Unraveling mouthfeel

Impact addendum

The success rate of new food products or food reformulation has been reported to range below 20 % at the moment. One of the main reasons for the high failure rate is the mismatch between consumer expectations or preferences and the food's sensorial properties. Therefore, to achieve a successful product design food industry and designers/researchers need to gain a better understating of the food sensorial properties, and their origin while developing evaluation methods that can capture those properties.

Understanding and being able to measure the sensorial properties of food is harder than it sounds. The absence of a well-defined lexicon among industry, food researchers/designers and consumers is still lacking. Additionally, the use of subjective evaluation methods, such as sensory analysis, can be influenced by psychological and physical factors, while those methods are expensive, time-consuming, low repeatable and reproducible.

Overcoming such problems first a common lexicon for effective communication among disciplines needs to be established, while the establishment of objective sensorial evaluation methods needs to be further developed. However, to effectively design objective evaluation methods, understanding the origin and the characteristics of oral sensations are important.

This dissertation aimed to expand the understanding of the origin of mouthfeel sensations, based on physical changes in human saliva and the application of those insights to improve the chemical measurement specialized in mouthfeel sensations. Lastly, the association of the sensory attributes with the chemical measurement was evaluated by chemometric analysis.

Understanding salivary lubrication

The present thesis is a series of studies on mouthfeel sensations regarding their origin and the different chemical properties/interactions which induce those sensations. Changes in salivary film integrity are important for the perception of mouthfeel sensations. Interaction of polyphenols with salivary proteins lowers the salivary lubrication ability, while larger molecular weights and lower pH further increase the friction of oral surfaces. Cationic characteristics, such as valences, ionic strength, et cetera, influence the lubrication properties of saliva as well. Trivalent cations lower salivary lubrication while monovalent cations at high ionic strength values provide extra hydration lubrication. The findings of this dissertation provide new insights into salivary lubrication which is responsible for the drying sensations during food consumption. The findings suggest that measuring both polyphenols and cations concentration and their molecular characteristics could potentially be used for the prediction of drying perception.

Chemometrics and mouthfeel sensations

Predicting or measuring “flavor” based on chemical measurements is a valuable tool for the food industry and researchers. To objectively quantify flavor, a good understanding of the components and their properties regarding oral sensations is a necessity. Therefore, by incorporating this knowledge of food components and their chemical properties, new

innovative chemical and chemometrics analyses can be further developed to quantify oral sensations. The results show that applied chemical analysis regarding sensory sensations is highly correlated with sensory attributes. Those results suggest that oral sensations can be potentially classified based on tactile sensations and chemometric sensations. Where tactile sensations, such as coating and drying are negatively associated with each other, while the chemometric sensations do not influence the tactile sensations.

The use of innovative chemical analysis and chemometric techniques can potentially be used to predict oral sensations. Therefore, biomimetic devices, like artificial tongues, can potentially be used to replace the existing subjective sensory evaluations, provided that these instruments are based on a useful model for taste classification.

Conclusion

In sum, this dissertation enhances the understanding of mouthfeel sensations, especially based on salivary lubrication changes. Additionally, the use of chemometric tools showed a high correlation between sensory attributes and chemical analysis. Although these implications warrant further investigation, they can provide food researchers, designers and industry with novel strategies to improve the success rate of the new products or product reformulation. Therefore, this dissertation provides a useful starting point for developing novel strategies and tools for predicting flavor properties.