Subcellular Processes in Plants and Animal Cells

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Ultrastructural analysis of *Drosophila* nephrocytes by transmission electron microscopy

F. Hochapfel[1], M. Krahn[1]

[1]University of Regensburg, Molecular and Cellular Anatomy, Regensburg, Germany

florian.hochapfel@vkl.uni-regensburg.de
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Drosophila nephrocytes are podocyte-like epithelial cells which exhibit a complex network of labyrinthine channels in the cell periphery, which are covered by filtration slit diaphragms. They are located inside the fly body cavity anterior to the protoventriculus and alongside the dorsal heart, respectively. Their main function is the filtration of the haemolymph, thereby taking up toxins and wastes into the channel system in a size- and charge-selective manner, followed by endocytosis and storage [1].

In our study we describe the ultrastructure of the *Drosophila* nephrocytes in more detail using transmission electron microscopy. In order to investigate the subcellular localization of certain polarity regulators, we apply photoconversion using proteins tagged with MiniSog.

Furthermore, we aim to elucidate the role of several known polarity regulators in the formation and function of this cell type. Here, we have already found that a null-mutation (Δ1) of the cell polarity protein *PATJ* (Pals1-associated tight junction protein) severely impairs the development of both filtration slits and channel networks. In L3 larvae, the overall number of diaphragms is reduced and the distinct transition between the channel layer and the intracellular area is lost.

From these experiments, we hope to obtain insights into the mechanisms that regulate the formation and function of *Drosophila* nephrocytes, which might also be conserved in mammals, thereby qualifying nephrocytes as a model for mammalian podocytes and kidney function.

1. Weavers, H., Prieto-Sanchez, S., Grawe, F., Garcia-Lopez, A., Artero, R., Wilsch-Brauninger, M., Ruiz-Gomez, M., Skaer, H. and Denholm, B. (2009). The insect nephrocyte is a podocyte-like cell with a filtration slit diaphragm. Nature 457, 322-326.
2. We kindly acknowledge the help of the organizers of MC 2013 with the online submission procedure.

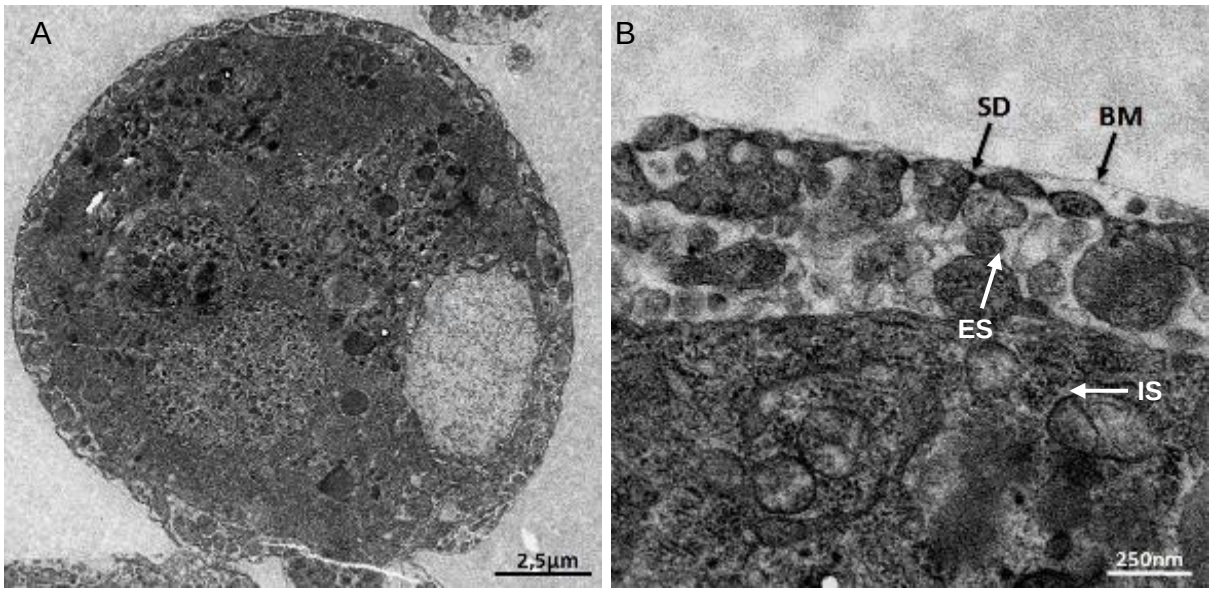

Figure 1. Wild-type organisation of nephrocyte ultrastucture. (A-B) TEM of the cortical region of nephrocytes from *sns-stinger* third-instar larva. (A) Cortical channel system made up of foot processes and extra-cellular space is apparent and distinct from the intracellular areas. (B) Slit diaphragms present throughout outer surface. Clear distinction between extra- and intracellular space. BM, basement membrane. ES, extracellular space. IS, intracellular space. SD, slit diaphragm.

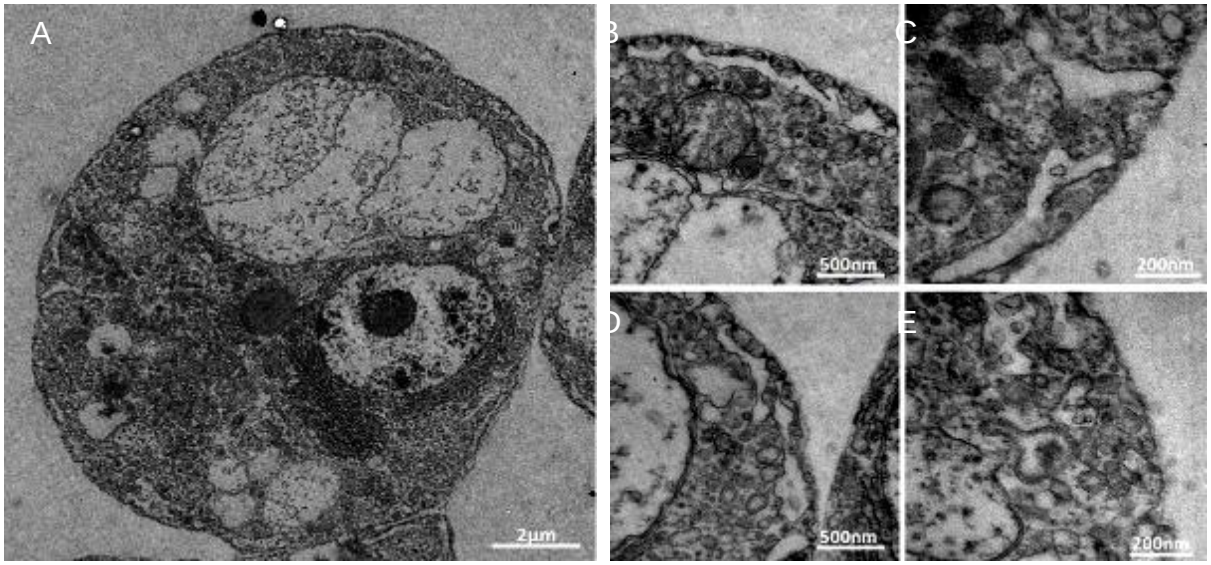

Figure 2. *PATJ* null-mutation leads to strong reduction of cortical channel layer and reduced number of slit diaphragms. (A-E) TEM of the cortical region of nephrocytes from *PATJ*$^{\Delta 1}$ third-instar larvae. (A) Cortical channel system shows reduced complexity. (B-E) Reduction or loss of slit diaphragms correlates with reduction of cortex complexity and loss of foot processes. (E) Slit diaphragms are almost completely lost.