Behavior

Powerless chemistry of depression

Laboratory animals exposed to uncontrollable and unpredictable stress, such as foot shocks or loud noises, rapidly learn that they cannot control their environment. When experimenters subsequently offer them various tactics to avoid these intrusions, such as pressing a lever, the animals refuse the options and resign themselves to further discomfort.

Psychologists have theorized that a comparable type of giving up, or "learned helplessness," lies at the root of some cases of human depression. A new report, published in the June AMERICAN JOURNAL OF PSYCHIATRY, suggests that severely depressed people who show evidence of elevated activity by a particular chemical messenger in the brain are most likely to feel powerless and at the mercy of others.

Pervasive perceptions of powerlessness may be either the cause or the result of a surfeit of this chemical messenger, norepinephrine, assert psychologist Jacqueline A. Samson of McLean Hospital in Belmont, Mass., and her colleagues.

The researchers measured concentrations of a norepinephrine by-product, MHPG, in urine samples obtained over a 24-hour period from 20 adults hospitalized for severe depression. Participants—who had not taken any psychoactive medication for at least 10 days—also filled out a psychological questionnaire with separate scales that measure feelings of alienation, security and powerlessness.

In previous studies, urinary MHPG levels ranged widely among depressed patients. But Samson's team found higher MHPG levels among volunteers who believed that society in general or specific others controlled their lives. In contrast, no association appeared between MHPG levels and feelings of powerlessness due to fate, chance, luck or forces beyond one's comprehension.

Although scientists do not know the exact proportion of urinary MHPG that derives from the brain, Samson and her coworkers note that animal studies have shown a strong link between learned helplessness and higher brain levels of the substance.

Depressed patients with greater amounts of urinary MHPG often prove less likely to benefit from antidepressant drugs, they add. Cognitive-behavioral therapy, which attempts to correct negative perceptions and behaviors, may provide the best treatment for "powerless" depression, the researchers suggest.

Destined for a dangerous ride?

Belief in an inevitable destiny outside one's control may account for the greater propensity of blacks and Hispanics to leave their seat belts unbuckled, according to a preliminary report in the June AMERICAN JOURNAL OF PUBLIC HEALTH.

A survey of 1,063 individuals in Harrisburg, Pa., and its suburbs found that white participants reported using seat belts 75 percent of the time they drove, compared with 67 percent for black and Hispanic volunteers. Previous research reports had also noted lower rates of seat belt use by racial minorities.

But the Harrisburg survey indicates that blacks and Hispanics also agree substantially more than whites with the statement, "There is no point in using seat belts, since you can't change your destiny." Participants reported their level of agreement or disagreement with the statement on a seven-point scale. The difference in seat belt use by race disappears when the belief in destiny is statistically controlled, asserts survey director Israel Colón of Temple University in Philadelphia.

Colón acknowledges that self-reports provide inflated estimates of seat belt use. However, he maintains, educational campaigns designed to increase the frequency of buckling up may need to address specific beliefs in black and Hispanic communities, perhaps in collaboration with influential local churches.

Biology

Carol Ezzell reports from Arlington, Va., at the Fifth International Conference on Lyme Borreliosis

Same disease, different transmission

On the U.S. West Coast, the bacterium responsible for Lyme disease is transmitted through a more complex network of infected animal hosts and tick vectors than on the East Coast, according to a new study. This finding has important implications for controlling the spread of this disease, which causes severe arthritis-like symptoms.

On the East Coast, white-footed mice serve as the reservoir of infection for the Lyme-causing bacterium, *Borrelia burgdorferi*. The bacteria thrive in the mice and are picked up by the deer tick *Ixodes dammini* when young tick nymphs feed on the blood of the mice during early summer. The infected nymphs then spread the infection to other animals, including humans (SN: 3/25/89, p.184).

On the West Coast, the process is much more involved, reports entomologist Robert S. Lane of the University of California, Berkeley. Wood rats, not mice, serve as the reservoir for *B. burgdorferi* in northern California, he says, so efforts to control the disease in that region must target these animals. Moreover, the ticks that transmit the bacterium to humans in northern California do not belong to the same species as the ones that spread it among the wood rats. And northern California harbors more different types of *B. burgdorferi* than does the East Coast — a factor that could complicate the development of a vaccine against Lyme disease in that state, Lane says.

Lane and Richard N. Brown, a biologist at the University of California, Berkeley, also present their results in the June 5 SCIENCE.

According to statistics compiled by the Centers for Disease Control in Atlanta, California has the fourth-highest incidence of Lyme disease among the 50 states, with 56 cases reported so far this year. The top three states—New York, Pennsylvania and New Jersey — reported 701, 247 and 79 cases, respectively, between Jan. 1 and May 15. However, most scientists believe that Lyme disease is vastly underreported by physicians and that many more cases exist.

Brown says he expects Lyme researchers will find that the disease spreads through different networks of hosts and vectors in various areas of the country.

"We should expect that in some communities, the hosts and vectors will interact differently," he concludes. "It won't be as simple as we once thought."

Success on the vaccine front

Vaccination with either of two specific proteins isolated from *Borrelia burgdorferi*, the bacterium that causes Lyme disease, can protect mice from the infection, researchers from Yale University have found. The vaccines can also prevent ticks from spreading the disease, they report.

The investigators, led by Erol Fikrig, injected mice with either OspA or OspB, two proteins from the outer wall of *B. burgdorferi*. When they allowed young deer ticks infected with the bacteria to feed on the mice, they discovered that the mice remained uninfected. Moreover, studies revealed that ingested blood from the mice killed all of the *B. burgdorferi* in the guts of the ticks, halting the dissemination of the disease.

Fikrig and his colleagues conclude that either protein might constitute an effective vaccine against Lyme disease. "They're both effective in our initial experiments," he says. But he cautions that the proteins vary among different strains of *B. burgdorferi*, so the best vaccine might consist of a combination of various OspA or OspB proteins.

Fikrig says his group hopes to begin clinical trials of a Lyme vaccine within the next three years. They also plan to test whether baits soaked with an oral form of the vaccine might reduce the number of infected mice in the wild.