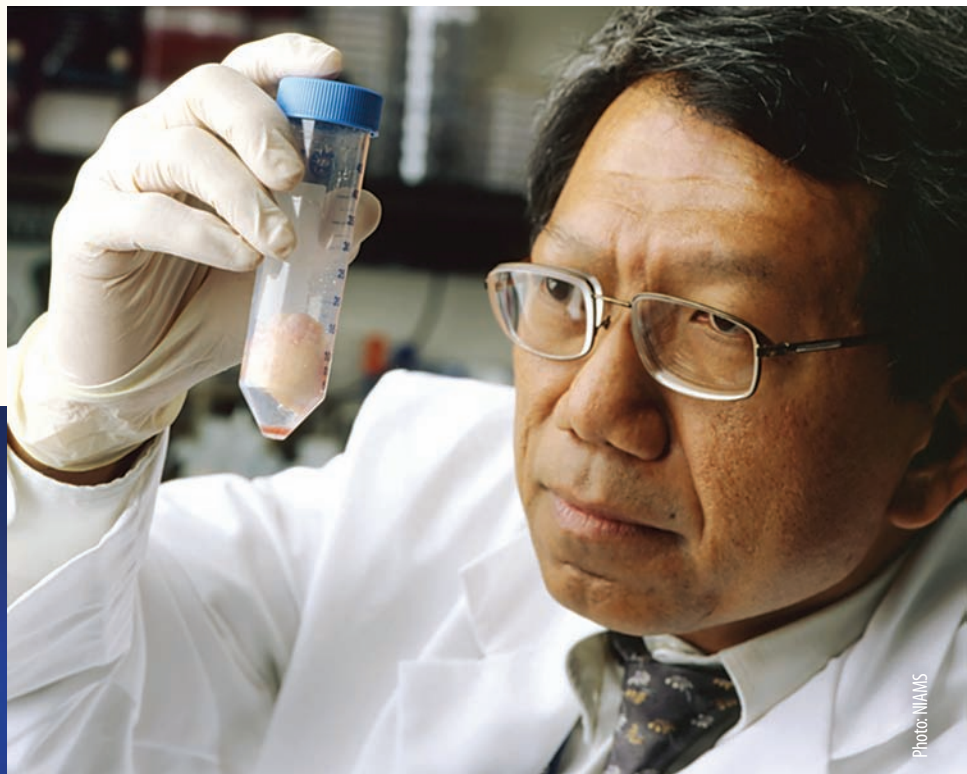
Foot

Common problems: Arthritis, tendinitis, gout, toe fractures, bursitis (big toe).

Photo: iStock

Targeting Musculoskeletal Pain

NIH researcher Dr. Rocky S. Tuan is helping to pioneer breakthroughs in how doctors deal with problems affecting their patients' tendons, ligaments, and other soft tissues—including their replacement.



Rocky Tuan, Ph.D., Chief of the Cartilage Biology and Orthopaedics Branch, holds a vial containing knee cartilage that was recovered from a total knee replacement. Part of his research is to engineer cartilage tissues that can be used to repair damaged joint cartilage.



Dr. Rocky S. Tuan is passionate about what, literally, connects us as human beings: the cartilage, ligaments, tendons, discs, and other soft tissue that hold the skeleton together, making movement possible. As Chief of the Cartilage Biology and Orthopaedics Branch at the National Institute of Arthritis, and Musculoskeletal and Skin Diseases, he heads a team of biologists, engineers, and clinical researchers who are pioneering advances in soft tissue development. He spoke about his research recently with *NIH MedlinePlus* magazine coordinator Christopher Klose.

For background, why are back and joint problems and diseases so important?

Dr. Tuan: Your musculoskeletal system is the body's largest system. Arthritis, back and joint pain, osteoporosis, and other problems can make life miserable. Though typically not life threatening, they are one of the most common reasons people go to the doctor. They're a huge economic burden for society, too.

What is the biggest problem?

Dr. Tuan: The biggest one is osteoarthritis. It affects 27 million Americans over the age of 25. As the population ages, the number of people with osteoarthritis will only continue to grow.

What causes osteoarthritis?

Dr. Tuan: Aging is a prime factor—wear and tear. Also, genetics and lifestyle can play a role. Both men and women have the disease, but it's more common in people who are overweight and in those with jobs that stress particular joints.

How does the disease work?

Dr. Tuan: There's damage or a tear in the cartilage. It worsens and pieces fall out, causing pain. The joint tissues are irritated and the body reacts by forming more tissue, known as "bone spurs." Pain increases, movement decreases, and something must be done.

What's the treatment for crippling osteoarthritis?

Dr. Tuan: Total joint replacements. They're a miracle. They restore activity and a person's self-esteem. But the problem is that artificial joints only last for 10 or 15 years, if you don't abuse them. That may be acceptable if you're in your 70s or 80s, but not in your 30s or 40s. You'll need another knee or hip—or two!

Are there any alternatives to joint replacement?

Dr. Tuan: Yes. In sports-related injuries, for example, one of the newest alternatives is cartilage or cartilage cell transplantation.

"We're close to a touchdown."

But it is not very efficient, requires many surgeries—with lots of little stitches, and cannot repair large defects.

Are you and your team working on new methods for cartilage replacement?

Dr. Tuan: Yes. Our goal is to mimic nature—to create a biological cure, not a mechanical fix. The idea is to grow a patient's own bone marrow stem cells, the ones that make connective tissues, outside the body into large pieces of cartilage, and then transplant the cartilage back into the patient. It's like a skin graft.

