

Social isolation: Female cancer risk?

Two types of social isolation — having few close friends and relatives, and feeling alone even when friends are present — appear to play an important role in elevating the risk of dying from cancer, at least among women, according to a 17-year prospective study of nearly 7,000 people. The report was presented last week in San Francisco at the annual meeting of the Society of Behavioral Medicine. A strong link between social isolation and subsequent death from cancer did *not* turn up among men in the study, say epidemiologists Peggy Reynolds and George A. Kaplan of the California Department of Health Services in Berkeley, although male cancer cases who were socially isolated tended to have poorer survival rates.

"It appears," says Reynolds, "that social connections have a significant effect on cancer mortality for women."

Long-term studies of people who later develop cancer are rare. Reynolds and Kaplan administered a wide-ranging questionnaire to a representative sample of 6,928 adults living in Alameda County, Calif., in 1965. None of the subjects had a previous diagnosis of cancer. By 1982, computerized records revealed a total of 476 newly diagnosed cancers in the sample and 257 deaths from cancer. Just over half of the cancer diagnoses and deaths occurred among women. The researchers calculated cancer risks after statistically controlling for age, smoking, physical health at the start of the study, alcohol consumption and household income. Cancers were grouped into two types: smoking-related (predominantly lung, throat and mouth cancer) and hormone-related (mainly breast and lymph cancer).

When compared with women who originally reported many social contacts, women who had no or few social contacts were twice as likely to die of all cancers and more than five times as likely to die of smoking-related cancers. In addition, women who both *were* socially isolated and *felt* isolated were nearly twice as likely to contract, and almost three times as likely to die from, all cancers when compared with women with many contacts and no feelings of isolation. Those in this "isolated" group also had five times the risk of dying from hormone-related cancers.

Women reporting many social contacts but who still felt socially isolated were more than twice as likely to die from hormone-related cancers as high-contact, low-isolation counterparts.

"It was a surprise to us that feelings of isolation by themselves could predict deaths from hormone-related cancers among women," says Reynolds. These

cancers rarely occur among men, she notes; for women, the observed association "may have something to do with the effects of emotions on hormone regulation." But the reasons for the strong associations between social isolation and deaths from cancers of all types among women are unclear, adds Reynolds.

Smoking-related cancer mortality is also connected to large increases over the past decade in the number of women who smoke.

Being depressed at the start of the study, she says, bore no relationship to cancer incidence or mortality among all subjects.

— B. Bower

Custom design for DNA snippers

The powerful gene manipulations that underlie modern biotechnology rely on a set of chemical scissors called restriction enzymes. Normally produced by microorganisms, each of these enzymes snips DNA wherever it encounters a specific string of nucleotides, the DNA subunits. A scientist can choose a restriction enzyme that cuts at one of about 100 different four- to six-nucleotide sequences. But there are many other segments where cuts might be desired.

Waclaw Szybalski of the University of Wisconsin at Madison now reports a method to customize a restriction enzyme to snip at any six- to 16-nucleotide sequence desired. It is as if a single adjustable wrench could replace, and provide more applications than, a toolbox full of fixed-size socket wrenches.

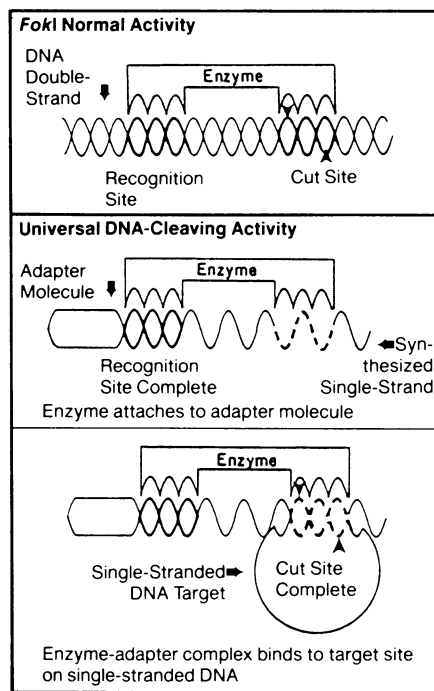
"It's a dream-come-true for enzymologists and molecular biologists who have always wanted a way to tailor their tools to particular tasks," says Szybalski. "Now we have a single, universal tool that can be easily adapted."

