Health-Promoting Foods: From ARS to You!

People say that "an apple a day keeps the doctor away"—but that's only part of the story.

The *Dietary Guidelines for Americans,* published jointly by the U.S. Departments of Agriculture and of Health and Human Services, recommend consuming a variety of fruits, as well as vegetables, whole-grains, low-fat or fat-free milk products, and lean meat and beans. Here are a few of the many ARS efforts under way to improve the nutritional value of these foods.

Valuable vegetables Today's carrots are more nutritious than the carrots we ate 30 years ago. That's because ARS scientists discovered a way to breed carrots with high amounts of beta-carotene, an orange pigment that helps humans make vitamin A. In fact, modern carrots have 75 percent more beta-carotene than their predecessors.

STEPHEN AUSMUS (K11611-1)

Colorful ARS-bred carrots, packed with healthful pigments to punch up their nutrition level.

The Vegetable Crops Research Unit at Madison, Wisconsin, which helped raise beta-carotene levels in carrots, is now working to produce the same results in cucumbers and melons. They're also breeding red carrots, which contain more lycopene; yellow carrots, containing more lutein; and purple carrots, full of anthocyanins. The same researchers are also using classical breeding methods to raise levels of thiosulfinate compounds—in onions and garlic—that are thought to have heart-healthy benefits.

Tip of the iceberg Plant breeders in the ARS Crop Improvement and Protection Research Unit at Salinas, California, want to boost the vitamin and mineral content of iceberg lettuce. In one experiment, the researchers periodically pried open the leaves of iceberg lettuces as they grew, so that the familiar, tightly closed heads couldn't form. With more leaf surface exposed to sunlight, the lettuces made twice as much iron and calcium, five times as much vitamin C, and eight times as much beta-carotene as a typical iceberg lettuce. Now the researchers are determining how to ramp up those health-imparting nutrients without changing the features that have made this lettuce America's favorite.

You say tomato... Many yellow, orange, and red vegetables get their color from carotenoids—colorful pigments that may help counter eye diseases, such as macular degeneration, and cancer. Scientists at the Genetic Improvement of Fruits and Vegetables Laboratory (GIFVL) of the Henry A. Wallace Beltsville (Maryland) Agricultural Research Center developed tomato breeding lines to produce cherry tomatoes with enhanced beta-carotene content. Colleagues at the Western Regional Research Center at Albany, California, are seeking genes that cue tomatoes to produce another carotenoid: lycopene. The California research may lead to fresh-market and processing tomatoes with more lycopene than ever.

Hot potato For years, Yukon Gold had the highest carotenoid content of any yellow-fleshed potato. Now, a new variety developed at GIFVL offers even more. With purple skin and pale-yellow flesh, the variety Peter Wilcox has a carotenoid content about 15 percent higher than that of Yukon Gold.

Researchers in the Vegetable and Forage Crops Production Research Unit at Prosser, Washington, have developed flavorful orange-fleshed potatoes with up to 52 times the antioxidants zeaxanthin and lutein as are found in white potatoes. They've also developed red- and purple-fleshed varieties with more than four times the antioxidants of existing commercial dark-fleshed potatoes. In addition, they've identified potatoes with elevated levels of folate, an important B vitamin, and are breeding folate-rich potatoes.

PEGGY GREB (K9640-1)

Colored potatoes with antioxidants galore.

Berry good Cranberries' bright-red pigments are made of anthocyanins, which may have important health benefits. Researchers at a GIFVL worksite in Chatsworth, New Jersey, worked with scientists at Rutgers University to breed cranberries with antioxidants that are more easily absorbed, making it easier to take advantage of the berry's health-promoting properties.

KEITH WELLER (K4418-5)

Cranberries being harvested in New Jersey. ARS developed a new cranberry with more-absorbable anthocyanins.

