**Decoding meat analogues: insights into ingredient structure-function relationships**

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Meat analogues play a pivotal role in the transition to more sustainable protein sources. Most meat analogues are primarily composed of textured vegetable protein (TVP), oil and binding agents. Each of these ingredients play a critical role in defining the functional properties of the meat analogue, including texture and serum release. Juiciness and flavour perception are particularly significant for consumer acceptance and largely depend on water and oil release upon consumption. Understanding the structure-function relationships of the ingredients is essential for optimising meat analogues.

This presentation delves into the intricate interplay between ingredient structure and functionality in meat analogues. For various TVPs, we quantified the structural characteristics, such as porosity, pore size and wall thickness using X-ray tomography. Our findings reveal how these characteristics influence water release, mechanical properties and protein digestibility of meat analogues. Oil release is less dependent on TVP structure, but is governed by oil droplet characteristics. We will demonstrate how modifying the interfacial characteristics and interactions between oil droplets and the meat analogue matrix can help to tune oil release dynamics.

Besides TVP and oil, also binding agents are important as they provide structural cohesion and influence texture and serum release. The most commonly used binding agent in meat analogues is methylcellulose (MC). Despite its widespread use, the gelation behaviour of MC in protein-rich systems such as meat analogues remains poorly understood. We will present how the gelation behaviour of MC is influenced by proteins, and how this is dependent on MC molecular weight and protein characteristics. Additionally, we will discuss the tribological properties of meat analogues and the serum released, offering insights into how different ingredients contribute to the lubrication of meat analogue surfaces.

Overall, this presentation provides a comprehensive overview of the complex relationships between structure and functionality, offering insights to advance the design and quality of meat analogues.