2016/2017 Summer Studentship Project Application Form

Send to: Research Office, University of Otago Christchurch, PO Box 4345, Christchurch, by 5pm on **4 July 2016**

Supervisor Information (First named supervisor will be the contact):

First Supervisor's Name and Title: Dr Heather Parker

Department - UOC &/or CDHB (if applicable): Pathology UOC

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State: Canterbury
ZIP Code: 8140

Co-Supervisors Name and Title(s): Professor Tony Kettle, Professor Christine Winterbourn

Research Category (Choose one category only – to be used for judging the students' presentations):

	Laboratory	

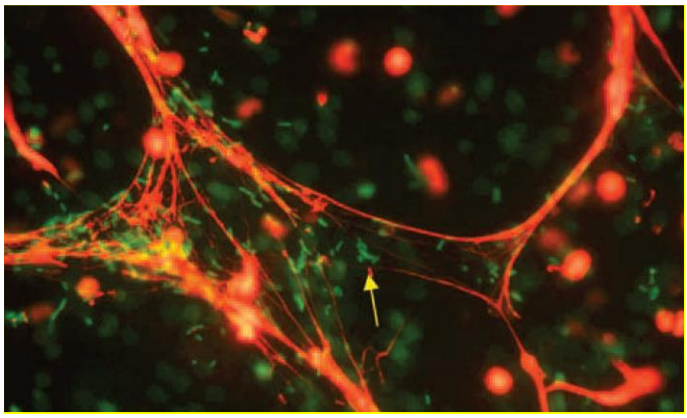
Project Title (20 words MAXIMUM):

Effect of hydrogen peroxide produced by *Streptococcus pneumoniae* on bacterial survival in the presence of peroxidases released by immune cells.

Project Description:

Introduction:

Pneumonia is an infectious disease that is the fourth leading cause of death globally. Deaths are primarily due to bacterial infections, particularly infection with *Streptococcus pneumoniae*. Of serious concern for the treatment of these infections is the increase in antibiotic resistance. An unusual feature of *S. pneumoniae* is its ability to produce hydrogen peroxide. Peroxide by itself is not very toxic. However, it can be converted into chlorine bleach and other highly bactericidal chemicals via peroxidases released from immune cells. Under these conditions *S. pneumoniae* could potentially be killed and/or kill other surrounding bacteria. Therefore, we want to see if *S. pneumoniae* are killed in the presence of peroxidases and whether therapies to improve this process may be valuable. One example of where this may occur is on structures released by certain immune cells called neutrophil extracellular traps (NETs). Bacteria can become trapped in these structures (see Figure) which also contain peroxidases. Therefore, the release of NETs by immune cells may help to control *S. pneumoniae* infection.



Example of bacteria (green) trapped on NETs (orange).

Aim:

To determine whether the presence of peroxidases from immune cells causes *S. pneumoniae* to kill themselves and other surrounding bacteria.

Possible impact (in lay terms):

If enzymes released by our immune cells can convert a chemical (hydrogen peroxide) produced by *Streptococcus pneumoniae* into toxic chemicals that can kill this and potentially other bacteria, this will identify a novel bactericidal mechanism which could be a target for future therapeutic strategies.

Method:

This project will involve growing *S. pneumoniae*, exposing them to a peroxidase from immune cells and determining if a bactericidal species is produced that kills the S. pneumonia and other cultured bacteria that are added to the mixture. Conditions for optimising the bactericidal activity will be established. On its own this will provide a defined project but if time permits, further experiments will be carried out to generate neutrophil NETs and investigate whether they can kill S. pneumoniae by this mechanism. The techniques are all established in the host lab and will include colony forming unit assays to measure bacterial viability and biochemical assays to measure production of toxic chemicals.