The Oral Processing of Semi-solid and Soft-solid Foods

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Abstract

Fluid foods are popular in modern life. They are not only enjoyable to consume and provide nutrition, but are also beneficial to special populations, such as those with dysphagia and temporomandibular joint disease or who are edentate. Food rheological properties have an important influence on food oral processing and swallowing. Tongue movement plays a vital role during oral processing of liquid, semi-solid and soft-solid foods. The purpose of this research was to investigate the boundary criteria for categorising liquid, semi-solid and soft-solid foods; identify relationships between food properties and oral processing behaviours; and characterize tongue and lower jaw behaviours during food oral processing, in particular shear stresses generated between the tongue, lower jaw and hard palate.

Constant weight samples were served to subjects who were instructed to consume them naturally, whilst movements of the tongue and lower jaw were measured via articulography and masseter and submental muscle activities were measured via electromyography. Food rheological properties (viscosity, flow curve, stretch-ability, storage modulus and loss modulus), pH and moisture content were characterized for each food sample.

The oral residence time was found to be an important oral processing behaviour, which is affected by the original food viscosity, viscoelastic properties, moisture content, and stretch-ability. Tongue movements dominate the oral processing of semi-solid and soft-solid foods instead of mastication which occurs for hard-solid food. The shear stress of the tongue and lower jaw is the main power during oral processing of semi-solid and soft-solid foods. The maximum shear stress of Greek yoghurt on tongue tip was 123 ± 31 Pa and 151 ± 59 Pa for two subjects; for custard, it was 144 ± 46 Pa and 192 ± 20 Pa. These results agree with estimated data which is currently available for the same food types. Overall, the shear stress tends to increase with increasing food viscosity.

The method developed for measuring shear stresses applied in the oral cavity during oral processing was novel and is the closest to measuring real, in – mouth, shear stresses, which has not been possible to date.

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Experiments conducted in Chapter 3, Chapter 5, Chapter 6 and Chapter 7 were registered as low risk with the Massey University ethics committee. Experiments (Southern A Application 10/12) were approved by the Massey University ethics committee.

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