

# Non-coding RNA, Gene Polymorphisms and RNA interference role in Human disease

## Overview

Noncoding RNAs are RNA molecules that function without being translated into proteins; examples include tRNA, ribozyme, microRNA (miRNA), long noncoding RNA (lncRNA), guide RNA (gRNA) as well as noncoding parts of mRNAs. Over last two decades, numerous studies have documented the potent pro- and anti-tumorigenic functions of miRNAs and other noncoding RNAs. Yet the vast noncoding landscape of the human genome in cancer remains largely uncharted. The involvement of miRNAs in the regulation of cell cycle, proliferation, differentiation, cell transformation, and cancer progression has opened new fields of research aimed to better elucidate their mechanisms of action in cancer and cardiovascular diseases. gRNA-mediated CRISPR-Cas9 gene-editing technology has empowered cancer biologists to investigate genes and genetic mutations in cancer. Systemic delivery of miRNAs and other noncoding RNAs as anti-cancer approaches in preclinical models using liposomes, viral vectors, and nanoparticles has been attempted. Noncoding RNAs play pivotal roles in the regulation of pathways involved in tumor development, progression, and immunotherapy and obstacles will be overcome before RNA-based diagnostics and therapeutics become clinically viable.

RNA interference can be used to knockdown the expression or defective protein expression at genetic level, it also use to knockdown excessive expression of a particular gene in disease condition. RNAi approach is a very promising approach for future therapy with fewer side effects and more specific as comparison to the existing one. RNA interference (RNAi) is gaining increasing popularity both as a molecular biology tool and as a potential therapeutic agent. For therapeutics use RNAi has advantages over other therapies including specificity at the gene level, potency, small molecular size and activity at the nanomolar or picomolar concentration range. In a number of studies have shown that lung diseases can be treated using RNA interference (RNAi) approach via inhalation route. RNA interference combination with nanotechnology shows a promising approach for the effective treatments of lungs and other diseases. Recently, aerosol delivery of Akt1-targeting siRNA into mice with urethane induced lung cancer twice weekly for 4 weeks led to down-regulation of Akt related signals and inhibited the progression of tumors in the lung cancer model of K-rasLA1 mice. Targeted nanoparticles therapy reduced toxicity and increases effectiveness of therapy by increasing deposition at the site in in-vivo. We will be also discussing genetic polymorphism, genotoxicity and its role to cancer progression. Hands and training would be demonstrated to the participants on basic molecular biology techniques

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| <b>Course</b>                         | <b>January 10<sup>th</sup> 2016 to January 19<sup>th</sup> 2017</b>   |
| <b>Host Institute</b>                 | <b>University of Allahabad, Allahabad-211002</b>  |
| <b>Maximum Number of Participants</b> | <b>20</b>   |
| <b>You Should Attend If...</b>        | <ul style="list-style-type: none"> <li>▪ Master students, Ph.D. students, Research Scholars, Faculty member and Industrial person. Specialization in Botany, Zoology, Chemistry, Biochemistry, Biotechnology, Molecular Biology, Nano technology, Microbiology and Environmental Biology</li> </ul>   |
| <b>Fees</b>                           | <p>The participation fees (excluding lodging and boarding) for taking this course is as follows:</p> <p><b>Faculty/Scientists/Industry Personnel from abroad : US \$200</b><br/> <b>Student participants from abroad : US \$100</b><br/> <b>Persons working in Industry/ Consultancy Firms: Rs. 8,000/-</b><br/> <b>Faculty (Internal &amp; External)/ Scientists from Research Organizations: Rs. 4,000/-</b><br/> <b>Students: Rs. 1,000/- (without grading) and Rs. 2,000 (with grading)</b></p> <p>The above fee includes all instructional materials, computer use for tutorials and assignments, and session refreshments. The participants will be provided with accommodation on payment basis.</p> |