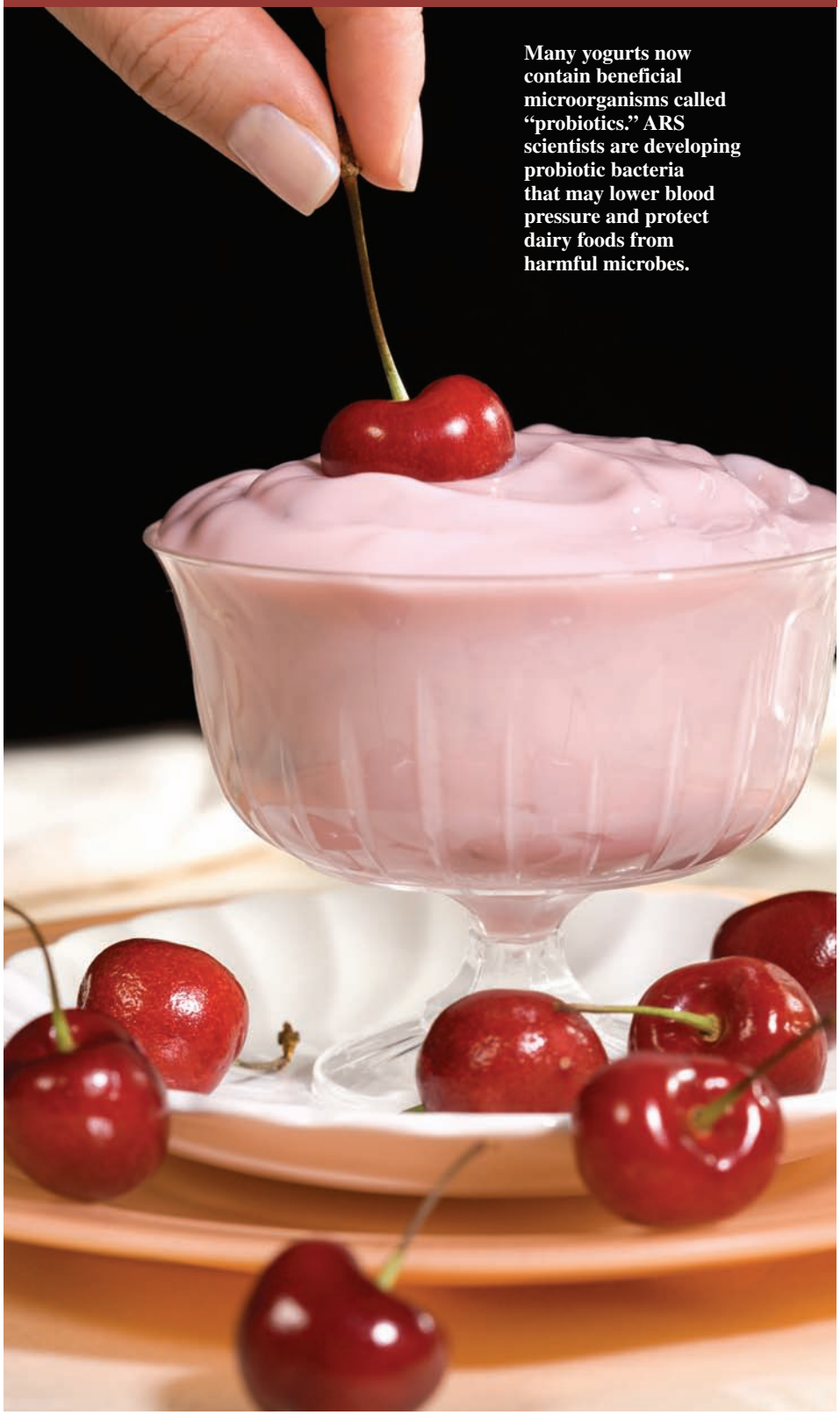
Mighty melons Spraying potassium on honeydew melons and cantaloupes as they grow boosts levels of that mineral in both melons by about 20 percent and increases their vitamin C and beta-carotene levels by 18 percent, when compared to unsprayed fruit. According to scientists with the ARS Kika de la Garza Subtropical Agricultural Research Center, at Weslaco, Texas, and their co-investigators, the spray also led to a 20-percent increase in sugars, making these already luscious melons even sweeter.

Goodness of grains Researchers in the Small Grains and Potato Germplasm Research Unit at Aberdeen, Idaho, are helping our bodies get more of the minerals packed into oats, rice, barley, and corn. Their patented work has led to new varieties that have lower amounts of phytic acid, thereby enhancing our absorption of minerals like calcium, zinc, iron, and magnesium, and stepping up the grains' nutritional value.

