Dynamics of splicing factor compartments during mitosis

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The nucleus is compartmentalized into specific protein-rich domains such as splicing factor speckles or compartments (SFCs), Cajal bodies and nucleoli. SFCs are storage and recruitment sites for splicing factors. In mammalian cells, SFCs are associated with the nucleoskeletal protein lamin A in domains termed lamin speckles and this interaction helps in the spatial coordination of transcription and splicing. SFCs and lamin speckles disassemble and reassemble during mitosis but the mechanisms involved have not been elucidated.

We have investigated the localization of an essential splicing factor, SC-35 as well as lamin A during mitosis using nuclear markers. These proteins were dispersed during metaphase and reassembled during the anaphase to telophase transition. Using emerin as a nuclear envelope marker, SFCs were observed outside the nascent envelope during telophase, before formation of nucleoli, and migrated into the nucleus during cytokinesis. Since mitotic kinases play an essential role in the disassembly of nuclear components, a possible role for cyclin-dependent kinase 1 (CDK1) in the dispersal of SFCs during metaphase was examined. Inhibition of CDK1 during mitosis led to a block in disassembly of SFCs during metaphase, and these speckles became enlarged in interphase nuclei. Enforced expression of CDK1 during interphase caused dispersal of SFCs. Therefore, CDK1 activity appears to be required for the dynamics of SFCs during mitosis. We have also studied the dynamics of GFP-SC-35 by FRAP (fluorescence recovery after photobleaching) experiments in live HeLa cells. By analysis of diffusion coefficients, we concluded that the SC-35 speckles that remained intact during metaphase showed the same kind of dynamics as interphase speckles. Hence first time we are showing that the mechanisms governing disassembly of SFCs during mitosis involve CDK1 activity.

![Image of GFP-SC35 and emerin during different stages of mitosis](image)

Figure 1: Localization of GFP-SC35 and emerin during different stages of mitosis (emerin in red)