

SCIENCE NEWS of the week

Family Ties and Risk of Breast Cancer

For women worried about their risk of breast cancer, a new study offers some reassuring news: In most cases, a family history of breast cancer is associated with a smaller risk than previous studies have indicated.

A second study by the same research team weighs in on the question of diet. The good news here is that a diet rich in vitamin A appears to help protect women against breast cancer.

Both reports, published this week in separate journals, stem from data gathered in the Nurses' Health Study, a long-term effort to assess the risk factors for breast cancer and other diseases.

Previous studies indicated that women with a family history of breast cancer faced a heightened risk of developing the disease. However, researchers weren't sure about the magnitude of that threat. Graham A. Colditz of the Harvard School of Public Health in Boston and his colleagues decided to take a closer look at family ties and breast cancer risk.

The Harvard researchers began by analyzing data culled from 117,988 women who participated in the Nurses' Health Study. The researchers kept track of women who developed breast cancer during a 12-year period and identified 2,389 cases from 1976 through 1988. Yet, only a fraction of those could be chalked up to family history, says epidemiologist David J. Hunter, also at the Harvard School of Public Health.

The team found that women with a maternal history of breast cancer are 1.8 times more likely to develop breast cancer than women who report no such history. According to results from past studies, such women would have two to four times the risk of developing the disease.

Women who reported both a mother and a sister with breast cancer face 2.5 times the risk of developing the disease, the new study shows. That risk too is less than has been reported in the past. Colditz and his colleagues report their results in the July 21 *JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION*.

The Harvard investigators discovered that maternal age makes a difference in a daughter's risk profile. They estimate the probability of a 40-year-old woman finding a malignant breast lump by age 70 at about 12 percent if her mother was diagnosed with breast cancer before age 50.

By contrast, women whose mothers get the disease later in life appear at slightly less risk. That same 40-year-old has about a 10 percent chance of developing breast cancer if her mother received the bad news at or after age 60.

Even if a woman has no family history

of breast cancer, she still has about a 7 percent chance of developing this disease by the time she reaches her 70th birthday, Hunter points out. The Harvard team urges women to put their risk in perspective.

"For women who have a single affected sister or mother, their risk is elevated, but they need not feel they will inevitably develop breast cancer," Colditz says. Such women probably need to follow the standard guidelines on mammography and breast self-examination, Hunter advises.

At the same time, women who notice that breast cancer riddles their family tree should talk to their doctor, says Clark W. Heath Jr., vice president for epidemiology and statistics at the American Cancer Society in Atlanta.

A small subset of women do inherit a tendency to develop an aggressive type of breast cancer, generally before the age of 40, Hunter says. A gene that puts a woman at very high risk of breast cancer can typically be traced throughout a family, striking women in more than one generation, he says.

Women can't do anything to alter their pedigree. Yet, findings from a second study suggest a dietary approach may help prevent breast cancer.

Hunter, Colditz, and their colleagues decided to focus on the intake of certain vitamins and the risk of developing breast cancer. Their report appears in the

July 22 *NEW ENGLAND JOURNAL OF MEDICINE*.

This time, the researchers studied 89,494 women who participated in the Nurses' Health Study from 1980 to 1988. The team calculated vitamin A intake by asking detailed questions about diet and the use of vitamin supplements. The investigators discovered that women who consumed the greatest amounts of vitamin A proved to have a 20 percent lower risk of breast cancer than women who took in the smallest amounts of this vitamin.

Women who took multivitamin supplements, which contain vitamin A, gained an edge against breast cancer only if their diet didn't already provide enough of this nutrient, Hunter says.

Another study coauthor, Walter C. Willett, also at Harvard, points out that vitamin A can be toxic in large doses. Thus, the Harvard team suggests that most women should focus on their diet instead of popping vitamin pills. Spinach, carrots, and yellow squash are all rich in vitamin A.

Most public health experts now agree that a diverse diet — one low in fat and rich in fruits and vegetables — can protect against a variety of diseases, not just breast cancer. "This study adds substantially to a growing body of evidence that eating more vegetables should be a part of a healthy lifestyle," says Hunter.

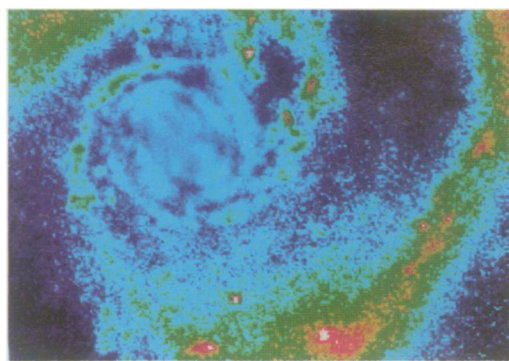
— K.A. Fackelmann

All awhirl about a nearby spiral galaxy

Its starlit arms forming a giant pinwheel in space, M51 stands out as one of the most striking spiral galaxies ever observed. But despite the fame of this nearby swirl of stars, aptly nicknamed the Whirlpool, its center has remained a mystery, hidden behind a shroud of dust. Viewing M51 in the near-infrared, however, a trio of astronomers has attained the first unadulterated peek at the galaxy's core.

In the July 22 *NATURE*, the team reports that M51's spiral arms wrap around the galaxy nearly three times — twice as far as observed in visible light in any spiral galaxy — and reach closer to the galactic center than theory had suggested. The researchers also find that M51 has a bar-shaped structure at its core, a feature that visible-light images only hinted at.

The infrared portraits are more than just pretty pictures. They "pose a strong challenge to our theoretical understand-



False-color, near-infrared view of M51 shows spiral arms wrapping three times around the galaxy, reaching close to the core. M51 lies 30 million light-years from Earth.

