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Hibernating Mice May Someday Save Humans

By NICHOLAS BAKALAR

Many animals hibernate, although mice have never been among them. But big changes may be ahead in the mouse world.

Researchers have succeeded in putting mice, without harming them, into a state of suspended animation that looks suspiciously like that of a hibernating bear.

If the technique can be applied to humans, the scientists say, it may eventually offer new ways to treat hypothermia, slow down bleeding in traumatic injuries, quickly reduce high fevers, or even help heart attack patients in emergencies by slowing their breathing and heart rates.

The scientists, led by Dr. Mark Roth of the Fred Hutchinson Cancer Research Center in Seattle, was published in the April 22 issue of the journal Science.

In the study, they made use of a common gas, hydrogen sulfide.

Within five minutes of breathing air that was 80 parts per million hydrogen sulfide, the mice dropped into a peaceful slumber, their oxygen consumption cut in half, their body temperature reduced to 58 degrees from a normal 98, and their breathing rate reduced to 10 breaths a minute compared with a usual 120.

The researchers left them like this, fast asleep and apparently in no distress, for six hours. Then they turned off the gas and let them breathe normal air again. In short order, they were up and about, their body temperature and breathing restored to normal, and, to all appearances, acting like healthy mice.

"They come out of it in about two hours," Dr. Roth said.

The process, according to the researchers, is similar to what happens in rare cases when someone falls into icy water: the body's metabolic rate - the consumption of oxygen by cells - declines so radically that the person can survive, completely unconscious and virtually deprived of oxygen, for several hours and then be revived without injury.

In such cases, brain cells prevent damage by shutting down all activity until they receive the oxygen needed to go on working.

Eric Blackstone, a graduate student at the University of Washington and a co-author of the paper, said that until now, "no one has been able to induce hibernation on demand, even in animals that can hibernate in the wild."

The mechanism of natural hibernation is not well understood, but the hydrogen sulfide gas technique

precisely mimics its effects. Hydrogen sulfide works by inhibiting a specific enzyme in the electron transport chain, the part of a cell's energy-producing process that requires oxygen. With the mice, breathing rate and body temperature decreased in direct proportion to the amount of gas they were breathing.

Dr. Roth said that no one yet knows if the procedure would work in humans, or even in higher mammals, and that finding out would require considerable research and testing. But he expects that within five years, humans could begin to benefit from the work. Dr. Roth is a co-founder of Ikaria Inc., a biotechnology company that plans to develop treatments based on the process.

For example, he said: "With a heart attack, you could be 'hibernated' while you're on the way to the hospital. We would hope that this procedure would buy time for you until you could get treatment."

No one, however, should get the idea that depriving a person of oxygen is a beneficial treatment in an emergency, Dr. Roth emphasized.

The procedure, he said, causes a reduction in use of oxygen at the cellular level, and "it's not the same as reducing oxygen by putting a plastic bag over your head."

Hydrogen sulfide is produced in the human body, and Dr. Roth speculates that humans may have an evolutionary ability to use it to control oxygen use.