UNIVERSITY OF
INSPIRING
RESEARCH
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Project title: An experimental and computational study of Rho GTPase signalling in cancer development and metastasis

Studentship Code: LS8

Background to research and synopsis

Although some evidence indicates that RhoU and RhoV GTPases play role in regulating cell morphology, adhesion, motility and cancer metastasis, the physiological function of these proteins and their intracellular partners and effector molecules are not fully understood and need to be further investigated. These small GTPases are members of the Rho family of the Ras superfamily of small GTPases that consists of 23 proteins found in humans. They function as GDP/GTP-related molecular switches that are activated by various extracellular signal-mediated stimuli and by activation interact with downstream effectors to regulate cytoplasmic signaling networks. RhoU and RhoV proteins share significant sequence and functional similarities with other members of the family but possess additional N- and C-terminal sequences, exhibit unusual GDP/GTP binding properties, undergo distinct post-translational lipid modifications and are potential new targets for anti-cancer therapies.

The aim of this project is to use experimental approaches, computational modelling and molecular dynamic simulation to understand how atypical Rho GTPases fold, bind to their partners, and regulate cellular activities, with an emphasis on the identification of effector molecules that can be linked to clinical data for cancer metastasis. To achieve this goal, we will develop accurate approaches for simulation and subsequent analysis of protein structure and function. The research will involve molecular engineering, high-resolution cellular imaging as well as the use of distributed computing and molecular dynamic simulation approaches for studying conformational changes that occur in protein binding events. These studies will provide new insights into the mechanisms of Rho GTPase activity and regulation in cancer development and metastasis and may identify new possibilities for cancer therapy.

This project will enable the student to develop skills in cell culture, confocal microscopy, protein engineering and computational biology. The student will be encouraged to attend relevant conferences, participate in the University of Westminster Graduate School training programme and have the opportunity to obtain a Postgraduate Certificate in teaching and learning.

Recent publications relevant to the project


T Kiss, P Borsody, G Terstyanszky, S Winter, P Greenwell, S McEldowney, H Heindl: Large-scale virtual screening experiments on Windows Azure-based cloud resources, Concurrency and Computation, Practice and experience, DOI: 10.1002/cpe.3113, 2013

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For details of how to apply: www.westminster.ac.uk/courses/research-degrees/research-areas/life-sciences/research-studentships