Whereas most restriction enzymes make their cuts at a site within the sequence of nucleotides that the enzyme recognizes, members of one small group of natural restriction enzymes have separate "recognition" and "cut" sites. For example, the enzyme *FokI* recognizes a stretch of five nucleotides, then cuts the DNA at a site a fixed distance away.

A hairpin-shaped piece of DNA, synthesized in the laboratory, serves as an adapter, allowing the scientists to snip a target piece of DNA at any specified site. One portion of the adapter contains the recognition site for *FokI*. The enzyme binds to this "portable" recognition site instead of requiring a site on the target.

The method takes advantage of the enzyme's requirement for double-stranded DNA at the cut site. Szybalski and his colleague Anna J. Podhajaska include in the adapter a tail of single-stranded DNA, whose sequence specifies where the enzyme will cut. The enzyme *FokI* will make a cut only after the adapter tail forms links to a complementary sequence of nucleotides, found within the target DNA (provided in single-stranded form). Once snipped, the DNA is released and reconverted to a double strand.

Some caution is expressed by Ira Schildkraut of New England Biolabs, the Beverly, Mass., company that sells *FokI* and that funded Szybalski's research. "As



it stands, it's a clever thing to do, but it's not easy and it's relatively expensive," Schildkraut says. He sees its immediate value in special applications; for example, for cutting at sites with a relatively long specified sequence or for snipping DNA of large chromosomes into long pieces.

— J. A. Miller

Mystery disease stalks older cats

Around 1980, veterinarians began noticing that some cats were displaying symptoms similar to those of humans with a hyperactive thyroid gland: weight loss despite a healthy appetite; high-strung activity; rapid heart rate; overactive gut; high-volume stools. Initially a rare disease, feline hyperthyroidism has mushroomed to epidemic proportions in some regions of the United States, according to Leslie Bullock, a veterinarian studying the disease at Tufts University in Boston. Baffled vets are trying to determine what's causing this disease and why it strikes only older cats.

Bullock says the disease may affect one in 100 cats 8 years old and older in the most highly affected regions, like Boston and New York. Veterinarian Mark Peterson, a feline hyperthyroidism expert at

the Animal Medical Center in New York City, says the disease really is becoming more common: "It's not just that we're diagnosing it more because we know what to look for now."

Untreated, an affected animal would likely die from heart failure or malnutrition. Detecting the disease, however, is not very difficult, and there is effective treatment: controlling thyroid activity with a daily pill, removing the affected thyroids, or radiation therapy.

So far, Bullock says, vets have been unable to correlate the disease with diet, disease history, an urban environment or whether the animal spends time outdoors. However, she says, data from cats treated surgically for the disease suggest that some circulating factor — such as an antibody — might be responsible.

That possibility is especially provocative, Bullock says, because the human disease that feline hyperthyroidism most resembles — the relatively rare toxic multinodular goiter — is initiated by

the development of antibodies that mimic the activity of the hormone that controls thyroid activity. But because no such antibody has yet been found in cats with hyperthyroidism, Peterson says that "these cats have a different disease."

Though incidence data are still largely anecdotal, the disease seems to be most common in large East Coast cities and in California, and least common in the Midwest, according to Peterson.

At the New York State College of Veterinary Medicine, in Ithaca, N.Y., Janet Scarlett Kranz is just completing an epidemiologic survey in the hope of identifying predisposing factors, such as pesticide exposures, sharing a household with an already affected cat or differences in iodine consumption. What concerns all the vets is a suspicion that some environmental factor — such as exposure to a pollutant — might be responsible. If so, they say, these older cats may be a harbinger of what's in store for other species — including humans. — *J. Raloff*

See how they run: Motion symmetry

Robots are starting to move. In recent years, a number of legged machines have taken their first hops, steps and jumps (SN: 7/6/85, p. 9). These efforts to design walking and running robots are also leading to a better understanding of how two- and four-legged animals move.

