Abstract

My thesis is focused on the role of integrin-linked kinase (ILK) during the morphogenetic process of egg chamber elongation in *Drosophila*. In order to study primarily the role of ILK and secondary the role of Parvin, as cental components of integrin adhesome we followed the following methodology: a) create ILK deficiency conditions in egg chambers either through genetic ablation of *Ilk* gene with the FRT/FLP or GAL4/UAS-FLP systems either through ILK knockdown by RNA interference, b) create Parvin deficiency conditions in egg chambers through the FRT/FLP system. The techniques we used were mostly a) immunofluorescent assays or b) live imaging techniques of egg chambers during rotation or during actomyosin oscillations in order to create and analyze timelapse series.

Firstly, I analyzed the expression levels of β_{PS} integrin, ILK, Parvin, PINCH and Talin in follicle epithelial cells during oogenesis. The expression levels of these processes are increased as the egg chamber develops and they are localized at the terminals of actin stress fibers. Only β_{PS} is localized not only at the terminals of actin stress fibers but it is distributed all around the plasma membrane. Then, I examined if ILK is implicated in the process of egg chamber rotation. The analysis of rotation velocity showed that ILK is not required for egg chamber rotation, as the egg chambers where ILK knockdown was induced rotated with similar velocity to the wild type egg chambers.

However, ILK is implicated in the morphogenetic process of actomyosin oscillations. The analysis showed that non-muscle myosin II and actin oscillated faster and with decreased intensity in in absence of ILK. Moreover, *Ilk-/-* cells showed increased levels of phosphorylated non-muscle myosin II. At the same time, the plasma membrane periphery in *Ilk-/-* cells is smaller and displays increased fluctuations. Thus, we concluded that ILK acts as regulator of the contractility state of follicle epithelial cells.

Also, in absence of ILK actin organization is completely abolished Similar phenotypes for actin were observed in mosaic egg chambers for *Parvin* too.

Besides actin's organization, the organization of plasma membrane in the basal side of follicle cells is also affected. In egg chambers genetic mosaics for *Ilk* and *Parvin* the plasma membrane and the β_{PS}-GFP has expanded width. Laminin also displays a broader

distribution around the plasma membrane. The plasma membrane also generated lamellipodia towards random directions and performed fast and wavy movements. The defects in β_{PS} organization and the unusual movements of plasma membrane led to the analysis of β_{PS}-GFP mobility by FRAP assays in egg chambers genetic mosaics for *Ilk* and *Parvin*. Although, we expected increased mobility in β_{PS}-GFP we obtained the opposite result since the mobile fraction of β_{PS}-GFP is decreased. The above results indicate that ILK and Parvin cooperate with integrins and they regulate their organization and their mobility in plasma membrane.

Finally, ILK plays a key role in collective cell movement. In the middle to the later oogenesis stages follicle cells migrate towards the anterior site of the egg chamber. In egg chambers genetic mosaics for *Ilk* in *Ilk-/-* cells these migratory movements take place with fast and random movements of plasma membrane and of lamellipodia. The measurement of migration velocity showed that *Ilk-/-* cells, despite their random movement, migrate faster than wild type cells. It is the first time such an observation is reported and sets the foundations for a new round of experiments.