Master Biologie Moléculaire et Cellulaire 'BMC',
Université Paris Cité - *UFR Sciences du Vivant*

Parcours : **Biologie et Développement Cellulaires 'BDC'**
https://master2bdc.ijm.fr/
Fiche de Projet de Stage de M2, 2024-2025

Unité INSERM ou CNRS ou Université : U1163 INSERM **Intitulé Equipe : Morphogenèse du coeur** **ED d'appartenance : BioSpc** **Responsable de l'Equipe : Sigolène Meilhac**	**Responsable du Stage : Audrey Desgrange** **Contacts** Adresse : 24 Boulevard du Montparnasse, 75015 Paris Email : audrey.desgrange@institutimagine.org Tel : 0142754483

Titre du projet : Extracellular matrix asymmetry during heart morphogenesis

Résumé du Projet de Stage (en 300 mots maximum, mots clés en gras)

Organ acquisition of shape is key to achieve their specific function. Understanding the mechanisms controlling organ morphogenesis is a major challenge in developmental biology. In the context of cardiac morphogenesis, this also represents a major public health issue, since congenital heart disease affects 1% of newborns and is a major cause of perinatal mortality. During embryogenesis, the heart is initially a straight tube that loops into a helix. This looping process is the first asymmetric morphogenesis event in the embryo and positions the future cardiac chambers to establish double blood flow. How cardiac precursor cells receive and interpret the molecular and mechanical asymmetries to form the heart remains largely unknown. By performing a transcriptomic screen with a unique spatiotemporal resolution during mouse heart looping, we have uncovered asymmetric expression of extracellular matrix (ECM) components. Recent studies suggest an important role of the mechanical properties of the ECM as active factors shaping organs. However, it remains unknown how such mechanical properties influence cardiac progenitors patterning and behaviour during heart morphogenesis.

The Master research project aims to characterise the mechanical properties of cardiac precursors in relation to ECM composition during heart looping by characterizing the spatiotemporal composition of the ECM in cardiac precursor cells during heart looping. The project will be carried-out in the mouse model (micro-dissections), relying on cutting-edge techniques in quantitative 3D imaging of gene expression (wholemount RNAscope and immunofluorescence, Lightsheet microscopy) and organ shape (Image analysis with Fiji and Imaris), which are already developed in the laboratory.

This work is expected to provide novel insight into the role of biomechanics during asymmetric organogenesis and is relevant to the pathological mechanisms of congenital heart disease.

Key words : Heart morphogenesis, extracellular matrix, biomechanics, 3D imaging

Publications de l'équipe relatives au projet de stage (max 5)

Le Garrec et al, eLife 2017
Desgrange et al., Development 2018
Desgrange et al, Dev Cell 2020
Bernheim et al., Dev Cell 2023
Bønnelykke et al., BioRxiv 2024