

2019/20 PhD Proposal – CSC-NZ-CFPN CRCC Joint Funding Programme

Information to be published on NZ-CFPN CRCC website if proposal is selected	
Project title	Biocontrol of the foodborne pathogens <i>Bacillus cereus</i> and <i>Cronobacter sakazakii</i>
Supervisor title and name	A. Prof. Stephen On (1), Dr Craig Billington (2), Prof. Ding Yu (3)
Department	(1) Wine, Food and Molecular Biosciences
School / Centre	
University	(1) Lincoln University (2) Institute of Environmental Science and Research (ESR) (3) Jinan University
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Link to Supervisor's research page	(1) https://www.researchgate.net/profile/Stephen_On (2) https://www.linkedin.com/in/craig-billington-24150833/ (3) https://faculty.jnu.edu.cn/lqxy/dy/list.htm
Project outline 150-300 words (approx) describing a possible PhD project, which has a link with an existing or potential research partner in China	<p>Species of <i>Bacillus</i> and <i>Cronobacter</i> are foodborne pathogens that can cause serious diseases. <i>Bacillus</i> are Gram-positive, rod-shaped, spore-forming bacteria which can be isolated from dried foods, dairy products and fermented vegetables. <i>B. cereus</i> and related organisms can produce both emetic illness via preformed toxin and diarrheal illness via enterotoxins following colonization of the gut. The toxins and spores are both heat stable and some strains are psychrotrophic. <i>Cronobacter</i> (formerly <i>Enterobacter</i>) are Gram-negative, rod-shaped, bacteria with biofilm forming ability that are associated with dried foods. <i>C. sakazakii</i> is a pathogen that has been linked to contamination of infant milk formula powder and has a high mortality rate in neonates. Both <i>B. cereus</i> and <i>C. sakazakii</i> naturally occur in the environment and are difficult to eliminate from food production premises, therefore new approaches such as biocontrol are warranted.</p> <p>This PhD project will involve the isolation and application of bacterial viruses (phages) to control these microorganisms, with the eventual aim of developing new tools to mitigate contamination of foods and food processing premises. The potential advantages of phages over chemical agents for pathogen control include their ability to adapt and their host specificity. Their often relatively narrow host specificity means that nontarget bacteria present in the environment will not be killed by them and unlike antibiotics, the use of phages should therefore be less disruptive to commensal microbial communities. The project will be a collaboration between Lincoln University, ESR and Jinan University.</p>
References for further reading (optional)	Billington, C., J. A. Hudson and E. D'Sa (2014). Prevention of bacterial foodborne disease using nanobiotechnology. <i>Nanotechnology, Science and Applications</i> 7 73-83 Lee, W. J., C. Billington, J. A. Hudson and J. A. Heinemann (2011). Isolation and characterization of phages infecting <i>Bacillus cereus</i> . <i>Letters in Applied Microbiology</i> 52(5): 456-464.
Additional information to be used in proposal selection process	
NZCFPN CRCC priority area to which proposal is aligned (see list below)	Risk assessment and mitigation
Brief outline of Supervisor's current research links with China or interest in developing them	Lincoln University has extensive links with various Universities in China as is evidenced by a strong cohort of students from the region. Stephen On has a long history of research in the food safety area and was formerly a Pillar Leader in the NZFSSRC until moving to Lincoln University. Craig Billington has been collaborating with numerous institutes in China for more than 10 years and is a member of the academic advisory committee of the International Phage Research Centre based in Nanjing.