Studying protein-protein and protein-polysaccharide interactions
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Abstract

Proteins and polysaccharides can be found in many types of food, and both contribute to the texture and structure of the food. These effects can be attributed to their thickening and gelling behavior and surface properties.

When both biomolecules are present in foods they may interact with other molecules and form complexes. These interactions are mostly between proteins and charged (acidic) polysaccharides such as carrageenan. Interactions between non-ionic polysaccharides are generally much weaker. Since the main interactions are ionic, they depend heavily on the pH which dictates the charge of the protein and the polysaccharide. The complexes formed are crucial to the texture and the microstructure of products and are therefore interesting to study. In yoghurt, protein-polysaccharide interactions can arise from two sources, polysaccharides can be added before fermentation or they can be produced by lactic acid bacteria during fermentation in the form of EPSs (Exopolysaccharides). EPSs especially are a subject of interest in recent years due to their ability to modify yoghurt texture in a natural manner. To be able to improve and predict food textures, it is necessary to understand the interactions between the proteins and the EPSs. The study of interactions between EPSs and proteins is an analytical challenge. Another area of interest is the study of interactions between production enzymes and interacting proteins present in the production matrix. Enzymes are widely present in nature, and their high catalytic rates at mild condition make them interesting for use in a biotechnology perspective.

Many cases of interactions between protein inhibitors and enzymes are known. They are commonly strongly associated with dissociation constants ranging between 10^-7 and 10^-13 M. Interactions between proteins usually consist of multiple types of interactions. The major interaction mechanisms are steric complementarity, hydrophobic interactions, electrostatic interactions and hydrogen bonds. Water present in interaction interfaces can stabilize the complex by forming additional hydrogen bonds and interacting with charges. Many types of analytical methods have been developed for the evaluation of enzyme inhibitor interactions.

The aim of this review is to evaluated analytical methods which could be suitable to study interactions between EPSs and proteins and production enzymes and inhibitors as described above. It is important to note that interactions between these molecules are preferably studied in situations mimicking native conditions, which should be considered during method development. In this thesis the most relevant methods for studying protein interactions and their advantages and disadvantages, will be discussed. Some recommendations will be made regarding method development, after reviewing the most relevant methods.