

SCIENCE NEWS OF THE WEEK

The Brain's Own 'Angel Dust'?

The possibility that the human brain produces its own natural form of the widely abused, potentially lethal drug PCP, or "angel dust," has been reported by two New York psychiatrists. The finding may pave the way not only for an effective antidote but also for insight into the workings of serious psychoses, which PCP can induce for a temporary period, say Stephen R. Zukin of Mount Sinai School of Medicine and R. Suzanne Zukin of the Albert Einstein College of Medicine.

But perhaps more critical in the long run is the question of why the brain would manufacture a substance that seems, in its synthetic form, to cause some of the most unsavory side effects known to drug experts.

The Zukins say that although a "natural PCP" is still "highly speculative," their results render its existence "not as far fetched" as it had been. Angel dust, primarily abused by young people 12 to 25 years of age, works on the central nervous system to produce schizophrenia-like symptoms of agitation, hallucinations and paranoia, sometimes leading to suicide or "drug-induced accidents," according to the researchers. But it can also stimulate the cardiovascular system, triggering convulsions and sudden jumps in blood pressure that could lead to death.

Using radioactively labeled PCP (phenylcyclidine), the Zukins discovered "receptor" sites in the brains of rats that appear to attract and bind—exclusively—PCP. The receptor cells were found in various regions of the brain, but were most concentrated in the hippocampal area. Similar experiments in recent years have helped uncover the brain's "natural opiates"—enkephalins and endorphins—and what seems to be a natural form of Valium (diazepam).

But even though overdoses of the synthetic equivalents of those chemicals—morphine, opiate derivatives and Valium—can be harmful or fatal, when taken in moderate amounts they bring euphoria and relief from pain and anxiety. Hence, their natural existence in the brain seems to serve a logical purpose. With PCP, no such purpose is immediately apparent.

Stephen Zukin notes, however, that the drug was introduced originally as an anesthetic (and is still used as such for animals). Also, it is reported to be a "powerful self-reinforcer"—in various laboratory experiments, monkeys have repeatedly self-administered the drug, even to the point of sacrificing their food in favor of PCP, Zukin said in an interview. Finally, the observation that PCP-induced symptoms bear an "uncanny resemblance" to those of schizophrenia suggests the drug's natural analog might

be involved in the "regulation of the thinking processes [and] perhaps some normal functioning... in the sensory system."

More immediately, though, the Zukins' work could lead to more effective angel dust abuse treatment, which the researchers say now consists of "only supportive, non-specific" therapy. Even though the abuser may appear to be in a psychotic state, standard antipsychotic drugs such as thiorazine have been found to have "severe, even fatal effects" when interacting with PCP, according to Zukin. "It's [the administration of antipsychotics to counteract PCP] not considered safe,"

he says. In addition, Valium appears to be "not effective" in treatment. Nevertheless, the psychotic symptoms triggered by angel dust usually disappear on their own—although they may last up to four to six weeks in the heavy user, Zukin says.

From a purely scientific view, PCP induces "an excellent model psychosis," he says. "If we can figure out which PCP actions are causing this facet of the syndrome... it may give us an experimental model for approaching novel treatments of schizophrenia." The Zukins' report appears in the October PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. □

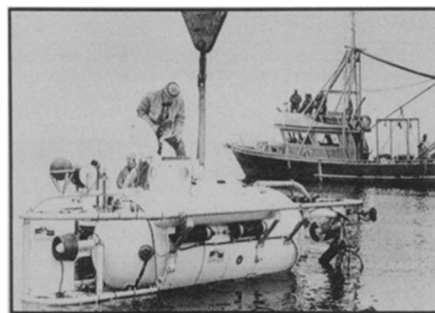
Lake Tahoe: The view from below

"It's an entirely different view of the lake," says Charles R. Goldman of his recent exploration via submersible of Lake Tahoe at the California-Nevada border. After 21 years of research on the ecology and behavior of the lake, it's hard to believe that Goldman hasn't seen Lake Tahoe from every conceivable angle. But according to the University of California at Davis scientist, last week's underwater expedition, cut short by inclement weather, marks an "important, turning-point phase" in the lake studies conducted by U.C. Davis's Tahoe Research Group. And for Goldman, the venture, sponsored not by a scientific organization but by the San Jose Mercury News, is a 16-year-old dream come true.

Lake Tahoe, 6,225 feet above sea level, is the largest high-altitude lake in the United States, according to a U.S. Geological Survey spokesperson. While other lakes drain mineral-rich sedimentary rock, high-altitude lakes such as Tahoe and Crater Lake in Oregon drain granite and thus have a low mineral—and therefore low nutrient—content. The addition of nutrients—in the form of sewage or industrial wastes, for instance—can radically tip the lake's balance, spawning runaway algae blooms and destroying its near-transparent purity.

"It was an enormous success," Goldman says of the project, though it was halted by gale-force winds Oct. 18, 20 hours shy of its 50-hour goal. Forest debris and sediment from a nearby lumbering and construction outfit and great waving masses of algae nearly 500 feet below the surface affirmed the lake's decline as documented by the group's surface studies.

Among the most significant finds was the discovery of pregnant mysis, or opossum shrimp, indicating that these animals, introduced as food for the government-stocked Kokanee salmon population, were again increasing. Several years ago, the



Pioneer I prepares for Lake Tahoe dive.

World Wide Photos

shrimp nearly eliminated the lake's natural population of daphnia and bosmina plankton. Because the researchers had not recently found pregnant shrimp in their surface studies, and had noted an increase in the plankton population, they had hoped that the lake's food chain was stabilizing. This discovery may indicate such hope is in vain.

Goldman, credited with the nearly single-handed rescue of the lake from environmental destruction, demonstrated almost 20 years ago that, contrary to then-current thinking, pumped-in wastes do not remain trapped on the bottom by the 39-degree water, but mix thoroughly and may kill the lake. Since then, the Tahoe Research Group, consisting of more than 30 biologists, limnologists, geologists and social scientists, has monitored the popular recreational lake. The group is funded by agencies such as the National Science Foundation and the Environmental Protection Agency. Goldman had long hoped to check his results by underwater exploration, he says, but the cost of a submersible prevented him from doing so. The San Jose newspaper, according to a spokesperson, became interested and offered to obtain use of the 17-foot submersible Pioneer I of Martech International, Inc., in Houston, Tex. The project is estimated to cost the paper \$30,000. □