

NIH News in Health

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Understanding Breast Cancer

Early Detection, Improved Treatments Save Lives

More women are beating breast cancer these days, in part because of improved treatments and screening. When abnormal tissue or cancer is found in its early stages, it may be easier to treat.

NIH-funded scientists are searching for better ways to diagnose, treat, and even prevent breast cancer. Some are studying cancer at the cellular level to learn which tumors pose little danger and can be left alone. Others are developing targeted therapies with fewer side effects and seeking ways to boost survival. Certain drugs are already being used to help prevent breast cancer in some women at greatest risk.

Breast cancer is the second most common kind of cancer among women (after skin cancer). Men can get breast cancer too, although it's rare. A woman's risk of developing breast cancer rises as she gets older. Family and personal health history also affect her chances. Risk increases if a close relative has been diagnosed. Risk also goes up the longer a woman is exposed to the **hormone** estrogen. This means that risk is greater the earlier a woman starts menstruating, the later in life she has her first child, and the later she enters menopause. Exposure to

radiation and other environmental factors can also raise the risk of breast cancer.

Warning signs of breast cancer can sometimes be seen or felt. Symptoms include a lump in the breast or armpit, breast pain, unusually firm breast skin, nipple discharge, or changes in the size or shape of the breast. Having one or more of these symptoms doesn't necessarily indicate cancer. In fact, most lumps are not cancerous. But any of these changes should be discussed with a doctor.

Even before symptoms appear, screening tests can check for early cancer. Mammograms, or X-ray images of the breast, have helped reduce the number of deaths from breast cancer among women ages 40 to 70, especially those over age 50.

"Mammograms decrease the risk of dying of breast cancer, although no screening test is perfect," says Dr. Barry Kramer, who heads cancer prevention research at NIH.

Mammograms, though, can have some drawbacks. Sometimes mammograms detect tumors that may not cause harm in the long run but are treated anyway. In these cases, women might receive toxic therapies for tumors that weren't really a threat to their health. In addition, mammograms can sometimes have "false-positive" results; the tissue may look abnormal even though no cancer is present. False-positives can cause fear and anxiety and may lead to unnecessary follow-up testing.

Despite these concerns, mammo-



grams remain an effective screening test. "Mammograms detect 80–85% of all breast cancers," says Dr. Powel Brown, a breast **oncologist** at MD Anderson Cancer Center in Houston. "It's still the best screening test we have, although imaging tests such as breast MRI, ultrasound, and breast tomograms are also being used, particularly in high-risk women."

Experts recommend that women consult a health care provider at age 40, discuss their risks, and together decide when it's best to start mammogram screening. Some women

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Definitions

Hormone

A substance produced in one part of the body to signal another part to react a certain way.

Oncologist

A doctor who specializes in treating cancer.

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may not need to start these tests until age 50. "Screening, like treatment, should be individualized," Brown says.

"Data shows an approximately 20% relative reduction in death for women who start getting mammograms at age 50 and have them every year or 2," says Dr. Leslie Ford, who specializes in clinical research and cancer prevention at NIH.

When early-stage breast cancer is detected, the main treatments are surgery and radiation. A lumpectomy removes the affected area, but some women need a mastectomy, removal of the whole breast. Chemotherapy, or cancer-fighting medications, may also be used before or after surgery. In some cases, oncologists use targeted drugs or hormone therapy to treat certain types of tumors.

Once cancer spreads to other

parts of the body, there's no effective cure. Still, new therapies can control **metastatic** breast cancer to prolong life. Last year, one NIH-funded study found that a combination of 2 drugs can lengthen the lives of postmenopausal women with the most common type of metastatic breast cancer.

When it comes to preventing breast cancer, strategies can vary depending on each woman's risk. Women at greatest risk include those who've already had cancer in one breast and those with a mother, sister, or daughter who's had breast cancer, especially if they were diagnosed before age 50.

"If you have a strong family history of breast or ovarian cancer, get evaluated by a genetic expert," Brown recommends. One genetic test looks at the *BRCA* genes. Women with certain *BRCA* mutations have a greatly increased risk of developing breast cancer, a risk that rises with age.

"If a woman has a *BRCA* mutation, she's faced with deciding at what age to deal with it and how," says Ford. "She must decide between preventive surgery and monitoring it closely."

