IMEG Seminar Series

The road to global science

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February 29th, 2024, 9:00-10:00

Pioneer and PRDM transcription factors coordinate bivalent epigenetic states to safeguard cell fate

This seminar series is open to all students and researchers in Kumamoto University.
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Pioneer transcription factors (TFs) regulate cell fate by establishing transcriptionally primed and active states. However, cell fate control requires the coordination of both lineage-specific gene activation and repression of alternative lineage programs, a process that is poorly understood. Here, we demonstrate that the pioneer TF FOXA coordinates with PRDM1 TF to recruit Nucleosome Remodeling and Deacetylation (NuRD) complexes and Polycomb Repressive Complexes (PRC), which establish highly occupied, accessible nucleosome conformation with bivalent epigenetic states, thereby prevent precocious and alternative-lineage gene expression during human endoderm differentiation. Similarly, the pioneer TF OCT4 coordinates with PRDM14 to form bivalent enhancers and repress cell differentiation programs in human pluripotent stem cells, suggesting that this may be a common and critical function of pioneer TFs. We propose that pioneer and PRDM TFs coordinate to safeguard cell fate through epigenetic repression mechanisms.

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