Journal Club Abstract
Research Center for Mathematics on Chromatin Live Dynamics (RCMCD)

Bacterial Chromosome Organization and Dynamics during Cell Cycle

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In this JC, I focus on studies for bacterial chromosome organization and dynamics. Bacterial chromosomes(nucleoids) appear simpler than eukaryotic ones, but actually their conformation is optimized evolutionally and therefore elaborately organized in order to carry genetic information to daughter cells robustly [1]. Some bacterial species have been suggested to have chromosome-segregation machineries like eukaryotic organisms [2]. On the other hand, in *Escherichia coli*, one of the bacterial model organisms, the machineries remain still unknown. Recent studies proposed a new model that entropic forces generated by the confinement within the cylindrical cell could be sufficient to segregate daughter chromosomes without active processes by molecular mechanisms [3], nevertheless, what mechanisms drive *E. coli* chromosome segregation remains controversial. In the paper by Fisher *et al.*, "*Four-Dimensional Imaging of E. coli Nucleoid Organization and Dynamics in Living Cells*", *Cell*, **153**:882-895, 2013 [4], they examined *E. coli* nucleoid morphology and its dynamics during cell cycle progression in a growth condition, and discussed its complex dynamics through nucleoid stress cycles, possibly driven by DNA-tethering factors. In this JC, I review [4] and other studies for bacterial chromosomes, and finally I discuss possible mechanisms for these phenomena.

References:

[1] Wang X, Llopis PM, Rudner DZ, Organization and Segregation of Bacterial Chromosomes, *Nat. Rev. Genet.* **14**:191-203, 2013.

[2] Ptacin JL, …, Shapiro L, A Spindle-like Apparatus Guides Bacterial Chromosome Segregation, *Nat. Cell Biol.* **12**:791-798, 2010.

[3] Jun S, Wright A, Entropy as the Driver of Chromosome Segregation, *Nat. Rev. Microbiol.* **8**:600-607, 2010.

[4] Fisher JK, …, Kleckner N, Four-Dimensional Imaging of *E. coli* Nucleoid Organization and Dynamics in Living Cells, *Cell*, **153**:882-895, 2013.
