

ance and flavor of foods.

"Another byproduct of this Maillard reaction is the creation of antioxidant compounds," notes Dawson. Because extra sugar can foster the reaction, his group mixed a large amount of honey into the batter that binds small pieces of turkey into a restructured turkey roll. The honey made up 15 percent by weight of the ingredients but did not impart a sweet flavor to the finished product.

When they assayed the rate of oxidation in slices of the cooked meat after 2 days of refrigeration, the honeyed turkey exhibited only 15 percent as much fat oxidation as the untreated meat.

These data indicate that adding honey "probably would extend the shelf life of such deli-type products by several weeks to a month," Dawson says. Moreover, the honey treatment also appeared to reduce bacterial growth in the product. "We're not sure why," Dawson says, though it may reflect the sweetener's ability to tie up water—as sugars do in jam—rendering it unavailable to microbes.

Though the Clemson studies have focused on techniques likely to aid commercial food processors, Dawson notes that some of the findings might offer ideas to home cooks interested in extending the life of their leftovers. For

instance, applying a honey glaze to a roast may retard the oxidation of the uncut meat. Similarly, adding honey to recipes for sausage, meat loaves, and other entrees that include ground meat should retard the rate at which rancid off-flavors develop, he says.

Antioxidant-rich honeys may also find a role in skin-care products, according to David Ropa of Thomas J. Payne Market Development. The Chicago-based consultant prepared a study last year for the National Honey Board in Longmont, Colo.

Honey "can be used to produce alpha hydroxy acids (AHAs), a vital ingredient in the growing market for skin creams and moisturizers," he says. Indeed, manufacturers are currently developing commercial methods to make honey-derived AHAs. The AHAs work, Ropa explains, "by exfoliating the skin and increasing the rate of cell renewal."

Several manufacturers already tap honey in the prepa-

ration of moisturizers. Honey "retains moisture and resembles the skin's natural moisturizing factor," notes David Chin, manager of technical marketing in the Somerville, N.J., office of Laboratoires Serobiologiques. Indeed, he says, that's why the French company has used a honey extract in one of its moisturizers for more than 20 years.

Because antioxidants can protect key components of the skin's cells from damage, many firms now add antioxidants to their products, especially sunscreens, Ropa reports. "If honey can act as both an antioxidant and a moisturizer in sunscreens and other skin-care products," he told *SCIENCE NEWS*, "the potential for this natural ingredient is enormous."

Though Laboratoires Serobiologiques employs antioxidants in many of its products, it has never considered honey as a possible source, Chin says. If, however, manufacturers can look to this natural product for both moisturizing and antioxidant functions, he told *SCIENCE NEWS*, "demand for honey could go flying out of sight—just like a bee." □



Biomedicine

Drug smokers have precancerous signs

Regular smoking of marijuana or crack cocaine produces changes in the lungs that appear to be precursors of cancer, scientists at the University of California, Los Angeles find.

To assess these effects, the researchers took lung biopsies of 104 healthy adults—81 men and 23 women. The group included 28 nonsmokers, 12 who smoked marijuana only, 13 who smoked crack cocaine only, 14 tobacco-only smokers, and 37 who smoked combinations of two or three of these substances.

The scientists then examined the biopsied lung tissues for several proteins that can indicate a heightened cancer risk. These included the p53 protein—a known cancer fighter normally produced in response to the disease—and two others, Ki-67 and epidermal growth factor receptor (EGFR), that play a role in cell proliferation. They also looked for tissue-growth abnormalities at the cellular level, including overproduction of cells in the lung lining and DNA variations.

Few nonsmokers displayed any of the high-risk signs. However, 8 of the 10 cellular abnormalities studied showed up in at least half of the marijuana-only smokers, who had smoked an average of 10 or more joints a week for 5 years. Those who used both marijuana and tobacco registered even more abnormalities. Also, 11 of the 12 marijuana-only smokers had Ki-67 protein in their lungs, and 7 had EGFR, the researchers report in the Aug. 19 *JOURNAL OF THE NATIONAL CANCER INSTITUTE*.

The crack cocaine smokers, who had used the substance for at least 9 months, showed similarly high levels of Ki-67 and EGFR but had widely varying evidence of cellular abnormalities. The p53 protein, usually seen only in cancer patients, showed up only in some smokers who combined substances.

Although the abnormalities measured don't necessarily lead to cancer, lung cancer patients virtually always have them, says study coauthor Donald P. Tashkin, a pulmonologist at UCLA.

Of the cellular abnormalities, he notes, "the most serious in-

volve nuclear variations that increase the cells' replication rate." All 7 people who smoked both marijuana and tobacco had these variations, as did 6 of the 12 marijuana-only smokers. —N.S.

Two embryos are better than three

Although in vitro fertilization (IVF) helps thousands of infertile couples to have children, it also yields multiple births roughly a fourth of the time. In the procedure, doctors typically take eggs from a woman's ovaries, fertilize them with sperm in a laboratory, then place them in the woman's uterus. IVF results in pregnancy in about one in five tries.

Multiple births, which occur in less than 2 percent of unassisted pregnancies, arise more often from IVF because doctors transfer several fertilized eggs, or embryos, to improve the odds. The United Kingdom restricts the number of embryos transferred to three at a time; the United States imposes no limits.

Seeking a way to limit multiple births, scientists in Scotland reviewed data from 25,240 women who had undergone IVF. The researchers report in the Aug. 27 *NEW ENGLAND JOURNAL OF MEDICINE* that when more than four eggs were fertilized but only the two most robust-looking embryos were chosen, pregnancy resulted at the same rate as when women received three or more embryos. Moreover, women receiving two embryos instead of three had many fewer multiple births.

Fertilizing a greater number of embryos enables the doctors to have more selectivity, says coauthor Allan Templeton, an obstetric gynecologist at Aberdeen University. The best embryos, he says, "look nice and round and are dividing at a good rate."

"Clearly, there is pressure from patients to maximize the chances" of a successful pregnancy by using more embryos, Templeton says. "In the U.K., there's an increasing perception that in most circumstances putting back [into the woman] lots of embryos doesn't achieve very much." —N.S.