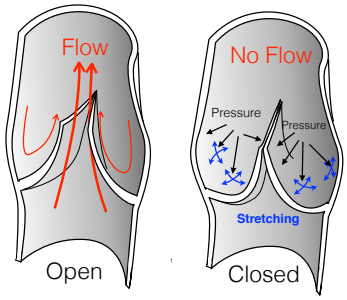
UNIVERSITÉ DE MONTPELLIER

MUSE
MONTPELLIER UNIVERSITÉ D'EXCELLENCE

PhD Position open at the University of Montpellier in the CBS
Thrombosis in Veins and the Dynamics of Their Valves

Deep vein thrombosis (DVT) is a major public health issue, currently one of the largest sources of morbidity and of mortality in the world (370 000 deaths per year in Europe). It is associated to the formation of blood clots, predominantly in the legs, leading often to potentially lethal complications such as the pulmonary embolism when the thrombus ruptures and travels up to the arteries of the lungs. While lying position immobility is a major risk factor of DVT, there are very few data to evidence the rest-associated molecular and cellular mechanisms involved at the thrombotic process onset. In fact, blood clot formation most often seems to be initiated at the level of venous valves which most veins harbor as a series of bicuspid (two-leaflet) valves, forming a 'bag' when transiently closed and operating one-way the blood flow to the heart and preventing retrograde deleterious effects. Up to now, venous thrombogenesis through hemodynamic-endothelium interactions in valve bags remains poorly explored and **the mechanisms leading to the onset of thrombus remain debated and the answer to the question, why the lying position is so favorable to the appearance of venous thrombus, is still elusive.**



This project aims to better understand:

1. Endothelial cells – blood flow interactions, especially in the valves and valve sinuses,
2. Their implications in the formation of a venous thrombus,
3. The characteristics of the valves and their functioning in post-thrombotic sequelae.

The thesis will address these issues from a variety of complementary approaches:

1. With a model of **mechanical stimulation** (stretching) of endothelial cells in vitro to test the relationship mechanical constraint – antithrombotic properties,
2. **Microfluidics** exploration if the cellular asymmetry existing between the valves leaflets opposite surfaces play a role,
3. Through an **ex vivo** analysis of blood flow in superficial veins obtained after vascular surgery, to characterize for the first time the full 4D dynamics of valves in veins.

This three-year project starting early fall is part of an interdisciplinary consortium of biophysicists, biologists, clinicians and computational physicists gathered in Montpellier (France) and dedicated to a better understand both of DVT and of the fundamental dynamics of valvular sacs. The project has been selected in a highly competitive call from the i-site MUSE (Montpellier University of Excellence).

The PhD project will be held at the Centre de Biochimie Structurale, under the supervision of Dr. Manouk Abkarian (biophysicists, expert in cell mechanics and microfluidics) and the co-supervision of Dr. Christine Benistant (Expert in cellular biology). Two visits are programmed to Bordeaux at the IECB in the team of Prof. E. Génot and in Korea in the team of Prof. P. Kim at the KAIST.

The candidate will exchange both with the team of clinicians in Nîmes lead by Prof J.F. Gris as well as the team of computational physicists from the IMAG lead by Prof. F. Nicoud in Montpellier. As a successful candidate, she/he will have either a Master in BioPhysics / Physics or Biology (Cell and Tissue Biology), Biomechanics or Biomedical Engineering, as well as if possible Experimental skills in cell biology and mechanics, with an interest in working in an interdisciplinary environment.

CV + motivation letter + letter of recommendation and contact details of at least one professor/advisor) should be sent by email to Manouk Abkarian: Manouk.Abkarian@umontpellier.fr