What's another area you're working on?

Dr. Tuan: Low back pain; specifically, engineering discs to treat low back pain. There is a huge need for such treatment. Now the disc is removed entirely and the vertebrae fused together. This stops the

pain but lessens the patient's mobility, which can lead to other problems.

Using tiny, biodegradable fibers seeded with adult stem cells, we've made a prototype disc which is remarkably similar to the natural disc. We will be testing it in the laboratory shortly to see how it performs.

Are you working on injuries to our soldiers in Iraq and Afghanistan?

Dr. Tuan: Yes, especially injuries to the arms and legs. We hope that what we're learning can also be applied in civilian

life. Previous studies have found that amputees frequently develop abnormal bone formation around the amputation site. This slows healing and makes it difficult—and painful—to fit prosthetic arms and legs.

Inside the traumatized muscles, we have discovered the cells responsible for abnormal bone formation. Interestingly, we have also found that these cells can stimulate nerve growth! So we are experimenting to see if we can stimulate them to repair the peripheral nerves damaged from injury and amputation.

How do you assess what you're doing?

Dr. Tuan: In all these areas, we are trying to solve very complicated questions. How to make cartilage, for example? Or keep adult stem cells young? I tell my team, "The ball is still in the air, but we're close to a touchdown."

Joint Health and Care

Prevention

Regular exercise, a balanced diet, and a healthful weight can help you reduce your risk of developing osteoarthritis, especially in the hips and knees, or suffering sports injuries. Exercise helps bone density, improves muscle strength and joint flexibility, and enhances your balance. Take part in regular walking, strength training, swimming, dancing, tai chi, gardening, and similar low-impact activities.

A bone-healthy diet should be rich in calcium and Vitamin D. Check to see if your favorite foods are fortified, and consider taking a daily vitamin or mineral supplement. Several medications are available to prevent osteoporosis. Ask your doctor which medications can best help you minimize additional bone loss and reduce your risk for fractures.

Symptoms

The symptoms of rheumatic disease or arthritis can vary. If you have a sports-related injury, get prompt medical attention to determine the severity. Symptoms of distress include:

- Swelling, warmth, or redness in the joint
- Recurring or constant joint pain or tenderness
- Joint stiffness or difficulty in using or moving the joint after a period of movement or activity
- A crunching feeling or the sound of bone rubbing on bone

Diagnosis

No single test can diagnose osteoarthritis. It is so common that symptoms or signs seemingly caused by the disease actually may be due to other medical conditions. Your doctor will ask you to describe the symptoms and review your medical history, and will examine any bothersome joints. A number of tests may be used to help achieve an accurate diagnosis, including:

- X-rays
- Magnetic Resonance Imaging (MRI)
- Blood tests
- A joint aspiration, which involves drawing fluid from the joint for examination

Treatment

The only type of arthritis that can be cured is that caused by an infection. All other types must be managed with a combination of rest, regular exercise, vitamin and mineral supplements, and medication. Consult your doctor before using any alternative therapy that has not been prescribed or recommended by your healthcare team. Common treatments include:

- Acetaminophen (Tylenol) for pain without inflammation
- NSAIDs such as aspirin or ibuprofen (Motrin, Advil) for pain with inflammation
- Topical analgesic products or the nutritional supplement combination of glucosamine and chondroitin may help
- Corticosteroid medications, such as prednisone or cortisone to reduce inflammation

Joint replacement: Your doctor may try a combination of exercise, walking aids, or medication to help strengthen muscles surrounding the joint and to ease associated stress and pain before considering joint replacement. In the case of hip replacement, doctors have found that surgery can be very successful in younger people as well as for those over 60 years of age. Recent studies suggest that people who elect to have surgery before advanced joint deterioration occurs tend to recover more easily and have better outcomes.

Osteoarthritis— What You Should Know

How much do you know about osteoarthritis, its causes, and its therapies? Take this quiz and find out.

- 1. True/False:** Osteoarthritis occurs when bone breaks down and wears away.
- 2. True/False:** The chance of developing osteoarthritis increases with age.
- 3. True/False:** Researchers suspect that osteoarthritis is caused only by environmental factors.
- 4. True/False:** Joint injuries from sports, work-related activities, or accidents increase the risk of developing osteoarthritis.
- 5. As a tool for diagnosing osteoarthritis, x-rays are:**
 - A. not useful
 - B. limited in their usefulness
 - C. the only way a doctor can make a diagnosis
- 6. Which of the following is not a sign or symptom of osteoarthritis?**
 - A. joint pain
 - B. stiffness
 - C. fever
 - D. bone rubbing on bone
- 7. True/False:** There is no cure for osteoarthritis.
- 8. True/False:** Exercise can help a person with osteoarthritis.
- 9. True/False:** Both heat and cold can be useful treatments for osteoarthritis.
- 10. What is the most common type of arthritis?**
 - A. Osteoarthritis
 - B. Rheumatoid Arthritis
 - C. Reactive Arthritis
 - D. Psoriatic Arthritis

ANSWERS:

- 1. FALSE.** Osteoarthritis occurs when cartilage, the tissue that cushions the ends of the bones within the joints, breaks down and wears away.
- 2. TRUE.** The chance of developing osteoarthritis increases with age. By age 65, half the population has x-ray evidence of osteoarthritis in at least one joint.
- 3. FALSE.** Researchers suspect that osteoarthritis is caused by a combination of factors including being overweight, the aging process, joint injury, and sports activities.
- 4. TRUE.** People with joint injuries from sports, work-related activities, or

accidents may be at increased risk of developing osteoarthritis.

