Biology

Marrow for Krabbe's and twitcher mice?

Enzymes occur in the body in very low concentrations and therefore might seem inconsequential, but there are some severe disorders caused by errors in enzyme metabolism. Among these is Krabbe's disease, a rare hereditary condition characterized by a deficiency of galactosylceramidase. Without this enzyme, toxic fat accumulates in the nervous system and in other body tissues. As nerves deteriorate, about four months after birth in most cases, symptoms such as seizures and vision problems appear, followed by death one or two years later. Despite the dire aspects of the disease, however, scientists have two reasons to be optimistic: a good mouse model of the disease and the encouraging results from bone marrow transplant studies, including one reported last week by a group of researchers in the Netherlands, Japan and the United States.

Like a human with Krabbe's disease, the twitcher mouse lacks galactosylceramidase, has brain tissue infiltrated with the abnormal fat-containing globoid cells, and loses the myelin sheaths around nerves. The toxic fat psychosine also accumulates in the central nervous system, and physical symptoms similar to those of Krabbe's disease develop in affected mice, which die about five weeks after birth. In recent years, scientists have used the twitcher mouse to study bone marrow transplants as a way to replace enzyme-deficient cells with normal, enzyme-producing cells. Despite some good results with restoring enzyme activity in the lung and liver, researchers have remained uncertain whether the transplanted cells could cross the selective blood-brain barrier to the tissues most affected by the lack of enzyme.

Scientists from the Netherlands' University Hospital in Leiden, the University of North Carolina in Chapel Hill and Kyushu University in Fukuoka, Japan, report in the Feb. 26 SCIENCE that they have confirmed that donor cells do migrate into the brain. Results also show that marrow transplants — performed when the mice are 9 to 12 days old — increase enzyme levels in the central nervous system, result in much lower levels of psychosine and are followed by a disappearance of globoid cells. Myelin around nerves is at least partially restored, say the authors.

The recent results support those from earlier studies at the John F. Kennedy Institute for Handicapped Children in Baltimore, where Hugo W. Moser and his co-workers found that twitcher mice given transplants live four to five times longer than untreated mice. Moser said in an interview that his group is currently looking for nontoxic ways to disrupt the blood-brain barrier, to allow more transplanted cells into the central nervous system. Although there are prenatal tests to detect the juvenile form of Krabbe's disease (which occurs in 1 in 40,000 live births), Moser says transplants would more likely be used in the even rarer adolescent-onset form of the disease.

Future obesity set by age 3 months?

Infants who become overweight by the age of 1 year have total body energy expenditures about 21 percent lower than infants who do not become overweight, and this slower metabolism appears by the age of 3 months, according to a study reported in the Feb. 25 NEW ENGLAND JOURNAL OF MEDICINE by scientists at the Massachusetts Institute of Technology in Cambridge and the Dunn Nutrition Unit in Cambridge, England. In preventing obesity in infants of overweight mothers, an increase in physical activity might be more useful than reducing food intake, say the researchers. An accompanying report from the National Institutes of Health facility in Phoenix, Ariz., agrees that a person's inherited energy expenditure can contribute to obesity. Results from that study of Pima Indians were presented last fall at a seminar in Bethesda, Md. (SN: 11/14/87, p.309).

Earth Sciences

A frustrating start for life on earth

Comets and meteors striking the earth frequently during its early history may have repeatedly exterminated the first living cells from the planet, forcing life to originate over and over again, according to two earth scientists who have examined the record of craters on both earth and the moon.

The records indicate that during the first billion years of the earth's history, the frequency of large impacts declined until leveling off around 3½ billion years ago. Small meteors, the most numerous objects to hit the earth, would have caused local catastrophes, upsetting a small portion of the young planet, which scientists believe was largely covered by oceans. But larger impacts could have sterilized the whole earth by sending water and dust into the atmosphere, creating huge waves and raising the planet's temperature.

As primitive biological molecules were arranging themselves into living cells, frequent impacts may have disrupted the environment before these cells developed the ability to reproduce. Therefore, only when the developing cells had enough time between impacts to become self-replicating would they establish a foothold on the planet, suggest Kevin A. Mahler and David J. Stevenson in the Feb. 19 NATURE.

Basing their suggestion on the crater record, the researchers say life could have evolved on land or in shallow seas as far back as 4 billion to 3.7 billion years ago. On the other hand, if life began near hydrothermal vents in the deep sea, it would have escaped some of the smaller global catastophes. Life in this locale could have started as early as 4.2 billion years ago.

Mahler and Stevenson, from the California Institute of Technology in Pasadena, suggest that organisms that formed near hot springs would be better equipped for surviving the elevated temperatures after large impacts. "If life could have evolved in or near the midocean-ridge hydrothermal systems, then it probably began there," say the researchers.

A housewarming under the waves

A team of oceanographers resurfaced last month after spending two weeks on the seafloor in the first use of the *Aquarius* habitat, the nation's newest underwater laboratory, which is sponsored by the National Oceanic and Atmospheric Administration. Located under 50 feet of water near the Caribbean island of St. Croix, *Aquarius* served as a base for researchers from the University of Maryland, who were studying how algae in the sand contribute nutrients that support other organisms on the seafloor. Christened late last year, *Aquarius* will this year host five other projects.

Warmest, wettest and windiest

The competitive spirit is deeply ingrained in the American fiber, and cities are no less prone to boasting than are individuals. The National Weather Service (NWS), with more than 280 offices in the United States, keeps long-term precipitation and temperature records for all of its bureaus, which are collated by the National Climatic Data Center in Ashville, N.C. From the most recent set of data, here are the extremes for the U.S. stations located in or near cities in the contiguous states:

Extreme	Location	Average Annual Value
Warmest	Key West, Fla.	(mean temp. 77.7°F)
Coldest	Int'l. Falls, Minn.	(mean temp. 36.4°F)
Driest	Yuma, Ariz.	(2.65 inches precip.)
Wettest	Quillayute, Wash.	(104.5 inches precip.)
Windiest	Blue Hill, Mass.	(mean speed 15.4 mph)
Snowiest	Blue Canyon, Calif.	(243.2 inches snowfall)
Cloudiest	Quillayute, Wash.	(242 cloudy days)
Rainiest	Quillayute, Wash.	(212 rainy days)
Sunniest	Yuma, Ariz.	(17 rainy days)