

## **Changing our fundamental understanding of vascular control: Unravelling the microtubule network in the vasculature**

### **Background**

Cardiovascular disease is the single biggest killer worldwide, and it is especially prevalent in developed countries such as Denmark and the United States. Aside from deaths, vascular diseases, such as ischemic heart disease and stroke, cause countless suffering and disability, and result in billions spent each year in healthcare costs.

**The proposed work in this project will fundamentally change our understanding of vascular biology and disease by investigating the role of microtubules, the importance of which in vascular function was previously overlooked.**

The orchestration of protein movement within a cell has major implications on cell function. In excitable cells it is particularly important that proteins such as receptors, ion transporters, enzymes and other cell membrane bound molecules are correctly trafficked to their specific microdomains within the cell membrane. Vascular dysfunction is often related to the smooth muscle cells in the arterial wall becoming more contracted and less responsive to relaxant mechanisms. This transition in cell phenotype is often caused by dysregulation and miss-trafficking of proteins. It is of utmost importance that we understand fundamental vascular physiological processes that determine protein regulation and control, and how these are affected in vascular disease.

One such trafficking mechanism utilised by the cell to control the transport, proximity and signalling of proteins is that of the microtubule network. Much like a road network within the cell, the microtubules regulate the movement of proteins to microdomains and the signalling molecules within these microdomains. **Very little is known about how microtubules affect vascular smooth muscle cell contractility and nothing is known about the state of microtubules in vascular diseases.**

### **The Project**

Our aim is to unravel the complexities of the microtubule network in regulating vascular tone, for the very first time. To do this we will use live rat and human blood vessels and manipulate the microtubule network using a selection of pharmacological modulators. Ultimately, these experiments will elucidate whether microtubules could provide a novel therapeutic target in different vascular diseases, such as ischemia and hypertension.

### **The Student**

You should be enthusiastic about research! We will teach you our state-of-the-art techniques and, to begin with, direct the research. We hope your enthusiasm will enable to learn fast and quickly become more independent, thereby allowing you to take the research in a direction that interests you.

### **Contact**

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