Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Seminar

Understanding the mechanisms that govern distribution of phase separating germ granules and germline progenitor specification in Zebrafish

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The germline, the cell lineage that gives rise to sperm and eggs, is specified early during zebrafish development by ribonucleoprotein (RNP) complexes called germplasm or germ granules. During early cleavage divisions in the simple vertebrate model, zebrafish, germ granules aggregate in the distal corners of cleavage furrows and subsequently, the cells that acquire the granules become germline progenitors or primordial germ cells (PGCs). The mechanisms underlying this highly dynamic behaviour of germ granules are not known. Germ granule distribution is thought to be facilitated by the cytoskeleton and components of the cell division machinery, but a clear mechanistic understanding of the process is currently lacking.

To address this gap, we have developed tools for high resolution imaging across scales, using spinning disk confocal and lattice light sheet microscopy. We performed careful quantitative image analysis of germplasm dynamics relative to dynamic cytoskeletal reorganization in early zebrafish embryos by live imaging of reporters, and find that substantial germ granule movements commence with furrow formation during the 1st cleavage division. This contrasts with a current model which proposes that microtubules push f-actin/germ granule assemblies to form aggregates prior to the 1st cell division. Finally, using zebrafish mutants affecting the RNA-binding protein Ybx1 (Y-box binding-protein 1), we show that the timing and dynamics of germ granule accumulation in the blastoderm is a crucial factor for appropriate later distribution to PGCs. Germplasm accumulation in the cleavage furrows is reduced and ectopic aggregates form at the blastoderm margin of maternal *Ybx1* mutant embryos. Our work establishes Ybx1 as a novel factor that functions in germplasm distribution, and suggests that additional driving forces are required for normal germplasm dynamics.

Monday, Apr 24th 2023

11:30 AM (Tea / Coffee 10.45 AM)

Auditorium, TIFR-H