

International Research Fellowship report

International Research Fellowships have been replaced by International Research Grants. The scheme aims to facilitate visits to and from the UK/Republic of Ireland to carry out a microbiological research project. Full details, the rules and an application form are at www.sgm.ac.uk/grants. The closing date is 11 October 2004.



ABOVE:
The research group of Professor Paul Williams and Dr Miguel Camara. The author is fourth from the right, Miguel Camara is fifth from the right and Paul Williams is seventh from the right.

COURTESY IAIN LAMONT

Involvement of quorum sensing in regulating pyoverdine synthesis in *Pseudomonas aeruginosa*

■ Iain Lamont

I was fortunate enough to be awarded an International Research Fellowship to contribute to the costs of a 6-month research visit to the laboratory of Professor Paul Williams and Dr Miguel Camara at the University of Nottingham.

My research group in New Zealand has for many years been studying an iron-uptake compound, pyoverdine, secreted by the opportunistic human pathogen *Pseudomonas aeruginosa*. One of our main interests is the mechanisms that regulate pyoverdine synthesis. There has been a lot of research recently into quorum sensing, whereby bacteria use signalling molecules to monitor population density and adjust gene expression accordingly. Prior to my visit to Nottingham there was evidence that quorum sensing affects pyoverdine synthesis and the purpose of my visit was to explore this in more detail. The Nottingham laboratory was a great place to carry out this research – as well as being one of the leading international research groups studying quorum sensing in bacteria, they have developed a number of approaches that were ideal for the questions I wanted to address and that were not readily available to me in New Zealand.

The approach that I used was to take the promoters of two genes that are involved in pyoverdine synthesis and fuse them to luciferase (*lux*) reporter genes. These constructs were then integrated into the genomes of wild-type *P. aeruginosa* and of mutants that are defective for different components of the quorum sensing network. The resulting bacteria were

grown to stationary phase with the amount of light emitted by the bacteria (reflecting expression of the pyoverdine genes) being measured at 30 minute intervals over a 24 hour growth cycle. This was not as tough on the experimenter as it might sound as measurements were taken by a robot – it is very nice to feel that you can have a good night's sleep while a machine is collecting your data! The results showed that expression of pyoverdine genes is maximal during exponential phase and is down-regulated during stationary phase – this had not been looked at previously, but makes intuitive sense as the iron

requirements of the bacteria are presumably highest in growing cells. Work with the quorum sensing mutants confirmed and extended on previous results and showed that quorum sensing does indeed play a big role in controlling production of pyoverdine. This opens up several avenues for future research that will be an on-going collaboration between the Nottingham and New Zealand groups.

My research visit has been a great experience for many reasons – as well as advancing our understanding of gene expression in a human pathogen, it has allowed me hands-on exposure to a number of important experimental approaches and, at least as importantly, to make new scientific contacts and friends. I would like to thank the SGM for helping to make this possible. I am also very grateful to Paul Williams, Miguel Camara and their research team – especially Steve Diggie, Steve Atkinson and Stephan Heeb – for letting me loose in their lab, making it easy for me to settle in and providing huge amounts of scientific input.

More information on these research groups is available at <http://www.nottingham.ac.uk/quorum/index.htm> and at <http://biochem.otago.ac.nz/staff/lamont/ilamont.htm>

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