5. B. X-rays are often used in combination with other methods to diagnose osteoarthritis. However, x-rays are limited in their capacity to reveal how much joint damage may have occurred, and they do not usually show osteoarthritis damage until significant cartilage loss occurs.

6. C. Common signs of osteoarthritis include joint pain, stiffness after getting out of bed, and a crunching feeling or sound of bone rubbing on bone. Fever is not a symptom of osteoarthritis.

7. TRUE: Current treatments for osteoarthritis can relieve symptoms such as pain and disability, but right now there

Research to Results

- NIAMS has embarked on several innovative efforts to understand the causes and identify effective treatment and prevention methods for osteoarthritis. Through a public/private partnership, researchers are identifying biomarkers (laboratory and imaging signposts that detect disease) that will help develop and test new drugs.
- NIH's National Center for Complementary and Alternative Medicine and NIAMS funded a major, 16-center study on the usefulness of the dietary supplements glucosamine and chondroitin sulfate, which previous studies have suggested may be useful for osteoarthritis.
- Scientists are studying replacement joints to find out which are best to improve movement and flexibility. They are also studying new joint materials and prosthesis designs, and new surgical techniques.

To Find Out More

Go to the National Library of Medicine's www.medlineplus.gov and search on "arthritis," "osteoarthritis," and other related terms.

The Web site for the National Institute of Arthritis and Musculoskeletal and Skin Diseases has much more information on osteoarthritis. www.niams.nih.gov

is no cure for the disease.

8. TRUE. Exercise is one of the best treatments for osteoarthritis. It can improve mood and outlook, decrease pain, increase flexibility, and help you maintain a healthy weight. Ask your doctor or physical therapist what exercises are best for you.

9. TRUE. For temporary pain relief from osteoarthritis, you can use warm towels, hot packs, or a warm bath or shower. Cold packs are often used to reduce the inflammation of swollen joints.

10. A. Osteoarthritis is the most common form of arthritis. It causes pain, swelling and reduced motion in your joints. It can occur in any joint, but usually it affects your hands, knees, hips, or spine.

Understanding Headaches: From Mild to Migraine

Photo: iStock

FASTFACTS

- The most common type of headache is a tension headache. These usually are due to tight muscles in your shoulders, neck, scalp, and jaw.
- Migraines, the most serious of headaches, can cause intense pain and nausea, and occur again and again. There are medicines that can help.
- Sometimes, but not often, headaches warn of more serious problems. If you suffer sudden, severe headaches, tell your healthcare provider. Get immediate medical help if you have a headache after a blow to your head, or if you have a headache along with stiff neck, fever, confusion, loss of consciousness, or pain in the eye or ear.

Millions of people have headaches every day. But not all headaches are the same. From mild tension headaches to crippling migraines, there are steps you can take to prevent them or reduce their pain.

Karl Eckhart first felt the crushing, very painful symptoms of a migraine headache as a college student in his native Iowa. “My bouts usually lasted six to eight hours. The only way to get through them was to lie down in a dark room and just suffer through it.

“My migraines start as a dull ache at a pinpoint spot in my head,” he says. “Then I get really sensitive to light. That’s when I know it’s not just a regular headache. I often get nauseated, sometimes sick to my stomach; then I have to lie down.”

For nearly two decades, Eckhart, now living in Alexandria, Virginia, coped with the migraines on his own. First, he took

an over-the-counter pain reliever. It helped. But then he developed a stomach ulcer, which the pain reliever only aggravated.

That's when he decided he had to see his doctor, who happens to be a neurologist. He started Eckhart on a prescription medication for migraines, and, so far, the results have been good.

"The medicine knocks them out in three to four hours," he says. "You feel a little cold but that's how I know it's working. I wish I'd gone to the doctor a lot sooner."

“My bouts usually lasted six to eight hours. The only way to get through them was to lie down in a dark room and just suffer through it.”

What Are Headaches?

What is it that hurts when you have a headache? Your skull bones and tissues of the brain never hurt, because they do not have nerves that are sensitive to pain. But other areas of the head can hurt, including the network of nerves that extends over the scalp and certain nerves in the face, mouth, and throat. Also sensitive to pain are the muscles of the head and the blood vessels found along the surface and at the base of the brain.

Understanding why headaches occur and improving their treatment are part of the research goals of the National Institute of Neurological Disorders and Stroke (NINDS). As the federal government's primary brain researcher, NINDS also supports studies to improve the diagnosis, treatment and prevention of headaches. Much of that research focuses on migraines.

"The more we understand, the likelier we can develop good drugs to treat migraines," says Dr. Nabih Ramadan of the National Headache Foundation and a clinical professor of neurology at Loyola University. His migraine research is partially funded by NIH. "There are drugs currently in clinical trials that may make treatment even better," he says.

"In the next five years, we should see some new and novel treatments, even some non-medicinal ones that have long-lasting benefits. Understanding what happens at the cellular and molecular level has improved migraine treatment tremendously over the last 20 years," Ramadan says.

"For us, migraines are hereditary," says Karl Eckhart. "My mom and her side of the family all have them. For the women, migraines occur in a cycle. For the men, migraines are triggered mostly when the weather changes and the barometric [air] pressure falls. It goes back generations.

"For me, migraines began with the weather. Now they're triggered by workplace stress. My advice? Don't delay going to the doctor. There are many different causes of migraines. People need to identify and try to address them. Regular exercise helps me with the stress trigger. Also, I avoid chocolate.

"The point is," Eckhart declares, "medical research has really made a difference for me."



