Viscosity of artificial chewed boluses of cereal foods

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Food Oral Processing (FOP) is a key step for foods assimilation and the benefit of their nutrient properties, especially for elderly whom oral physiology is altered. The main objective of this process is to form a food bolus that can be swallowed safely. Nevertheless, most of the studies about relationships between FOP, oral physiology and food bolus properties focus on particle size and dental status, saliva is only partly considered. However, for cereal products, food bolus viscosity is a function of the added saliva [1], which evidences the interaction between food and saliva. Our aim is to establish a model to determine a coefficient that characterizes this interaction.

To do so, we first study sponge cakes, one sample is standard and the other one is enriched with pea isolates. Artificial boluses composed of crushed sponge cake and a surrounding fluid, representative of saliva, are prepared. Four fluids are used: three of them are Newtonian, water and two Dextran solutions of viscosities 3mPa.s and 10mPa.s. The fourth fluid is shear thinning, composed of different salts and mucin distilled in water, as already used in different studies [2-4]. Viscosity measurements (shear and elongational) are realized using capillary rheometry, including Bagley’s corrections. The shear viscosity of boluses follows a power law model from which the consistency K can be derived. A phenomenological model of the consistency is obtained (Figure 1): K = K0 e-α ΔWC, where α is the interaction coefficient and ΔWC is the difference of water content between the food bolus and the sponge cake. Results also show that the viscosity plays a minor role, compared with its concentration. By varying properties of the surrounding fluid, the interaction between food and saliva can be assessed.



Figure 1: Phenomenological model of the consistency for a standard sponge cake. Red line is a fit by an exponential function that gives the interaction coefficient: α = 12.3.

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