Depression and cancer: No clear connection

Disease and depression seem to go hand in hand. If you get sick, you may feel depressed. But can feeling depressed cause disease? Past research has indicated depression can compromise the immune system, and a few studies have hinted at a link between depression and cancer.

Epidemiologists now report that chronic feelings of depression do not affect a person's likelihood of developing cancer. They draw this conclusion from what they say is the first nationally representative study of depressive symptoms and cancer incidence among U.S. adults.

In 1971, Alan B. Zonderman and his coworkers at the National Institute on Aging's research center in Baltimore began looking for symptoms of depression among 6,913 people participating in the National Health and Nutrition Examination Survey, conducted in numerous communities across the nation. Ten years later, they retested participants and found that most high scorers retained their depressive outlook. They then compared the cancer incidence of the high and low scorers. As a further check, they counted new cancer cases among elderly participants after 15 years. In both cases, high scorers showed no greater tendency than low scorers to develop cancer, the team reports in the Sept. 1 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION.

Zonderman cautions, however, that the study sheds no light on how depression might affect the course of an already-diagnosed cancer.

He stresses that his team did not measure clinical depression *per se*. Instead, they asked participants to complete the "cheerful vs. depressed" part of the General Well-Being Schedule, a standard inventory of depressed feelings experienced during the past month. To double-check the results, they also gave some participants the Center for Epidemiologic Studies Depression Scale. "The instruments we used can predict who's likely to be clinically depressed, but it's not the same as making a diagnosis of depression," Zonderman says.

The researchers obtained cancer diagnoses from death certificates and hospital records. In the group with depressive symptoms, they found, 11 percent suffered some form of cancer, compared with 10 percent of those without such symptoms.

Zonderman says the lack of a significant difference in cancer incidence "calls into serious question the hypothesis that depressive symptoms are a risk for cancer morbidity or mortality."

But Karl Goodkin of the University of Miami says he finds that broad conclusion unwarranted. Depression might influence different types of cancer in different ways, he says. "Since [Zonderman and his colleagues] don't stipulate which tumors are picked up in their sample, we don't know whether their results are supportive of depression's effect on [the incidence of] viral tumors or not," he argues. Noting that his and other research on virus-caused cancers suggests depression and stress may increase the likelihood of precancerous tissue developing into full-blown tumors, Goodkin contends that Zonderman's practice of pooling all cancer types could bury a link between depression and certain cancers. Paradoxically, he adds, animal research has suggested that stress may limit the growth of nonviral malignancies. "There may be two strong, opposite effects hidden by mixing all types of cancers," he speculates. *– S. Hart*

Pumping gas to fuel a galaxy's active core

Many galaxies have central regions that appear extremely active and spew out tremendous amounts of radiation. In some cases, this activity takes the form of a strong burst of star formation at a galaxy's core. Other galaxies seem to have black holes at their centers, which apparently pull in vast quantities of matter. What fuels this activity has long mystified astrophysicists.

One possibility is that the disturbing effects of a modest cluster of stars merging with a large galaxy can drive much of a galaxy's interstellar, molecular gas toward its center. New computer simulations support this scenario.

"Gas distributed throughout a galaxy responds strongly to the tidal field of a companion during a merger," says Lars Hernquist of the Institute for Advanced Study in Princeton, N.J. Hernquist's computer simulations, reported in the Aug. 31 NATURE, track the behavior of interstellar gas during a merger between a parent galaxy similar to the Milky Way – having stars and gas in a spiral-armed disk – and a smaller, satellite galaxy containing only stars.

Initially orbiting the disk, the satellite galaxy gradually spirals in and loses energy, in effect "rubbing" against the parent galaxy's stars, which gain energy. At the same time, the satellite's perturbing gravitational field causes gas streams to intersect, building up regions of high-density gas. Some of this gas collects into a large, gravitationally bound cloud that sinks to the galaxy's center.

The concentrated gas at a galaxy's core could initiate star formation, possibly spurring the eventual formation of a black hole while supplying a reservoir of fuel for future activity. "Continued accretion of gas by the black hole may provide sufficient power to explain quasars and nuclear activity in otherwise normal galaxies," Hernquist says.

"Hernquist's calculations are particularly interesting because he simulates the dynamics of both the gas and the stars simultaneously," says astrophysicist Mitchell C. Begelman of the University of Colorado in Boulder. "The processes are so complicated it's now difficult to make theoretical progress in this area without these kinds of computer simulations." Other groups, including researchers at Tokyo University and the Paris Observatory, have done similar calculations and continue to explore various scenarios.

Hernquist's model predicts that the origin and evolution of activity in at least some galaxies could be controlled by events on a galactic scale. However, his simulations do not directly tackle the question of what happens to the gas after it reaches a galaxy's core.

"It is certainly plausible that the large gas density built up at the galactic center should result in vigorous star formation . . . but there is no reliable quantitative theory for this," writes Cedric Lacey of the University of California, Berkeley, in a commentary accompanying the research report. Hernquist's model also neglects the effect of subsequent supernova explosions of massive, dying stars, which could heat the gas and inhibit processes that tend to concentrate gas at the galaxy's center, Lacey adds.

Moreover, mechanisms other than galaxy mergers may also cause the concentration of gas, which in turn could lead to activity in galactic nuclei. "Some people have gone a little too far in the direction of believing that mergers or close encounters between galaxies are the only way to trigger this kind of activity," Begelman says. "A merger is certainly one possible process that could lead to a lot of gas plunging into the nucleus of a galaxy, but I don't think it's the only or even necessarily the main effect. It's not clear how common these kinds of mergers are."

Observational evidence gathered so far remains contradictory. Some, but not all, quasars appear buried at the center of disturbed galaxies. At the same time, studies of nearby Seyfert galaxies, which also have active cores, show that weakly interacting pairs of galaxies have an excess of active nuclei, whereas strongly disturbed galaxies have fewer active nuclei than expected.

"It's a confused situation," says William C. Keel of the University of Alabama in Tuscaloosa. "Statistically, you can make a case that whatever a galaxy does to turn on nuclear activity, it's a little easier if there's a companion nearby. But there's no evidence that anything as simple and straightforward as [galaxy mergers causing active nuclei] is going on." That leaves lots of room for debate. *– I. Peterson*