Karl and Lisa Eckhart are enjoying life even more, now that his migraine headaches are responding to medicine prescribed by a neurologist.

Headache Symptoms, Diagnosis, and Treatment

There are several types of headache. Each has distinct symptoms and treatments.

Migraine and Other Vascular Headaches—Symptoms and Diagnosis

- **Migraine:** The most common of vascular headaches, migraines are thought to involve abnormal functioning of the brain's blood vessels. Migraines cause severe pain on one or both sides of the head, upset stomach, and, at times, disturbed vision. People often describe migraine pain as pulsing or throbbing in one area of the head. During migraines, people become very sensitive to light and sound. They may also become nauseous and vomit. Women are more likely than men to suffer migraines.
- **Toxic:** The second most common type of vascular headache, toxic headache, occurs during fevers from disease.
- **Cluster:** Cluster headaches cause repeated, intense bouts of pain lasting from 15 minutes to three hours or more.

Tension and Other Muscle-Contraction Headaches—Symptoms and Diagnosis

- **Tension:** Ninety percent of all headaches are tension headaches. They are brought on by stressful events and involve the tightening or tensing of facial and neck muscles. Pain is mild to moderate and feels like pressure is being applied to the head or neck. Tension headaches normally disappear after the period of stress is over.
- **Chronic:** Chronic muscle-contraction headache may last for weeks or months. The pain is often described as a tight band around the head or a feeling that the head and neck are in a cast. "It feels like somebody is tightening a giant vise around my head," says one patient. Pain is steady, and usually felt on both sides of the head. Chronic muscle-contraction headaches can cause sore scalps—even combing one's hair can be painful.
- **Traction and Inflammatory:** Less common than tension and migraine headaches, these headaches usually are symptomatic of other disorders, ranging from sinus infection to stroke.

Treatment

When headaches occur three or more times a month, treatment is typically recommended. Pain medication, biofeedback training, stress reduction, and elimination of certain foods from the diet are the most common methods of controlling and preventing vascular headaches. Regular exercise, including swimming or vigorous walking, can also reduce the number and severity of migraines.

Not all headaches require medical attention. But some types signal more serious disorders and call for prompt medical care. These include:

- **sudden, severe headache**
- **sudden headache associated with a stiff neck**
- **headaches associated with fever, convulsions, or accompanied by confusion or loss of consciousness**
- **headaches following a blow to the head, or associated with pain in the eye or ear**
- **persistent headache in someone previously headache free**
- **recurring headache in children.**