## The Faculty



**Prof. Yong Li** is a Staff at the Department of Cancer Biology, Cleveland Clinic and a Professor at Cleveland Clinic Lerner College of Medicine of Case Western Reserve University. Dr Li obtained a PhD degree from Shanghai Institute of Biochemistry and Cell Biology, Chinese Academy of Sciences, and did his postdoctoral research with a Nobel Laureate Dr Sidney Altman at Yale University; he started his independent research at University of Louisville. Dr Li's academic career has focused on the biological and pathological functions of noncoding RNAs, which are RNA molecules that function without being translated into proteins. Supported by five federal grants, he employs molecular cell biology, mouse models, and human specimens to define the precise noncoding molecular events that are responsible for cancer initiation, cancer progression, and cancer susceptibility. He has published more than 70 articles, about half of them during the past four years. Dr Li has trained numerous pre-doctoral and post-doctoral biomedical researchers and served as the advisor to five PhD graduate students. A testament to his training record is that five of eight postdoctoral trainees have found independent faculty/staff positions. Dr Li has served on multiple national and international grant review panels of federal and private funding agencies, including the NIH, NSF, NASA, DOD, and American Heart Association, Canada Foundation for Innovation, National Natural Science Foundation of China, Wellcome Trust Fund, and Wellcome Trust Fund-DBT India Alliance.



**Dr. Munish Kumar** is currently Assistant Professor at the Department of Biochemistry, University of Allahabad. Dr. Kumar was a Postdoctoral fellow at University of Louisville 2007-2010. He has a Master degree in Biochemistry from Dr. R M Awadh University and PhD in Biochemistry from University of Lucknow. He also worked at the Department of Biotechnology, Assam University for three and half years before joining University of Allahabad. He has been working at Biochemistry for the past 3 years. He is interested in understanding genetic polymorphism, genotoxicity, Cancer biology, and genomics. Dr. kumar has published more 25 articles in high repute journals and have citations of more than 1200. He was been awarded Yong Scientist award from DST and also selected for Raman Postdoctoral fellowship. Dr. Kumar received 3 grants from DBT, DST and UGC. He is member of several societies and editor of several journals.



**Dr. Awadh Bihari Yadav** is currently Assistant Professor at the Centre of Biotechnology (CBT), University of Allahabad. Dr. Yadav was a Postdoctoral Researcher at the Royal College of Surgeons in Ireland (RCSI) from 2009-2011. He has a Master degree in Biochemistry from CSJM University Kanpur and PhD in Targeted drug delivery from JNU, CDRI campus Lucknow. He also worked at the Imperial Life Sciences in Gurgaon for one year before joining to the University of Allahabad. He has been working at CBT for the past two and a half years. His area of interest is targeted delivery of vaccine, therapeutics proteins, siRNA/shRNA and drugs using different nanocarriers. He was been awarded Yong Scientist award from DST. Dr. Yadav received 3 grants from DBT, DST and UGC. Dr. Yadav has published 15 papers in international peer reviewed journal. He is also the Associate Proctor and Coordinator of Carrier counselling and placement cells of center of biotechnology in University of Allahabad.

## Course Co-ordinators

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<http://www.gion.ilkgp.ac.in>

## Course Outline

*Lecture 1: microRNA biogenesis*

*Lecture 2: non-coding RNA Early history*

*Lecture 3: RNA world*

*Lecture 4: MicroRNA and its role in Cancer*

*Lecture 5: Non-coding role in translational research*

*Lecture 6 and 7: non-coding RNA in cardiovascular disorders*

*Lecture 8 and 9: Genetic polymorphism and microRNA*

*Lecture 10: SNP and Cancer*

*Lecture 11: RNA interference and lungs diseases*

*Lecture 12: Genotoxicity and Cancer*

*Lecture 13: Targeted delivery of siRNA using nanotechnology approaches*

*Lecture 14: RNA interference promises for future cure*

*Lecture 15: RNA interference as a tool for research*

*Lecture 16: Long noncoding RNAs (lncRNA)*

*Lecture 17: Noncoding RNAs in the p53 Cancer Pathway*

*Lecture 18: Gene Editing: from ZFN to CRISPR*

*Lecture 19: Chimeric Antigen Receptor (CAR) T-Cell Therapy*