Preventive mastectomy—or surgical removal of a seemingly healthy breast—is an option for women at very high risk for breast cancer. A woman considering this aggressive

**Web Links**

For more about breast cancer, click the "Links" tab at:

<http://newsinhealth.nih.gov/issue/Oct2013/Feature1>

surgery should talk with her doctor about her cancer risk, the surgical procedure, its potential complications, and alternatives to surgery.

Studies have shown that reducing prolonged exposure to the hormone estrogen might be another way to lower the risk of breast cancer. One preventive approach is to take medicine that blocks the effects of estrogen. Two such drugs, tamoxifen and raloxifene, are sometimes given to women at high risk for breast cancer. Raloxifene can only be given to postmenopausal women. Both of these medicines can have serious side effects. Still, their potential benefits for both prevention and treatment are encouraging. Large NIH-funded primary prevention studies of women at increased risk for breast cancer showed that "tamoxifen and raloxifene each reduced the risk of developing breast cancer by about 50%," says Ford.

The drug exemestane, which decreases the amount of estrogen produced by the body, also shows promise for preventing breast cancer in at-risk postmenopausal women. Exemestane is usually given after breast cancer treatment to reduce the risk of the cancer returning.

"It's a lost opportunity to not use these medicines," says Brown. Women at elevated risk of breast cancer should talk with their doctor about the potential benefits and harms of taking these preventive medicines.

No matter what your risk for breast cancer, you can make healthy changes that might lower your chances of getting the disease. Eat a heart-healthy diet, reduce alcohol intake, don't smoke, and get regular exercise. Talk to a health care provider about how you might lower your risk of cancer. ■

**Wise Choices
Talk To Your Doctor**

- if you notice a lump or firm tissue on your breast or under your arm.
- if you see a change in the size or shape of your breast.
- if cancer runs in your family.
- about when to start and how often to get mammograms.
- about treatment choices and possible risks if you've been diagnosed.
- about clinical research trials.

**Definitions****Metastatic**

Cancer that's spread to another part of the body.

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Protect Yourself Against HPV

Block This Cancer-Causing Virus

More than half of all sexually active people get a genital infection with the human papillomavirus (HPV) at some point in their lives, but most never know it. As a result, they might be spreading the virus to others without realizing it. Fortunately, vaccines are available to protect against the most harmful forms of HPV. These vaccines work best if given well before a person becomes sexually active.

HPV infection is the most common sexually transmitted disease in the United States. The virus is spread from person to person through direct contact during vaginal, anal, or oral sex.

Many different types of HPV can cause infections in the throat or genital area in both men and women. In most cases, HPV infections go away on their own without being noticed. Other times, they can cause health problems, including genital warts and certain cancers. "A variety of cancers are caused by HPV infec-

tion," says Dr. Douglas Lowy, a cancer researcher at NIH. "The most prominent is cervical cancer."

Cervical cancer is the fourth-deadliest cancer among women worldwide. Nearly all cases are caused by HPV.

The U.S. Food and Drug Administration (FDA) has approved 2 vaccines that protect against harmful forms of HPV. These vaccines were developed in part based on initial discoveries made by Lowy and his NIH colleague Dr. John Schiller.

Both HPV vaccines, called Gardasil and Cervarix, protect against the 2 types (or strains) of HPV that are responsible for about 70% of all cervical cancers. These 2 strains also cause most cancers of the anus, vagina, vulva, and the middle part of the throat (the oropharynx). Thus the HPV vaccines protect against all these forms of cancer. Gardasil also blocks 2 HPV strains that cause 90% of genital warts. Both vaccines are available for females. Only Gardasil is available for males.

"Because the vaccines only work before you get infected, and most people become infected relatively soon after they begin sexual activity, the vaccines are mainly targeted to young adolescent girls and boys," Lowy explains.

The vaccines are given in a series of 3 shots over a 6-month period. The U.S. Centers for Disease Control and Prevention recommends that all girls and boys get vaccinated at ages 11 or 12. In addition, the vaccines are recommended for teen boys and girls not yet vaccinated, young women through age 26, and young men through age 21. The vaccines are also suggested for gay and bisexual men and certain people with weakened immune systems.



"An HPV vaccine is your best opportunity to protect your child or yourself against HPV infection and subsequent disease," says Dr. Carolyn Deal, an NIH expert on sexually transmitted diseases.

