

Project proposal template – Faculty studentships Summer 2014

<i>Project title</i>	Exploring mechanotransduction and bone remodelling with bioscaffold and growth factor-	<i>Director of Study</i>	Dr Dhaya Perumal
<i>Second Supervisor</i>	Dr Hossein Ashrafi	<i>School</i>	Pharmacy and Chem ▾
<i>Other members of supervisory team</i>	Professor Raid Alany, Dr Amr Elshaer	<i>Any requirements from applicant (eg degree in specific subject area)</i>	Preferably Pharmaceutics or molecular biology but not ▾

Project summary
(max 1,000 characters)

The percentage of people over 50 years of age that are affected by bone diseases is expected to double by 2020¹. This calls for newer regenerative approaches in bone repair. The bone modulating cells, osteoblast and osteoclast work together to actively remodel and maintain healthy bone. Osteoclasts resorb bone matrix, leading to a decrease in bone mass. However, events of the osteoblast differentiation process that results in bone mineralisation is not well understood. Mechanical loading has also been shown to directly influence bone modelling². The entry of calcium ions via voltage gated operated calcium channels is crucial in osteoblast mechanotransduction and remodelling³.

This study combines molecular biology, tissue culture and pharmaceutical formulation techniques and proposes to explore bone remodelling of primary rat osteoblasts in the presence of loading and growth factors. Microarray, PCR and western blot will be used to elucidate gene and protein regulation on loading. The formulation of bioscaffolds for the provision of a temporary support structure and nanoparticles for the delivery of necessary growth factors to aid osteoblast growth and differentiation will also be investigated.

References

1. Navarro et al, (2008), *J R Soc Interface* **5**, 1137-58; 2. Rubin CT et al, (1984), *J Bone Jt Surg Am.* 66, 397

3. Jorgensen et al, (2004), *Current Opinion in Biotechnology* , 15:5 ,406