Ultrashear Technology for Clean Label Protein Dairy-Plant Beverages, Dispersions and Emulsions

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Health-conscious consumers are driving changes in the food manufacturing industry by increasing demand for safer and healthier clean-label processed foods that are free from synthetic additives. In place of sugary drinks, consumers prefer beverages that not only quench thirst, but also meet various lifestyle demands including satisfying hunger with high protein, enhancing immune health, and improving recovery after endurance training and competitions.

Ultrashear technology employs 400 MPa to pressurize the liquid food followed by depressurizing the treated liquid via a special self-controlling shear valve. The shear valve converts high pressure into fluid dynamic force. It also employs a new method of delivering fluid pressure to the valve, allowing for high flow rates and lower costs. By selecting appropriate UST process parameters such as pressure, temperature, and shear rate, as well as product parameters including pH, water activity, and composition, a range of treatment effects can be achieved. This include preservation (pasteurization or commercial sterilization) of liquid foods, blending dairy-plant proteins and fats to produce stable colloidal systems such as dispersions and nano emulsions.

Our research demonstrated the feasibility of making clean-label dairy-plant protein dispersions from various dairy and plant proteins (including soy, pea, mung-bean, almond, chickpea) without the need for synthetic stabilizers. We also demonstrated the feasibility of making ice-cream without any emulsifiers from UST-treated simple ice-cream mix. Similarly, our industrial collaborator has demonstrated feasibility of producing various stable nanoemulsions including curcumin, astaxanthin, prednisone, algae, and neem oil. In addition to food industry, other UST applications include medical drug delivery, cosmetics, biotechnology, agriculture, and advanced nanomaterials manufacturing. Our group is now exploring small angle scattering measurements that enable characterization of the effects of different processing approaches on protein structure and other components. Neutron scattering and contrast techniques are well suited to the complexity of the sample components, and we are looking forward to take advantage of the high-pressure measurement capabilities at the NCNR.

Speaker Bio

Dr. Bala's laboratory conducts multidisciplinary research for the development and validation of next generation of sustainable food processing technologies. His food process development efforts focus on identifying safe processing conditions for various foods treated with combined pressure-thermal treatment. His group develops mathematical models for destruction of vegetative bacteria, spores, nutrients, and toxic compounds.

Recent research from Dr. Bala's lab developed a semi-continuous high-pressure method for preserving different dairy and plant protein liquid beverages, sauces, and gels without any chemical preservatives. Their research demonstrated that superheated steam could serve as a tool for surface sanitation of dry food processing plant surfaces to potentially reduce water and synthetic chemical use in food plant sanitations. Dr. Bala's laboratory also contributes to transfer of knowledge to food processors via pilot plant demonstrations, short courses, workshops, and webinars. Bala was elected as IFT Fellow in 2012. Since 2018, Dr. Bala has been serving as Editor-in-Chief of Journal of Food Process Engineering. To learn more about Dr. Bala's research visit website https://u.osu.edu/foodsafetyeng/

Friday, July 28, 2023

10:45 AM (UTC-05:00) Eastern Time (US & Canada) | Hybrid format

Attend in person (room K04B, NCNR) if you have access to the NIST campus, or remotely using the link below.

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