FDA to Ban Sulfites From Fresh Produce

This past Feb. 15, the McPike family of Salem, Ore., went out for a Mexican dinner. Ten-year-old Medaya ordered her "usual" — a guacamole tostada. But at home half an hour after finishing the meal, Medaya, an asthmatic, complained to her parents that she thought the guacamole was making her sick. "While we were phoning our doctor and the emergency room at the hospital, Medaya's lips started turning blue," her father, James McPike, recalled to a congressional hearing on March 27. By the time Medaya reached the hospital, she had gone into cardiac arrest. The emergency room staff resuscitated her, but the girl developed severe brain damage and survived only five days. Her doctors ruled that sulfites, a food additive, were the cause of death.

Since the Washington, D.C.-based Center for Science in the Public Interest (CSPI) in 1982 first petitioned the Food and Drug Administration (FDA) to rescind its "generally recognized as safe" listing for sulfites (SN: 11/6/82, p. 294), at least six persons have died from reactions to sulfites in their food. Scores more have reported life-threatening allergic-type reactions. This week FDA announced it would move to ban use of the antioxidants on fresh fruits and vegetables.

In announcing the proposed ban, FDA noted that sulfites are harmless to most people. But for those who have a sulfite sensitivity, says Ronald A. Simon of the Scripps Clinic Research Institute in La Jolla, Calif., levels as low as 5 to 50 parts per million in food might trigger a severe reaction. Asthmatics are the largest group at risk; FDA estimates that 10 percent of the nation's asthmatics — 1 million people — may be sulfite sensitive.

As "freshening agents," sulfites prevent wilting and discoloration in fresh produce. Six chemicals can be used: sulfur dioxide, sodium sulfite, sodium bisulfite, potassium bisulfite, sodium metabisulfite and potassium metabisulfite.

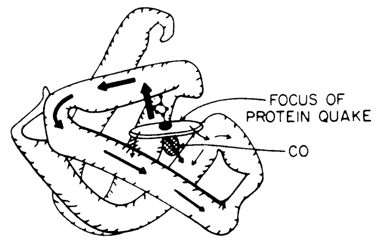
Sulfites are also widely used in prescription drugs, alcoholic beverages and a variety of other foods, including fresh seafood for market. FDA has received reports of many adverse reactions attributed to sulfites in such products; one that involved canned potatoes resulted in death. Although the current FDA proposal has no bearing on these products, FDA says in announcing its new measure in this week's Federal Register that it "intends to address all other uses of sulfiting agents, including ... potato products, in the near future." The agency says it singled out fresh produce for priority action because of the growing popularity of salad bars, and because roughly half the 500 reports of sulfite reactions it has received have been linked to fresh fruits and vegetables.

CSPI staff attorney Mitchell Zeller characterized the FDA proposal as "a step in the right direction." However, he adds, "I think it's pathetic that it took the agency this long to just get out a document that deals with one of the hundreds of uses of sulfiting agents."

Rep. Ron Wyden (D-Ore.), prompted in part by the Oregon girl's death, has authored a bill that would ban sulfites not only in produce but also in cut and frozen potatoes. The bill would additionally require FDA to study whether sulfites' "generally recognized as safe" status should be dropped for other uses. Noting that "FDA does not go as far as I wanted" in the current proposal, he told SCIENCE NEWS that as a result of a discussion with the agency's commissioner Monday, "I'm hopeful that there will be action taken on other fronts."

— *J. Raloff*

Shaking up a protein's tangled world



Frauenfelder, S.F. Bowne/PNAS

A proteinquake propagating along a myoglobin molecule.

There's violence in the microscopic world of proteins. The evidence — continuously on display in the human body and other living systems — is in the vibrations that surge through a myoglobin molecule when the bond between the molecule's iron-containing group and an attached carbon monoxide or oxygen molecule is broken. The stress created by the original bond is released, and the protein "relaxes" by sending quakelike waves along the molecule's convoluted twists and turns. In the human body, myoglobin, located in muscle, serves as a reserve supply of oxygen.

On its scale, "a proteinquake is far more violent than an earthquake," says Erramilli Shyamsunder of the University of Illinois at Urbana-Champaign. "The energy released is of the same order of magnitude as the total energy required to completely denature a protein."

But even more interesting to researchers is the way in which the energy involved is released. In the August PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, the Illinois group, led by Hans Frauenfelder, proposes a new model suggesting that proteins behave a lot like glass or the earth. The vibrations appear in distinct stages, starting with small, rapid, local oscillations that evolve into larger but slower wiggles that wander over the entire molecule. The existence of this hierarchy of vibrations also means that a protein molecule doesn't lose its excess energy as quickly as a simpler mechanism would allow.

The similarities between earthquakes, glass vibrations and protein motions are quite remarkable, says Frauenfelder. "It gives us a concept that allows us to look at proteins in a more unified way," he says. "It's clear that the same phenomenon has to happen in essentially every protein reaction in some way."

In the Illinois experiments, a laser flash initially breaks the bonds between myoglobin's iron group and a carbon monoxide molecule. The researchers monitor the vibrations by observing changes over time at various temperatures in the intensity of several spectroscopic "markers." These markers are sensitive to small changes in the molecule's structure and reflect what's happening in the protein as a whole.

"Although it looks like an earthquake, we don't know exactly how the energy is dissipated," says Shyamsunder. "Right now, all we have are experimental data that chart the precise time course, temperature course and decay rate of the proteinquake. We don't have as yet a microscopic picture, just guesses about where the vibrations are occurring."

An equally compelling question is why a protein would behave like a glass. "Maybe the purpose is to keep the energy available locally longer so that it can be used for other biological work," says Shyamsunder, "but we have no experimental evidence for that."

The Illinois model may also lead to a fruitful collaboration between glass and protein specialists. "We hope it goes in both ways," says Frauenfelder. "They can help us and we can help them."

"The key question is whether or not the behavior of proteins can in fact be treated as a glasslike behavior," says Denis L. Rousseau of AT&T Bell Laboratories in Murray Hill, N.J. "Ultimately, you want to unravel the physics that governs proteins, and once you really understand that, you want to relate it to the biological properties of the molecules."

— *I. Peterson*