BIOMEDICINE

Zinc-deficient diet produced

Evidence has been building for some years now that the trace element zinc is crucial for the mammalian diet. In 1934, for example, zinc deficiency was produced for the first time in experimental animals. Then in the late 1950s an Indian physician, Ananda S. Prasad, identified young men in Iran and Egypt suffering from zinc deficiency. They were grossly underdeveloped both in stature and sexually. When he gave them a dietary supplement of zinc, they matured dramatically.

Now further evidence that dietary zinc is essential for humans is reported by Prasad and his colleagues at Wayne State University in Detroit. They have produced a state of zinc deficiency in human volunteers. This is the first time it's been done.

Prasad and his team were up against a knotty challenge—developing a zinc-deficient diet that would be acceptable to human subjects on a long-term basis. But they finally came up with one—a synthetic soybean protein diet that supplied all known essential nutrients except zinc. With this diet they were able to produce zinc deficiency in human volunteers. Weight loss, loss of libido, roughness of skin, lethargy and appetite loss were some of the clinical features.

Such experiments, Prasad explains, are essential for defining the amount of zinc that people need before any large-scale zinc therapy programs can be undertaken.

Microtubules in the making

One of the many things that turns biochemists on these days are microtubules—tiny cylindrical structures that play a crucial role in formation of the mitotic spindle during cell division, neuronal outgrowth and flagella development. Exactly where are those microtubules located? How are they assembled? Light is shed on both these questions in the April PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

Jane E. Aubin and her colleagues at the University of Toronto report that they've made antibodies against tubulin from chick brain. Tubulin is a kind of protein that comprises microtubules. They have used the antibodies to detect microtubules in cells and believe they can also be used to study the effects of stimuli on microtubules.

Gerhard Wiche and R. David Cole of the University of California at Berkeley, report that tubulin from cultures of rat glial cells can be changed, in the test tube, into intact microtubules. The change was reversible and spontaneous. This discovery, the researchers declare, "establishes a model system for studies of cell-cycle- and cell-type-dependent regulatory mechanisms controlling the assembly of microtubules."

Amino acids affect sleep and behavior

Changing the amounts of amino acids circulating in the bloodstream can affect sleep and behavior, Phillip L. Poffenbarger of the University of Texas Medical Branch at Galveston, reported last week at the annual meeting of the American Federation for Clinical Research in Atlantic City.

Poffenbarger and his colleagues injected an enzyme into monkeys that depleted some of the amino acids in their bloodstreams, then examined the monkeys to see whether the amino acid depletion in turn altered their sleep and behavior. They found that it did, and strikingly so. The animals slept less, spent less time in REM (dream) sleep and performed poorly on complex tasks compared with the control monkeys. Subsequent experiments on rats showed similar changes in sleep and behavior, as well as changes in brain neurotransmitters.

So amino acids in the bloodstream can influence both sleep and behavior, possibly by altering brain neurotransmitters.

SPACE SCIENCES

Close-passing Eros draws a crowd

On Jan. 23, 1975, the asteroid 433 Eros passed within less than 23 million kilometers of the earth, its closest approach in this century. In a viewing opportunity that extended from August 1974 through May 1975, astronomers around the world aimed their instruments at the small, irregularly shaped object, making Eros "the best-studied asteroid by a large factor," in the view of ICARUS editor Carl Sagan. The current ICARUS (28:1-153) reports many of these results, representing scientists from the United States, Germany, Italy, Puerto Rico and Romania.

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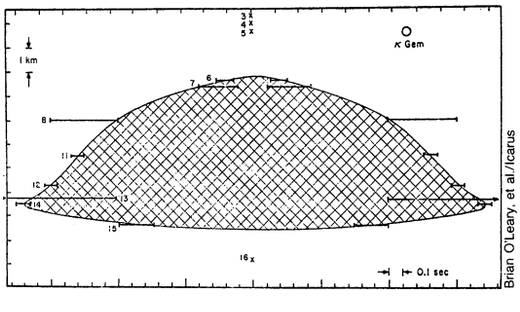
Early hopes that all the data would produce a single solution for the shape and spin orientation of Eros were only partially realized, according to Ben Zellner of the University of Arizona. Radar observations with the Goldstone antennas at 3.5- and 12.6-centimeter wavelengths suggested a "rotating triaxial ellipsoid" (R.F. Jurgens and R. M. Goldstein of Jet Propulsion Laboratory). Ultraviolet lightcurves suggested a cylinder with rounded ends (R.L. Millis, et al. of Lowell Observatory and J.L. Dunlap of the University of Arizona). A series of observations when Eros occulted the star Kappa Geminorum also suggested an ellipse or possibly "a kind of dumbbell" (Brian O'Leary, now at Princeton, et al.). The Goldstone researchers also found that their projected axis of rotation did not equally divide the projected area of the asteroid, a conclusion Zellner says suggests a tapered or wedge-shaped figure. But, he warns, "undoubtedly the shape has been over-idealized in all cases."

Size estimates were similarly disparate. In a summary paper, Zellner estimates that overall dimensions of 13 by 15 by 36 kilometers ±1 km in each axis "probably satisfy all the observations well enough."



Possible profile of asteroid 433 Eros based on observations of its occultation of the star Kappa Geminorum.

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Despite the range of interpretation in 433 Eros's shape, calculations of its rotational characteristics fell in a workably small range. Several independent solutions yielded a pole of rotation with an ecliptic longitude of 16° ± 2° and an ecliptic latitude of + 11° ± 2°. The asteroid's sidereal period, according to Dunlap, appears to be 0.219599 days or 5 hours 16 minutes 13.4 seconds ± 0.2 seconds.

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Structurally, according to Jurgens and Goldstein, Eros's surface is "very much rougher than any planetary or lunar surface" studied by radar, and is "completely covered with sharp edges, pits, subsurface holes or embedded chunks" on the order of the 3.5-to-12.6-centimeter radar wavelength size range. Radiometry (D. Morrison, presently University of Arizona) indicated a highly porous, rocky regolith, and polarization studies (Zellner and J. Gradie, U. of Ariz.) suggested a "dusty" surface overall. Compositionally, several researchers reported signs of iron and pyroxene silicates, but the scarcity of laboratory comparison spectra leaves a wide range of possible iron-silicate ratios from less than 15 percent to 50.