Biomedicine

Kathy A. Fackelmann reports from San Francisco at the annual meeting of the American Association for Cancer Research

Immune trait ups cervical cancer risk

Certain inherited immune system proteins may boost the risk of developing cervical cancer after infection with a sexually transmitted virus.

It's well known that infection with certain types of human papillomavirus (HPV) can increase a woman's chances of developing cervical cancer. Yet no one knows why some women clear this virus with no apparent ill effects while others go on to develop a precancerous condition and even cancer of the cervix. Immunologist Raymond Apple of Roche Molecular Systems in Alameda, Calif., believes that the immune system may play a part in this sometimes deadly molecular game.

Apple's team analyzed tissue samples from 318 women at high risk of cervical cancer. The group included 118 women previously diagnosed with the disease and 200 controls who did not suffer from it. The researchers obtained tissue either during a routine Pap smear or a biopsy. Using polymerase chain reaction, a technique for detecting minute quantities of DNA, the researchers searched for DNA from different types of HPV in the samples.

They also conducted laboratory tests to determine what type of HLA proteins each woman produced. HLA proteins sit on the surface of certain immune cells and play a role in the body's recognition of and response to foreign tissue or a microbial invader, such as a virus. Each person inherits a genetic blueprint for a distinctive mix of HLA proteins.

The new study suggests that certain HLA proteins may increase drastically the chance that a women will suffer from cervical cancer if she is infected with HPV-16, a virus type associated with cervical cancer. In contrast, the findings hint that other HLA proteins may actually be protective. Certain HLA proteins may help the body clear HPV-16, while others lead to an ineffectual fight, thus increasing the risk that a cervical cell will become abnormal and eventually turn malignant, Apple speculates.

Ewing's sarcoma tied to other cancers

Families with a history of Ewing's sarcoma, a rare type of soft-tissue cancer, develop more than their share of skin, brain, and stomach cancers as well, according to a new study.

Cancer researcher Biljana Novakovic and her colleagues at the National Cancer Institute (NCI) in Bethesda, Md., studied 256 families with one member afflicted with Ewing's sarcoma who had been treated at NCI between 1965 and 1992. The scientists gathered medical information about other members of these families and noted whether any relative had received a cancer diagnosis of any type. The NCI researchers compared the observed rate of cancer in those families with rates derived from cancer cases reported to a tumor registry.

They found higher-than-expected rates of melanoma – a deadly skin cancer – brain malignancies, and stomach cancer in the families. The study found no heightened risk of other cancers for relatives of the Ewing's sarcoma patients.

These findings are preliminary, cautions NCI's Margaret A. Tucker. And while the higher-than-average cancer risk seen in families of Ewing's patients may be inherited, a genetic mechanism has yet to be found. However, a single gene probably can't account for the clusters of cancers seen in these families, Novakovic adds.

Although scientists have long believed that Ewing's sarcoma is a cancer of the bone, recent research has shown that it develops in tissue which can be traced back to the so-called neural crest region of the embryo. The brain and skin cancers afflicting these families also arise from tissue derived from the neural crest. Further study may provide researchers with a better understanding of such cancers as well as yield clues about embryonic development, Tucker says.

Earth Science

Richard Monastersky reports from Pasadena, Calif., at a meeting of the Seismological Society of America

Northridge quake packed unusual punch

The earthquake that struck the San Fernando Valley on Jan. 17 shook the ground much harder than seismologists would have anticipated for a tremor of its size, according to measurements taken at the time of the quake.

The Northridge tremor had an estimated moment magnitude of 6.8, a number referring to the amount of energy released by the rupturing rock beneath the surface. But the accelerations recorded at the surface were typical of a jolt with a magnitude greater than 7, according to Mansour Niazi, a seismologist at Berkeley (Calif.) Geophysical Consultants.

Paul G. Somerville, a seismologist at Woodward Clyde Consultants in Pasadena, agrees that Northridge had an unusually fierce kick. "This earthquake produced ground motions that were 40 percent stronger than expected," he says.

Somerville speculates that the depth of the quake might have enhanced its vibrations at the surface. Unlike most California quakes, which occur in the upper 12 kilometers of the crust, the principal faulting in Northridge took place at depths of 12 to 20 km. When seismic waves from a shallow quake radiate toward the surface, the rock layers through which they pass defocus the waves, diffusing their destructive energy. But when the waves start deeper, they keep a tighter focus, thus retaining their strength at the surface, says Somerville.

Niazi, however, offers a different explanation. If the fault released the seismic energy unusually quickly, it could have produced particularly intense shaking, he suggests.

Whatever the reason, Northridge residents say that they have never experienced such a strong jolt. "It felt to me as if an entire pro football team grabbed the edge of our bed all the way around and just started yanking in every direction. My wife and I were asleep. I woke up terrified and screaming. We just rolled over and clutched each other," says Peter W. Weigand, a geologist at California State University, Northridge.

Although the overall shaking surpassed expectations, several seismologists refuted previous reports that the quake generated disproportionately large vertical forces. Researchers from Geomatrix Consultants in San Francisco say the ratio of vertical to horizontal motion in the Northridge tremor matches that of other California earthquakes. Niazi saw a similar pattern when he looked at 12 other earthquakes around the world.

Santa Monica's dangerous geometry

On a map of buildings declared unsafe after the Northridge quake, Santa Monica stands out as a cluster of dots huddled along the Pacific coast. Although the city sits 25 kilometers from the shock's epicenter, it suffered much more than did many areas less than one-third that distance from the jolt.

Northern Santa Monica, the section of the city hardest hit, lacks the typical weaknesses that might explain its fate. Unlike other pockets of destruction, this region does not have poor soil conditions or a concentration of unreinforced masonry buildings. In fact, the southern end of the city sits atop much weaker sediments and has more unreinforced masonry buildings, yet this region rode out the quake relatively well, says geologist Douglas B. Bausch of Leighton and Associates in Diamond Bar, Calif.

Bausch thinks that the presence of the Santa Monica fault beneath the damaged region may have somehow amplified the ground shaking there.

The Santa Monica fault dips toward the north and may intersect with the south-dipping fault that generated the Northridge temblor. If so, the Santa Monica fault could have channeled some of the seismic energy up toward the northern section of the city, much as an optical fiber carries pulses of light, Bausch speculates.