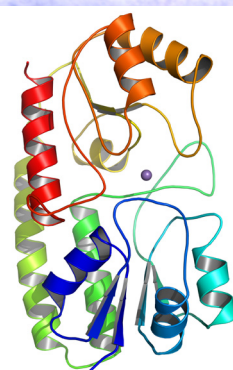
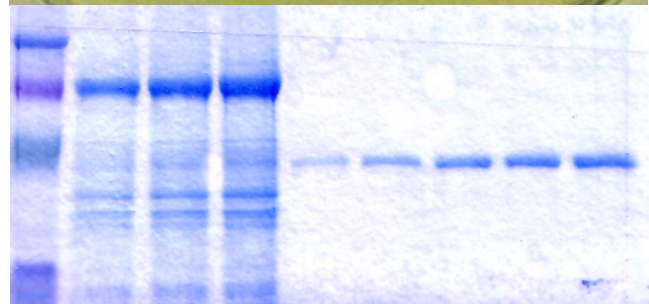
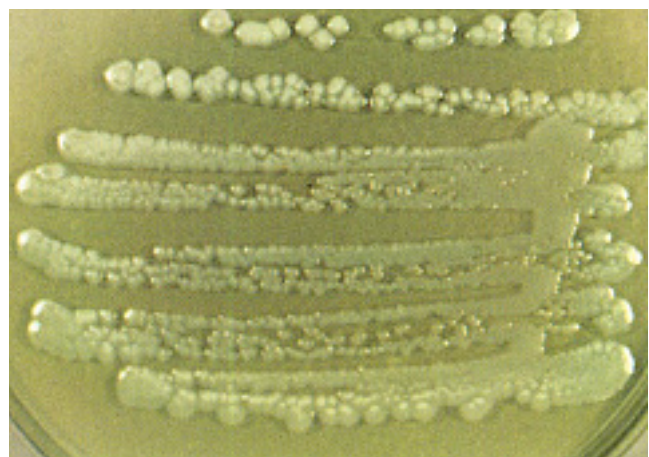


# honours 2012

Honours is the most important year in your science degree. It provides you with your first real exposure to full time research in a lab. So it's important to keep several points in mind when choosing your project. Find a project that you're interested in, ask about the laboratory environment (*i.e.* who will you be working with day to day), and what skills that project will develop.

The McDevitt laboratory offers a range of multidisciplinary projects that combine genetics, biochemistry, and microbiology. A project in our lab will provide you with a diverse set of research skills ideally suited for a PhD project or a job in science.



## honours projects

3 projects are available in 2012

1. Zinc toxicity in Gram-positive pathogens
2. Structure and function of substrate binding proteins in pathogenic bacteria
3. Multidrug resistance pumps of *P. aeruginosa*

## mcdevitt laboratory

for more information contact me or visit the website

room 4.13; molecular life sciences building

email: [christopher.mcdevitt@adelaide.edu.au](mailto:christopher.mcdevitt@adelaide.edu.au)

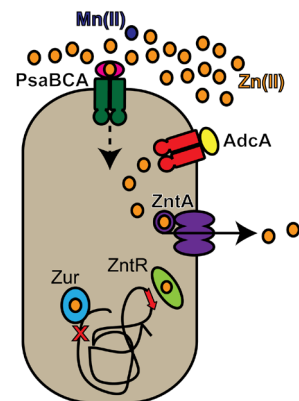
<http://www.adelaide.edu.au/mbs/research/mpbp/>

### 1. Zinc toxicity in Gram-positive pathogens

Metals are essential for bacterial survival but can be toxic in excess. Zinc is unusual as it does not generate oxidative stress and is essentially non-toxic but, despite this, zinc is capable of killing many bacterial species at relatively low concentrations. We have recently established a new model for how this process occurs in the major human pathogen *Streptococcus pneumoniae*. This Honours project will investigate whether a similar susceptibility to zinc toxicity exists in the superbug *Staphylococcus aureus* and define its molecular and biochemical basis. Your work on this project will identify a new Achille's heel in this multidrug resistant pathogen to be exploited.

This project will develop skills in:

- PCR
- Generating chromosomal deletions in bacteria
- Western & Southern blotting
- Protein expression and purification
- Biochemical assays
- Metal content analyses (inductively coupled plasma mass spectrometry)
- Isothermal titration calorimetry

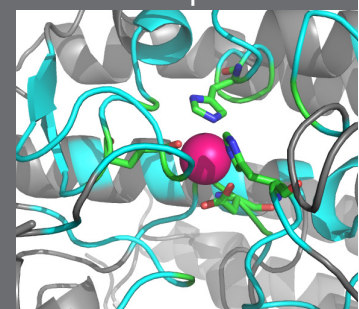


### 2. Structure and function of substrate binding proteins in pathogenic bacteria

All pathogenic bacteria employ small binding proteins to recruit metal ions (e.g. Mn, Fe and Zn) for their transporters. This process is essential for their survival as they must acquire these micronutrients with high affinity to survive within the host environment. Despite the importance of these proteins, the molecular basis of their interaction with metal ligands is poorly understood. This Honours project will investigate the structure and function of cation binding proteins. Your work will allow us to understand how these proteins bind and release their ligands so that we can exploit this knowledge in rationale drug design approaches.

This project will develop skills in:

- PCR
- Gene cloning
- Protein expression and purification
- Crystallisation
- Metal content analyses



### 3. Multidrug resistance pumps of *P. aeruginosa*

*Pseudomonas aeruginosa* is a major human pathogen and the leading cause of death in cystic fibrosis. The genome of *P. aeruginosa* encodes 4 uncharacterised ATP-binding cassette efflux pumps. Their architecture are strongly indicative of poly-specific xenobiotic efflux (i.e. multidrug resistance) pumps that likely contribute to the rapid development of multidrug resistance in *Pseudomonas aeruginosa*. This project will investigate their physiological roles and biochemical mechanisms.

This project will develop skills in:

- PCR
- Generating chromosomal deletions in bacteria
- Protein expression and purification
- Western blotting
- Membrane protein reconstitution (nanodiscs)
- Drug transport assays
- Drug screening studies
- Baking

