Biomedicine

New support for echinacea's benefits

In last year's movie *Celebrity*, Woody Allen satirized echinacea's trendy status by showing a panicked supermodel who, feeling the first hints of a cold coming on, demanded a middle-of-the-night search for the herbal remedy. She shouldn't have had to look far. Today, even many supermarkets carry this botanical derived from the purple coneflower (*Echinacea purpurea*). Less easy to find have been scientific studies that back up echinacea's reputed infection-fighting powers.

Now, a nutritionist at the University of Florida in Gainesville has preliminary data to suggest that anecdotal claims for this herbal remedy hold merit.

Susan Percival administered a commercial over-the-counter echinacea supplement to 10 male college students for 4 days. According to the label, each pill contained 150 milligrams of active ingredients, known as echinosides. On the first and last day of treatment, Percival drew blood from the volunteers and separated out the neutrophils, a type of white blood cell. These cells respond to infectious agents by generating superoxide anion, a highly reactive and biologically damaging oxidant.

Percival stimulated the students' cells using a technique that mimics an encounter with germs. Neutrophils collected after the echinacea treatment produced triple the amount of superoxide anion as did those gathered at the start of the test. Percival plans to report her new data next month at the Experimental Biology meeting in Washington, D.C.

"Our studies so far have shown only that we could enhance certain functions of the immune system," she notes. Echinacea might suppress other, as yet unexamined aspects, she adds. At a minimum, she argues, "it's very important that we find out exactly what the active compounds are," how they work, and their optimal doses.

Her current findings argue against taking the supplement on a regular basis, she says, because "a stimulated immune system produces a lot of [oxidizing] free radicals," which can damage healthy tissue. This therapy "is meant to treat something," she stresses, "not to prevent disease." —*J.R.*

Some herbals may threaten fertility

Herbal remedies are hot. Concerned because many of his patients with infertility problems admitted to using these products, Richard R. Ondrizek decided to investigate their potential to affect reproduction. His research team at Loma Linda (Calif.) University School of Medicine now reports that some of the more popular botanical therapies appear capable of inhibiting conception or damaging sperm.

The scientists began by incubating hamster eggs for an hour with preparations of echinacea, saw palmetto (*Serenoa repens*), ginkgo biloba, or St. John's wort (*Hypericum perforatum*). The saw palmetto had no effect, but high concentrations of the others impaired human sperm's ability to penetrate the eggs. In the absence of any herbal remedy, the sperm penetrated 63 to 88 percent of the eggs. That proportion dropped to 13 percent in the eggs incubated with echinacea and to 0 in those exposed to ginkgo or St. John's wort, Ondrizek's group reports in the March Fertility and Sterility.

In a second set of experiments, the researchers bathed sperm for 1 week with dilute solutions of the herbal preparations. Echinacea and St. John's wort damaged the sperm's outer membrane. St. John's wort also produced mutations within the sperm in *BRCA1*, a gene in which mutations have been linked to breast cancer.

Ondrizek cautions that his tests were preliminary but says his findings—especially those documenting mutations—"warrant some attention." Certainly, he explains, "if something is able to change *BRCA1*, you have to assume that it has the ability to change DNA," perhaps even leading to cancer. —*J.R.*

Physics

Icy observatory launches neutrino hunt

Locked in crystal-clear ice more than a kilometer below the South Pole's surface, an array of glass bulbs the size of bowling balls watches for telltale flashes of blue light.

The photomultiplier tubes—422 of them so far—are the eyes of the Antarctic Muon and Neutrino Detector Array (AMANDA), an instrument whose mission is to detect elusive subatomic particles known as neutrinos arriving from space (SN: 10/5/91, p. 219).

"The news is that, after 30 to 40 years of people dreaming about a large neutrino telescope, it finally exists, and it works, and it can be expanded to a kilometer cube," says Francis Halzen of the University of Wisconsin-Madison. He came up with the idea of the ice-bound telescope a dozen years ago.

When neutrinos strike the nuclei of atoms in ice, they can spawn muons and other particles, which emit light as they speed through the frozen mass. Since the 1960s, neutrino detectors consisting of underground tanks of liquid surrounded by photomultiplier tubes have observed tracks of neutrinos from the atmosphere and sun. These tanks can't detect the rare, high-energy neutrinos that the ice may capture.

AMANDA's cylindrical array of tubes already exceeds 120 meters in diameter and 400 meters in depth, dwarfing other neutrino detectors, and tubes are still being added. Because of its large volume, scientists expect AMANDA to detect significant numbers of the high-energy neutrinos that theorists suspect are generated by cosmic sources, such as black holes.


Douglas Lowder/UC Berkeley

A photomultiplier tube begins its descent into the Antarctic ice.

On March 3, the University of Wisconsin reported that—after 7 years in construction, including a year of tuning and testing—the $7 million telescope has begun its hunting. —*P.W.*

Light crawls through cold-atom cloud

A bunch of cold atoms are dragging down light's speedy reputation. While many materials retard the velocity of a beam, a new experiment has slowed a traveling light pulse to an unprecedented crawl. It was sodium atoms fine-tuned by a laser and chilled to less than 50 nanokelvins that put on the brakes.

Usually, a light pulse rockets through space at 300 million meters per second. Passing through the laser-influenced atom cloud, it pokes along at just 17 meters per second. At that pace, it would hardly keep up with a hard-pumping bicyclist.

"This experiment is the stuff that Nobel prizes are made of," comments Marlan O. Scully of Texas A&M University in College Station. "It's a giant step in quantum control."

Lene Vestergaard Hau of the Rowland Institute for Science in Cambridge, Mass., and her colleagues report the slowdown in the Feb. 18 Nature. "It's really opening up a lot of new exciting things you can start doing," she says.

For instance, it raises the prospect of using a few photons to control optical properties of materials, optics experts say. The new technique may also lead to novel telecommunications components, such as optical delay lines and switches.

To achieve the slowdown, Hau's team first induced the sodium atoms to form a superatom, or Bose-Einstein condensate (SN: 11/28/98, p. 342). The condensate is as opaque as lead until interaction with a specially tuned laser makes the cloud transparent by preventing the traveling light pulse from permanently losing energy to the atoms' electrons. The laser-atom system saps the pulse's energy in such a way that the pulse recovers its energy, and its speed, upon exiting the cloud, Hau explains. —*P.W.*