

GS02-8 **Transcription and Splicing Could Be Regulated by Liquid-Liquid Phase Separation**

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Liquid-liquid phase separation (LLPS), a phenomenon in which liquid-like non-membrane droplets mainly composed of RNAs and proteins form, has recently attracted great notice in cell biology. LLPS is thought to be a fundamental regulation system of cells because it enables specific reaction to go efficiently in crowded environment inside cells. For example, P-granules, transcription factor clusters, and nuclear bodies such as nucleoli and Cajal bodies are phase separated liquid-like droplets. Here, in living human cells, we have observed that phase separated RNA polymerase II (RNAPII) clusters co-localize with Cajal bodies where splicing machinery maturation takes place. In addition, RNAPII molecules in Cajal bodies were often phosphorylated at Ser5 (Ser5P) of its C-terminal domain. An aliphatic alcohol, 1, 6-hexanediol which inhibits LLPS, disrupted the RNAPII clusters, while Cajal body structure was not affected. Finally, using our unique antibody-based phosphorylation targeting probes, we have observed that the foci containing both RNAPII and Cajal body coalesced each other, which is a typical behavior of liquid-like droplets. Currently, we are working on elucidating biological function of the present heterotypic nuclear body. Hopefully, we would like to discuss the potential of LLPS as a drug target.