2016-17
MCB Distinguished Speaker Series

Dr. Peter L. Davies

Professor of Biochemistry, Queen's University
Canada Research Chair in Protein Engineering

" Bacterial adhesins: adhesion, cohesion, and early events in biofilm formation"

Wed. Nov. 2, 2016
SSC 1511 @ 10:30 am

A bacterium-surface interaction is a prerequisite for biofilm formation. To bind various biotic and abiotic substrates many bacteria produce adhesion proteins (adhesins). One of the largest of these is the 1.5-MDa *Mp*AFP ('antifreeze protein') produced by the Antarctic bacterium *Marinomonas primoryensis* found in sea ice. Using a 'dissect and build' approach with X-ray crystallography, NMR, and SAXS, we have completed the structure of this giant adhesin. Several domains at its N-terminal end anchor the protein to the bacterial outer membrane. Following this section are ~120 identical extender domains that project the ligand-binding region ~ 0.6 µm away from the host cell surface. This C-terminal region includes ice-, sugar-, and peptide-binding domains. Homologues of these domains are also found in adhesins produced by pathogenic bacteria. Using a temperature-controlled microfluidic apparatus, we have shown that *M. primoryensis* forms bacterial clusters on ice, and are only released when melting occurs. Binding is aided by the motility of the bacterium and is dependent on the functionality of its ice-binding domain. A polyclonal antibody raised against the ice-binding domain abolished bacterial ice adhesion. This concept may be the basis for blocking surface attachment of other bacteria. By identifying their ligand-binding domains it should be possible to stop hosts from binding other surfaces including cell receptors. Our study gives insight into how bacterial biofilms, including those of pathogens, can be disrupted early on, by blocking their ligand-binding domains. We hypothesize that the ice-binding function of *Mp*AFP keeps its obligate aerobic host immediately under the surface ice in the phototrophic zone of the water column where photosynthetic organisms produce oxygen. Indeed, recent results show that *Marinomonas primoryensis* binds diatoms and helps attach them to ice to form a symbiotic community. *(Supported by NSERC)*

Fall 2016 Schedule	
Oct. 19th	Dr. Roger Lévesque, IBIS, Université Laval (Co-Hosts: Dr. C. Khursigara and Dr. J. Lam)
Nov. 2nd	**Dr. Peter Davies, CRC Protein Engineering, Queen's University (Host: Dr. S. Graether)**
Nov. 16th	Dr. Philip Hieter, Michael Smith Laboratories, University of British Columbia (Host: Dr. K. Yankulov)

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*** ALL WELCOME TO ATTEND ***

*** COFFEE, TEA AND TIMBITS ***

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