Mice get an earful from left brain

A mouse pup strays too far from the litter and lets out a distinctive ultrasonic squeak. Immediately its mother comes to the rescue, dragging the misplaced tyke back to the nest.

There is, however, more to the mother's perception of her pup's emergency call than meets the ear. The "communication" call is preferentially processed by the left hemisphere of her brain, according to a report in the Jan. 15 NATURE, just as language is predominantly handled by the left hemisphere in humans. This suggests, says Günter Ehret of the University of Konstanz, West Germany, that a left-hemisphere advantage in recognizing communication sounds evolved early in mammals.

Until now, the only animal known to have this type of lateralized brain function was the macaque monkey.

In his first experiment, Ehret removed pups from the litters of 44 female mice and placed the youngsters along a running board that extended across a central nest. Pups were quickly retrieved and a comparable level of "maternal motivation" was created among the mothers. Two loudspeakers, one at either end of the running board, were then switched on. One emitted signals resembling a pup's natural call for help (around 50 kilohertz) and the other gave off 20-kHz tone bursts. The mothers headed for the 50-kHz sound source when both ears were clear and when their left ears were plugged. When their right ears were plugged, the mice showed no preference.

But were females merely unable to pin down the location of the sound sources with only the left ear functioning, or was the *meaning* of the artificial calls blocked? In a second experiment, virgin female mice with no pup experience were placed in the central nest and trained to approach the 50-kHz tone bursts for a reward of drinking water. This response persisted when either the left or right ears were plugged, suggesting that in the mothers' case, the response was a result of recognizing the pups' call, rather than some extraneous, physiological phenomenon.

The two experiments, says Ehret, show that mothers with pups have a right-ear, left-hemisphere advantage in recognizing pup calls that does not occur when females with no pup experience are conditioned to respond to the same ultrasounds.

He suggests that brain specialization for the perception of communication sounds among mice "should be considered as a possible basis of the left-hemisphere advantage for speech sound recognition in man."

Ehret's demonstration of a left-hemisphere advantage in processing communication sounds among animals that rank far below humans on the evolutionary scale is important, points out psychologist John C. Marshall in an accompanying editorial, but lateralized brain functions are far more complicated in humans than in mice. In the human brain, the right hemisphere appears to be in charge of the perception of emotional types of communication, either seen or heard, says Marshall, of The Radcliffe Infirmary in Oxford, England. The recognition and interpretation of facial expressions is one example. There is also evidence, he notes, that the right hemisphere can process nonspoken language and may have access to the meaning of spoken words.

Furthermore, the linguistic specialization of the left hemisphere in humans covers more than spoken words. A recent study found that the ability to use and understand sign language, in which hand movements and their manipulation in space are critical to meaning, appears to be rooted in the left brain hemisphere (SN: 8/2/86, p.70).

The customary explanation for lateralized control of human speech, says Marshall, is that it would be too difficult to synchronize timing in complex brain centers that were duplicated in two hemispheres. But this account, he contends, "seems not to apply to the perception of 50-kHz tone bursts . . . why nature should choose an asymmetrical [brain] location for critical biological functions remains as mysterious as ever." — *B. Bower*

Cocaine cardiology: Problems, mysteries

As more and more cases of cocaine-related heart problems and deaths are recognized, researchers are beginning to get an idea of what types of heart disease the drug causes. But how the damage occurs, who is prone to problems and why so few users are affected remain a mystery, says Jeffrey M. Isner of Tufts University in Boston.

Isner, one of the first to publish in the scientific literature on the connection between cocaine and heart disease, is studying the physiological correlation between the two. He discussed some of the cases and their possible causes at last week's American Heart Association Science Writers Forum in Monterey, Calif.

Of the U.S. cases reported so far, three-quarters have been heart attacks and the rest were due to inflammation or arrhythmia. The problems occurred immediately after cocaine use, and none of the users had discernible underlying conditions that might have predisposed them to heart disease.

Isner and his colleagues' description of seven cases in the Dec. 4, 1986, NEW ENGLAND JOURNAL OF MEDICINE followed previous reports of 26 other incidents. Since he published, Isner says, at least four more cases have appeared and details of 19 more have been submitted for publication. Most of the people had snorted "normal" levels of the drug.

While researchers don't know how cocaine causes heart attacks, they are beginning to rule things out. Spasms in the coronary arteries and subsequent formation of a blood clot at the spasm are believed capable of causing heart attacks in non-users, but users are evidently not especially prone to such spasms.

Using a diagnostic test routinely used to test for coronary artery spasms, Isner and his colleagues, as well as researchers at several other laboratories, checked nine cocaine users who had suffered heart attacks. In the test, a drug that can cause spasms in susceptible people is injected via catheter directly into the coronary arteries. If the test shows the person to be sensitive to the drug, naturally occurring spasms are presumed to be causing the heart problems.

Isner and his colleagues tried the same test with cocaine after obtaining consent in a user with heart problems. Again, no signs of spasms were seen.

Some researchers have also linked cocaine use to myocarditis, or inflammation of the heart muscle. Isner has checked a tissue biopsy from someone with cocaine-related myocarditis and found an unusually large number of a certain type of white blood cell. The cells are characteristic of cardiac hypersensitivity to some therapeutic drugs, suggesting that an allergic reaction may be to blame for cocaine-related myocarditis.

Researchers are at a loss to explain the epidemiology of the association. Although the number of reports linking cocaine to specific instances of heart disease has been rising over the past five years, it is still extremely small compared with the estimated 5 to 6 million cocaine users in the United States. The apparent increase in the rate firms up the relationship, Isner says, but why the drug's effect on the cardiovascular system of most users is limited to a boosting of the heart rate and blood pressure, while a small percentage get heart disease, is unknown. "This is something that's going to affect a distinct minority of users," says Isner. "But we don't have any way of predicting who is going to belong to that subset.

"The drug has an awfully long history. It's still used by millions of Indians in Peru and Colombia. And at least in that population, the potential for sudden, fatal cardiac disorders has not been described or recognized." One potential source of the difference — impurities in the U.S. street product — has not been checked because of the difficulty of obtaining samples of the drugs used by the patients, he says. — *J. Silberner*