Vitamins C and E May Prevent Cataracts

A Canadian epidemiologic study suggests vitamin C and vitamin E supplements help prevent cataracts in humans. The new findings, which seem to corroborate vitamin C-related results from a similar U.S. study, represent the first time researchers have shown a relationship between vitamin E intake and cataract prevention in humans, says study coauthor James McD. Robertson at the University of Western Ontario in London.

If confirmed, the work could lead to a "tremendous" public health benefit, says Allen Taylor of the USDA Human Nutrition Research Center on Aging in Medford, Mass. "If you could delay cataract formation by just 10 years, you would eliminate the need for half of the cataract extractions," he says. Cataracts, which can lead to blindness, afflict 20 percent of people between the ages of 60 and 75 in the United States, prompting half a million surgical procedures each year, Robertson says.

Animal studies have suggested a biological basis for the epidemiologic findings. Last year, Robertson's colleague John R. Trevithick and his team showed that diabetic — and therefore cataract-prone — rats given high dietary levels of vitamin E had less lens-protein leakage than did controls, indicating reduced cataract formation in the treated rats. And experiments with guinea pigs have demonstrated that vitamin C boosts the amount of ascorbic acid in the eye, helping to stop cataract formation (SN: 6/28/86, p.410). Now that epidemiologic observations suggest these results may apply to humans, a clinical intervention trial appears warranted, Robertson says.

Robertson, Trevithick and Allan P. Donner compared the self-reported supplemental vitamin intake, general health, education and other demographic characteristics of 175 cataract patients over the age of 55 living in southwestern Ontario with those of 175 age- and sex-matched cataract-free adults. The scientists found that the only significant difference between the two groups, other than the presence of cataracts, was that the cataract-free individuals had taken at least 400 international units (one regular capsule) of vitamin E and/or a minimum of 300 milligrams of vitamin C per day over the last five years. They assumed the patients and controls ate similar diets because of similar backgrounds.

People who took only vitamin E supplements had about 50 percent less cataract risk than those who took no vitamins. Those taking vitamin C alone showed a 70 percent risk reduction, the researchers say. They hesitate to draw conclusions about the advantage of taking both vitamins, because very few of the study's subjects did so. Their report is scheduled to appear this fall in the ANNALS OF THE NEW YORK ACADEMY OF SCIENCES.

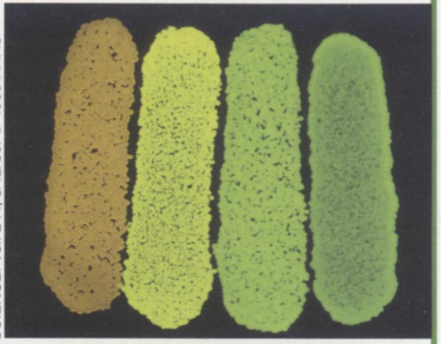
Cataracts form when proteins oxidize in the lens of the eye, aggregating into opaque clumps. The lens harbors enzymes that counter the process, but these also oxidize as the eye ages. Vitamins E and C are antioxidants, and so prevent lens proteins from clumping.

Recent research in Japan has demonstrated that the shorter-lived, water-soluble vitamin C works to rejuvenate the eye's supply of the fat-soluble vitamin E, which is oxidized — and so becomes inactive — when it neutralizes the free radicals that might otherwise cause cataracts, Trevithick says. Sunlight, X-rays, diabetes and steroids all may contribute to the risk of cataracts, Robertson told SCIENCE NEWS. — *I. Wickelgren*

Beetlejuice genes now in biotechnicolor

"Beetlejuice" may be *passé* by Hollywood standards; the popular comedy film has been gone from theaters for months. But Beetlejuice II is coming soon — not to local theaters this time, but to a biotechnology lab near you.

Researchers working with Caribbean click beetles have isolated the genes coding for bioluminescence from the juices of these glow-in-the-dark bugs. Having inserted this DNA into bacteria, they have developed a multicolored system of "reporter genes" they say will allow scientists to measure simultaneously the activity of several otherwise invisible, spliced genes in cell cultures. Until now, reporter gene systems — which indicate when a gene is turned on — have necessitated much more complicated procedures and could only track one spliced gene at a time.



Four streaks of luciferase-producing bacteria. Each color streak contains hundreds of bacterial colonies.

Keith V. Wood and William D. McElroy of the University of California, San Diego, and their colleagues started with the Jamaican click beetle, *Pyrophorus plagiophthalamus,* a distant relative of the firefly. Like fireflies (which are beetles, not flies), click beetles contain light-generating organs in their abdomens. But unlike fireflies, click beetles glow in a variety of colors.

All bioluminescent beetles, including fireflies, produce colored light by enzymatically cleaving molecules of an identical protein substrate, called luciferin. Different enzymes, known collectively as luciferases, cut luciferin in different places, producing various colors of light. Wood and his co-workers cloned the genes for four click-beetle luciferases and inserted them into the common intestinal bacteria *Escherichia coli.* When they bathed the bacteria in luciferin, characteristic colors appeared within about 30 seconds, indicating gene activity.

By linking various luciferase genes to other genes of interest spliced into cells, scientists can now measure the relative activity rates of multiple genes in cells over time. The one-step process (scientists simply add luciferin and measure light intensity for each color) is far easier and more than 100 times more sensitive than current methods, the researchers report in the May 12 SCIENCE. In the standard reporter gene system commonly used today, scientists spend hours separating and measuring enzymatically altered, radioactively labeled substrates.

"A real revolution has come from our ability to look at how genes work," says Wood, who first basked in the glow of scientific luminosity in 1986 when he and co-workers made the world's first glow-in-the-dark tobacco plants by splicing into the plants a luciferase gene from a firefly. "We've gotten to the point now where we'd like to look at how more than one gene works at a time. This supplies a marvelous technology for allowing us to go that next step and look at the coordination between genes."

The researchers have identified minor variations in luciferase genetic sequences that account for the different colors — a finding that suggests they may soon be able to add to their *Pyrophorus* palette. Soon, says Wood, "we may be able to do things with color that we haven't yet seen in natural systems." — *R. Weiss*