Chemistry

Linda Garmon reports from Kansas City, Mo., at the American Chemical Society meeting

Enzyme linked to epileptic seizures?

Researchers at Warren State Hospital in Pennsylvania have discovered significantly elevated levels of a central nervous system enzyme in a limited number of patients with grand mal epilepsy. High concentrations of beta-glucuronidase were detected in blood samples drawn from epilepsy patients either one day to nine weeks after they had experienced a seizure or one day to five weeks before one occurred. If such a finding holds true, it could have implications for predicting or more effectively treating the seizures associated with the disease.

The high levels of beta-glucuronidase were discovered by chance when Rajendra Varma and colleagues were analyzing blood samples for another investigation. To rule out the possibility that the drugs to treat epilepsy were causing the increased enzyme levels, Varma and colleagues then checked blood samples from a "control" group that included non-epileptic patients who were taking the drugs for the treatment of other disorders; only average enzyme levels were detected.

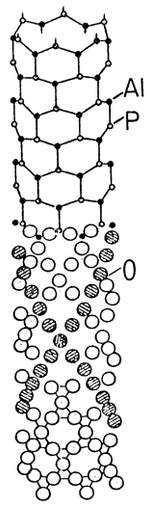
While researchers know the normal job of the beta-glucuronidase enzyme is to degrade GAG molecules — components of synapses and the barrier between the bloodstream and the brain — they do not know what role it plays in epilepsy.

New class of molecular strainers

Just as a chef cannot use a tea strainer to efficiently separate pasta from boiling water nor a colander to press the tea beverage from its leaves, a scientist cannot depend on just one type of molecular sieve to efficiently perform all sorts of chemical separations. As a result, researchers have spent decades developing an array of novel crystalline structures in hopes of finding appropriate micro-sifters for various industrial applications. The newest crystalline sieves with the potential for a future in industry are aluminophosphate materials ($AlPO_4$-n) recently synthesized by Stephen T. Wilson, Edith M. Flanigen and colleagues of Union Carbide Corp. in Tarrytown, N.Y.

This new family of sieves includes about 20 different three-dimensional framework structures. For example, $AlPO_4$-5 has a central channel bonded by 12-membered rings composed of alternating AlO_4 and PO_4 tetrahedra (see diagram). The numerous structures in this class have pores, in which materials to be separated from the rest of a solution will be adsorbed, that range in size from 0.3 to 0.8 nanometers. That range spans the entire spectrum of pore sizes in previously existing classes of sieves.

The most well-known group of sieves, the synthetic versions of the zeolite minerals, have been used in hundreds of industrial applications since 1954. Because of their strong hydrophilic (water-attracting) nature, the zeolites have been used in drying and water-softening (calcium- and magnesium-removing) processes; in addition, the petroleum refining and petrochemical industries have found them to be useful catalysts. The development of a second major class of sieves, the silicalite (SiO_2-containing) group, was announced by Union Carbide researchers in 1978 (SN: 3/4/78, p. 133). Because of their strong hydrophobic (water-repelling) nature, the silicalites might prove to be efficient removers of unwanted organic material from industrial waste water.



The new aluminophosphate sieves lie between zeolites and the silicalites in their affinity for water, Wilson and colleagues report. Although they have just begun screening these molecules for industrially useful candidates, the researchers believe the unique water-affinity and surface properties of the aluminophosphate class could usher in a new era in sieve technology.

Earth Sciences

Did cloudiness affect early climate?

If theories of the sun's history are correct, four or five billion years ago when the earth was an infant planet the amount of radiation emitted by the sun was 20 to 30 percent less than it is today. This condition poses problems for researchers trying to construct a reasonably accurate model of the earth's early atmosphere: models incorporating properties of the current atmosphere show that if the sun were that much cooler, the earth would have frozen over. The geological record, however, attests that the earth did not freeze. In the Sept. 24 SCIENCE three researchers from NASA Goddard Institute for Space Studies in New York suggest that many efforts to model the earth's early atmosphere and climate slight or overlook the effect of cloud cover that may have had a "stabilizing effect for the early earth."

William B. Rossow, Ann Henderson-Sellers and Stephen K. Weinreich used a type of model often used to study the primitive atmosphere and the effects of reduced solar radiation, absence of oxygen and ozone, and the combined effects of reduced total energy from the sun (solar constant) and increased levels of carbon dioxide. Until now effects of cloudiness have been neglected or possibly misrepresented, they write. In their model, they included cloud cover that mimics present-day conditions. They found that the model temperatures of the early earth were greater than in those models without cloud feedback. This indicates that cloud cover may affect climate as much as changes in both output of solar energy and the atmosphere's composition.

Often modelers emphasize drastic changes in atmospheric composition, such as greatly elevated levels of carbon dioxide, so that the model atmosphere will retain the warmth of the weaker sun, maintaining the earth's unfrozen state. "These kinds of conclusions just aren't supportable because the kinds of modeling used are inadequate," Rossow says. He suggests that inclusion of ocean circulation in the climate models might show similar results. "All we're pointing out is that there are other things that you can stick in the model that don't require you to make major changes in the atmosphere," he adds. "When you start talking about big changes you have to be very careful not to leave out physical properties that might themselves undergo big changes in response to a changing climate, and therefore provide some new feedback."

Earth Science briefs

- Gleeful rumors notwithstanding, birth rates in Washington did not jump nine months after the eruption of Mt. St. Helens in May 1980, reports a researcher for the Washington Center for Health Statistics. When Patricia Staryzk compared birth rates for Feb. 1981 with those for Feb. 1982 she found that they were slightly elevated, but were well within the realm of normal variations. In eastern Washington counties, there were 878 births in Feb. 1981 compared with 828 in 1982. In the entire state, 4,405 babies were born in Feb. 1981, while in Feb. 1982, 4,177 babies made their debut.
- The office of the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES) has moved from Scripps Institution of Oceanography in La Jolla, Calif., to the University of Miami's Rosenstiel School of Marine and Atmospheric Science. JOIDES oversees the planning and operation of the Deep Sea Drilling Project, sponsored by the National Science Foundation.
- Researchers from the State University of New York at Albany are beginning a project designed to penetrate the secrets of inland fog — how much cooling of the ground is necessary, how long fogs persist, the influence on fog formation of turbulent mixing of air layers. Once they obtain an understanding of the physical processes involved in fog formation, the principal researchers, James Juisto and G. Garland Lala of the Atmospheric Sciences Research Center at SUNY in Albany, will try to develop a model that can be used to forecast fog conditions.