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**COVER:** Portion of a vast canyon in the Ma'adim Vallis region of Mars is about 800 kilometers long and averages 16 km wide and 2 km deep, its sinuous shape suggesting that it may have formed by water erosion. It was photographed in June 1980 by the Viking 1 orbiter, which ran out of gas two months later, but the spacecraft and its Viking 2 twin took so many pictures that computer-processing was only recently completed on the latest of them. For more, plus images from the still-working Viking 1 lander, see p. 364. (Photo: Jet Propulsion Laboratory)

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## Suicide Linked to Brain Chemical Deficit

Persons who commit or seriously attempt suicide appear to be influenced by a specific brain chemical abnormality that may be genetic in nature, according to two separate studies by researchers at Wayne State University in Detroit and at the National Institute of Mental Health. Both studies—the first of their kind, according to NIMH scientists—compared the activity levels of naturally occurring compounds, associated with depression and aggression, in the brains of very recent suicide victims with levels in the brains of non-suicide victims who had died in similar, violent ways.

The results reveal that in the suicide victims' brains, the number of receptical or "binding" sites for the chemical imipramine is one-third to one-half less than in the "normal" brains. Imipramine binding is believed to be a reflection of the brain's utilization of serotonin, a naturally occurring neurotransmitter, or chemical messenger. Studies in recent years have linked low serotonin levels to depression, aggression and impulsivity.

The findings suggest that whether a person suffers primarily from depression, schizophrenia, alcoholism or a personality disorder, an abnormally low serotonin level may be the critical, common factor in deciding whether or not to attempt suicide. Low serotonin "could cut across all these conditions," says Michael Stanley, associate professor of pharmacology and psychiatry at Wayne State. Stanley reported the results of his study of nine "suicide brains" and nine normal brains last week in Toronto at the annual meeting of the American Psychiatric Association. The report is scheduled to appear in an upcoming issue of SCIENCE.

Stanley, who performed the research with colleagues Joanne Virgilio and Samuel Gershon, reported that "the number of imipramine binding sites in the frontal cortex of suicides is reduced to approximately half of those present in matched controls." The suicide victims were screened to rule out drugs as a factor in either the suicide or in brain chemistry abnormalities.

In almost identical, yet-to-be-reported research with 10 suicides and 10 controls, NIMH researchers Frederick K. Goodwin, Steven Paul and Joel Kleinman say they have found 30 to 40 percent fewer binding sites in suicide brains—essentially "the same thing" as Stanley did. "This is an interesting finding—we may have found a clue" to the workings of the brain of the suicide victim, Goodwin, director of NIMH's Intramural Research Program, told SCIENCE NEWS. "This has implications for screening potential suicides," he said.

The finding punctuates work within the

last two years by both Paul and a French team headed by S.Z. Langer reporting abnormally low imipramine binding in the blood platelets of depressed patients. But though the "vast majority" of suicide victims have depressive symptoms at the time of the act, Goodwin explains, probably just one-fourth to one-third of them would be diagnosed as having "major affective disorder," or strict clinical depression.

These latest brain studies seem to explain the discrepancy by pinpointing serotonin—not simply depression—as the key factor in suicide. As the NIMH team has found previously, low serotonin levels seem as prevalent in highly aggressive and impulsive personalities as they do in depressives. "My guess is that suicide is a reflection of not just depression," Goodwin says, "but of some kind of intersection of depression with aggression and impulsivity."

Both Stanley and Goodwin are quick to note that their studies must be replicated before any final, cause-effect relationship is established between serotonin and suicide. Nevertheless, they are confident enough of their work to discuss possible screening and treatment approaches in suicide prevention. At the genetic level, Harvard psychiatrist Seymour Kety's epidemiological studies of adoptees in Denmark indicate that suicide may run in families, Goodwin notes. Since blood platelet imipramine levels seem to accurately reflect what's going on in the brain, Goodwin suggests that family members of suicide victims and attempters may be screened at a young age.

Persons found to be at high suicide risk might be more carefully observed or treated with more specific antidepressive drugs, at least one of which—Zimeladine—is already being tested at NIMH. Zimeladine "enhances the functional level of serotonin," Goodwin says, and is being administered experimentally to depressed patients with a history of suicide attempts. Goodwin was inspired to test the drug in part by the work of Swedish researcher Marie Asberg, who reported that of a group of patients admitted to a hospital for a suicide attempt, 22 percent of those with low serotonin levels (measured in spinal fluid) had succeeded in killing themselves within a year of admission. Says Goodwin: "We'd like to see if we can prevent this type of thing."

Stanley, who performed his initial examination of the brains in New York City, said he is equally hopeful, particularly since the NIMH results match his own. "But," he says "I'll feel a hell of a lot more confident when we've done fifty brains."

— J. Greenberg

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