Researchers have discovered that human runners and animals such as cats sometimes adopt a simple, symmetric gait that is more often associated with legged robots than with animals. In this type of motion, reversing both the direction of forward travel and the direction of time (equivalent to running a movie backward) would not affect the pattern of footfalls and of body movement.

Running is a series of bouncing and ballistic motions that accelerate the body within each stride, says robot designer Marc H. Raibert of Carnegie-Mellon University in Pittsburgh. The bouncing motions result from the rebound of the body when the legs push on the ground.

For a legged system running at a constant speed with a stable upright posture, the net acceleration of the body over an entire stride must be zero. Many patterns of body movement satisfy this constraint. People and many animals generally move their legs in complex, asymmetric modes and still travel at constant speed. Symmetric leg motions provide especially simple solutions that have been applied in the design of one-legged hopping machines, four-legged trotting machines and other mobile robots.

"The importance of symmetry in the control of legged robots," says Raibert, "raises the question of what role symmetry may play in the behavior of running animals." Raibert's study of symmetry in running appears in the March 14 SCIENCE.

About 20 years ago, zoologist Milton Hildebrand of the University of California at Davis observed that the left half of a horse often uses the same pattern of footfalls as the right half, but 180° out of phase. Raibert's study of a human running on a cinder track and a cat trotting and galloping on a treadmill looked at a body's path through space and the trajectories of its feet with respect to the body. These data revealed another, robotlike symmetry in the way some animals run.

Why animals sometimes choose this symmetric type of motion isn't clear, says Raibert. As in robots, such patterns may simplify the controls necessary for steady movement. Instead of controlling the detailed motion of each leg joint, all an animal need do is provide the initial conditions that automatically lead to steady-state forward travel. That's the way robots run. — *I. Peterson*

A moderate view of population excess

Ever since Malthus, economists have been unable to look at populations without multiplying in their heads. But the math keeps giving different answers. Recently, "market theorists" have challenged the pessimism of ecologically oriented projections of world population growth, arguing that the demands of growing populations can bring advances that counter the tendency toward depletion of resources (SN: 10/17/81, p. 245). Into the midst of the debate, the National Academy of Sciences (NAS) last week released a report that takes the middle ground.

The NAS committee looked at the effect of population growth on the economies of developing countries, focusing on such issues as resource degradation and exhaustion, distribution of capital, positive effects of technological innovation and economies of scale, and quality-of-life indicators such as levels of schooling and health. In most of these arenas in such countries, the report concludes, slower population growth would improve well-being. But the authors take a moderate view of the hazards of growth, giving much greater weight than earlier studies to the adaptability of institutions and individuals.

"The rate of population growth is an important variable, but there are many other variables that can have a greater effect on people's welfare," says D. Gale Johnson of the University of Chicago, a member of the NAS working group on population and economic development. For instance, urban bias in developing countries can leave rural areas without roads or access to goods;

or a decision to tax crops destined for export can dissuade farmers from planting — and "people can change that," Johnson told SCIENCE NEWS.

With population in developing countries growing at an average of 2 percent each year — doubling in numbers every 35 years — some would have preferred a stronger statement from NAS. "I have no doubt that the world can accommodate a 1 percent growth rate for the next 100 years, with no problem," says Hans Binswanger of the Washington, D.C.-based World Bank. "Countries that are growing . . . at a 4 or 5 percent growth rate would need agricultural miracles" to avoid extreme declines in income and living standards, he says. "All policies have to be right and governments have to be wise and all goals have to be achieved. And that's a lot to ask."

Lester Brown of the Washington, D.C.-based Worldwatch Institute puts it more strongly. "There will be adjustments [in population growth rates]; I don't think there's any question about that. The question is whether those adjustments will take the form of declining birth rates or rising death rates."

Because of its measured tone, though, the report may be taken more seriously by the market-oriented Reagan administration, and it may well increase support here for international family-planning programs, some observers believe. Ben Wattenberg of the American Enterprises Institute in Washington, D.C., says, "I would argue that from realism — and I regard this as a profoundly realistic document — flows credibility. And from credibility flows money." — *L. Davis*