COHESIN AND CHROMATIN 3D STRUCTURE

Importance of 3D architecture of chromatin for genome function is now widely recognized. Chromatin organization relies on small loop domains, either active or inactive, and is delimited by the zinc finger CTCF anchor and cohesins. However, the way by which cohesins generate DNA loops has remained elusive up to now. Cohesins are multiprotein complexes which belong to the family of Structural Maintenance of Chromosomes (SMC), as do Condensins. Condensins have been shown to form DNA loops by extrusion during mitosis, through their motor activity: the authors of this paper (appeared in Science) sought to investigate whether cohesins could act in a similar way using an assay designed to visualize looping on DNA molecules tethered to a glass slide.

The authors show that cohesins do have an extrusion activity which depends on ATP hydrolysis and needs the presence of two partner proteins, NIPBL and MAU2. Furthermore, the authors shed a first light on a long-debated issue regarding the topology of DNA – cohesin interaction during the extrusion process. According to the results obtained with engineered cohesins, in which all the proteins of the complex are cross-linked together avoiding opening of the cohesion ring, the authors suggest a model where cohesins extrude DNA without entrapping chromatin inside the ring.