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Do microbes really talk?

University of Westminster PhD Fellowship

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Project Background

Communication is not an activity solely confined to the animals. It is now well established that bacteria as well as yeasts communicate with each other through complex routes. The outcome of microbial communication makes them more robust in their interactions with the external factors such as antibiotics.

Inter-cell communication is facilitated by production of auto-inducers (quorum sensing molecules) in response to an increase in cell-density. This phenomenon is called Quorum Sensing.

Quorum sensing has been associated with different processes such as bioluminescence, antibiotic production and conjugative DNA transfer. The phenomenon was reported in 1970 describing that a marine bacterium, *Vibrio fischeri*, produced light when its population reached a critical size. It took another decade for the first Quorum Sensing molecule (3-oxo-hexanoyl-homoserine lactone) to be elucidated as the autoinducer responsible for causing bioluminescence in *Vibrio fischeri*. Another autoinducer system called autoinducer-2 (AI-2) was discovered subsequently. The role of AL-2 in bacterial systems is under study currently.

Variety of molecules have been isolated and identified as quorum sensing molecules for example in Gram Negative bacteria, Acyl-Homoserine lactones are responsible for production of serine proteases and regulation of carbapenem synthesis. Quorum Sensing in Gram positive bacteria involves small post-translationally modified peptides which are implicated in competence for uptake of DNA by *Bacillus subtilis* and *Streptococcus pneumonia*, microcin production by *Lactobacillus sake* and virulence determination in *S. aureus*. In actinomycetes, γ-Butyrolactones have been reported as the quorum sensing or signalling molecules and in *Candida albicans* Farnesol and Tyrosol are identified as autoinducers.

Although substantial information has been collected regarding quorum sensing in the above microbial systems, very little is known about communications in filamentous fungi and basidiomycetes. The aim of this project is to investigate quorum sensing in industrially important fungi and exploit the findings for production and enhancement of industrially useful bioproducts.

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PhD project

This project provides the students with the opportunity to do their PhD within an established group of 11 post-doctoral fellows, PhD students, research assistants and visiting scientists. The group has funding support for projects from the European Union and Pfizer. The students are expected to gain experience in a variety of techniques suitable to the Industry including fermentation technology, molecular biology and biochemistry.
The consumable fees for this project will be absorbed by the Director of Studies.

Supervisory Team

This studentship brings together the expertise of supervisors in areas of microbial physiology/fermentation technology and molecular biology/biochemistry.

Facilities

Research will be undertaken in newly refurbished research laboratories at the University of Westminster. This includes analytical and fermentation suites.

Ideal candidate

We are looking for a motivated dynamic and enthusiastic graduate (with a 1st or 2:1 or an MSc in microbiology/biotechnology or related areas with an interest in molecular biology or biochemistry. The candidate should be a lateral thinker with the drive to want to explore new ideas.

Informal Enquires

Please contact Professor Taj Keshavarz (T.Keshavarz@wmin.ac.uk) for further information regarding the studentship.

References

1. Bassler, B.L. (2002) Small talk: Cell-to-cell communication in bacteria. Cell **109**(4): 421-4.
2. Bassler B.L. and Miller, M.B. (2001) Quorum Sensing in bacteria. Annual Review of Microbiology **55**: 165-199.
3. Bassler, B.L. (1999) How bacteria talk to each other: regulation of gene expression by quorum sensing. Current Opinion in Microbiology **2**(6): 582-7.
4. Bibb, M.J. (2005) Regulation of secondary metabolism in *Streptomyces*. Current Opinion in Microbiology **8**: 208-215.
5. Nealson, K.H., Platt, T. and Hastings, W. (1970) Cellular control of the synthesis and activity of the bacterial luminescent system. Journal of Bacteriology **104** (1): 313-322.