

Visualizing Chromatin Compaction as Stem Cells Become Neurons

Scientific Achievement

Chromatin compaction was quantified as human stem cells differentiated into motor neurons. Compaction increased from pluripotent to neural stem cells and was greatest in motor neurons, consistent with genome-wide contact changes observed in Hi-C experiments.

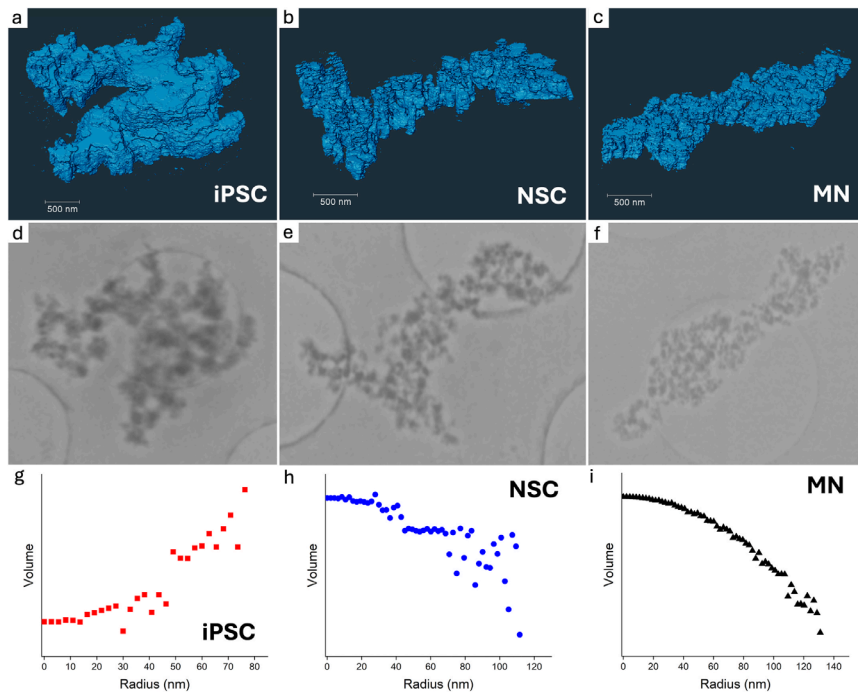


Figure. Cryo-EM and cryo-ET images from chromatin extracted from iPSC, NSC, and MN cells, along with the radial volume distribution of chromatin, which is a measure of compaction.

Significance and Impact

Chromatin organization regulates gene accessibility and helps establish cell identity. Integrating structural imaging with genomic contact maps links chromatin reorganization to cellular differentiation.

Research Details

- Compared chromatin in pluripotent stem cells, neural stem cells, and motor neurons.
- Refined extraction and vitrification to limit artificial compaction and sample loss.
- Used cryo-electron tomography and AI segmentation to reconstruct and quantify 3D chromatin density.
- Compared structural changes with Hi-C contact frequencies and genome compartment organization.

Watt, J.; Roth, C.; Huber, I.; Hall, A. S.; Singh, M. K.; Micheva-Viteva, S.; Sanbonmatsu, K. Y.; Starkenburg, S. R.; Steadman, C. R., AI-assisted Cryo-ET workflow for 3D visualization of chromatin during cellular differentiation. *Biochemistry and Biophysics Reports* **2026**, 48, 102789.