

High-Pressure Processing (HPP) Targets Multi-Billion Dollar Low-Acid, Canned Food Market

HPP poised for growth after making inroads in the pasteurized, refrigerated marketplace: an industry HPP consortium aims to make traditional, low-acid foods safe, tasty, and shelf-stable

The present is bright for HPP in the food industry and that's nothing compared to what the future holds. In the last decade, HPP - which uses pressure up to 87,000 psi to disrupt the cellular functions of microorganisms - has emerged as a serious contender to thermal processing in the pasteurized, refrigerated marketplace.

This is due to HPP's proven ability to kill a range of dangerous microorganisms such as *E. coli O157:H7* in fresh juice, *Listeria monocytogenes* in ready-to-eat meats, and *Vibrio* bacteria in raw oysters - without the use of heat, which can damage the taste, texture, and nutritional value of food. Pressure not only destroys the *Vibrio* family of bacteria found in shellfish, but also detaches the meat from the shell, saving labor and increasing production efficiency. Since spoilage organisms can be destroyed, too, many foods stay fresher longer.

HPP is based on hydrostatic pressure, which is equal from every direction and doesn't create shear force to distort food particles. Thus, any moist food can be exposed to these high pressures without being crushed. HPP is effective throughout food items from the surface through the center because pressure transmission is uniform, instantaneous, and not controlled by product size. This uniform application of lethal conditions eliminates adverse edge or thickness effects associated with conventional thermal processes.

If a consortium of high profile food industry players including Kraft, Hormel, ConAgra, Basic Ameri-



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can, Avure Technologies, and The National Food Laboratory (The NFL) has its way, however, HPP could create a whole new category of shelf-stable foods vastly superior to traditional canned foods.

"Imagine shelf-stable carrots that are safe and crunchy after two years at room temperature," said Ed Ting, Chief Research Officer at Avure Technologies in Kent, WA, a leading manufacturer of HPP technology. "Or consider microwaving a pouch of mashed potatoes from the pantry that tastes homemade, even though it's been sitting unrefrigerated on a shelf for six months. HPP's impact on the low-acid, canned food

market will eclipse its current use for pasteurization of refrigerated products. The result will give consumers fresh taste with a safe, portable shelf-life unheard of today.”

While canned, low-acid foods are among the safest in the world, there’s currently a price paid in taste due to the severe thermal treatment given to kill any *Clostridium botulinum* spores that may be present. Spores of this pathogen are highly resistant to heat and require processing equivalent to 250°F for at least five minutes to be destroyed. Thermal processing that high, however, is destructive to the quality of many products and can significantly reduce consumer appeal.

“Already HPP is widely used for foods sensitive to cooking, such as fresh produce, raw meats, fruit products, non-thermally pasteurized juices, and seafood products,” said Paul Gerhardt, Microbiology Segment Leader at The NFL. “The bar will soon be raised from delivering refrigerated products with fresh quality and long shelf-life to delivering quality, low acid, shelf-stable foods. This will include gourmet entrees, dinner kits, meats and sauces, and other combinations of foods whose quality would be destroyed by conventional canning processes.”

“The food industry will be able to combine ingredients in ways not previously offered to satisfy consumer needs and create new consumer niches,” continues Gerhardt. “Beyond increased freshness and shelf-life, selective use of HPP and thermal processing, for example, could optimize sensory characteristics. New nuances of taste, aroma, and appearance will be possible. Of course, as required by federal regulations any process for shelf stable low-acid foods would have to ensure commercial sterility and deliver a lethality equivalent to a 12 log reduction of *C. botulinum*.”

The NFL, a FDA and USDA recognized processing authority and industry leader in food safety contract research based in Dublin, CA, serves as a strategic partner for HPP manufacturers and processors of food, food ingredients, and food related packaging. Scientists at The NFL work closely with clients in every phase of product development, testing, and evaluation: from concept and prototype, to formula-

tion, processing, microbiology, chemical analysis, scale-up, packaging, sensory testing, and market research. Clients rely on The NFL’s scientific expertise for their proven ability to develop custom methodologies for unique situations.

“Introducing new products based on HPP technology requires a multi-disciplinary team that many companies do not fully have on staff,” adds Ting. “I have recommended to such companies that they utilize the product development and food safety skills offered by The NFL to objectively help them commercialize these products.”

Though Avure Technologies has its own microbiological lab and pilot plant facility, the consortium turned to The NFL for an extensive *Clostridium botulinum* study. From a comprehensive collection of *C. botulinum*, The NFL will identify the most robust strain, characterize responses to pressure, temperature, and time, then develop a predictive model to determine future processing parameters.

As research continues, The NFL will likely participate on a team to develop HPP processing parameters for specific food products. One goal is to develop a shelf-stable omelet, which has been nearly impossible to do through traditional means because thermal processing essentially destroys egg products intended for that purpose.

“To develop HPP technology for shelf stable products, it’s important to have a credible, independent third party such as The NFL on hand for both technical expertise and regulatory guidance,” says Ting. “Their background as a canning industry processing authority will help not only with proper system design, protocol, and microbiological validation but also with filing for FDA approval.”

The NFL is the only national research lab with in-house microbiological, processing, and product development expertise, along with *C. botulinum*, pathogen surrogate development, and FDA recognized *C. botulinum* toxin testing ability. They provide expertise on all phases of food safety studies from experimental design and microbiological process validation testing to interpretation of results and document filing, including studies with: *C. botulinum*; *Salmonella spp.*; *E. coli* O157:H7; *Listeria*

monocytogenes; *C. perfringens*; *Staphylococcus aureus*; as well as specific spoilage organisms.

“For years, we’ve been pointing manufacturers needing third party validation to The NFL,” adds Ting. “To meet new FDA pasteurization requirements, they’ve helped juice producers implement an intervention kill step with a five order of magnitude reduction of pathogens. Anybody needing to document challenge, validation, or microbiology test results for regulatory agencies should consider them. This will be as true for upcoming HPP shelf-stable products as it has been for pasteurized, refrigerated products.”

For more information, write to The NFL at 6363 Clark Ave., Dublin, CA 94568; call Dr. Paul Gerhardt at 925-551-4285; fax 925-828-2548; e-mail GerhardtP@TheNFL.com; or visit them on the Web at www.TheNFL.com.

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