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Indraneel Mittra
Tata Memorial Centre, India

Biology of cell-free nucleic acids and its role in initiation and metastasis of cancer

Several hundred billion to a trillion cells die in the adult human body daily and a considerable amount of fragmented cell-free nucleic acids (cfNAs) from dying cells are released into the circulation. Our research has shown that circulating cfNAs can freely enter into healthy cells, accumulate in their nuclei, trigger a DNA damage repair response (DDR) and integrate into host cell genomes by a unique mechanism. Similarly, at the tissue level, locally generated cfNAs from dead cells can be taken-up by healthy bystander cells to induce DDR that facilitates their integration into recipient cell genomes. Genomic integration of cfNAs leads to dsDNA breaks, inflammation, chromosomal instability, senescence and apoptosis of recipient cells. cfNAs from cancerous cells can cause oncogenic transformation of NIH3T3 cells which are tumourigenic in immune-deficient mice. These findings raise a new hypothesis of cancer metastasis which posits that metastasis arises from de novo oncogenic transformation of cells of target organs induced by cfNAs arising from apoptotic circulating tumor cells (CTCs). This hypothesis challenges the current dogma that metastasis are produced by growth of CTCs that are lodged in distant organs.

Biography

Indraneel Mittra has obtained his Medical degree from University of Delhi and is a Fellow of the Royal College of Surgeons of England and holds a PhD degree from University of London. He did his Post-doctoral training with Dr. Renato Dulbecco, Nobel Laureate, at the Imperial Cancer Research Laboratories in London. He is a Breast Cancer Surgeon while at the same time being deeply involved in public health and basic research in cancer. His current research interests lie in the area of biology of extracellular nucleic acids and their role in ageing, inflammation, degenerative disorders and initiation and metastasis of cancer.

indraneel.mittra@gmail.com

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