

Q novel way for whey: a life's work

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Objectives: With increasing health concerns about multi-drug resistant bacterial diseases and foodborne pathogens, food-derived antimicrobial peptides are very promising in the field of both health and nutrition. The aim of this work was to identify new antimicrobial peptides, with benefits to the human and animal health, which may be used in the food industry. For this purpose, we used as biological material essential fermented cheese whey, mainly composed by lactic acid and bioactive polypeptides.

Material and Methods: An extended fermentation was carried out with whey obtained from a known Portuguese cheese industry, in the presence of the specific LAB consortium. Lactic acid production was monitored throughout time by using IE-HPLC chromatographic techniques and protein variations were analyzed. Fermented whey was tested against several foodborne pathogenic bacteria and the selected fermentation was used to produce a whey-based disinfectant and tested in lettuce, using a chlorine-based disinfectant as control. Low Molecular Weight (LMW) polypeptides were further isolated by ultra-filtration, characterized by RP-HPLC, sequenced and tested for their bioactivities against model pathogenic bacteria and multi-resistant bacteria. The isolated peptides were then tested for their potential for gut inflammatory diseases and their influence on the gut microbiome was also assessed.

Results: Our results also showed that the observed antibacterial activity was due to a synergy between lactic acid and bioactive peptides formed by fermentation and proteolysis. We were able to isolate a specific peptide with high antibacterial, anti-inflammatory, and anticancer activity *in vitro*. When used orally, *in vivo*, these peptides were able to reduce gut inflammation and protect the gut microbiome in TNBS-induced colitis in mice.

Conclusion: Our results point out that fermented whey can be a viable and healthy alternative as an antibacterial agent and a source of bioactive peptides with high potential not only for the food industry but also for human and animal medicine. Being a byproduct of the food industry and completely GRAS (generally accepted as safe), these whey peptides hold great potential either as nutraceutical alternatives to antibiotics or in functional diets for gut inflammatory diseases.

Keywords: Whey, Peptides, Antibacterial, Food safety, MMP-9, Gut inflammation.

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