



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

Parcours : **Biologie et Développement Cellulaires 'BDC'**

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Fiche de Projet de Stage de M2, 2024-2025

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**Titre du projet : Actin dynamics in cell shape remodelling during tracheal system morphogenesis in *Drosophila***

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

Epithelium remodelling is an essential mechanism for organogenesis during which cells change shape and positions while maintaining contact with each other. Similar mechanisms are used again during solid tumour invasion. **Adherens junctions (AJs)** mediate stable cohesion between cells but must be actively reorganised to allow morphogenesis. An essential component of AJ is the transmembrane protein E-Cadherin (E-Cad). Through its intracellular domain, E-Cad is associated in part with cytoskeletal elements of the **acto-myosin** and the **microtubule (MT) networks**. Both networks are highly dynamic and crucial for cell migration, cell deformation, cell adhesion and molecular transport.

To further uncover fundamental processes essential during **collective cell migration**, we study the formation of the respiratory or so called tracheal system in the *drosophila* embryo. The tracheal network is an excellent model system to explore, *in vivo* in a whole organism, cellular junction remodelling during **organ formation in 3D**.

We now focus on the actin network and will address the followings points:

1. We have revealed a differential distribution and dynamics of the actin cytoskeleton at AJs during tracheal cell remodelling. We will **characterise the distribution of the linear or branched actin networks**. We will investigate the distribution of different actin regulators and test their functional importance *in vivo*. Finally, using a candidate gene approach, we will identify partners that regulate the association of the actin network with AJs.

2. We will determine the **actin functional requirement** during tracheal cell migration. To approach this question, we have established new tools to depolymerise the actin network *in vivo*. We will evaluate their effect on tracheal morphogenesis. Genetic experiments, optogenetic tools, cell imaging (conventional and high-resolution confocal microscopy) and quantitative image analysis will then be carried out to determine the importance of the actin cytoskeleton *in vivo*.

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

Microtubule-dependent apical restriction of recycling endosomes sustains adherens junctions during morphogenesis of the *Drosophila* tracheal system. Le Droguen PM, Claret S, Guichet A, **Brodu V**. Development. (2015)

A developmentally regulated two-step process generates a non-centrosomal microtubule network. **Brodu V**, Baffet A, Le Droguen PM, Casanova J, Guichet A. Developmental Cell . (2010)