Small interfering RNA

Small interfering RNA (siRNA), sometimes known as short interfering RNA or silencing RNA, is a class of double-stranded RNA molecules, 20-25 base pairs in length, similar to MicroRNA, and operating within the RNA interference (RNAi) pathway. It interferes with the expression of specific genes with complementary nucleotide sequences by degrading mRNA after transcription, preventing translation.

siRNA can also act in RNAi-related pathways as an antiviral mechanism or play a role in the shaping of the chromatin structure of a genome. siRNAs and their role in post-transcriptional gene silencing (PTGS) were first discovered in plants by David Baulcombe's group at the Sainsbury Laboratory in Norwich, England and reported in Science in 1999.

Thomas Tuschl and colleagues soon reported in Nature that synthetic siRNAs could induce RNAi in mammalian cells.

This discovery led to a surge in interest in harnessing RNAi for biomedical research and drug development. Significant developments in siRNA therapies have been made with both organic (carbon based) and inorganic (non-carbon based) nanoparticles, such as these which have been successful in drug delivery to the brain, offering promising methods of delivery into human subjects. However, significant barriers to successful siRNA therapies remain, the most significant of which is off-targeting.