Comparison between meat analogues developed using high-moisture extrusion processing and protein elongation method

CHIANG J. (1), ONG D. (1), HENRY C. (1)
1 Singapore Institute of Food and Biotechnology Innovation, A*STAR, Singapore, Singapore

Meat analogues exhibit anisotropic (e.g., layered or fibrous) structures that give an appearance and taste-texture sensation similar to muscle meats. Meat analogues can be produced by various methods such as extrusion, freeze structuring, electrospinning, in-vitro animal cell culture, and shear cell technology. Out of these technologies, high-moisture extrusion processing has been the preferred and widely used technique of choice, notably by large-scale Asian manufacturers, and especially among Western manufacturers. This is because of its scalability and the consistent quality of the textured products produced. Our research team recently developed a method to produce such meat analogues, which is more affordable and uses less sophisticated equipment, known as protein elongation. This technique involves cutting protein dough into smaller fragments, followed by stretching and pulling these protein fragments, resulting in anisotropic structures resembling meat fibres. The study compares the physicochemical, textural and structural properties of meat analogues (soy protein concentrate (SPC) and wheat gluten (WG) at the ratio of 40:60 or 60:40 %w/w dry protein basis) made from extrusion processing and protein elongation method. The protein and moisture content of the meat analogues showed no significant differences, as the formulation used in the two processes was similar. Interestingly, the pH levels of the meat analogues were different. The extruded meat analogues were found to be harder, springier and chewier than the protein-elongated meat analogues. Extruded meat analogues demonstrated more aligned macrostructures upon visual examination, while protein-elongated meat analogues at SPC: WG ratio of 60:40 did not exhibit any fibrous network. Scanning electron microscopy analysis showed that fibrous structures were more prominent in extruded meat analogues than in protein-elongated meat analogues. It was concluded that the protein elongation method could be an alternative approach to rearranging protein fibres to produce textures and structures like meats, other than extrusion processing. This allows smaller-scale manufacturers to contribute to the market with more variety of plant-based food products in the future.