Sea Grant Oregon

Economic Leadership

Seafood Lab researchers demystify histamine-albacore connection

Haejung An helped establish that Pacific albacore are relatively free of histamine-producing bacteria, which cause allergic responses in some people.

PACIFIC SEAFOOD MARKETERS have been trying for years to persuade the public that a grilled filet of fresh-caught albacore tuna has about as much in common with a standard tuna salad sandwich as prime rib does with a fast-food burger.

But all the marketing in the world won't do much good if the fish triggers a violent allergic reaction in people who eat it.

Fortunately for the seafood industry—and for seafood-loving consumers—Oregon Sea Grant researchers have determined that albacore is a lot slower to develop allergy-causing histamines than some of its better-known tuna cousins. In fact, by the time histamine levels are high enough to provoke a reaction, the albacore would be so old and smelly you wouldn't want to eat it anyway.

Thanks to Sea Grant's research and education efforts, Pacific fishermen and seafood processors are finding it much easier to meet federal consumer safety guidelines than they did before. But it took more than three years of work by nearly a dozen Sea Grant-funded researchers to reach that point.

Albacore tuna belongs to the fast-swimming Scombridae family, known for the fact that, once caught, its flesh is prone to rapid development of histamines. Most species of tuna, mackerel, mahimahi, swordfish, marlin, and bluefish are susceptible to histamine formation.

Histamine, a neurotransmitter allergen, can cause mild to severe symptoms—runny nose, itchy eyes, wheezy breath—that are usually relieved by antihistamines. But severe attacks can be lethal to people with weak immune systems or certain kinds of heart disease. So well known is the allergen concern that the U.S. Food and Drug Administration (FDA) has long maintained especially strict guidelines for how Scombridae are handled after they are caught.

Those guidelines, requiring rapid, at-sea chilling and careful testing at dockside, have been a burden for fishermen and seafood processors, many of whom have turned to albacore in hopes of recovering some of the income lost to the Pacific salmon decline.

Ken Hilderbrand, Oregon's Extension Sea Grant seafood specialist, knew that albacore caught off the Oregon coast had no reported history of causing allergic reactions. That knowledge prompted him to encourage researchers at the OSU Seafood Lab in Astoria, led by Haejung An, to delve deeper into the question of albacore and histamines.

Most tuna and other Scombridae are known to have high levels of free histidine in their muscles, An said. Bacterial enzymes convert that histidine to allergy-triggering histamine rapidly—as fast as four to six hours after catch. Chilling slows the process.

An and graduate student Shin-Hee Kim first tried to determine the source of the bacteria that transform histidine to histamine. "If the bacterial source was natural, we could prevent it. If it was from contamination, we could remove the source through better sanitation and handling," An said.

The researchers discovered that the most common histamine-producing bacteria, *morganella morganii*, are a normal inhabitant of the fishes' guts. Other bacteria were found largely in the gills. That meant careful cleaning of the fish held potential for protecting the meat. And sure enough, lab and field tests proved that true.

"Eviscerated fish were more attractive after three weeks on ice, did not develop such a pungent odor, and did not accumulate histamine much," An said.

Heat was also expected to be a factor. Hilderbrand and Sea Grant fisheries engineering specialist Ed Kolbe, along with several graduate researchers, had been working with fishermen for years to develop economical ways of rapidly chilling fish shipboard to maintain quality—and, in susceptible species like albacore, to prevent histamine formation. But An thought that even the fastest at-sea chilling would leave albacore loaded with histamines. Her initial tests were a big surprise.

"We couldn't find any!" she said.

Researchers began intentionally leaving samples of albacore at room temperature for longer and longer periods. At two days, the fish finally began to show some histamine formation. But "even among four-day, spoiled fish, some were below the FDA histamine guidelines . . . It was totally against our predictions," she said.

An's research led Hilderbrand to draft revised hazard prevention procedures for albacore processors, taking into account the extremely low risk of histamine production compared with other tuna. The FDA has accepted sanitation plans based on the Sea Grant work, allowing processors to relax the at-sea care requirements they set for fishermen from whom they buy fish. The result: less difficulty and less expense, for fishers and processors alike—but a final product whose quality and wholesomeness still meets consumer demands.

An, meanwhile, has left Oregon for a research position at Auburn University, though her work at OSU's Seafood Lab continues. Graduate researcher Shin-Hee Kim expects to complete a doctorate in fall 2000, based on the albacore histamine work. And labs in Hawaii have confirmed the OSU results with yellowfin and mahimahi caught in even warmer waters.

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