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The microRNA-drug resistance connection: A new era of personalized medicine using noncoding RNA begins

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Referred to as the micromanagers of gene expression, microRNAs (miRNAs) are evolutionarily conserved small noncoding RNAs. Cumulative evidence now suggests that specific miRNAs and genetic variations interfering with miRNA function (miRNA polymorphisms) are involved in the prognosis and progression of a variety of diseases and can serve as biomarkers to predict drug response. Over expression or down regulation of a miRNA, and loss or gain of miRNA function due to miRNA polymorphisms can potentially affect expression of hundreds of genes and related pathways contributing to a drug resistant phenotype. Detection of prognostic-miRNAs and miRNA polymorphisms can potentially improve diagnosis, treatment and prognosis in patients and has profound implications in the fields of pharmacogenomics and personalized medicine.

Biography

Mishra is a scientist at National Cancer Institute (NCI), National Institutes of Health (NIH). He received his Ph.D. degree in Cellular and Molecular Pharmacology from Rutgers, the State University of New Jersey with the highest honors (outstanding thesis research award). Dr. Mishra received his research training in medical oncology at the Robert Wood Johnson Medical School, where his research focus was to identify novel mechanisms of drug resistance, identify mechanism of actions of new drugs, and design novel drugs/combinations to facilitate anticancer drug development. In 2008 Dr. Mishra joined the US Department of Health and Human Services, NCI, NIH, where his research focus has primarily been to identify and exploit "druggable" early genetic events, driving cancer progression, to design a more effective anticancer therapy. With a successful track record of 'bench to bed side' or 'translational research', Dr. Mishra has established himself as an internationally recognized scientist in the field of microRNA, drug resistance, cancer biology and developmental therapeutics. He has received numerous awards and honors throughout his distinguished career including NCI Director's Innovation Awards (2009 as well as 2011), Federal Technology Transfer Awards (2009, 2010, 2011 as well as 2012), NIH FARE Awards for Research Excellence (2010 as well as 2012), Gallo Awards for Outstanding Cancer Research (2005 as well as 2007), Young Investigator Awards (2004, 2005 as well as 2006) and New Jersey Cancer Research Award for Scientific Excellence (2007). He is a member of many professional societies, is on the editorial board of several journals and serves as referee of a number of high impact journals. During the course of his career, he discovered a new role for microRNA in drug resistance and pharmacogenomics. Since the discovery of the first miRNA associated with drug resistance, several other miRNAs have been identified to be associated with drug resistance/sensitivity to almost all types and classes of drugs (~500 papers till date), indicating the existence of a wider phenomenon. Dr. Mishra also uncovered a new mechanism of miRNA action; he demonstrated that, besides translational inhibition, miRNAs can act by destabilizing its target mRNAs, which is a mainstream idea now. He was also first to demonstrate the functional significance of a miRNA target site polymorphism. Dr. Mishra has contributed to development of several new anti-cancer drugs and drug combinations. His discoveries have led to the development of new and viable strategies of prevention, diagnosis and treatment of cancer patients in the clinic.

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