National Institute of Technology Rourkela

Synopsis Seminar

Seminar Title	: AKNA as a Molecular Switch Regulates Stemness and Differentiation in Neuronal cells in an Association with Epigenetic Modifiers
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Supervisor	: Samir Kumar Patra
Venue	: LS Seminar Room
Date and Time	: 29 Jul 2025 (11:00 AM)
Abstract	: Neuronal differentiation orchestrated by different factors from structural proteins to different transcription factors (TFs). AKNA is one of them, which took attention due to its different localization, multidimensional role and its correlation with different neurodegenerative disorders. Having a large structure with DNA binding AT-hook, AKNA has the capacity to regulate the cell fate in many ways. Despite evidence of AKNA's involvement in immune and centrosomal functions, its influence on transcription during neuronal differentiation remains uncharacterized. Here, in neuroblastoma cell lines utilizing knockdown approach, immunoblotting, chromatin immunoprecipitation and coimmunoprecipitation experiments its function is elucidated. During induction of stemness and pluripotency, AKNA expression significantly upregulated which is confirmed to be essential for maintaining stemness. Pluripotency and stemness are maintained by H3K27me3 demethylase KDM6B and AKNA recruits KDM6B to activate those genes by physical interaction. Apart from its activation role, AKNA repressed many genes, which disrupts the pluripotent states of the cells. Motor protein KIF5A is one of them and explored at depth herein. KIF5A was described only as cargo transporter, but its exact potential in changing the fate of any cells was not elucidated. Herein, it is observed that KIF5A is necessary to transport the mitochondria to the growing neurite to support the energy supply. Knockdown or chemical inhibition of KIF5A leads to disruption of mitochondrial network, as a result hampers the neuronal differentiation process. Given the paucity of knowledge regarding the regulation of KIF5A, this study seeks to elucidate its transcriptional regulatory mechanisms, in the context of neuronal lineage specification. AKNA was explored to be associated with H3K4me3 demethylase KDM5A to repress KIF5A and other differentiation markers. DNA methyltransferase, DNMT1 was found to be associated in this process as well. FAK signaling orchestrates the localization of AKNA and expression of KDM5A and DNMT1. AKNA was also found to be repressing glial lineage commitment in neuronal cells. Overall, this study depicted the potential of AKNA in neuronal developmental processes.