XENON BIOSENSOR FOR MOLECULAR IMAGING

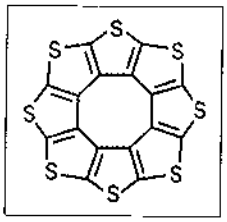
Magnetic resonance imaging (MRI) biosensors with enough sensitivity to analyze specific biomolecules in living tissue and in vitro have been developed by David E. Wemmer, Alexander Pines, and coworkers at the University of California, Berkeley, and Lawrence Berkeley National Laboratory (*Science* 2006, *314*, 446). They use hyperpolarized (nuclear spin-enriched) ^{129}Xe to improve target molecule detection limits by several orders of magnitude over conventional MRI. The technique uses a cryptophane molecular cage that encapsulates xenon atoms and binds via a linker group to specific biological targets. The cages would localize at target sites when administered to patients. They would then inhale hyperpolarized xenon, which would enter the bloodstream and be distributed. Entry of xenon into molecular cages at sites of interest changes the element's resonance signal and would subtract intensity from the background level of hyperpolarized xenon in the body. This quenching could be sensed and used to map and quantify the molecular target. A radiologist commenting in *Science* notes that the technique is far from human use but is "promising."

POLYACYLATION FOR PURIFYING NANOTUBES

Single-walled carbon nanotubes are notoriously difficult to purify, as they tend to aggregate in bundles and are therefore insoluble in common organic solvents. Teodor Silviu Balaban and coworkers at Karlsruhe Institute of Technology, in Germany, have now shown that polyacylation using Friedel-Crafts catalysts in nitrobenzene and other organic solvents can be used to attach acyl groups with long aliphatic chains or perfluorinated acyl residues to the nanotubes and render them soluble (*Adv. Mater.* 2006, *18*, 2763). The polyacylated nanotubes were separated from impurities, such as metal catalyst nanoparticles, by size-exclusion chromatography. The polyacylation was also carried out under mild conditions in an $AlCl_3$/NaCl melt, which was subsequently separated from the polyacylated products by washing with water. Methanolysis or other defunctionalization methods restore the purified nanotubes by removing the acyl chains. The Karlsruhe team also showed that the nanotubes can be cross-linked to form Y-shaped structures by polyacylation with diacyl dichlorides.

'SULFLOWER' CIRCULENE DEBUTS

Sometimes a molecule's name is inspiration enough to instigate its synthesis. But the molecule nicknamed "sulflower"—a mash-up of sulfur and flower—recently synthesized by a team in Russia, has more going for it than a clever moniker (*Angew. Chem. Int. Ed.*, DOI: 10.1002/anie.200602190). The compound (shown), also known as octathio[8]circulene, $(C_2S)_8$, represents a new form of carbon sulfide, according to Valentine G. Nenajdenko and colleagues at Moscow State University. Sulflower is the first fully heterocyclic circulene, and it may possess electronic properties similar to those of other oligothiophenes, which are popular materials in light-emitting devices and thin-film transistors. The researchers started from an eight-membered carbon ring symmetrically fused with four thiophene moieties. They then sulfurized the unsubstituted carbon atoms of the thiophene moieties, and acidification and vacuum pyrolysis knit the acyclic sulfur atoms of this intermediate into the circulene. By varying the heteroatoms, Nenajdenko hopes to make other novel heterocyclic circulenes.



SUGAR MIMIC COULD HELP EPILEPTICS

For many epileptics, a spoonful of sugar brings on seizures, but the sugar mimic 2-deoxy-D-glucose (2DG) may actually help prevent them, according to neurobiologist Avtar Roopra at the University of Wisconsin, Madison, and colleagues (*Nat. Neurosci.*, DOI: 10.1038/nn1791). Biomedical researchers have long known that sugar-free diets thwart seizures in epileptics, but the exact mechanism has been something of a mystery. It turns out that, in epileptics, high levels of the cofactor NADH, a by-product of glycolysis, disrupt normal regulation of a neuron's chromatin, the quaternary structure of DNA. This disruption leads to expression of genes that bring on severe seizures. Roopra and his coworkers found that 2DG blocks glycolysis, thereby preventing epileptic seizures in rats without taking away the sweet taste of their food. The ketogenic (low sugar) diet "requires a lot of control and often fails with children, who are fed up of missing out on sweets and cookies," Roopra says. "But 2DG may work as an effective substitute."

STRAWBERRY FLAVONOID ENHANCES MEMORY

Neurotrophic factors are polypeptides that promote the well-being of nerve cells, but their clinical use for, say, sustaining memory is limited because the compounds have trouble getting past the blood-brain barrier. Pamela Maher of the Salk Institute for Biological Studies in La Jolla, Calif., and colleagues have now identified the flavonoid fisetin (shown) as a small molecule that has several properties of a neurotrophic factor and can be taken orally (*Proc. Natl. Acad. Sci. USA*, DOI: 10.1073/pnas.0607822103). The researchers report that fisetin, which is found in strawberries and other foods, enhances memory in mice by increasing activation of the transcription factor CREB (cAMP response element-binding protein), which is involved in the physical changes in the brain underlying the development of long-term memory. Chowing down on strawberries isn't a feasible memory-enhancing regimen, Maher warns, since a person would have to eat 10 lb of the fruit per day to obtain a beneficial effect.