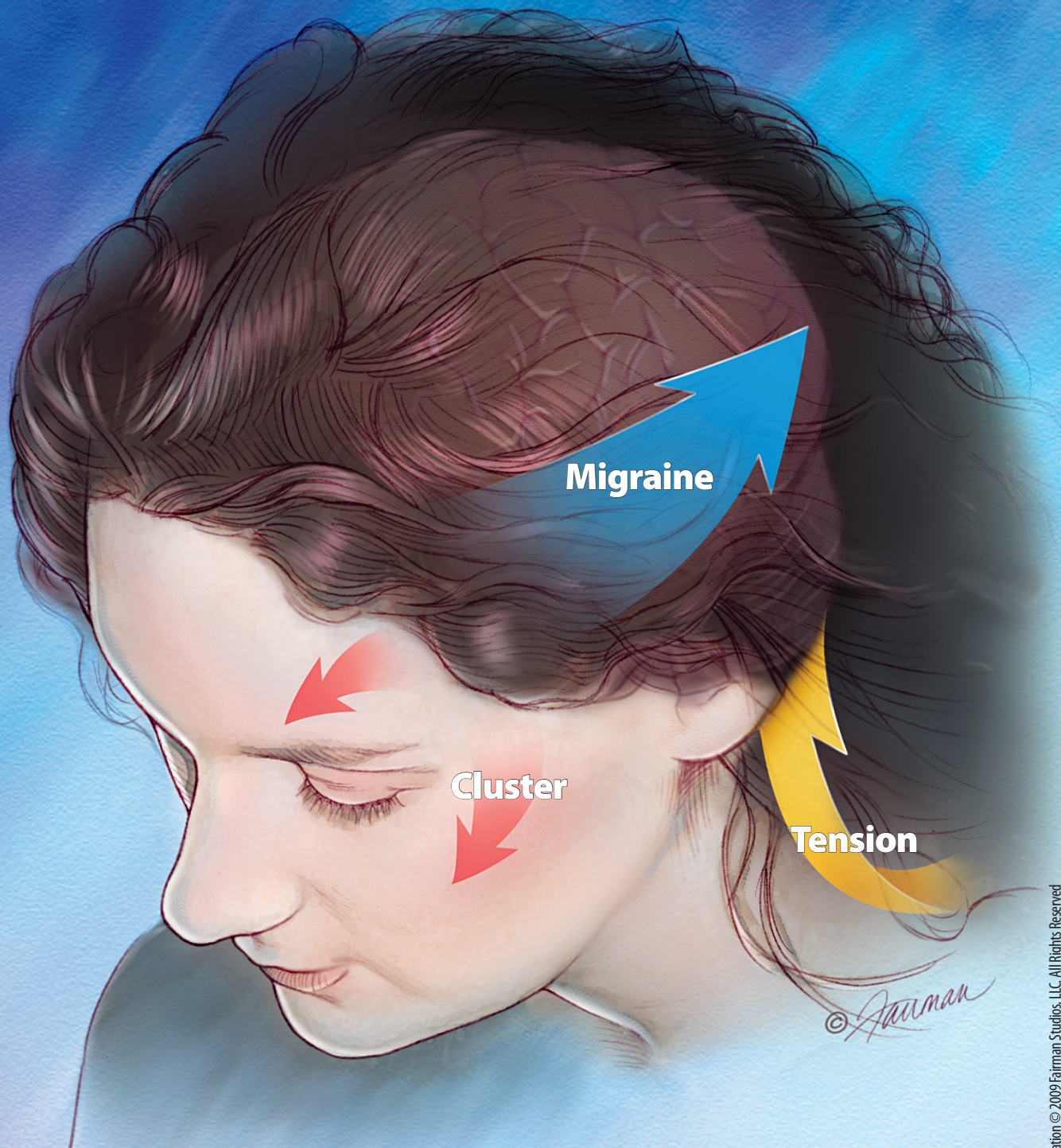


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Where Does It Hurt?

Headaches are felt in different parts of the brain, as shown here:

- **migraine (blue arrow)**
- **cluster headache (red arrows)**
- **tension type (yellow arrow)**

Migraine 101

Not sure of the facts when it comes to headaches and migraines? Test your knowledge with this quick quiz.



Photo: iStock

1. **True/False:** A migraine headache begins with a visual disturbance called an aura.
2. **True/False:** All migraines involve only one side of the head.
3. **True/False:** There is a cure for migraine headaches .
4. **Dietary triggers for migraines include:**
 - A. Chocolate
 - B. Cheese
 - C. Food additives such as MSG
 - D. Alcohol
 - E. A, B, and C
 - F. A, B, C, and D
5. **True/False:** Migraines sometimes run in families.
6. **True/False:** A bad headache is usually a sign of a brain tumor.



Answer key:

1. True.
Before the actual headache, the patient usually sees spots, dots, or even zigzag lines.
2. False.
Atypical migraines sometimes involve the whole head instead of only one side.
3. False.
Migraine headaches can be treated with medication, but there is no cure.
4. F.
5. True.
Although many sufferers have a family history of migraine, the exact hereditary nature of this condition is still unknown. People who get migraines are thought to have an inherited abnormality in the regulation of blood vessels.
6. False.
Headaches can serve as a warning sign of more serious disorders, but there are many causes. See your doctor if your headaches aren't relieved by standard treatments.

Sources: Patient Education Institute,
National Institute of Neurological Disorders and Stroke



NIH Research to Results

Much headache research focuses on migraines, which are frequently so severe they prevent people from being able to work or go about their daily activities.

- NINDS has helped to uncover why, when the level of a certain brain molecule goes up, migraine pain increases. Clinical trials are currently studying how to block the molecule and thus reduce migraine pain.
- Functional magnetic resonance imaging (fMRI) has been used to discover that the brain stems of migraine sufferers are more sensitive to certain stimulations than people without migraines. Researchers hope this will lead to new, targeted treatments.
- Gene mutations have been linked to migraines. A Massachusetts General Hospital study has connected a well known mutation found in certain families with the wave of electrical activity in the brain that happens during a migraine. This could help explain why migraines occur more frequently in some families than others. The study was supported by National Institute of Neurological Disorders and Stroke (NINDS).

Questions to Ask Your Doctor

- How can I reduce stress, or make other changes in my life to cut down on my headaches?
- What pain relievers should I take for a headache?
- Is there anything, besides medication, that can help me?

To Find Out More

- Go to the National Library of Medicine's www.medlineplus.gov and search on "headaches," "migraine," and other related terms.
- The Web site for the National Institute for Neurological Disorders has much more information on headaches. www.ninds.nih.gov
- The National Headache Foundation's Web site: www.headaches.org
- The American Headache Society's Web site: www.achenet.org

Most people have heard of hepatitis, but few understand the harm posed by this potentially deadly collection of diseases. **Here's what you need to know.**

The Dangers of Hepatitis

What you should know from A to E

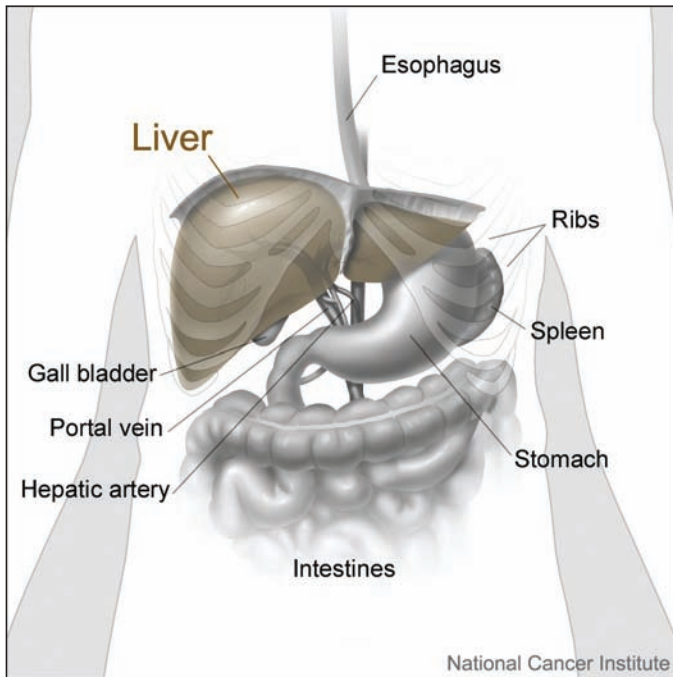
FASTFACTS

- **Hepatitis means inflammation of the liver. With hepatitis, the liver stops working well.**
- **Viruses cause most hepatitis. Viral hepatitis is the most common cause of liver disease in the world.**
- **At least five different viruses cause hepatitis in people. Hepatitis A and E are spread through contaminated food, water, and human waste. Hepatitis B, C, and D are spread through an infected person's blood or body fluids.**
- **Vaccines protect against hepatitis A and B. No vaccines are available for hepatitis C, D, and E.**
- **Hepatitis B, C, and D can cause long-lasting problems, including liver scarring (cirrhosis) and cancer.**

