REGIONAL CENTRE FOR BIOTECHNOLOGY
Seminar series

Role of Oxygen and Flower Code in Cancer and Cardiovascular Diseases

Rajan Gogna, PhD
Ohio State University, USA

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Seminar Room

The modern science is struggling to find successful interface of basic research and its application in disease models. There is a great need to identify cellular basis of disease development, and to delineate common models which could be effective in treatment of various non-communicable forms of diseases. This lecture focuses on identification of two common factors "Oxygen" and "Cell-Competition" responsible for cancer and cardio-vascular disease development at the physiological, cellular and molecular level. "Oxygen" or the lack of it, hypoxia, is known to be involved in cancer progression and myocardial infarction. Here we show that oxygen has the ability to determine protein-folding and DNA-binding ability of p53 tumor suppressor and is thus involved in the generation of functional p53 mutants, which carry the wild-type genome but are transcriptionally non-functional. Re-oxygenation or chaperone-mediated restoration of hypoxia-induced p53 functional mutants in tumor xenografts induces above 93% tumor regression in 84% tumor types. In cardiac disease model, oxygen regulates the affinity of p53 towards its response elements (RE) in the genome by controlling p53 post-translational modification patterns. p53 from infarct and oxygenated hearts show differential DNA-binding ability towards its RE in cardio-protective (NOS3) and apoptotic (BAX) genes. Oxygenation induces a pro-survival p53 form which is phosphorylated and acetylated at the N/C-terminus, but not at the DNA-binding domain. "Cell-Competition" is a type of short-range cell–cell interaction, where one of the cells disappears from the tissue (the loser), whereas the other (the winner) not only survives but also proliferates to fill the space left by the disappearing cells. We present molecular and *in-vivo* data in support of the hypothesis which establishes "Cell-Competition" via flower-code as cellular basis of development of pre-infarct and pre-cancerous fields which are later fueled by "Oxygen" into development of disease models.