Understanding Beta-Carotene Better

Carotenoids are fat-soluble pigments responsible for many of the colorful hues of plant leaves, fruits, and flowers. They also act as biological antioxidants, protecting cells and tissues from damage caused by naturally occurring oxygen free radicals in the body. And they've been linked to enhancing immune system function, protecting from sunburn, and inhibiting development of certain cancers.

Beta-carotene and lutein are two important carotenoids. Not only does beta-carotene give carrots their orange color, it may also be an important means of lessening the vitamin A deficiency prevalent in much of the world. Lutein, a major yellow pigment in corn and leafy green vegetables, is believed to protect the human retina's macular region, reducing risk of the macular degeneration responsible for the most common age-related blindness.

Using isotopes to tag carotenoids in kale, a food especially rich in nutrients, researchers have increased their understanding of how the human body absorbs and uses carotenoids from a whole food and how efficiently the body uses beta-carotene to form vitamin A. The work was reported in the *Journal of Lipid Research*. *Beverly A. Clevidence, USDA-ARS Diet and Human Performance Laboratory, Beltsville, Maryland; phone (301) 504-8367, e-mail clevideb@ba.ars.usda.gov.*

How the Beetle Gets Its Shell

Scientists now know which three genes orchestrate formation of the flexible, durable, lightweight outer shell that protects the red flour beetle, *Tribolium castaneum,* and most other insects. Working with researchers at Kansas State University, they found that one gene cues production of a beetle's outer cuticle, or exoskeleton. Another gene tells the fresh exoskeleton to harden up, while a third prompts an enzyme to build an inner cuticle that lines the insect's gut.

The red flour beetle is best known as a stored-product pest that's particularly fond of cereals and nuts. Understanding the processes involved in production of chitinous material—and the genes that guide them—may lead to development of alternative nonchemical pest-control measures. For if the beetle were to become unable to harden up its outer shell, it would be more vulnerable to control measures. *Richard W. Beeman, USDA-ARS Grain Marketing and Production Research Center, Manhattan, Kansas; phone (785) 776-2710, e-mail richard.beeman@gmprc.ksu.edu.*

PEGGY GREB (D268-1)

Red flour beetle, about one-eighth-inch long.

Making U.S. Rice Even Nicer

Researchers bent on improving one of the world's top staple crops are painstakingly reviewing the nation's Rice Core Collection. Comprising 1,791 entries, the core collection represents about 70 percent of the genetic variation among the National Small Grains Collection's 18,408 rice accessions.

Why are they doing all this work?

They're searching for rice germplasm with a natural resistance to an important plant disease. It's called "straighthead" because it makes the entire rice head remain upright at maturity, and that causes infected heads to have sterile florets and lower yields. Losses can reach nearly 100 percent if highly susceptible varieties are planted during the wrong conditions. Commercial U.S. rice cultivars currently have no straighthead resistance, but 26 resistant indica and japonica rice lines with no yield losses due to this disease have been identified. Breeders are already incorporating some of them into their rice-breeding programs.

Scientists are also working on adjusting the amylose content of indica rice, the principal type grown worldwide. Intermediate-amylose rice, typical of U.S. long-grain rice, is dry and fluffy, whereas low-amylose rice, typical of U.S. medium-grain rice, is moist and sticky. The goal is to use hybridization and induced mutation breeding to produce high-yielding indica lines with good-quality grain and ideal amylose content for the U.S. rice industry. *Wengui Yan and J. Neil Rutger, USDA-ARS Dale Bumpers National Rice Research Center, Stuttgart, Arkansas; phone (870) 672-9300, e-mail wyan@spa.ars.usda.gov, jnrutger@spa.ars.usda.gov.*

A Quick PEC Check for Turkeys

Poult enteritis complex, or PEC, is hardly a household word. But this complex of viruses causes diarrhea, poor weight gain, and—in some cases—death of young turkeys. So it's very good news that a new test for PEC has been developed that's in a format that allows for detection of several types of viruses at one time. It relies on a molecular technique called real-time reverse transcription-polymerase chain reaction. Unlike current diagnostic methods for PEC-associated viruses, it's both a highly sensitive and specific method for detecting viral RNA.

Formerly, intestinal samples have always been needed to make a definitive PEC diagnosis, but cloacal samples—easier to collect and process—have been found just as suitable for testing. Not only will this save time and money, it will also eliminate the need to euthanize birds for sampling. The technology has been provided to several laboratories for diagnostic use, and efforts are now under way to adapt the technique to diagnose related diseases in chickens. *Erica Spackman and Darrell R. Kapczynski, USDA-ARS Southeast Poultry Research Laboratory, Athens, Georgia; phone (706) 546-3617 [Spackman] and (706) 546-3471 [Kapczynski], e-mail espackman@seprl.usda.gov, dkapczynski@seprl.usda.gov.*