Paving the Way for Sustainable Proteins: An Integrated Research Approach

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Providing consumers with a wider variety of daily protein sources is integral to increasing the demand for sustainable food options. Designing foods with new protein-rich ingredients is a challenging undertaking because their physicochemical and functional properties are often very different from traditionally used proteins. To fully leverage the promise of new proteins, an integrated research approach is crucial. This involves gathering knowledge across various stages of the value chain and conducting a critical evaluation of their potential. This talk will focus on four main steps of the food technology value chain of alternative proteins: upstream and downstream processing, characterization, and model food production.

In each stage, a new technology along with its associated challenges will be highlighted, illuminating the research focus across the processing value chain. Firstly, the talk will introduce the 'Power-to-protein' concept, an innovative approach that utilizes electricity to produce green hydrogen, which is then used as a feedstock to cultivate protein-rich biomass using hydrogen-oxidizing bacteria. This decouples protein production from agricultural-based feedstocks. Next, the talk will explore the tailored fractionation of microbial and plant proteins to yield protein fractions with specific physicochemical and functional properties. Applying near-infrared spectroscopy allows for rapid identification of chemical differences in protein-rich materials to identify potential candidates for further analysis. The extraction processes can then be adjusted based on the raw material to maximize or minimize the amount of different sidestreams that typically occur during the protein extraction process. Eventually, these fractions are studied to understand their physicochemical and functional behaviors in food matrices. Lastly, the focus will shift to processing these ingredients, with emphasis on extrusion processing. A critical aspect of this technique involves the in-line inclusion of lipids, which typically results in extrusion instabilities because of wall slip. Current emulsification approaches to mitigate this challenge will be discussed.