Oxford-Cambridge BHF 4 –Year Multidisciplinary DPhil: *VascularRewind*

OXFORD-based Projects for 2026 Entry

1. Tracking microbiome-derived extracellular vesicles *in vivo*: biodistribution and functional effects on vascular smooth muscle

Supervisors: Professor Daniel Anthony (Ox), Associate Professor Naveed Akbar (Ox), Others (TBC)

This project will investigate how gut microbiome-derived extracellular vesicles traffic through the body and influence vascular function. Using labelled vesicles and gnotobiotic models, we aim to uncover how microbial signals regulate smooth muscle behaviour in health and disease.

2. Relationship between tumour microenvironment and atherosclerotic cardiovascular disease

Supervisors: Professor Audrey Gérard (Ox), Professor Claudia Monaco (Ox), Others (TBC).

This project sits at the interface of cancer and cardiovascular immunology, investigating how tumour-driven immune responses reshape systemic immunity and influence vascular inflammation. By integrating approaches across disciplines, it seeks to define how immune activation is coordinated across tissues and how this balance may become disrupted. The findings will provide a foundation for next-generation approaches to disease management.

3. Tracking extracellular vesicle dynamics in human cardiovascular disease models

Supervisors: Associate Professor Naveed Akbar (Ox), Professor Nicola Smart (Ox), Dr Alessandra Granata (Cam)

This project will investigate how cardiovascular cells communicate through extracellular vesicles during stress and disease. We aim to identify early indicators of disease activity that could improve patient disease prediction and response to treatment using induced pluripotent stem cells (iPSCs).

4. Epigenetic Reprogramming of Human Bone Marrow Progenitor Cells in Diabetes

Supervisors: Professor Robin Choudhury (Ox), Professor Claudia Monaco (Ox), Professor Ziad Mallat (Cam, TBC).

This is a highly translational project examining the epigenetic re-programming and transcriptome of human bone marrow stem cells and the progeny in type 2 diabetes.

5. Integrated Omics to unravel human coronary microvascular dysfunction

Supervisors: Professor Kim Dora (Ox), Professor Weston Struwe (Ox), Other (Cam, TBC).

This project will establish the key transcriptomic and proteomic markers that underpin human coronary resistance artery dysfunction. Skills will include studies of vascular function through to analysis of datasets and target validation.

6. Endothelial cell–derived extracellular vesicle responses as biomarkers of cardiac microvascular function in human coronary disease

Supervisors: Associate Professor Naveed Akbar (Ox), Associate Professor Adam Lewandowski (Ox), Professor Paul Leeson (Ox), Professor Keith Channon (Ox), Other (Cam)

This project will investigate how endothelial-derived extracellular vesicles reflect cardiac microvascular function in patients with coronary disease. By combining invasive endothelial cell sampling with circulating biomarkers, we aim to define new tools to assess vascular dysfunction in humans.

7. Cross-ancestry rare-variant regulation of coronary artery disease through epigenetic regulatory mechanisms

Supervisors: Associate Professor Anuj Goel (Ox), Associate Professor Adam Lewandowski (Ox), Associate Professor Helle Jørgensen (Cam).

This project will investigate how rare genetic mutations influence coronary artery disease risk by altering gene regulation through epigenetic mechanisms such as DNA methylation. It integrates cross-ancestry genomic, regulatory data and experimental functional testing to identify population-specific and shared pathways linking rare variants to disease biology.

8. Therapeutic nanomaterials for vascular repair and cardiovascular intervention

Supervisors: Professor Keith Channon (Ox), Dr Tanveer Tabish (Ox), Associate Professor Helle Jørgensen (Cam).

This project will explore therapeutic nanomaterial platforms designed to improve vascular healing after cardiovascular intervention. Combining nanomaterials, vascular biology and translational vascular models, the student will investigate how local bioactive delivery strategies can reduce restenosis and improve repair.

9. Lipotoxicity in coronary artery smooth muscle

Supervisors: Associate Professor Robin Klemm (Ox), Professor Nicola Smart (Ox), Dr Ana Vujic (Cam, TBC)

This project will investigate how mitochondrial lipids control the metabolic fitness and phenotype of smooth muscle cells in vascular disease.

10. Small molecule biased GPCR modulators to tune macrophage function in vascular inflammation

Supervisors: Professor Angela Russell (Ox), Professor David Greaves (Ox), Other (Cam, TBC)

This project will use small chemicals as tools to understand the biology of G protein-coupled receptors (GPCRs) that are involved in cardio-metabolic inflammation. GPCRs of interest include GPR84 and FFAR4, but we continue to search for new candidate receptors using bioinformatics approaches.

11. Investigating mechanostimulation of an inflammatory response by ultrasound and microbubbles

Supervisors: Professor Eleanor Stride (Ox), Professor Ashok Handa (Ox), Other (Cam, TBC)

This project will investigate how the mechanical forces generated by ultrasound stimulated gas microbubbles can stimulate purinergic signalling pathways. This application has the potential to be exploited in treating vascular disorders.

12. Mechanotransduction in coronary artery disease.

Supervisors: Professor Ellie Tzima (Ox), Others (TBC)

This project will investigate how the mechanical forces due to blood flow regulate artery function and instigate endothelial inflammation and atherosclerosis. Our lab utilises bespoke fluidics models combined with in vivo models to investigate molecular mechanisms of atherosclerosis and coronary artery disease.

13. Decoding the structural and functional biology of lipoprotein (a) using mass spectrometry-based multi-omics

Supervisors: Professor *James McCullagh* (Ox), Others (TBC)

This project will combine targeted and discovery proteomics, lipidomics, and metabolomics to investigate Lp(a) biology, with particular focus on its oxidized phospholipid cargo and pathway-level metabolic signatures across clinically relevant human samples and via cellular mechanistic studies. By linking molecular composition to genetic background and disease phenotype, the study will generate a mechanistic understanding of Lp(a) biology, with the aim of identifying causal pathways of pathogenicity, new biomarkers and potential therapeutic targets for cardiovascular medicine.