BDR SEMINAR (Yokohama & Virtual)

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Wednesday, February 14, 2024

15:00-16:00

Koryu-to Hall, Main Office Bldg., Yokohama & Broadcast online via Zoom

Zoom meeting URL will be announced on the event day by e-mail.

※This seminar is open only to BDR members.

Cryo-electron tomography revealed the importance of the nuclear pore scaffold for nuclear envelope integrity

Summary

Nuclear pore complexes (NPCs) constitute giant channels within the nuclear envelope and mediate nucleocytoplasmic exchange. NPCs are known to dilate and constrict within cells in response to nuclear envelope tension, but how NPC scaffold architectures impact such conformational plasticity remains unstudied. Intriguingly, Nup133, one of the core components of the NPC scaffold, is dispensable in mouse embryonic stem cells but is required for their neural differentiation. To understand the mechanisms underlying this differentiation-specific phenotype, we used cryo-electron tomography and analyzed the NPC architectures in mouse embryonic stem cells and in differentiated neural progenitors. Assessing the wild-type cells, we revealed that NPCs dilate during differentiation into neural progenitors. In Nup133-deficient cells, NPCs however fail to dilate. By analyzing the architectures of individual NPCs using template matching, we found that the Nup133-deficient NPCs are structurally heterogeneous and often exhibit incomplete architectures. We further showed that the Nup133-deficient NPCs more frequently disintegrate, leading to the formation of large openings in the nuclear envelope. Moreover, these disintegrated NPCs increase in number and become widened in the neural progenitors. We thus propose that an intact NPC architecture protects the openings in the nuclear envelope from excess expansion and thereby mechanically safeguards the nuclear envelope integrity.

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