FOOD FILES

Words by Dr Russell Keast, Dr Georgie Russell, Dr Andrew Costanzo and Jookyeong Lee

Which is more filling: plant-based or dairy-based protein?

Foods with added protein have increased in popularity in recent years. This may be because of their potential health properties, including their ability to regulate appetite due to being highly satiating (or filling). Whey protein has traditionally been the main source of added protein in foods. There has been an increased interest in plant-based proteins as they are perceived as being more natural, healthy, and better for the environment. However, it is unclear whether plant-based proteins add the same appetite-regulating value as whey protein.

A recent study investigated the effect of protein source on appetite control in healthy adults. In this study, 37 healthy adults were fed breakfast meals with added protein on separate days, which were one of the following: yoghurt with whey protein, yoghurt with pea protein, and a carbohydrate-based meal as a control (no protein). Following the breakfast meal, appetite questionnaires were completed to assess appetite over the next 4-hours, and then an all-you-can-eat pizza lunch was provided to the participants.

Overall, there was no effect of the different protein sources on 4-hour postprandial appetite. The questionnaire responses and the amount of pizza eaten at the all-you-can-eat lunch were similar regardless of which protein was consumed for breakfast beforehand. So, what does this mean for the development of new products with added protein? Essentially, it means whey and pea proteins are equally effective at regulating appetite. Pea protein can be an effective addition or substitution in novel foods to target health conscious or environmentally conscious consumers without compromising on appetitive qualities. It should be noted that this study only assessed pea protein, so this may not apply to other plant-based proteins like hemp or soy.

Griffith C, Piacquadio K, Braden M & Leidy H (2021). "Effects of Protein Source and Quantity on Appetite Control, Satiety and Subsequent Food Intake in Healthy Adults". *Curr Dev Nutr* 5(Supp 2): 409. https://doi.org/10.1093/cdn/nzab038_021

Which sweetener is best in high protein foods?

For a number of years there have been dietary trends/fads for increased protein, low carbohydrate foods and diets. Think about the keto based diets such as South Beach or Atkin or the increase in protein based beverages that use non-nutritive (no sugar) sweeteners for flavour. The use of non-carb based sweeteners can help meet the high-protein low-carb philosophy, however the effectiveness of non-nutritive sweeteners to effectively mask some of the protein off-flavours has been questioned.

Recent developments in sensory science have led to the development of temporal (time course) measurements which yield superior results to a static or moment in time approach. The temporal measurements can be on product attributes or liking. A study utilised temporal methods including an attribute analysis along with liking to assess which sweetener performed best (flavour wise) in a high protein beverage. A penalty analysis was conducted to identify key attributes

that have a negative influence on liking of the high protein beverage.

Results showed that the control sucrose was the best sweetener with no negative attributes identified. Monk fruit was penalised for metallic flavour over the course of consumption, while stevia was penalised for bitter, metallic and astringency attributes. A combination of monk fruit and stevia was more effective as it reduced the attribute penalties of the individual sweeteners. The positive effect of combining sweeteners to reduce an individual sweetener's off-flavours is an emerging trend in the food industry and studies investigating combinations of sweeteners have been overwhelmingly positive.

Harwood W and Drake M (2021). Application of temporal penalty analysis for the optimization of sugar reduction in protein beverages. *Journal of Sensory Studies* 36 e12644 https://doi.org/10.1111/joss.12644

Mahato *et al*. (2021). Optimization of natural sweeteners for sugar reduction in chocolate flavoured milk and their impact on sensory attributes. *International Dairy Journal* 115 https://doi.org/10.1016/j.idairyj.2020.104922

Understanding links between texture and food acceptance

Texture is a dynamic and complex attribute of foods mainly perceived by the sense of touch but can also include visual and auditory perceptions. Food texture can tell us about the quality aspect of foods. For example, tender and juicy steak and crispy chips would be more desirable than tough steak or soggy chips. Food texture is also an important reason why some foods are rejected by both children and adults. For children in particular, a food's texture can influence whether a food is rejected. Yoghurts with pieces of fruit, for instance, have been shown to be rejected by children in favour of smooth yoghurts.[1] Other studies have shown that foods with slimy or mushy textures also tend to be rejected more often.[2] Scientists have tried to understand how and why food texture might affect food acceptance and rejection for some individuals. This has led to the examination of oral tactile sensitivity, or how sensitive individuals are in their tactile perception. Tactile perception is underpinned by mechanoreceptors in the mouth. Despite the important role of texture in food acceptance and rejection, studies have rarely investigated the oral tactile sensitivity of children.

One of the challenges to understanding more about oral tactile sensitivity has been the lack of a suitable way of measuring it. We have recently tested a screening tool to determine oral tactile sensitivity in children: the grating orientation task. This task utilises a custom stimulus (the grate) which looks like a lolly pop in the shape of a cube with varying groove widths along its base, and a 4 cm- long handle. The oral grate is pressed on to the child's tongue either vertically or horizontally in a random order and children are asked to identify the orientation of grooves. This is done with grooves of varying widths, with the narrower grooves being more difficult to detect the orientation.

We have recently shown that this task is able to measure oral tactile sensitivity in children, distinguishing those who are more sensitive from those who are less sensitive. It is therefore a suitable and convenient measure of oral tactile sensitivity in children. The result of our study is encouraging in that oral tactile sensitivity using the grating orientation task can now be better understood that we have a suitable measure. The next steps in this research are to examine whether oral tactile sensitivity relates to how much children like and dislike different food textures. This will ultimately advance our knowledge on food acceptance and perception in children, particularly those driven by food texture.

1. Werthmann, J., Jansen, A., Havermans, R., Nederkoorn, C., Kremers, S., & Roefs, A. (2015). Bits and pieces. Food texture influences food acceptance in young children. *Appetite*, 84, 181-187. https://doi.org/10.1016/j.appet.2014.09.025

2. Boquin, M. M., Moskowitz, H. R., Donovan, S. M., & Lee, S.-Y. (2014). Defining perceptions of picky eating obtained through focus groups and conjoint analysis. *Journal of Sensory Studies*, 29(2), 126–138. https://doi.org/10.1111/joss.12088

Dr Russell Keast is Professor, Dr Georgie Russell is a Senior Lecturer, Dr Andrew Costanzo is a Lecturer and Jookyeong Lee is a PhD candidate. They are all members of the CASS Food Research Centre at Deakin University..