The liver is the body's largest internal organ. It performs many important jobs, including changing food into energy and cleaning alcohol and poisons from the blood. The liver:

- **Makes bile, a yellowish-green liquid that helps with digestion**
- **Produces proteins and blood-clotting factors that the body needs**
- **Regulates glucose (sugar) in the blood and stores extra sugar**





The largest organ in your body, the liver is found behind the lower ribs on the right side of the abdomen. It changes food to energy and cleans alcohol and other poisons from your blood.

- Works with the stomach and intestines to digest food
- Stores vitamins and minerals
- Removes toxic (poisonous) substances from the blood

Hepatitis swells the liver, stopping it from working well. It can lead to scarring (cirrhosis) or cancer. Viruses cause most cases of hepatitis. The various types of the disease are named for the viruses which cause them. For example, the cause of hepatitis A is the hepatitis A virus. Drug or alcohol use can also lead to hepatitis. In other cases, your immune system attacks healthy liver cells in your body by mistake. Vaccines prevent some viral hepatitis forms. Sometimes hepatitis goes away by itself. If it does not, it can be treated with drugs. In some cases, hepatitis lasts a lifetime.

Hepatitis: Acute or Chronic?

Acute hepatitis is the initial infection, which may be mild or severe. If the infection lasts for six months or longer, the condition is called chronic hepatitis. Hepatitis A and E do not cause chronic hepatitis. Hepatitis viruses B, C, and D can produce both acute and chronic episodes of the illness. Chronic hepatitis B and C are especially serious.

Types of Hepatitis

Currently, five different viruses are known to cause viral hepatitis:

- **Hepatitis A:** Sometimes called “infectious hepatitis,” hepatitis A is spread by eating food or drinking water contaminated with human waste. Hepatitis A is rarely life-threatening.
- **Hepatitis B:** Also called “serum hepatitis,” hepatitis B spreads from mother to child at birth or soon after, and also through sexual contact, contaminated blood transfusions and needles. Hepatitis B may scar the liver (cirrhosis) and lead to liver cancer.
- **Hepatitis C:** Formerly known as “non-A, non-B hepatitis,” hepatitis C is the most common form of viral hepatitis. While it can be transmitted through contaminated blood transfusions and/or needles, for a substantial number of patients, the cause is unknown. It may scar the liver. Hepatitis C infection is common in about 25 percent of people who are HIV-positive. Hepatitis C also infects up to 90 percent of HIV-infected injection drug users. And it is more severe in patients with HIV.
- **Hepatitis D:** This form most often infects intravenous (IV) drug users who are also carriers of the hepatitis B virus. It is spread only in the presence of the hepatitis B virus and is transmitted in the same ways. Hepatitis D is a serious health problem because it occurs in those with hepatitis B, increasing the severity of symptoms associated with hepatitis B.
- **Hepatitis E:** Similar to hepatitis A, hepatitis E is prevalent in countries with poor sanitation. It is rare in North America and rarely life threatening.

Hepatitis Can Strike Anyone

From Hollywood's "Walk of Stars" to Main Street, USA, people from all walks of life are affected by hepatitis, especially hepatitis C, the most common form of the disease. And that includes many well-known names:



Photo: AP Photo

Legendary television star Larry Hagman was diagnosed with advanced hepatitis C liver disease. He received a life-saving liver transplant in 1995 and has gone on to advocate for organ donation.



Photo: AP Photo

Grammy-winning singer Natalie Cole was diagnosed with hepatitis C in early 2008. She is currently undergoing dialysis after suffering kidney failure after her treatment.



Photo: AP Photo

After retiring from the award-winning country music duo, The Judds, because of hepatitis C, Naomi Judd founded the Naomi Judd Research Fund. With her hepatitis in remission, Judd continues her work as a spokesperson for the National Liver Foundation.

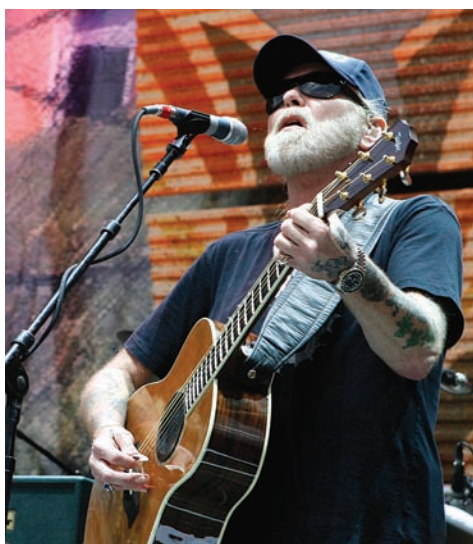


Photo: AP Photo

After having to cancel several concert dates in 2008 to treat his hepatitis C, Greg Allman, singer for the Allman Brothers Band, is in remission and back on the road.

