Antimicrobial activity of buttermilk and lactoferrin peptide extracts on poultry pathogens

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Summary

Antibiotics are commonly used in poultry feed as growth promoters. This practice is questioned given the arising importance of antibiotic resistance. Antimicrobial peptides can be used as food additives for a potent alternative to synthetic or semi-synthetic antibiotics. The objective of this study was to develop a peptide production method based on membrane adsorption chromatography in order to produce extracts with antimicrobial activity against avian pathogens (Salmonella enterica var. Enteritidis, Salmonella enterica var. Typhimurium, and two Escherichia coli strains, O78:H80 and TK3 O1:K1) as well as Staphylococcus aureus. To achieve this, buttermilk powder and purified lactoferrin were digested with pepsin. The peptide extracts (<10 kDa) were fractionated depending on their charges through high-capacity cation-exchange and anion-exchange adsorptive membranes. The yields of cationic peptide extracts were 6.3% and 15.4% from buttermilk and lactoferrin total peptide extracts, respectively. Antimicrobial activity was assessed using the microdilution technique on microplates. Our results indicate that the buttermilk cationic peptide extracts were bactericidal at less than 5 mg/ml against the selected avian strains, with losses of 1.7 log CFU/ml (Salm. Typhimurium) to 3 log CFU/ml (Esch. coli O78:H80); survival decreased by 1.5 log CFU/ml for Staph. aureus, a Gram-positive bacterium. Anionic and non-adsorbed peptide extracts were inactive at 5 mg/ml. These results demonstrate that membrane adsorption chromatography is an effective way to prepare a cationic peptide extract from buttermilk that is highly against avian pathogens.

Running title: antimicrobial peptide against avian pathogens

Key words: Antimicrobial peptide, buttermilk, lactoferrin, avian pathogen, membrane adsorption chromatography