Food & Nutrition

Of carotenoids and diabetes

People with diabetes can produce large quantities of free radicals in their blood. Because these molecular fragments impair insulin action, researchers have wondered whether chemicals that mop up free radicals head off diabetes. Dietary antioxidants might do just that, a new study hints.

Epidemiologist Earl S. Ford and his colleagues at the Centers for Disease Control and Prevention in Atlanta analyzed data on 1,665 adults, ages 40 to 74. These volunteers, participants in the Third National Health and Nutrition Examination Survey, had all submitted to blood-glucose tests to determine whether they had diabetes. The researchers then compared each individual's diabetic status with his or her blood concentrations of beta-carotene and related plant-based pigments that possess antioxidant properties.

Healthy people had the highest blood concentrations of beta-carotene. Volunteers diagnosed with "impaired glucose tolerance," which can lead to diabetes, had concentrations about 87 percent as high. Among people first diagnosed with diabetes by the study, beta-carotene concentrations were only at 80 percent that of the healthy group. Several other carotenoids in the blood exhibited a similar trend, Ford's team reports in the Jan. 15 AMERICAN JOURNAL OF EPIDEMIOLOGY.

What these data can't answer is which came first: diabetes or low levels of carotenoids. If it's the latter, Ford argues, eating more carrots, kale, and other carotenoid-rich fare might help prevent this disease. —*J.R.*

Do carrots ward off heart attacks?

A healthy diet of beta-carotene might reduce senior citizens' risk of heart attacks, a Dutch study finds.

Kerstin Klipstein-Grobusch of Erasmus University in Rotterdam and her colleagues analyzed diets, smoking habits, and other heart-disease risks among 4,800 men and women. Of this group, 124 experienced a first heart attack within 4 years of entering the large, ongoing Rotterdam Study of the elderly.

Relatively few of the heart-attack victims had a diet rich in beta-carotene. However, the researchers find, people who ate at least 1.6 milligrams of beta-carotene per day had only 55 percent the heart-attack risk of those whose average daily diet contained no more than 1.1 mg of the antioxidant. Overall, smokers and former smokers appeared to gain a slightly larger benefit than nonsmokers from eating plenty of beta-carotene-rich foods.

A report of the work appears in the February AMERICAN JOURNAL OF CLINICAL NUTRITION. —*J.R.*

Ferreting out beta-carotene's toxicity

While it's hard to get toxic quantities of beta-carotene from eating fruits and vegetables, one study found that high-dose supplements might be harmful. They appear to increase a smoker's risk of lung cancer (SN: 1/27/96, p. 55). A 6-month study in ferrets, which process this carotenoid much as humans do, now indicates that excess beta-carotene oxidizes. The resulting metabolites unleash a toxic double whammy.

Xiang-Dong Wang of the Agriculture Department's Human Nutrition Research Center on Aging in Boston and his coworkers supplemented the animals' diet with beta-carotene in an amount comparable to that used in the earlier human cancer study. Some animals were also exposed to cigarette smoke.

In the lung, beta-carotene's metabolites destroyed retinoic acid, a vitamin-derived compound that suppresses cancer growth. The metabolites also activated a protein that spurs cell division, Wang's group reports in the Jan. 6 JOURNAL OF THE NATIONAL CANCER INSTITUTE. While the untreated ferrets had healthy lungs, those exposed to the supplements underwent precancerous changes. The lung damage was most prevalent in the animals who were also exposed to the smoke. —*J.R.*

Paleontology

Dinosaur shifts metabolic gears

The beautifully preserved but flattened innards of a fossil dinosaur suggest that the extinct beast may have breathed much like modern mammals. Paired with other, more characteristically reptilian traits, this finding suggests that dinosaurs' metabolism functioned unlike that of any living animal.

In the Jan. 22 SCIENCE, physiologist John A. Ruben of Oregon State University in Corvallis and his colleagues describe a fossil of *Scipionyx samniticus*, a small meat-eating theropod, found in Italy. They mapped the traces of internal organs and muscles by using ultraviolet light, which makes residual liver pigments fluoresce.

The pattern supports Ruben's earlier analysis of a *Sinosauropteryx* fossil (SN: 11/15/97, p. 310). In both, he says, the liver connected to a diaphragm that separated the lungs from the viscera. A muscle pulled the diaphragm back and sucked air into the lungs. Modern crocodiles have a similar structure, perhaps a remnant from more active ancestors, he says.

Most modern reptiles, cold-blooded creatures that maintain a low resting metabolic rate, breathe by expanding their rib cages. Mammals and birds use both rib-based and diaphragm-driven respiration. The diaphragm system provides extra oxygen for sustained, intense activity.

Ruben starts with the assumption that theropods were cold-blooded. While resting, their respiration and metabolism would have been as slow as a modern reptile's. When necessary, however, these dinosaurs and ancestral crocodiles could shift gears from rib-based respiration to diaphragm-driven overdrive. "They had the best of both worlds, metabolically," says Ruben.

The dual-metabolism theory, says paleontologist James O. Farlow of Indiana University-Purdue University at Fort Wayne, "accounts for some otherwise odd features about dinosaurs." They were cold-blooded, he says, yet fossil evidence suggests that theropods were as active as warm-blooded animals.

The squashed, two-dimensional remains could be interpreted differently, warns paleontologist Philip J. Currie of the Royal Tyrrell Museum of Palaeontology in Drumheller, Alberta. "I think this is pushing the bounds of what can be said on the basis of the evidence." The supposed liver in the *Scipionyx* fossil could be a smudge from the animal's stomach contents. Of the dual metabolism hypothesis, he says, "It's a nice thought experiment." —*L.H.*

Scipionyx samniticus may have breathed with a diaphragm, like birds and mammals today. This juvenile's fossil is 24 centimeters long.

Dinosaur family hails from Texas

The oldest duck-billed dinosaur fossil has been found where it was least expected: North America. Hadrosaurs, previous paleontological findings suggested, originated in Asia and migrated to North America about 90 million years ago.

The 99.5-million-year-old fossil of *Protohadros byrdi*, an ancestor of other hadrosaurs, is described in the December 1998 JOURNAL OF VERTEBRATE PALEONTOLOGY. According to the author, paleontologist Jason J. Head of Southern Methodist University in Dallas, the duck-billed dinosaurs may have originated in Asia or North America, or their ancestors may have flourished before those land masses split. —*L.H.*