Women's brains present hormonal mystery

A scientific team exploring hormonal influences on the brain and mind has come across an intriguing puzzle. During a drug-induced decline in concentrations of a steroid hormone produced by the ovaries, women given a series of complex problems fail to show surges in the frontal brain activity that has been considered crucial for success on that test. Yet they solve the problems as well as women who possess far greater quantities of the hormone and boast much more frontal brain activity.

Alternate brain networks, which perhaps differ from one woman to another, may pick up the slack when a hormonal deficit blocks the usual cerebral responses to a mental challenge, contend neuroscientist Karen F. Berman of the National Institute of Mental Health in Bethesda, Md., and her coworkers.

Their study, described in the Aug. 5 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, represents the first use of positron emission tomography (PET) imaging to examine the effects of hormones on brain responses evoked by specific mental maneuvers.

"These data are an important start," remarks Barbara B. Sherwin, a psychologist at McGill University in Montreal. "But a clear connection between hormonal influences on neural activity and behaviors or cognition has yet to be made."

Several animal studies have suggested that gonadal steroid hormones affect brain activity and certain cognitive skills, such as the ability to delay learned responses. Little relevant evidence exists regarding people, however.

Berman's team studied 11 women who ranged in age from 27 to 49. Six of the volunteers had no physical or psychological disorders; five were diagnosed with menstruation-related mood disorder.

The researchers took PET scans of the women's brains over 4 to 5 months during each of three treatment phases. First, the women received Lupron, a drug that suppresses the ovaries' production of gonadotropin-releasing hormone. Then they received both Lupron and one of two consecutively administered hormone replacement therapies. Some women, selected at random, received an inactive substance instead of one hormone replacer.

Imaging sessions took place as the women completed a problem-solving test that required them to recall and manipulate recently studied material.

Previous PET investigations had found large increases in blood flow in part of the frontal lobe, known as the prefrontal cortex, when men and women completed this problem-solving test. Comparable brain activity occurred in women given Lupron and either of the hormone-enhancing therapies, but not in women receiving Lupron alone, the scientists hold.

Nonetheless, women in each group (including those with a mood disorder) solved as many complex problems as volunteers in other studies have. Further investigations should employ more powerful brain-scanning instruments and additional mental challenges in a search for brain circuits that may substitute for the prefrontal cortex during times of hormonal drought, Berman's team says.

— B. Bower

Newfound worm's world under the sea

From a distance, the glinting deposit of ice-like hydrate jutting from the mud bottom of the Gulf of Mexico was most remarkable for its size. Such deposits—crystallized structures combining water and hydrocarbon gases—typically only peek through crevices in the ocean floor. This outcropping (right top), spotted July 15, cuts a swath the size of a refrigerator.

As their research submersible moved closer, Charles Fisher and his colleagues noticed that the canary yellow hydrate was crawling with pastel pink animals 1 to 2 inches long (digitally modified photo, right bottom).

"We were astounded," says Fisher, a physiological ecologist at Pennsylvania State University in State College. The widespread hydrates of methane and other gases have been eyed as a possible source of fuel (SN: 11/9/96, p. 298), not of fauna.

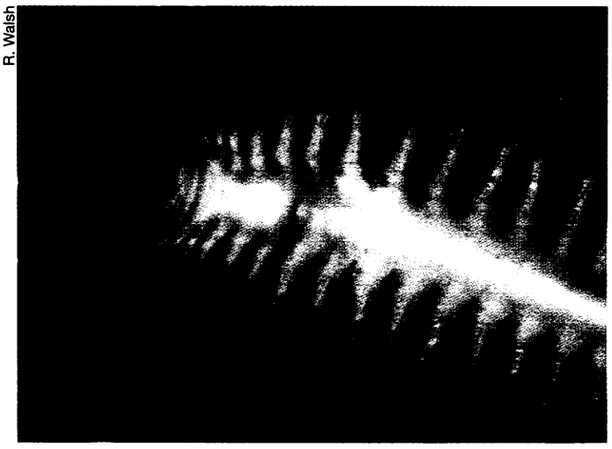
The pink creepers turned out to be flat, segmented marine worms known as polychaetes. With their brushlike appendages (below), "they look like centipedes at first," says André Toulmond of the Observatoire Océanologique de Roscoff in France.

Researchers are now studying some of the retrieved worms, which Toulmond says appear to be an unknown species from a familiar marine worm family (Hesionidae).

The hydrate worms are probably as common as the deposits themselves, says Fisher. They've just been hidden under sediment. Spying the worms on the exposed and burrow-filled hydrate was like "seeing the underside of a log," says oceanographer Ian MacDonald of Texas A&M University in College Station. He and Fisher have since picked out the occasional pink worm on earlier photos of other hydrates.

Photos: Fisher and P. Santos

R. Walsh



In the last 2 decades, researchers have found life around other unusual deep-sea habitats, including hydrothermal vents and oil seeps. Fisher usually studies tube worms (SN: 9/28/96, p. 201), which were also present near the hydrate (top photo, left side).

Like these organisms, the hydrate worms are no doubt living off bacteria that can feed on the hydrocarbons within the deposit, says Fisher. "What we don't know yet is whether bacteria are living on the hydrate, in the hydrate, on the worm, or in the worm."

Something else is no doubt living off the worms. Various fish and other organisms probably regard these worms as lunch, says MacDonald.

—C. Mlot