Project Number & Title: 2C-123**:** Self-assembled peptides as antimicrobial nanomaterials

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Project Participants

Aims and Objectives

Self-assembling peptides have become an important class of hydrogels attracting considerable research and commercial interest due to their broad range of biomedical and biotechnological applications. In a previously funded Pork CRC project, we discovered two peptides (JCT3/2 and 2ECT2/4) that spontaneously self-assembled to form a hydrogel in bacterial growth media. Because these two peptides were newly discovered, our aims were to 1. characterise the hydrogels and 2. assess the potential of developing these hydrogels into a coating for controlling *Escherichia coli* biofilms on surfaces.

Key Findings

JCT3/2 and 2ECT2/4 were novel peptides that formed highly stable hydrogels in physiological solutions and salts (JCT3/2). In particular they:

1. Formed SS-Gels in a range of biological media including media used for tissue culture, physiological saline (JCT3/2) and in blood
2. JCT3/2 and 2ECT2/4 exhibited shear-thinning (viscous flow under stress) and self-healing (recovery after shear-thinning) properties and could be needle injected.
3. We incorporated two molecules into the JCT3/2 hydrogel and monitored their rates of release into solution under physiological conditions. We found that the released cationic antimicrobial peptides retained their anti-bacterial activity towards *E. coli* O157, preventing its growth on surfaces over a 48 hr period.
4. An attachment of a cationic antimicrobial peptide to the JCT3/2 peptide imparted 'inherent' antimicrobial activity to the self-supporting hydrogel, preventing the colonisation of *E. coli* on its surface.

Application to Industry

JCT3/2 in particular was found to have a wide range of applications to the food, medical and animal industries. Some examples of applications include:

1. JCT3/2 has the potential to be further developed into an antimicrobial gel with potential applications to wound control or as an antimicrobial coating preventing the colonisation of bacteria onto surfaces
2. JCT3/2 could potentially be used to encapsulate select antimicrobial peptides for their oral delivery to the gastrointestinal tract of pigs and other animals
3. Because of its injectable qualities, JCT3/2 and 2ECT2/4 could potentially be used as an adjuvant for the delivery of live attenuated vaccine strains, improving their performance.