

Students' Annual Webinar

Investigating the structural and functional reorganization of the nucleolus in response to rDNA damage

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The nucleolus, a phase-separated sub-organelle within the eukaryotic cell nucleus, is emerging as an important sensor for cellular stress. Nucleolus is the major site of ribosome biogenesis, and damage to the ribosomal DNA (rDNA) affects the translational status of the cell immediately. Additional challenges have to be overcome in repairing rDNA encoded and enclosed within the nucleolar domain because of its phase separated organization. Double strand breaks (DSBs) caused within the nucleolus thus elicit a unique response involving reorganization of both DNA damage response proteins, and nucleolar factors, but the dynamics and the purpose of such reorganization remain elusive. We aim to address how DSBs in rDNA affect the architecture and functional organization of the nucleolus using laser-induced strand-breaks. Localized laser irradiation within the nucleolus led to its expansion, and differential localization of the nucleolar compartment protein Nucleolin and the repair factor Parp1. Nucleolar expansion is found to be ATP-dependent and may be regulated by motor proteins and chromatin remodelers. Using tools of expansion microscopy in the context of nucleolar DSBs can provide insight into structural reorganization of the compartment in response to DSBs, and I will also describe our preliminary efforts to this end. Further, probing the partitioning of nucleolar proteins under conditions of damage may provide insight into reorganization of nucleolar function in response to strand breaks in rDNA.

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4:00 PM