Brain peptide fights fever best

Molecule for molecule, a natural brain substance currently under investigation is more than 25,000 times as effective as acetaminophen or aspirin in reducing fever in rabbits. This impressive potency was measured in experiments in which the peptide was injected into fluid circulating in the rabbits' brains. But alpha-melanocyte stimulating hormone (α-MSH) also reduces fever when injected peripherally, into a vein in the rabbits' ears, scientists report. They suggest a potential clinical role for the 13-amino acid peptide.

"Since this peptide occurs naturally in man, its use as an antipyretic [fever-reducing agent] may amount to simply augmenting an endogenous antipyretic without introducing a foreign substance as with other antipyretics," say Mark T. Murphy, Dave B. Richards and James M. Lipton of the University of Texas Health Sciences Center in Dallas. Such a substance eventually may provide an alternative to currently available fever drugs.

The peptide α-MSH is derived in the body from a larger peptide molecule called adrenocorticotropic hormone (ACTH). Soon after ACTH was described by scientists in the 1950s, it was found to be effective in reducing fever. But the larger molecule stimulates release of steroid hormones from the adrenal glands, an unacceptable side effect that may result in the wide array of physical and mental symptoms of Cushing's syndrome.

"Alpha-MSH does not induce steroids," Richards says. "But its potency is similar to ACTH." No serious side effects have been reported in experiments giving large doses of α-MSH to either rabbits or to human subjects in unrelated research.

The scientists measured the potency of α-MSH in the course of work investigating how the brain controls body temperature regulation. "A lot of different peptide levels change with fever," Richards says. The researchers focused on α-MSH because it is found in brain areas that govern temperature regulation, and they find that in one of these regions, the septum, the concentration of α-MSH increases during fever. Injection of small amounts of the peptide directly into septal brain tissue reduces fever, Lipton and colleagues report. The scientists suspect that at specific receptor sites in the brain, α-MSH competes with a natural fever-producing substance provided by white blood cells.

"No endogenous substance other than ACTH is known to have such potency in reducing fever," the scientists report in the July 8 SCIENCE. "Although α-MSH is relatively expensive, only small amounts may be required to effectively reduce fever."

—J.A. Miller

Diatom mats supply mid-ocean nitrogen fix

Mid-ocean areas such as the North Pacific Gyre and the Sargasso Sea used to be considered biological deserts — vast stretches of open sea where virtually nothing lived. With the discovery several years ago that such areas support huge communities of microscopic life, scientists confronted a new set of puzzles: What nutrients support the organisms?

Nitrogen usually is required in areas where life abounds, but standard testing methods failed to detect fixed nitrogen, and scientists began to search for other ways to explain the high productivity. Now, through underwater studies, researchers find that fluffy mats of diatoms — microscopic marine algae — contribute significant amounts of fixed nitrogen to mid-ocean waters. This nitrogen may comprise as much as 14 percent of the total amount required to support life at the base of the food chain in such areas; the source of the remaining nitrogen is not known. The findings are reported in the July 8 SCIENCE by LeeAnne Martínez and Mary W. Silver of the University of California at Santa Cruz, and James M. King and Alice L. Alldredge of the University of California at Santa Barbara.

It is a major biological feat for organisms to pluck nitrogen from the atmosphere and convert it to organic molecules. Two species of the diatom *Rhizosolenia* accomplish the job by providing a home for nonphotosynthetic bacteria that actually fix the nitrogen. The bacteria then use the nitrogen to produce their own organic molecules, such as proteins. When the diatoms are broken down or eaten, their fixed nitrogen is released to other organisms in the food chain.

The finding is interesting in part because it identifies a "new" source of nitrogen for the open ocean. It also casts into doubt results of countless shipboard experiments designed to measure rates of nitrogen fixation by diatoms. On deck, where such studies usually are performed, experiments consistently underestimated or did not detect the diatoms' nitrogen-fixing ability, possibly because the mats were disturbed, the authors note. For comparison, scuba divers in the recent study also hand-collected the fragile diatom mats and conducted their experiments at the underwater site, using incubation chambers holding a single mat suspended in seawater. Not only did they find that the undisturbed *Rhizosolenia* mats fix nitrogen, but that the rates of fixation are much greater under dark conditions than light. The increased fixation in the dark supports the hypothesis, the researchers say, that the nonphotosynthetic bacteria living in the diatoms' cells are responsible for the nitrogen fixation.

—C. Simon

Fuller, 87, dies of heart attack

Once described as a free-lance genius, R. Buckminster Fuller, an inventor by title and an eclectic by trade, died of a heart attack on July 2. A startlingly innovative thinker, Fuller spent most of his 87 years searching for new ideas and for novel connections between existing ones.

Fuller, who espoused salvation through proper use of technology, believed that the essence of the universe is not matter, but design. He set as his goal "to discover the principles operative in the universe and turn them over to my fellowman."

Susan West

Fuller speaking at a seminar in Washington, D.C., in 1979.

Fuller presented his ideas to the world through a variety of mediums, from blueprints and buildings to lectures and poetry. He is best known for designing the geodesic dome, a sphere consisting entirely of interconnecting triangles. Like many of his other designs, the geodesic dome provides maximum strength with minimum space and materials.

In addition to the geodesic dome, Fuller patented 25 inventions in the United States. He also wrote 25 books, including three volumes of free verse and *Operating Manual for Spaceship Earth*. In the latter, he compared the earth to a large mechanical device capable of survival only if its inhabitants become familiar enough with its mechanics to keep it operating smoothly.

Using technology, Fuller believed, humans can save "spaceship earth." "Man has the capability through proper planning and use of natural resources," he said, "to forever feed himself and house himself and live in workless leisure."

Fuller's heart attack struck while he was visiting the bedside of Anne Hewlett Fuller, his wife of 65 years. She died just 36 hours later.

—S. Steinberg