'Hot spots' predict breast cancer's return

Malignant breast tumors laced with tiny blood vessels are at high risk of spreading and thus proving fatal, according to a new report. Women with such tumors may benefit from aggressive cancer therapy, the researchers conclude.

The new report, published in the Dec. 16 JOURNAL OF THE NATIONAL CANCER INSTITUTE, builds on research done last year by Noel Weidner, now at the University of California, San Francisco, and Judah Folkman of the Harvard Medical School in Boston. Weidner and Folkman discovered a link between the number of capillaries in a tumor and its propensity to metastasize, or spread (SN: 1/19/91, p.45).

After hearing of the 1991 report, Italian researcher Giampietro Gasparini sent the U.S. team slides of breast cancer tissue taken from 165 women who had been treated at St. Bortolo Regional Hospital in Vicenza, Italy, where Gasparini works as a cancer specialist. All patients had undergone primary treatment to remove their tumor with surgery or radiation therapy, or both. To kill any remaining seeds of cancer, researchers gave some of the women additional therapy, such as chemotherapy. Some women received hormonal treatment to prevent cancer recurrence.

The U.S. team then took the paper-thin slices of each patient's tumor, applied a stain that makes blood vessels appear bright orange, and looked at the slides under a microscope. The team examined each slide for "hot spots," areas of very dense blood vessel growth. The scientists homed in on such spots and counted the number of capillaries crowding the microscopic field.

Next, the researchers correlated the blood-vessel counts with what had happened to each patient. They discovered that breast cancer patients who had more than 100 vessels in the microscopic field had a 100 percent chance of tumor recurrence within 33 months. In contrast, cancer recurred in just 5 percent of the women who had 33 or fewer blood vessels per field.

Moreover, blood-vessel density was the only statistically significant predictor of a woman's chance of survival if she had so-called node-negative cancer, in which cancer has not spread to the lymph nodes, Folkman says. Doctors know that about 30 percent of women with node-negative breast cancer will suffer a recurrence, which is generally fatal. Yet, doctors don't have a good method of identifying women at high risk of such an event. Weidner and Folkman believe the blood vessel test may identify such women at the time of diagnosis, thus giving the oncologist an edge in the effort to prevent the cancer's spread.

The blood-vessel test outperformed many other markers of breast cancer recurrence, including size of the tumor and a test to determine whether the tumor contains certain hormone receptors, Folkman says.

David L. Page, a pathologist at the Vanderbilt University Medical Center in Nashville, Tenn., calls the correlation between survival and blood-vessel counts "an exciting observation." However, Page, who wrote an editorial in the same issue, cautions against "unbridled enthusiasm" for the test, which is not ready for widespread use. "There are too many problems with it," he said. "It's labor-intensive and it's difficult to do," Page adds. Weidner disagrees, saying that he thinks the test is ready for general use by pathologists.

The new test measures a tumor's ability to spread and thus may predict the course of other cancers, not just breast cancer. Folkman explains that a tumor starts its life as a tiny seed that can grow until it consists of about a million cells. At that stage, the tumor, which is roughly the size of a BB pellet, may begin to secrete substances that lure capillaries to the scene. With a fresh blood supply, the cancer starts to grow aggressively and will release millions of malignant cells into the bloodstream, a step that can lead to the deadly spread of this disease.

– K.A. Fackelmann

Hubble scopes possible planet-forming disks

Turning the Hubble Space Telescope toward the Orion Nebula, astronomers have discovered and photographed 15 infant stars surrounded by dense, flattened disks of dust. These images provide the strongest evidence to date, they say, that many young stars develop the dust rings required for planet formation.

The presence of such a large number of protoplanetary disks in the Orion Nebula – a typical gaseous, star-forming region in the constellation Orion – suggests that many suns besides our own possess the ability to evolve planets, according to C. Robert O'Dell of Rice University in Houston, who led the imaging project.

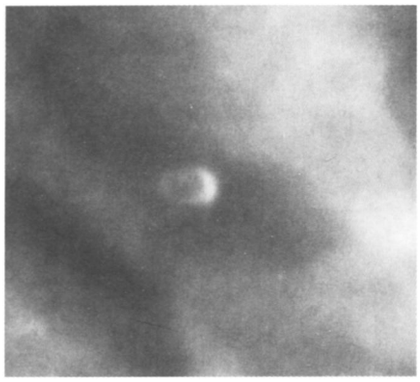
"The disks are a missing link in our understanding of how planets like those in our solar system form," O'Dell maintains. "Their discovery establishes that the basic material of planets exists around a large fraction of stars."

Current theory on planet formation – supported largely by indirect measurements of light reflected or emitted from suspected protoplanetary disks – holds that under certain conditions stars develop dense, revolving dust disks as they hatch in stellar nurseries such as the Orion Nebula.

Scientists have also detected traces of protoplanetary disks in a nebulous region that stretches across the constellations Taurus and Auriga. The dust in such disks emits infrared energy and induces telltale, measurable changes in the light of their central stars (SN: 10/3/92, p.213).

Researchers do not know how often or under what conditions planets evolve from these dusty disks, says Robert A. Brown, an astronomer at the Space Telescope Science Institute in Baltimore. However, the new Hubble images provide direct photographic evidence that "exactly the type of structure we believe produces planets is, in fact, prevalent around many young stars," he adds.

Previously photographed disks, such as one around the star Beta Pictoris, are much thinner and older than the fresh, young objects in the Orion Nebula. These elderly disks, says O'Dell, may be "planetary systems that have failed, because they're so thin you can see through them." Dense disks like those in Orion would stand the best chance of spawning planets, he says.



O'Dell and NASA

One of 15 in the Orion Nebula, this protoplanetary disk – a thick mass of dust encircling a newborn star – may eventually evolve into a mature solar system.

Indeed, notes O'Dell, some Orion disks are so thick that they completely block out the nebula's intrinsic background radiation, which comes from young, hot stars forming in the cloud. Hubble's camera therefore sees these disks in silhouette. Other disks in the cluster give off their own light because ultraviolet radiation from nearby stars sets their edges aglow.

Brown, a former chief scientist in the Hubble Space Telescope program, says the new observations substantiate past promises by Hubble's supporters that the telescope would prove useful in the search for other solar systems.

Establishing the existence of new solar systems "is one of the most important problems in astronomy," says Brown. "It's very exciting to see the telescope producing valuable evidence like this."

– D. Pendick