Biomedicine

Joanne Silberner reports from San Diego at the American Cancer Society's science writers' seminar

Broccoli pills?

In the search for a treatment for schistosomiasis, a parasitic disease that affects hundreds of millions of people, Ernest Bueding has come up with an explanation for why certain vegetables seem to have a protective effect against cancer. He and coworkers at Johns Hopkins University in Baltimore have found that a chemical in cruciferous vegetables such as broccoli, cauliflower and cabbage raises the level of certain cancer-fighting agents in the blood.

The vegetables contain chemicals called dithiolthiones, which Bueding and colleagues were testing against the worm that causes schistosomiasis. They found that dithiolthiones lower the worm's level of glutathione, a compound involved in normal metabolism and in detoxifying chemicals. Concerned about the implications for use of dithiolthiones in mammals, the researchers tested the drugs in mice and found that they *increased* glutathione.

But it's too early for broccoli haters to start downing dithiolthiones in pill form, Bueding says. "We have to prove the drugs are harmless before suggesting people take it every day."

Cancer sleight-of-hand

Tumor cells have two ways to thwart chemotherapy: They may require such large amounts of a drug to kill them that it kills healthy cells as well, and they have the disheartening ability to develop drug resistance, turning a remission into a recurrence.

The National Cancer Institute's Robert F. Ozols described NCI-sponsored tests of ways around these problems. One method combines a widely used anticancer agent, adriamycin, with verapamil, a drug that controls heart arrhythmias by blocking ion flow in cells. Evidence suggests that verapamil, in blocking this flow, counters the acquired ability of some cancer cells to push chemotherapy out.

Cisplatin is another widely used anticancer drug, but its dosage must be limited because it also kills kidney cells. However, when the patient is infused with a salty solution as cisplatin is being given, the salt holds the drug in a form less toxic to the kidneys until it infiltrates the cancer cells.

In preliminary trials on men with advanced testicular cancer whose likely cure rate was estimated at 50 percent, the combined therapy resulted in an 85 to 90 percent cure. The drug/salt combination also had a positive effect on women with ovarian cancer. Unfortunately, with the solution of one problem comes the development of another—with the kidney protected, cisplatin's nerve cell toxicity becomes the limiting factor. But, says Ozols, they're working on it.

More hazards from chemicals

Of the 800,000 industrial chemicals introduced since 1940, only 100 have been studied in terms of their effects on living systems. And few of those chemicals have been adequately studied, says Cesare Maltoni, director of the Bologna Institute of Oncology in Italy. Experiments in his laboratory, to be reported soon in the AMERICAN JOURNAL OF INDUSTRIAL MEDICINE, indicate that two organic solvents, xylene and toluene, should be added to the list of known chemical carcinogens.

About 10 million tons of toluene and 5 million tons of xylene are produced each year for use as solvents and in the synthesis of other chemicals, and both are found in gasoline. When Maltoni and his colleagues exposed rats to toluene, the occurrence of malignant tumors jumped from a 24.5 percent baseline rate to 68.8 percent. Xylene exposure resulted in a 56.4 percent incidence of malignant tumors.

An increased incidence of cancer among workers who deal with these substances has not been seen yet, says Maltoni, because the chemicals probably have a long latency period.

Paleontology

A fossil find: Early land amphibians

The brave fish that hauled themselves out of their aquatic homes and onto the new world of land at the end of the Devonian period, some 360 million years ago, radically changed the course of evolution. Unfortunately, the fossil history of their early descendants is fragmented and sparse. The earliest known records of amphibians, the first land vertebrates, date to 360 million years ago, but it is not until the Upper Carboniferous, 50 million years later, that the fossil record becomes plentiful. By then, many important changes in both amphibians and arthropods (invertebrates including insects and crustaceans) had already taken place.

Now paleontologists have a new assemblage of terrestrial animal fossils that will help fill in the gap. Stanley Wood, of Mr. Wood's Fossils in West Lothian, Scotland, and co-workers at The University at Newcastle upon Tyne discovered amphibian, arthropod and plant fossils in the Lower Carboniferous (320 to 360 million years ago) layers of the East Kirkton Limestone in Scotland. The most important find is a 40-centimeter-long, well-preserved, complete amphibian skeleton, the oldest ever discovered. "The specimen is remarkable for the intact preservation of the hands and feet, with ossified carpals and tarsals [wrist and foot bones], and should greatly augment our understanding of the early evolution of the tetrapod [four-footed] limbs," the researchers write in the March 28 NATURE. Also found was the earliest known fossil harvestman, or daddy longlegs.

The researchers write that the absence of fish fossils suggests that amphibians had become an integral part of terrestial life by that time—and also indicates that Wood's group has found the earliest record of completely land-based vertebrates.

Gauge the Galápagos with a younger age

It's been 150 years since Darwin first set foot on the Galápagos Islands and encountered the great variety of animals that helped transform his thinking about the origin of the species. One important question for the evolution biologists who followed has been how fast the species diverged from one another. On the Galápagos the answer rests in part on the age of the volcanic islands: The islands' rise above sea level marks the time available for animals to colonize them and "radiate" into new species.

Potassium-argon dating of the volcanic rocks puts the islands' ages between about 1 million (western islands) and 4 million (eastern islands) years. Past paleontology studies, however, suggested a much older age of 10 to 14 million years—a suggestion that caught on in the biological community, says Carole S. Hickman, a paleontologist at the University of California at Berkeley. Now Hickman and geologist Jere H. Lipps at U.C. Davis have reconciled the paleontologic age with the geologic evidence.

In the March 29 SCIENCE, the researchers conclude that the western islands emerged from the sea less than 2 million years ago and that the eastern islands rose at least 3 million years ago. They base their conclusions on the first complete survey of marine fossils found in six different settings. The researchers arrived at relatively young dates, they say, because they paid more attention to how the settings formed than did previous workers. "We found we were dealing primarily with species that are still alive today," says Hickman.

A 4-million-year divergence time agrees with most biochemical studies, which indicate, for example, that the 13 finch species on the islands could have come from one species in 1 million years. The one exception is the iguana. Biochemical evidence says that the land and aquatic forms of the iguana diverged in 15 to 20 million years. The new findings suggest that these two species had diverged before they arrived at the islands.