Research has shown that HPV vaccines are highly effective. A recent study found that even though only about one-third of girls ages 13 to 17 has been fully vaccinated against HPV, the number of HPV-infected young women has dropped by 50% since the first vaccine was introduced in 2006. "The vaccines are already starting to have a real-world impact," Deal says. "They are safe and effective vaccines."

When you get an HPV vaccine, you're not only protecting yourself from some strains of this cancer-causing virus, you're also helping to prevent its spread to others. ■



Wise Choices Protect Against HPV

- **Get vaccinated.** HPV vaccines can prevent most cases of cervical, vaginal, vulvar, and anal cancers.
- **Use condoms.** Consistent condom use can protect women from HPV infection.
- **Avoid direct contact.** The surest way to prevent genital HPV infection is to refrain from any genital contact with another person.
- **Get tested.** HPV infections can be diagnosed with a Pap test, which checks for cancer or precancerous changes of the cervix, or a molecular test that looks for HPV DNA.



Web Links

For more about preventing HPV infections, click the "Links" tab at:

<http://newsinhealth.nih.gov/issue/Oct2013/Feature2>

Health Capsules

For links to more information, see these stories online:
<http://newsinhealth.nih.gov/issue/Oct2013/Capsule1>

Video Game Training Improves Brain Function in Older Adults

Seniors who played a specialized 3-D video game improved their ability to focus and multitask during laboratory tests. The new findings show the aging brain's potential to improve certain skills.

As we get older, changes can affect our ability to reason, think, and remember. One function that may be altered is multitasking—the ability to do several things at once. You're multitasking if you write an email while talking on the phone. When driving, you're also performing many tasks at once, such as scanning the

road, steering, and braking.

To learn more, a team of NIH-funded scientists asked a small group of healthy adults, ages 60-85, to do multitask training by playing a specialized 3-D driving game. The seniors used a joystick to drive a virtual car along a winding road. They were told to press a button only when specific road signs appeared. As the seniors improved, the game got harder.

Seniors played the game on a laptop at home for 1 hour a day, 3 times a week for 4 weeks (12 hours of total training). The training significantly

enhanced their ability to multitask in laboratory tests. Their multitasking scores were even better than those of untrained 20-year-olds. Gains were still seen when the seniors were tested 6 months later.

The training also led to improvements in tests related to memory and attention—abilities that often decline with age.

"The finding is a powerful example of how 'plastic' the older brain is," says study leader Dr. Adam Gazzaley of the University of California, San Francisco, referring to the brain's ability to adapt and change. ■

Gut Microbes and Diet Affect Obesity

Gut microbes from thin people, when transplanted into mice, can help prevent obesity in the animals—but only if they also ate a healthy diet. The study results might lead to new approaches for treating obesity.

The complex community of bacteria and other germs living inside our guts can affect our health in many ways. In earlier research, NIH-funded scientists found that obese and thin human twins have clear differences in their gut microbes. To learn more, the researchers transferred bacteria from obese and thin human twins into different sets of germ-free mice.

When housed in separate cages and fed healthy food, mice with microbes from a thin twin stayed slim. But mice with microbes from an obese twin quickly gained weight.

The scientists then housed 2 sets of mice together: some had "thin" and others had "obese" bacteria.

Specific groups of "thin" bacteria invaded the guts of "obese-microbe" mice (mostly because mice eat each other's poop), and none of the mice became obese. There's no evidence, though, that this type of bacterial transfer occurs in humans.

Mice were next fed high-fat, low-fiber foods—similar to a typical American diet. This time, the bacteria didn't transfer from thin to obese mice, and mice with "obese" microbes became obese. The results suggest that diet can affect gut microbes.

"These experiments show that eating a healthy diet encourages microbes associated with leanness to become incorporated into the gut," says study leader Dr. Jeffrey Gordon of Washington University School of Medicine. "But a diet high in saturated fat and low in fruits and vegetables thwarts the invasion of microbes associated with leanness." ■



Featured Website What's On Your Plate?

www.nia.nih.gov/health/publication/whats-your-plate

Making smart food choices can be a challenge as we get older. This site offers helpful videos and ideas for healthy eating and aging. Get shopping tips and learn about nutrients, food safety, and maintaining a healthy weight.



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