Carotenoids: Colorful cancer protection

Carotenoids are a class of more than 500 yellow-to-red-hued pigments, chemically related to vitamin A. Though found predominantly in green and yellow vegetables, they also color tomatoes, carrots, egg yolks, algae and even shark oil. In recent years, a few carotenoids – most notably beta-carotene and canthaxanthin – have gained renown for their apparent role in limiting the development of certain cancers. Now, Japanese scientists working with cultured human cancer cells report data suggesting that at least some of these nontoxic pigments fight cancers by effectively putting malignant cells to sleep and suppressing the expression of a gene that might otherwise foster tumor growth.

Cancer involves rapid and unregulated proliferation of cells. Researchers at the Kyoto Prefectural University of Medicine observed a dramatic suppression in the proliferation of human neuroblastoma cells after adding alpha- or beta-carotene. Alpha-carotene shut down cell growth at concentrations as low as 2 to 5 micromoles (μM) and proved toxic at 10 μM. Beta-carotene showed similar effects at concentrations 10 times greater.

To find out what was happening, the researchers homed in on the activity of the gene *N-myc*, which codes for cell-growth-enhancing proteins when switched on. This so-called proto-oncogene is present, though inactive, in healthy mature cells, but it can contribute to cancer growth if damaged or if turned on by faulty regulatory cues. Three hours after treating some of the cancer cells with a 5-μM concentration of alpha-carotene, the researchers found *N-myc* activity 24 percent lower than in the untreated cells. Within 18 hours, activity dropped to 18 percent of that observed in untreated cancer cells.

Further examination showed cell-growth inhibition also peaked at 18 hours. In the Nov. 1 JOURNAL OF THE NATIONAL CANCER INSTITUTE, Michiaki Murakoshi and his co-workers report that the alpha-carotene apparently inhibits cancer growth by locking malignant cells into the rest phase of their growth cycle. And they remain in this sort of suspended animation until the effects of the carotenoid begin wearing off.

While these findings do not directly reveal how the pigments inhibit cancer-cell proliferation, "they do offer the first indication – at least in a human cancer-cell line – that carotenoids can cause such inhibition," says Joel Schwartz, a tumor immunologist at Harvard University's School of Dental Medicine in Boston. The new data also "are consistent with what we have observed but not reported," Schwartz told SCIENCE NEWS. He says he and his colleagues, working with another cancer-cell line, have found that beta-carotene not only suppressed the expression of a proto-oncogene but also arrested cancer proliferation by preventing malignant cells from cycling through their normal stages of growth and division. *– J. Raloff*

The deadly cost of 65 mph

New Mexico was the first of 38 states to resume the 65 mph speed limit on rural interstate highways. The 10 mph increase effectively doubled fatalities on affected roads, a new study shows. Nationally, the higher speed limit has increased traffic deaths on rural interstates by about 30 percent, a second study reveals. The Insurance Institute for Highway Safety (IIHS) in Arlington, Va., which released the second study's findings in September, now attributes some 550 deaths in 1988 to the higher speeds.

The New Mexico study found that in the five years preceding the April 1987 resumption of a 65 mph speed limit, the state saw a steady decrease in death rates on its rural interstates. "We extrapolated that [decrease] on into 1987, and then compared it to the actual death rate," explains C. Mack Sewell, an epidemiologist with New Mexico's Health and Environment Department in Santa Fe. Though Sewell and his colleagues predicted a rate of 1.5 fatal crashes per 100 million vehicle miles traveled, they found it was actually 2.9. On roads with slower posted speeds, no similar increase in fatalities occurred.

The rural-interstate fatality increase came from single-vehicle crashes, Sewell and his co-workers report in the Oct. 27 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION. Since there was no significant change after April 1987 in the use of seat belts, the proportion of accidents involving alcohol or the number of passengers per fatal crash, "the only thing that can account for the [increase] appears to be the higher speed limit," Sewell says.

Per mile traveled, rural interstates tend to be the safest roads in the nation, notes Adrian K. Lund at IIHS. One "rather striking finding" in Sewell's study, Lund says, is the observation that New Mexico's rural interstates became as deadly as its other roads after the return to a 65 mph speed limit. Sewell says he believes that driving above posted speeds probably played a factor. During the year after the speed-limit increase, state monitoring devices recorded a doubling – to roughly 30 percent – in the number of vehicles traveling faster than 65 mph on these interstates. *– J. Raloff*

Pregnancy raises risk of Type II diabetes

Each successive pregnancy may slightly elevate a woman's risk of developing Type II diabetes later in life, according to a new epidemiologic study. If confirmed, the findings may eventually help unravel the mechanism underlying the development of Type II, or non-insulin-dependent, diabetes – a condition less severe than insulin-dependent diabetes, usually affecting people after age 40.

Scientists know that obesity and a family history of diabetes increase a person's risk of getting Type II diabetes. Age also boosts the risk, because the pancreatic beta cells that produce insulin – the hormone that helps the body use sugar – work less efficiently as people get older. Past studies have hinted that pregnancy increases a woman's chance of later developing non-insulin-dependent diabetes, but many scientists pointed to weight gain during pregnancy to explain that association. Now, a report in the Nov. 2 NEW ENGLAND JOURNAL OF MEDICINE identifies pregnancy as an independent risk factor for Type II diabetes – a risk not explained by obesity.

Donna Kritz-Silverstein, Elizabeth Barrett-Connor and Deborah L. Wingard of the University of California, San Diego, studied 1,186 white, upper-middle-class women age 41 to 92. The scientists took reproductive and medical histories and calculated each volunteer's body mass index, a measure of obesity. When they gave subjects the glucose tolerance test, a standard measure of how well the body processes sugar, they found 326 women had impaired glucose tolerance – flawed glucose metabolism that leads to Type II diabetes in some cases. And 146 other women had Type II diabetes.

After controlling for age, obesity and family history of diabetes, the researchers found each pregnancy boosted a woman's risk of developing Type II diabetes after age 40 by 16 percent. Each pregnancy increased a woman's chance of developing impaired glucose tolerance by 10 percent, they found.

That risk may be important for women with multiple risk factors, comments Maureen I. Harris, an epidemiologist at the National Institute of Diabetes and Digestive and Kidney Diseases in Bethesda, Md. A family history of diabetes remains the most important risk factor, she says. In the California study, women with a family history of diabetes ran twice the risk of getting Type II diabetes compared with women who had no such history, Kritz-Silverstein says.

While women can't do anything about their inherited susceptibility to Type II diabetes, they can lower their risk by losing weight if they are obese, Harris says. And if further research confirms the link between pregnancy and diabetes,