Symptoms

- Jaundice (yellowing of the skin and eyes)
- Feeling tired
- Stomach ache
- Nausea
- Diarrhea
- No appetite
- Fever
- Headaches

NIH Research to Results

Liver diseases afflict Americans of all ages and stages, but most frequently those in the productive “prime of life” years, between the ages of 40 and 60 years, notes Jay Hoofnagle, M.D., of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). Minorities and the poor are especially hard hit.

Currently, an estimated 5.5 million Americans (approximately 2 to 3 percent of adults) suffer from chronic liver disease or cirrhosis. The combined diagnoses of chronic liver disease, cirrhosis, viral hepatitis, and liver cancer make liver disease one of the 10 leading causes of death in the United States. While death rates

“Hepatitis C is the most critical area of all liver disease research.”

from some forms of liver disease are decreasing, those for viral hepatitis and liver cancer are on the rise, both in the U.S. and worldwide. An estimated one quarter of Americans will suffer from a liver or biliary (gallbladder-related) disease at some point during their lifetime. Hepatitis, especially hepatitis C, is a chief cause of liver diseases.

“The hepatitis C virus was discovered just 20 years ago,” says Dr. Hoofnagle, who directs the Liver Disease Research Branch in NIDDK’s Division of Digestive Diseases and Nutrition. “Today it is clear that hepatitis C is the most common cause of chronic liver disease in the United States, the most common cause of liver scarring (cirrhosis), the most common reason for liver transplantation, and, now, the most common cause of liver cancer. Hepatitis C is the most critical area of all liver disease research.”

Among many NIDDK research projects related to hepatitis and liver disease:

- A recent study concluded that about half of patients with chronic hepatitis C recovered after receiving initial treatments from two drugs, peginterferon and ribavirin.

To Find Out More

- <http://digestive.niddk.nih.gov>
- www.medlineplus.gov

Diagnosis

To check for hepatitis viruses, your doctor will test your blood. You may also need a biopsy to see if there is liver damage.

Treatment

- Bed rest, abstaining from alcohol, and taking medication to help relieve symptoms. Most people who have hepatitis A and E get well on their own after a few weeks.
- Hepatitis B is treated with drugs, such as lamivudine and adefovir dipivoxil. Hepatitis C is treated with a combination of peginterferon and ribavirin.
- Liver transplant of hepatitis B or C, or D-caused liver failure.

Prevention

■ Hepatitis A

Immunization of children (1-18 years of age) consists of two or three doses of the vaccine. Adults need a booster dose six to 12 months following the initial dose of vaccine. The vaccine is thought to be effective for 15–20 years or more.

■ Hepatitis B

Safe and effective vaccines provide protection against hepatitis B for 15 years and possibly much longer. Currently, the Center for Disease Control and Prevention recommends that all newborns and individuals up to 18 years of age and adult participating at risk of infection be vaccinated. Three injections over a six to 12 month period are required to provide full protection.

■ In General:

- Wash your hands after going to the bathroom and before fixing food or eating.
- Use latex condoms, which may lower the risk of transmission.
- Avoid tap water when traveling to certain countries or regions. Ask your doctor about risks before you travel or call the Centers for Disease Control and Prevention at 877-FYI-TRIP.
- Don’t share drug needles.
- Don’t share personal items—such as toothbrushes, razors and nail clippers—with an infected person.

Questions to Ask Your Doctor

- What kind of hepatitis do I have?
- Can I spread it to my family and others?
- Can it be treated? If so, how?
- Can I drink wine or beer?
- How long will I be sick?
- What if I am not better in a few weeks?

DARWIN, DNA, and Milestones in the Evolution of Genetic Research



2009 marks the 200th anniversary of **Charles Darwin's birth** and the 150th anniversary of the publication of his groundbreaking work, *The Origin of Species*. Since that time, many more scientific milestones have occurred in our understanding of evolution and genetics.

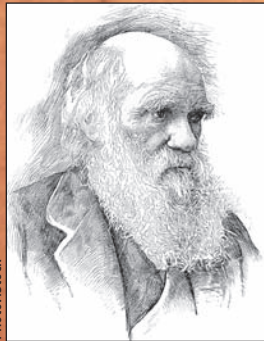


Photo: iStock

1809:
**Charles Darwin, the
Father of Evolution,
is born.**

1859:
**Darwin Publishes
*On the Origin of Species***

Radical in sweep, Darwin's *On the Origin of Species by Means of Natural Selection, or The Preservation of Favoured Races in the Struggle for Life* forces a rethinking of humankind's place in the natural world. Darwin ends his groundbreaking book with these words:

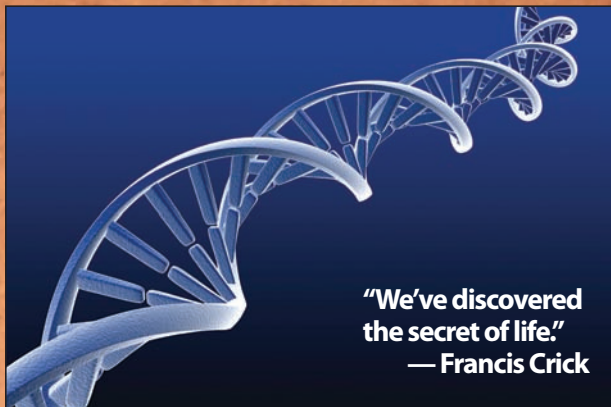
"...There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, **evolved.**"

— Charles Robert Darwin,
from *On the Origin of Species* (1859)

Darwin studies inheritance in organisms from peas to pigeons and produces variations over generations. But he does not know why living things resemble their parents or display certain traits.

