Rheological characterization of gels from whey protein hydrolysates

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The gelling ability of whey proteins can be changed by limited hydrolysis, and depending on the environmental conditions it can either be improved or impaired. Rheological studies are useful to evaluate the gelling ability of biological macromolecules; in particular, they allow accessing the structure of the gel, evaluating its texture, controlling the gelling behaviour or complementing the information provided by sensory methods. The heat-induced gelling properties of whey protein concentrate (WPC) and whey protein hydrolysates (WPH) from trypsin and pepsin with different degrees of hydrolysis - 1.0 (T1.0) and 3.5 % (T3.5) for tryptic hydrolysates and 1.5 (P1.5), 2.5 (P2.5) and 4.9 % (P4.9) for peptic hydrolysates - at different concentrations were studied at pH 7.0 by small deformation rheology. At WPC concentrations close to the gelling point, stronger gels with lower gelation temperatures were achieved with limited hydrolysis of whey proteins. G' was higher for P1.5 (138 Pa) followed by P2.5 (58 Pa) and T1 (17 Pa), for hydrolysate's concentration of 7.5 % w/w. All three were stronger than WPC at this concentration (G'=5.7 Pa). They were also more elastic as the loss angle was smaller. However, at higher protein concentrations this effect was impaired. The expected increase in gel strength was smaller for the hydrolysates than for the intact proteins. A similar increase in protein concentration corresponds to a lower increase of the amount of protein with effective gelation ability in the case of the hydrolysates. Gels from hydrolysates ruptured at lower strains than gels from WPC (i.e. more particulate gels with a coarser network structure). The results show that protein systems with many different textures can be tailored by manipulating the hydrolysis conditions and the type of the enzyme used to produce protein hydrolysates.