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Mitochondria-nuclear crosstalk in cancer

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Mitochondria, the powerhouse of mammalian cells, vary in their number and function in different cell types with different energy demands. Mitochondria are semiautonomous organelles within cells that play an important role in cellular energy metabolism, free radical generation, and apoptosis. Mitochondria contain their own genome (mtDNA), which encodes a number of proteins critical for energy metabolism, particularly in oxidative phosphorylation. So far, only limited studies (mostly focused on specific mtDNA mutations) analyzed the significance of mitochondria in cancer progression. However, it is not clear how proteins involved in inter-genomic cross talk are involved in tumorigenesis. Transmitochondrial cybrids (cybrids) are a great utility for the study of the functional effects of mitochondria in a defined nuclear background. Extensive crosstalk between the mitochondria and the nucleus known as mitochondrial retrograde regulation (MRR) also influences many cellular and organismal activities, including cancer development and progression. MRR is triggered by mitochondrial dysfunction and it responds in a continuous manner to the changing metabolic needs of the cell. Our in vitro and in vivo tumorigenic studies using cybrid systems and different cancer cell models suggest that mitochondrial retrograde signaling is playing important roles in oncogenic transformation. Thus, understanding MRR and mitochondria mediated oncogenic signature is critical in understanding the currently limited known etiology and treatment resistance of certain cancers like the triple negative breast cancer.

Biography

Benny Abraham Kaiparettu is an Assistant Professor in the Department of Molecular and Human Genetics at Baylor College of Medicine, Houston, USA. His lab focuses on the mitochondria-nuclear cross talk in tumor progression, nanoparticle based bioimaging and three-dimensional cellular models. He has published one of the pioneering studies that proposed the role of breast cancer stem cells in distant metastasis. His interesting article showed the utility of eggwhite as an economically viable alternative for three-dimensional cell culture. He has received several awards and serving as Editorial Board Member of different research publications.

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