Project Title: Novel materials and surface coatings to prevent thrombosis and biofouling of medical devices	**Code: CCS13**

Host School / Institute: Central Clinical School/Charles Perkins Centre	**Address:** Level 3, Charles Perkins Centre

Certificates & Clearances required: Yes *Vaccination Certificate

Information on how to obtain certificates, where necessary, will be given to successful applicants.

Primary Supervisor: Dr Anna Waterhouse

Phone: 02 8627 5648	**Email:** anna.waterhouse@sydney.edu.au

Co-Supervisor/team: The student will work in the Cardiovascular Medical Devices Group, led by Dr Anna Waterhouse (Central Clinical School and Heart Research Institute). The group has collaborators at RPAH in interventional cardiology and hematology to understand percutaneously implanted device compatibility and hemostasis management. Additionally, the group utilises state-of-the-art facilities at Sydney Nano and collaborates in the Schools of Chemistry, Physics and Biomedical Engineering**.**

Project Type: Laboratory based; Literature Review

Project Category: Cardiovascular; Technology

Skills / Attributes of a successful student: Enthusiasm, curiosity and dedication. No specific skills necessary.

Project Keywords: Medical Devices; Thrombosis; Biofouling; Biomaterials

Project Description: Medical devices such as artificial hearts, vascular stents, vascular grafts, heart valves, pacemakers, catheters and cardiopulmonary bypass circuits, can fail due to side effects from the interaction of the patients' proteins and cells with the device materials. This can cause blood clots (thrombosis) and microbe adhesion (biofouling), meaning that patients require additional blood thinning or antibiotic medication, increasing their risk for additional complications. Surface adhesion of proteins and cells is the driving factor in medical device fouling in processes such as thrombosis and pathogen adhesion in biofilm formation.

Dr Anna Waterhouse and her team are using micro- and nano-bioengineering strategies to design systems to test materials in the laboratory and understand these failure mechanisms, and design new materials and devices that are more compatible with the body. The group and collaborators are developing novel surface coatings that are super slippery to prevent protein and cellular adhesion, or specifically adhesive to preserve the native function of proteins so the device is not recognised as foreign. We utilise facilities at the Sydney Nano Institute to fabricate device mimetic systems to test surface coatings, and as part of the Australian Centre for Microscopy and Microanalysis (ACMM) at the University of Sydney, the Charles Perkins Centre houses a suite of microscopes with high resolution capabilities to visualize biomolecule-surface interactions. In this project, we aim to elucidate and compare the mechanism by which these surface coatings interact with proteins, mammalian cells and bacteria, with the goal of translating these to medical devices in the clinic to prevent their failure.