Zaritsky, Rix, Rieke

ing of . . . spiral structure in galaxies," writes Jeffrey Kenney of Yale University in a commentary accompanying the report.

Dennis Zaritsky of the Carnegie Observatories in Pasadena, Calif., and his colleagues observed M51 in the near-

infrared because they knew that such radiation, unlike visible light, can pass easily through the dust that cloaks the galaxy's core. In addition, infrared detectors pick out more low-mass stars — the dominant stellar population — providing a more complete view of the size and shape of the spiral arms. To make their observations, Zaritsky, Hans-Walter Rix of the Institute for Advanced Study in Princeton, N.J., and Marcia Rieke of the University of Arizona in Tucson used a state-of-the-art infrared array and the Steward Observatory's 90-inch telescope atop Kitt Peak near Tucson.

The leading theory to explain the formation of a "grand-design" spiral — a symmetrical pair of spiral arms like that in M51 — invokes the idea of a density wave. In this model, a disturbance in a rotating galaxy — akin to the ripples created by a rock tossed into a pond — causes gas and stars to pile up, producing regions of higher-than-average density. The galaxy's rotation then shapes these high-density regions into spirals. In one version of the theory, regions of high density move through the galaxy like

ocean waves; in another version, the regions stay put.

But in either case, although "it's easy to explain how to get the basic spiral shape, no one has ever shown how you can get spiral arms [that make] three full revolutions," notes Kenney. Calculations suggest that M51's spiral arms can't penetrate as far into the galaxy's center as the new images show they do, says Zaritsky. Yet both he and Kenney caution that the discrepancies between modeling and observations don't mean that astronomers must discard their models about spiral galaxies; they may only need to refine them. Current theories, says Kenney, provide "an understanding of only the very simplest things about spiral galaxies."

Zaritsky notes that the gravitational tug of a companion galaxy, NGC 5195, may have helped form M51's spiral arms. But it remains unclear whether this outsider could have triggered the spiral pattern so near the nucleus, he adds. Zaritsky says that infrared observations of spiral galaxies that lack the complication of a companion may shed more light on how spirals take shape.

—R. Cowen

Visible, UV-A light tied to skin cancer

Even with frequent applications of sunscreen, the millions of people now enjoying their summer outdoors may be putting themselves at increased risk of melanoma, the most serious skin cancer.

Some visible light, as well as a wide range of ultraviolet (UV) light, may fuel a series of changes in skin cells, leading to melanoma, says Richard B. Setlow, a biophysicist at Brookhaven National Laboratory in Upton, N.Y.

He and his colleagues use specially bred fish to study the effects of different types of light on cells that contain melanin, the skin pigment that colors moles brown. These studies have provided concrete evidence that not only UV-B — the rays with wavelengths between 280 and 320 nanometers that cause sunburn — but also light with longer wavelengths can induce cancer, says Setlow.

The fish are a cross between a swordtail and a hybrid of a swordtail and the platyfish, two popular tropical aquarium pets. When young, these heavily pigmented fish fit easily into the thimble-size glass tube of a spectrometer, which provides light of single wavelengths, and develop tumors after just one exposure to this light, Setlow explains. The pigment cells of the platyfish, like those of people, contain tumor-suppressing genes. Because the swordtail lacks such genes, some descendants of the cross possess just one tumor-suppressing gene and consequently less cancer protection.

Scientists have linked melanoma to damaged DNA because people who inherit a defect in their ability to repair DNA are more than 1,000 times more susceptible than others to this cancer. Many researchers had assumed that because DNA absorbs only UV-B energy, UV-B light caused the damage, says Setlow. Some suspected UV-A but lacked hard evidence of its role, he adds.

Then the Brookhaven group noticed that exposure to a wavelength of 365 nanometers — the UV-A used in black lights — resulted in tumors in 38 of the 85 fish tested. Furthermore, 30 of 124 fish not subjected to specific wavelengths but housed in a glass greenhouse as controls also developed melanoma, possibly due to sunlight, says Setlow.

Of 61 fish treated with violet light (405 nanometers), 18 developed melanoma. But only one of 20 control fish kept in subdued yellow light got cancer, they report in the July 15 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

Setlow suggests that melanin absorbs light, which sets off a chemical reaction, producing compounds that then damage DNA. He urges that people protect themselves from all sunlight, something that sunscreens do not do.

—E. Pennisi

Satellite sees extent of Midwest floods

A new technique for measuring soil wetness from space shows that flooding in the Midwest has spread far beyond the immediate vicinity of the Mississippi and Missouri rivers. Unlike photos taken from planes, this method can show the aerial extent of surface water over a broad region, according to scientists with the National Oceanic and Atmospheric Administration (NOAA) in Camp Springs, Md.

To produce these images, NOAA meteorologist Rao Achutuni and his colleagues mapped data collected by microwave-sensing instruments on several Defense Department satellites. Because water emits less microwave radiation than dry ground does, the satellite information can distinguish soil moisture and flooded regions. Shades of green, orange, and red indicate progressively wetter soil, while flooded land and lakes appear in blue. The experimental technique cannot determine the depth of the water, so deep lakes and shallow puddles appear the same on the images. However, by combining images from several days, the scientists can discriminate between true flooding and temporary puddles that follow rain.

Because the satellite sensors have a resolution of 50 kilometers, they cannot distinguish individual rivers. They can, however, measure soil moisture in overcast conditions, because microwave radiation passes through clouds.

Achutuni and his co-workers are currently testing the technique to determine its accuracy. NOAA's Norman Grody says the system does best at sensing flooded regions, adding that it has a difficult time measuring soil wetness in land covered by crops or other vegetation.

