BIOTECHNOLOGY-2011
doi:10.4172/jpb.1000240

OMICS Group Conferences
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World Congress on
Biotechnology

RNAi- A novel gene regulatory mechanism

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Double-stranded RNA-mediated interference (RNAi) is a simple and rapid method of silencing gene expression in a range of organisms. Disease therapy now based on genetic materials is in now reality for curing many diseases mainly cancer . This technique of gene silencing often sounded as RNAi keeps our hopes alive. The main excitement stems from the power of RNAi it has the capacity to destroy genetic materials at any point of our life time in a specific type called gene knock out system. The silencing of a gene is a consequence of degradation of RNA into short RNAs that activate ribonucleases to target homologous mRNA. Specific gene silencing has been associated with regulatory processes such as transposon silencing, antiviral defense mechanisms, gene regulation, and chromosomal modification. Extensive genetic and biochemical analysis revealed a two-step mechanism of RNAi-induced gene silencing. The first step involves degradation of dsRNA into small interfering RNAs (siRNAs), 21 to 25 nucleotides long, by an RNase III-like activity. In the second step, the siRNAs join an RNase complex, RISC (RNA-induced silencing complex), which acts on the cognate mRNA and degrades it. Several key components such as Dicer, RNA-dependent RNA polymerase, helicases, and dsRNA endonucleases have been identified in different organisms for their roles in RNAi. Some of these components also control the development of many organisms by processing many noncoding RNAs, called micro-RNAs. The biogenesis and function of micro-RNAs resemble RNAi activities to a large extent. Recent studies indicate that in the context of RNAi, the genome also undergoes alterations in the form of DNA methylation, heterochromatin formation, and programmed DNA elimination. As a result of these changes, the silencing effect of gene functions is exercised as tightly as possible. Because of its exquisite specificity and efficiency, RNAi is being considered as an important tool not only for functional genomics, but also for gene-specific therapeutic activities that target the mRNAs of disease-related genes.