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Health & Welfare

Nose training

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Courses teach participants to identify seafood problems by smell

FDA national seafood sensory expert Mike McLendon checks the decomposition level in a spoilage run sample that will be used at a shrimp decomposition workshop.

Freshly harvested seafood has a pleasant odor reminiscent of an ocean breeze. But when fish smells, it is past its prime. The odor can be an indication of decomposition that may pose a health hazard to consumers.

When seafood first comes out of the water, the muscle tissue is essentially a sterile product. As it goes through rigor mortis, bacteria and enzymes from the gills and gut cavity begin to multiply and produce compounds that cause a “fishy” smell. Other spoilage bacteria cause fish tissue to soften and further reduce quality.

Inspectors for the United States Food and Drug Administration (FDA) and U.S. Department of Commerce – Seafood Inspection Program (USDC-SIP) use their highly trained noses to determine whether or not imported seafood should enter U.S. commerce.

Sensory training

Sensory evaluation courses can help brokers, processors, regulators, analytical laboratories and retailers involved in supplying, purchasing and inspecting seafood in the U.S. think and smell on par with FDA inspectors. Processors and exporters to the U.S. may be especially interested in understanding the standards applied by the regulatory agencies of countries of origin and the types of odors that can cause their shipments to be rejected.

Sensory training is available through courses offered by universities, trade associations and consultants. Through a variety of teaching methods (blind sampling; sequenced, graded sampling; group discussions) using multiple increments of the same fish with different odor characteristics, participants gain valuable hands-on and “nose-on” calibrating experience in learning how U.S. federal seafood inspectors evaluate seafood products.

Experience shows that it is essential for evaluators to receive periodic training to recalibrate their noses because individuals’ skills tend to drift over time. Some participants become more conservative, while others become more aggressive with their sensory ratings.

Scoring scale

Sensory evaluation courses provide standardized training on different odors and intensities. Participants learn to train their noses to recognize where distinct odors of acceptance and decomposition fall on a 100-point linear scale.

Within seconds, trained sensory analysts can assign a numerical score to identify freshness, spoilage or improper handling. Seafood ranked closest to 100 has the greatest failure qualities, while seafood ranked closest to 0 has the most passing qualities. A score above 50 results in rejection and detention – an expensive consequence for countries that export to the United States, where about 80 percent of the seafood consumed is imported.

Even untrained analysts can easily determine whether a product passes or fails when the odors are closest to 0 or 100. But a challenge occurs even to trained sensory analysts when products exhibit midrange sensory scores of 45 to 55. When sensory quality ratings approach the low to mid-40s, it may not be in the processor’s interest to ship to the U.S. due to the strict guidelines applied by FDA.

Standard descriptors

Standardized seafood species descriptor charts serve as useful guides in sensory evaluation courses (Table 1). These charts provide a range of descriptive terms for odors and intensities varying from “high pass” to “borderline” to “strong fail.” Yet, terms such as “indole” and “yeasty” on the charts may be unfamiliar to participants.

Table 1. Abridged descriptor chart.

	Sensory Quality Indicators – Shrimp				
	Appearance and Texture, Raw	Odor, Raw	Appearance and Texture, Cooked/Canned	Odor, Cooked/ Canned	Flavor, Cooked/ Canned
Borderline Pass	Slightly-moderately opaque Slightly dull Surface dry Moderately soft Slightly varied color Faded Slightly yellow, pink or gray Shell slightly pitted	Moderately fishy Cardboardy Oxidized Slightly musty Slightly sulfur	Slightly soft Slightly mushy Slightly dry Faded color Slightly yellow or gray	Moderately fishy Cardboardy Oxidized Slightly sulfide	Slightly fishy Cardboardy Oxidized Slightly sulfide
Borderline Fail	Opaque Cooked appearance Dull Sticky, grainy Soft, slightly mushy Yellowish Brownish Slightly gray Pitted shell	Slightly sour Slightly cheesy Slightly rancid Slightly yeasty Moderately strong fishy Slightly indole Slightly taint Slightly sickly sweet Slightly ammonia Slightly musty/ moldy	Moderately yellow Moderately gray Moderately tough (or) slightly mushy Loss of shape Moderately dry	Slightly sour Slightly rancid Slightly cheesy Slightly fermented Slightly yeasty Moderately strong fishy Slightly pungent Slightly taint Slightly sickly sweet Slightly ammonia Slightly musty/ moldy	Slightly sour Slightly bitter Slightly yeasty Moderately strong fishy Slightly rancid Slightly amonia Slightly vegetable/ sulfur Slightly taint Slightly musty/ moldy

Source: U.S. Department of Commerce – National Sensory Section.

“Cheesy” is an unfamiliar term in Asia because cheese is not a normal product in diets there. However, this same odor can be identified by participants from the Asian region through association with examples that are endemic in their societies. As a result, descriptor charts become dynamic, especially when courses are offered internationally.

In evaluating seafood, feed or background odors can affect the rating of products. Different wild-caught and farm-raised fish and shellfish emit unique odors. It is also critical to know the sources of products when conducting sensory evaluations. A product can exhibit an odor that some mistake as decomposition but that is only a feed odor or something else natural to the species.

Sample preparation

Sensory course demonstration samples are intentionally spoiled via a controlled “spoilage run” to reach a certain quality level on the linear scale.

In preparing course samples, sensory experts start with the freshest, highest-quality seafood available and capture the essence of this quality through freezing or canning, The product is then intentionally subjected to time and temperature abuse in order to package varying stages of decomposition for demonstration at the course. As shown in Table 2, the process can take days. Simulations of how the seafood would have spoiled in the real world are also applied.

Table 2. Approximate shelf life for fresh fish fillets.

Holding Temperature (° C)	High-Quality Shelf Life	Edible Shelf Life
32.2	14.0 hours	1.0 day
15.5	1.5 days	2.5 days
5.5	3.0 days	6.0 days
0	8.0 days	14.0 days
-1.1	10.0 days	17.0 days
-1.7	12.0 days	20.0 days

Source: Why Seafood Spoils, Robert J. Price, 1989.

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