Analysis of changes in cell mass on cell cycle progression and interaction between the ORC associated protein (ORCA) and its interacting partners at a single molecule level

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Key Research Aims and Goals

• To study the dynamics of cell mass increase during different cell cycle stages and during senescence and quiescence
• To understand the role of interactions ORCA with other players involved in cell cycle

Research Highlights and Results

• The laboratory of Prof. Rashid Bashir has developed the MEMS resonant mass sensor instrument that has the unique ability to conduct direct and high-throughput accurate cell mass measurements (Park et al., 2010). They have demonstrated that by utilizing resonant mass sensors they can achieve very precise measurements of cell mass. This technology has the potential to provide important insights into the cell growth and dynamics of normal diploid human cells and compare how cancerous cells are different in their cell cycle dynamics.

• Single-molecule pull-down (SiM Pull) technique developed by the laboratory of Prof. Taekjip Ha (Jain et al, 2011) to study the dynamics of ORCA and its interactions with key components of cellular regulation at a single molecule level. This technique will provide a robust platform to visualize and measure dynamics of complexes in an environment mimicking in vivo conditions thereby lending more credence to observations we make.

Future Research Plans

• Make various stable cell lines expressing cell cycle specific markers to use for measuring cell mass at different cell cycle stages (like YFP PCNA as a marker for stages of S phase – refer figure )
• Use MEMS resonant mass sensor instrument to analyze cells at various stages of cell cycle
• Use SiM Pull technique to study the dynamics of ORCA and its interactions with key components of cellular regulation at a single molecule level

References

• Shen et al., 2010. Molecular Cell. 40: 99-111