Dark meat is all washed up

In recent years, fast-food franchises and frozen-food packagers have created a large and growing demand for chicken. But not the whole bird. For their nuggets, breast-patty sandwiches and other such products, they want white meat. Now James Acton and Bonnie Bowie of Clemson (S.C.) University have stumbled onto what could prove to be the ultimate solution: Bleach leftover thighs into more white meat.

It's an adaptation of the Japanese technique used in creating surimi — shellfish-flavored white fish.

What basically differentiates dark meat from white is its greater quantity of myoglobin, a water-soluble protein found in muscle fiber. Though washing will remove some myoglobin, the Clemson researchers found it still left the meat looking dark. So they whitened their wash with an oxidizing agent. Hydrogen peroxide and ascorbic acid each worked well.

Their technique requires cutting chicken thighs into small, thin, perforated strips. Strips emerge from an hour-long wash (having three 15-minute agitation cycles) with the texture and appearance of chicken breast meat. Smoked and packed in a casing, the meat is indistinguishable from similarly processed chicken breast — except in taste. And that, the researchers say, is midway between that of breast meat and thigh meat.

Burgers: Fatty patties vs. extra-lean

Buying extra-lean ground beef is not a very effective way to reduce dietary intake of fat and cholesterol, according to nutritionists Kenneth Prusa and Karla Hughes at the University of Missouri at Columbia. Comparing broiled hamburgers made from 100 grams of regular, lean and extra-lean ground beef, their studies show that cholesterol differences among precooked patties level out during broiling. Similarly, they found that fat in the different grinds varied by only 5 percent after broiling, even though they had a threefold precooked difference (regular being 28.5 percent fat by weight, extra-lean 9 percent).

During broiling, the leaner patties lost most of their weight as moisture, Prusa says, whereas fattier ones lost more fat and cholesterol. Moreover, the one-third loss in weight among broiled lean and extra-lean patties was only about 4 percent less than the broiling loss experienced in regular-grind burgers. Considering the premium price charged for leaner grinds, Hughes says, "that extra 4 percent isn't a very significant loss."

But the most important factor for burger lovers: A trained taste panel preferred regular beef to leaner grinds because it made for juicier and more tender burgers.

Botulism: The hard-boiled facts

It's not unusual for families to show off their colorful and cleverly decorated Easter eggs in seasonal displays around the house. But depending on how those hard-boiled eggs were cooled, their unrefrigerated storage may pose a risk of botulism, according to researchers with the National Food Processors Association (NFPA) in Washington, D.C.

In its raw state, the egg has several antimicrobial defenses. The cuticle, or outside portion of the shell, "protects the eggs from bacterial invasion as long as this layer remains intact," note Linda Lubin, Dale Morton and Dane Bernard of NFPA in the July-August JOURNAL OF FOOD SCIENCE. Some researchers believe shell membranes may be an even more resistant bacterial barrier, they add. And the lysozyme enzyme in shell membranes and in egg white (albumen) destroys many bacteria.

However, the group notes, cooking not only inactivates the egg's lysozyme but also enlarges the shell's pores. But the most important breakdown in defense may occur when boiled eggs are cooled in water — a common practice. A natural contraction of the eggs during cooling creates an air pocket between the albumen and shell membranes "which apparently produces a vacuum which can draw in bacteria present in the cooling water," the researchers say.

In their experiment, they cooled hard-boiled eggs for 30 minutes in water inoculated with spores of *Clostridium botulinum* — strains that thrive at room temperature. Even water contaminated with as few as 10 spores per milliliter eventually resulted in botulism toxin being produced in the eggs.

Since these bacteria flourish in the absence of oxygen, it was not surprising that eggs stored anaerobically spoiled first — in two or three days. Those in tightly sealed plastic storage containers produced botulism toxin in about a week; eggs stored in the open spoiled about a day later. Though most contamination produced spoilage sufficiently obvious to warn off any unsuspecting eater, not all did. And the toxin contained in those seemingly harmless eggs was "sufficient to produce symptoms in adult humans," the researchers say.

The lesson in all this, say the researchers, is that air cooling is safer than water cooling. If eggs must be cooled in water, they should not be stored in airtight containers. Moreover, these eggs should be considered perishable and thus refrigerated.

Fighting a juice's bitter end

Nobody sells 100 percent navel orange juice, because even the sweetest, tastiest fruit yields a hopelessly bitter drink. Shortly after it's squeezed from the fruit, the juice undergoes a chemical reaction that converts limonoate A-ring lactone into limonin, a bitter compound. Grapefruit juicers face a double whammy: the same delayed limonin development and the presence — even in the intact fruit — of a bitter chemical known as naringin. Citrus growers lose millions of dollars annually in the reduced prices these fruits bring when sold for juice. But chemistry may have an answer — several, really.

At the Agriculture Department's Fruit and Vegetable Chemistry Laboratory in Pasadena, Calif., Shin Hasegawa has identified five bacteria that will make minor changes in the molecular structure of limonin — such as the removal of a single hydrogen atom or addition of an oxygen — that render the compound nonbitter. Each "bug" has its own metabolic approach to debittering, he has found. While enzymes are their key actors, none of the 12 enzymes Hasegawa identified among the five bacteria is stable outside live cells. So he now immobilizes live microorganisms by encapsulating them in a gel and packing it into a glass column.

Fifty milliliters of navel orange juice, when passed through a column packed with 2.8 grams of bacterial cells, reduced limonin concentrations in the juice from an objectionable 20 parts per million to less than 5 parts per million — a very palatable level. Flushing the system with water between runs allows it to be used up to 20 times without a loss in debittering efficiency, Hasegawa says.

In Florida, where grapefruit presents the bitterest problem, Philip Shaw and Charles Wilson at the U.S. Citrus and Subtropical Products Lab in Winter Haven have taken an alternative approach. Their process, reported in the July-August JOURNAL OF FOOD SCIENCE, also involves running juice through a column. This column, however, is packed with beta-cyclodextrin polymer, a chain molecule with doughnut-shaped links. When grapefruit juice passes through the polymer, limonin *and* naringin are selectively trapped in its doughnut holes. Rinsing the column with a dilute lye solution regenerates the system for the next batch of juice.

Shaw says that before their tests ended, the system had been recycled 20 times without a loss in efficiency. And by reversing the direction of juice flow through the column, the researchers have overcome clogging by pith and other solids that cloud unfiltered juice.