Food Science

Marinating beef? Consider red wine

One way not only to tenderize but also to season tough cuts of meat is to marinate them. Many of the most popular Western marinades rely on wine or vinegar as the tenderizer, whereas oriental marinades are more likely to use soy sauce or sodium bicarbonate. Unfortunately, many of these ingredients contain tannins or sulfur dioxide or are alkaline – factors that can destroy thiamine. But a new study by researchers at Hawkesbury Agricultural College in Richmond, Australia, shows that the presence or absence of these anti-thiamine agents does not necessarily determine whether a tenderizer will affect a meat's thiamine content.

For example, though red wine contains thiamine-threatening tannins, in the Australian study it proved as benign as the distilled water used for a control. The researchers, who report their work in the July/August JOURNAL OF FOOD SCIENCE, suspect the wine's slight acidity prevented the tannins from acting on the vitamin. Though white wine is also acidic, it was most damaging to thiamine, destroying between 50 and 75 percent. Unlike the red wine, the white wine contained sulfur dioxide as a preservative, and thiamine destruction proved proportional to the amount of sulfur dioxide used. Alkaline sodium bicarbonate reduced thiamine by 55 percent, and soy sauce reduced it by 44 percent. The effect of soy sauce also came as somewhat of a surprise, the researchers say, since this acidic tenderizer lacks both tannins and sulfur dioxide.

While beef is not an especially rich source of this essential vitamin, it contributes about a third of the daily thiamine intake in the United States.

Preventing another pork-borne disease

Cysticercosis is a disease caused by eating the eggs or larvae of the pork tapeworm *(Taenia solium).* Though rare in the United States, globally it is the most common parasitic disease affecting the central nervous system, according to Julio Sotelo and his colleagues at the Instituto Nacional de Neurología y Neurocirugía in Mexico City. Able to cause extensive nerve damage, the disease can even induce a form of epilepsy. But in the Aug. 15 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, the Mexico City researchers report a simple method for killing any *T. solium* present in commercial cuts of pork: storage of the meat for four days at −5°C, for three days at −15°C, or for a single day at −24°C. The authors recommend requiring this freezing treatment at the slaughterhouse.

Mold linked to esophageal cancer

Several regions in the People's Republic of China have an unusually high incidence of esophageal cancer. Since the diet in one such region in Henan Province often contains food contaminated with molds, especially *Fusarium,* chemists at the Chinese Academy of Medical Sciences' cancer institute in Beijing decided to look for a dietary link to the disease. In the July/August JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY, the researchers report finding two nitrosamines – known as NMAMPA and NMAMBA – that commonly contaminate local millet and wheat flour, two of the region's food staples. In 1979, the group reported finding NMAMBA in cornbread – another regional staple – contaminated with mold.

"Most nitrosamines are potent carcinogens," at least in animals, the researchers note. Moreover, they point out, some nitrosamines – particularly asymmetrically structured ones like those they just identified – induce esophageal cancer in animals. Noting that the role of fungi in nitrosamine formation has been largely ignored, the team showed that the *Fusarium* strains commonly found in the area's food can convert nitrates in the local water supply and compounds in the food staples into nitrosamine precursors.

Paleontology

Mary Murray reports from the Fourth North American Paleontological Convention at the University of Colorado in Boulder

One way to survive mass extinction

Common wisdom among paleontologists holds that although plants and animals can adapt to their environments to avoid extinction in normal times, survival during mass extinctions – caused by floods, volcanoes or other catastrophes – may be just a matter of luck. But now, Jennifer A. Kitchell, a University of Michigan at Ann Arbor paleontologist, has found evidence that adaptations made in normal times may help some organisms survive mass extinctions.

Kitchell studied various species of marine plankton, or diatoms, and found that those that had adapted to northern climates survived the mass extinction between the Cretaceous and Tertiary periods (65 million years ago), while plankton that had adapted to low- and mid-latitude sites did not. The diatoms in the north evolved a life cycle that includes a resting stage, which allows them to survive during the season of coldest water. Farther south, where ocean temperatures are more constant, plankton do not have a resting stage. The northern diatoms were able to survive the cold ocean temperatures of the late Cretaceous by entering their resting stage, Kitchell reports.

"I'm proposing that this adaptation was a fortuitous benefit," Kitchell says. Her findings, she says, do not refute the argument that mass extinction is blind to adaptation, but they "qualify" it by suggesting that geographic range may be related to survival during catastrophic times.

Computerized mass extinction

Paleontologist James W. Valentine of the University of California at Santa Barbara used his computer to create and then kill off hundreds of animal species. Valentine wasn't just pretending to be a supreme being. He wanted to figure out whether the five great mass extinctions have been random or whether they affected some geographic areas or some kinds of animals more than others. From Valentine's results, it appears that mass extinctions have been random, he says.

Valentine first created in his computer an imitation world of species in various taxonomic groups, and then he performed three kinds of mass extinctions – one in which he killed off 85 percent of the species at random, one in which he hit 85 percent in a contiguous region, and a third in which he killed half of all the species in the four oldest taxa (which amounted to about 79 percent of all his species). He then looked at the profile of species left over after each trial and compared them with the real species profiles at the end of each of the five mass extinctions. "We found that the real events closely resemble random treatment profiles, and not the other two," he reports.

Dinosaur bone soup

More than 10,000 dinosaur bones – most of them remarkably well preserved – have been mined from the Cleveland-Lloyd quarry in eastern Utah, the most bountiful dinosaur bone bed in the western United States. Yet none of the bones have been found in the shapes of the animals they came from. Why are they so jumbled? Paleontologist Adrian P. Hunt of the University of New Mexico in Albuquerque offers two possible explanations.

The site might have been a sticky lake shore that trapped the dinosaurs, Hunt says. This type of "miring" would mix up the bones, as happened to the bones of Pleistocene mammals in the La Brea tar pits in Los Angeles.

The second explanation – and the one Hunt prefers – is that the dinosaurs of this age in Utah were caught in a great flood, which killed the animals and then washed them all together into a depression. In time, after the animals decomposed, their bones would have been mixed by the movement of water or sand.