High-tech packaging

Nanotechnology makes a difference in processing and beyond.

In addition to lowering the risk of microbial contamination in foods, nanotechnology in packaging offers the promise of extending food shelf life and reducing waste, said Hongda Chen, national program leader, bioprocessing engineering and nanotechnology at the US Dept. of Agriculture (USDA). Additionally, Chen said recent studies have gone a long way toward easing safety concerns about the technology.

Chen participated in a panel discussion about nanotechnology and packaging June 26 during the 2017 Institute of Food Technologists' annual meeting and food exposition, held beginning June 25 in Las Vegas.

The USDA's investment in nanotechnology for the food industry has been considerable, Chen said. The National Institute of Food and Agriculture at the USDA has invested more than $100 million in research over the last several years. The origins of nanotechnology date back to a 1959 speech by Richard Feynman, a theoretical physicist who later was awarded a Nobel prize for his work.

Nanotechnology has been used in packaging in antimicrobial coatings and time-temperature and freshness indicators.

Setting the stage for the role of nanotechnology for the industry, Chen said packaging serves numerous purposes, including containment, protection and preservation, marketing and communication and convenience.

“The objective is to modify packaging into intelligent packaging,” he said.

Examples of how nanotechnology has been used in packaging include reduction of moisture absorption, antimicrobial coatings, time-temperature indicators to show the range of temperatures a package has endured over a shown period of time and freshness indicators.

He devoted much of his discussion to concerns about the safety of nanotechnology, using hazard times exposure as a definition of risk.

Compounds already used for nano particles include gold, silver, zinc oxide, iron oxide, titanium dioxide and silicon dioxide. The technology has been used internationally in a range of food for decades.

Chen cited an extensive New Zealand study on the safety of nanotechnology that showed no evidence of a health risk. He noted another study showing that migration of particles from nanotechnology solutions into food occurs at levels far below legal limits.

“Nanotechnology should be fully exploited for enhancing food safety, quality, sensory attributes and improving human health,” he said.

Following Chen was a presentation by Tony Jin, a research food technologist with USDA’s advanced nonthermal processing and packaging technologies unit.

He noted that along the path from food to table come multiple steps that can lead to contamination.

Microbial contamination usually begins on a food’s surface, Jin said, and many foods are consumed with no kill step. He described antimicrobial packaging as a “final defense.”

The way nanotechnology is used includes coating food, food wrap or coated packaging. Certain edible substances may be used to carry nano particles, including pectin, cellulose and gelatin. Possible materials for this kind of technology include zinc oxide, which has GRAS status and has been shown to kill E. coli and Salmonella. Magnesium oxide is another possibility, but Jin acknowledged that concerns persist about the technology.

Still, he is hopeful.

“Food packaging with nanotechnology can extend food shelf life and reduce food waste,” he said. “It has the potential to impact many aspects of food processing and food packaging.”