University of Westminster

Elicitation: Another step towards industrial production

University of Westminster PhD Fellowship

Supervisors: Prof. Taj Keshavarz and Ipsita Roy

Project Background

Improving productivity of commercially useful bioproducts is a continuous concern of pharmaceutical and biotechnology companies. In this context, strain improvement and media development has been practiced over the years and continues to be a routine industrial procedure.

We have introduced, in microbial cultures, for the first time a new strategy, based on “elicitation”, which resulted in significant increases in the production of antimicrobials. Elicitation is a process in which addition of very small amounts of “elicitors” such as carbohydrates bring about physiological changes culminating in increased levels of e.g. antimicrobials. Adopting elicitation, we have achieved enhancements of up to 150% in penicillin production concomitant with changes in the morphology and metabolic intermediate levels in the cultures of *Penicillium chrysogenum*. Very recently, we determined the changes in the expression of the genes involved in penicillin production as a result of elicitation.

We have investigated also cultures of *bacillus licheniformis* for elicitation and have discovered increases in bacitracin production concomitant with changes at molecular level. The extension of our findings into other bacteria and fungi has shown that elicitation is a phenomenon that can be exploited in microbial cultures for the benefit of both the users and producers of antimicrobials.

Based on the pioneering research in microbial elicitation over the last decade our group is in a position to investigate mechanism of elicitation at cellular and molecular level. While we have found evidence of the mechanism operating at transcription level, the complexity of the metabolic pathways invites us to study a cascade of events both at intra- and extra-cellular levels leading to enhanced production of the target product.

The overall aim is to investigate mechanism(s) of elicitation at molecular level and implement the findings for robust fermentation at large scale suitable for industrial exploitation. To this end, the work involves studies into potential changes that occur after transcription of essential genes, communication of the cell with its environment looking into signal transduction process and the molecules involved and finally, fermentation for enhanced production.

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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 suits.

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. Murphy T., Roy I., Harrop A., Dixon K., **Keshavarz T**. (2007) Effect of oligosaccharide elicitors on bacitracin A production and evidence of transcriptional level control. *J. Biotechnol.,* **131** 397–403.
2. Murphy T., Parra R., Radman R., Roy I., Harrop A., Dixon K. and **Keshavarz T.** (2007) Novel application of oligosaccharides as elicitors for the enhancement of bacitracin A production in cultures of *Bacillus licheniformis*. *Enz Microbial Technol*., **40**, 1518–1523.
3. Radman R., Bucke C., and **Keshavarz T.** (2004) Elicitor effects on *Penicillium chrysogenum* morphology in submerged cultures. *Biotechnol Appl Biochem*. **40**, 229-233.
4. Ariyo B., Bucke C. and **Keshavarz T.** (1997). Alginate oligosaccharides as enhancers of penicillin production in cultures of *Penicillium chrysogenum*, *Biotechnol Bioeng*. **53**: 17-20.