ARS-funded tests at the Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University,

PEGGY GREB (D1072-1)

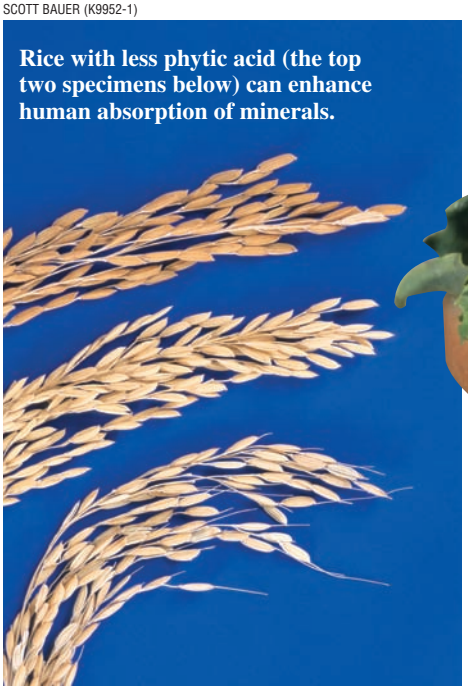
Did You Know?



Many yogurts now contain beneficial microorganisms called "probiotics." ARS scientists are developing probiotic bacteria that may lower blood pressure and protect dairy foods from harmful microbes.

in Boston, Massachusetts, showed that avenanthramide, a compound found in oats, helped prevent unwanted buildup of blood cells in laboratory cultures of artery-wall cells. Preventing blood cells from sticking helps reduce the risk of heart attack and stroke.

SCOTT BAUER (K9952-1)



Rice with less phytic acid (the top two specimens below) can enhance human absorption of minerals.

Back to basics ARS research benefits people not only in the United States but also around the world. At Ithaca, New York, ARS scientists in the U.S. Plant, Soil, and Nutrition Research Laboratory are working with the Gates Foundation and the U.S. Agency for International Development to improve the iron content and bioavailability of maize—a staple crop for many African nations.

Better burgers, choicer chops Selenium is an essential nutrient for humans and livestock. Researchers at the U.S. Sheep Experiment Station near Dubois, Idaho, are investigating how different selenium-rich feeds can enhance the selenium content of lamb meat. Scientists in the San Joaquin Valley Agricultural Sciences Center at Parlier, California, are using canola to take up selenium from soil that's overloaded with the mineral and then feeding the forage crop to cattle and sheep, which might result in selenium-enriched burgers and lamb chops.

STEPHEN AUSMUS (K9987-11)

Go fish Freshwater fish, such as catfish, have lower levels of nutritious omega-3 highly unsaturated fatty acids than marine fish. Researchers in the ARS Aquatic Animal Health Research Unit at Auburn, Alabama, increased these levels in catfish by feeding them diets supplemented with marine fish oil and determined the optimal feeding conditions—such as feeding duration and dietary fish oil level—for increasing fatty acid levels.

STEPHEN AUSMUS (K10428-1)

Research is leading to meatier rainbow trout.

Over-the-rainbow trout ARS experts in Idaho have developed an easy-to-use test that breeders of rainbow trout should be able to use to identify those fish that excel in converting feed into tender, delicately flavored meat instead of unwanted fat. Their RT-PCR assay, short for "real-time polymerase chain reaction," correlates the presence of a telltale protein, myosin, to a trout's ability to put on meat. The test can help single out those trout that are best suited to serve as parents of new generations of farm-raised fish.

Going "pro" Many yogurt varieties contain beneficial microorganisms called "probiotics." Researchers in the ARS Dairy Processing and Products Research Unit at Wyndmoor, Pennsylvania, are developing probiotic bacteria that produce bioactive compounds that may lower blood pressure and protect dairy foods from harmful microbes.

Melt in your mouth By modifying manufacturing procedures, researchers in the same unit created a flavorful mozzarella that melts and tastes like regular mozzarella, but has only half the fat. More than 46 million pounds of this mozzarella have been used in the National School Lunch Program since the cheese was introduced in February 1995.—By **Laura McGinnis** and **Marcia Wood,** ARS.

This research is part of Human Nutrition (#107), Plant Biological and Molecular Processes (#302), Quality and Utilization of Agricultural Products (#306), Plant Genetic Resources, Genomics and Genetic Improvement (#301), and Food Animal Production (#101), five ARS national programs described on the World Wide Web at www.nps.ars.usda.gov.

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