Photo: iStock

THE GENOME



**"We've discovered
the secret of life."
— Francis Crick**

Photo: iStock

1953: The Discovery of DNA

Using x-ray data collected by scientist Rosalind Franklin, fellow scientists James D. Watson and Francis Crick propose the double helix structure of the DNA molecule.

DNA, or deoxyribonucleic acid, is the hereditary material in humans and almost all other living things. Our genetic "code" is assembled from four chemicals: adenine (A), guanine (G), cytosine (C), and thymine (T). The order, or sequence, of these chemicals determines how an organism will be built and maintained—similar to how letters of the alphabet may be combined to form words and sentences.

2003: Human Genome Sequenced

Begun in 1990 and completed in 2003, the Human Genome Project now gives us the ability, for the first time, to read nature's complete genetic blueprint for building a human being. Sponsored by the U.S. Department of Energy and the NIH, the project has created the field of genomics—understanding genetic material on a large scale—and jump-started what some call the "biology century." Scientists are building on the knowledge, resources, and technologies resulting from the Human Genome Project to better understand genetic contributions to human health. As a result, the field of genomic medicine was born. Genetics is playing an increasingly important role in how we diagnose, monitor, and treat diseases.

Evolution in Medicine: Combating New Infectious Diseases

In late 2002, several hundred people in China came down with a severe form of pneumonia caused by an unknown infection. Called "severe acute respiratory syndrome," or SARS, the disease soon spread to Vietnam, Hong Kong, and Canada and led to hundreds of deaths. In March 2003, a team of researchers at the University of California, San Francisco, received samples of a virus isolated from the tissues of a SARS patient. Using a new technology known as a DNA microarray, within 24 hours the researchers had identified the virus as a previously unknown member of a particular family of viruses—a result confirmed by other researchers using different techniques. Immediately, work began on a blood test to identify people with the disease (so they could be quarantined), on treatments for the disease, and on vaccines to prevent infection with the virus.

An understanding of evolution was essential in identifying the SARS virus. The genetic material in the virus was similar to that of other viruses because it had evolved from the same ancestor virus. Also, knowing the evolutionary history of the SARS virus gave scientists important clues about the disease, such as how it is spread. Knowing the evolutionary origins of human infectious agents will be critical in the future as existing agents evolve into new and more dangerous forms.

To Find Out More

- **NIH Evolution Revolution—A Year-Long Celebration of Darwin's Work & Impact:**
www.science.education.nih.gov/evorevo
- **"Rewriting the Book of Nature" Darwin Exhibition**
www.nlm.nih.gov/exhibition/darwin/

By Shana Potash, NLM Staff Writer

The Alzheimer's Project Multimedia Campaign Debuts on HBO and Online

HBO Documentary Films and the NIH's National Institute on Aging (NIA) invite you to join *The Alzheimer's Project*, featuring a four-part documentary series, 15 short films, an extensive Web site, and nationwide community-based information and outreach, including other resources such as a companion book to the series. The series debuts May 10-12 on HBO. All films will also stream free of charge on hbo.com and will be offered for free on multiple platforms by participating television service providers.

Two years in the making, *The Alzheimer's Project* seeks to widen public understanding of Alzheimer's disease research and care giving. The films take you into the laboratories and clinics of leading experts in the field of Alzheimer's research, where the cutting-edge work of NIH grantees takes place. It also presents the moving stories of people with this disease and the families that care for them.

To promote education and discussion about the disease on a local level, *The Alzheimer's Project* will offer free "screening kits," containing film DVDs and viewing guides to organizations and groups nationwide interested in hosting discussions. The collaboration also includes the Alzheimer's Association, the Fidelity Charitable Gift Fund, and the Geoffrey Beene Gives Back Alzheimer's Initiative. The project is co-executive produced by Maria Shriver and HBO Documentary Films President Sheila Nevins.

For more information on the campaign and on Alzheimer's disease:

- www.hbo.com/alzheimers/screenings
- www.nia.nih.gov/hbo



Swimming Lessons for Tots?

Is it good to teach very young children to swim? A new NIH-funded study finds that formal swimming lessons for children between the ages of one and four does not increase the risk of drowning. It may even help prevent it.

In the past, concerns had been raised that swimming lessons for that age group could increase drowning risk if parents become so confident in their child's newfound ability that they are less watchful. Study authors say their findings should ease those concerns. The authors cautioned that swimming lessons alone are insufficient (many drowning victims are good swimmers), but they do offer an additional layer of protection. It's also important for residential pools to be fenced on all sides (separating the home from the pool) and to have adults trained in CPR watching over swimmers. The study was conducted by the Eunice Kennedy Shriver Institute on Child Health and Human Development.

Rethinking Drinking

How many "drinks" are in a bottle of wine? What counts as a "drink?" Is your drinking pattern risky? A new Web site could help many people reduce their risk for problems associated with risky drinking habits. Called "Rethinking Drinking," the Web site features information, interactive tools and resources to help people identify signs of a current or future alcohol problem and learn how to cut back or quit drinking. **Find the materials, produced by the National Institute on Alcohol Abuse and Alcoholism, at RethinkingDrinking.niaaa.nih.gov.**

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 Biomedical 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 1-866-615-6464
- **National Institute of Neurological Disorders and Stroke (NINDS)** www.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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HBO Documentary Films and the National Institute on Aging of the National Institutes of Health, in association with the Alzheimer's Association, Fidelity Charitable Gift Fund, and Geoffrey Beene Gives Back Alzheimer's Initiative, present *The Alzheimer's Project*.

For more information: www.nia.nih.gov/hbo

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