

Food structure - Effects on food functionality

Bryony J. James

University of Auckland
Auckland
b.james@auckland.ac.nz

Food structure influences its functionality in numerous ways, some of which are occasionally neglected when considering nutritional and health outcomes of functional foods. Primarily the structure of solid foods dictates texture, which influences oral processing and mastication. As the first stage in food breakdown for digestion this influence is critical in contributing to preservation of functionality and controlling later release of nutrients.

Food texture is defined in various ways but most succinctly as: “all the mechanical, geometrical and surface attributes of a product perceptible by means of mechanical, tactile, visual and auditory receptors”¹. Texture is very much a human perception but instrumental techniques and structural characterisation are used, alongside sensory panels, in its assessment. Manipulating structure allows us to manipulate texture and deliver “mouth appeal”. Ultimately we should be able to manipulate mastication behaviour, without consumers noticing a degradation of mouth appeal, and hence alter nutritional outcomes.

One difficulty of this approach is that food structure is a multiscale parameter. For example at the Ångstrom scale water is a vital plasticiser. At a few tens of nanometres casein micelles stabilise fat droplets in dairy products. The texture of common emulsions is controlled by phase separation at the micron scale. At a few tens of microns we can detect individual hard particles in food. Each length scale contributes to texture and mouth appeal and must be controlled to deliver desirable functional foods and influence oral breakdown.

Determining which length scale is the major contributor to the texture of any food product is essential and we are currently exploring the impact of length scale as part of an NZ government funded programme called the “Food Structure Platform”. Some of the techniques we are developing to assess texture combine instrumental measures with sensory tests and have required a new approach to the vocabulary used in the field, which will be presented. As the programme progresses we will be looking for collaborators to help us extend the work into manipulating mastication behaviour and relating this to nutritional outcomes.

In a more general context it is clear that there is an area of functional food research where food engineering, food science and nutrition overlap that requires substantial and immediate attention. In a recent review article² we highlighted this area with specific regard to the role of omega-3 PUFA in inflammatory bowel disease. Opportunities in this research space will also be discussed.

¹ ISO5492:2008 “Sensory analysis – Vocabulary”

² FERGUSON, L., SMITH, B., JAMES, B., “Combining nutrition, food science and engineering in developing solutions to Inflammatory bowel diseases – omega-3 polyunsaturated fatty acids as example” Food and Function 1:1, 2010, DOI: 10.1039/C0FO00057D