Mixtures of *Lactobacillus acidophilus*, *Lactobacillus plantarum*, and *Bifidobacterium lactis* mitigate α-amylase inhibition by extracts of non-gluten wheat proteins

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Introduction

Dietary triggers of gastrointestinal (GI) symptoms are complex and not fully understood. Gluten is associated with 20-45% of reported food hypersensitivity in adults (1), however other non-gluten components such as α-Amylase Trypsin Inhibitors (ATI) are known as inducers of immune response (2, 3). Various bacteria can degrade these ATI's and reduce pro-inflammatory activity (4).

Research objectives

We aimed to explore the interaction between bacterial and non-gluten wheat proteins in pursuit of development of therapeutic options such as probiotic-containing functional foods

Methods

Non-gluten soluble proteins of plain wheat flour (WE) were extracted with salt solution following previously described methods (5). Saliva was donated by a single healthy volunteer, collected, and processed according to standard protocols (6). A commercially available probiotic mixture containing Lactobacillus acidophilus, Lactobacillus plantarum, and Bifidobacterium lactis was used. For the assays, 0.01 ml raw saliva was diluted 1/1500 with PBS, and then 0.025 ml aliquots to individual wells of a microtitre plate and 0.025 ml of either: PBS (control, saliva); WE alone (to give a final concentration of 8 µg/ml, WE) or; the probiotic mixture from one capsule resuspended in 2ml PBS (ProB). In parallel, volumes of WE and the probiotic mixture were mixed together and incubated for 12 hours at 37°C, then 0.025 ml of this mixture was added to 0.025 ml saliva (Saliva + ProB + WE). The α-amylase activity present in of all these preparations was measured immediately via a coupled enzymatic assay using commercially available kits. Two biological replicates using the same source of saliva were performed.

Results

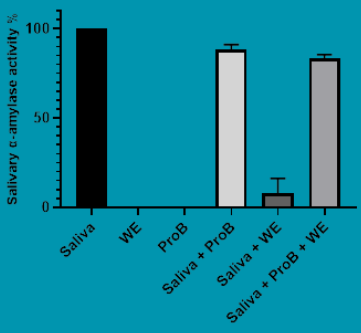

Figure 1 shows the α-amylase activity present in the different mixtures, normalised and expressed relative to the amount of α-amylase activity measured with untreated saliva. The addition of 8 µg/ml WE reduced α-amylase activity to 8.1% ± 8.0. However, the co-incubation of the probiotic mixture with WE for 12 hours appeared to mitigate this effect, as the α-amylase activity measured was 83.3% ± 2.1% of saliva alone. Salivary α-amylase activity was also effectively unchanged by the addition of the probiotic mixture alone (88.3% ± 2.7 of saliva alone). As such, neither the WE nor the probiotic mixture alone appear to possess detectable α-amylase activity.

Conclusion

Here, soluble non-gluten proteins from wheat were shown to inhibit saliva α-amylase activity, but the co-incubation of this extract with a commercial probiotic mixture for 12 hours appears to mitigate the inhibitory effects on salivary α-amylase activity. Non-gluten wheat proteins are well known to include ATI and our findings suggest the ATI in WE were inactivated on exposure to specific probiotic bacterial strains. ATI are also known to trigger pro-inflammatory responses in murine models and the probiotic strains used here, at least when provided in combination, may help to reduce gastrointestinal symptoms attributable to ATIs in patients with non-celiac wheat sensitivity

Selected references

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Princess Alexandra Hospital Health Symposium
24–27 August 2021
Queensland Government