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Foldback intercoil DNA: What it means to life science

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From rare and unusual conformations such as stem, loop, stem-and-loop and rigid rod of native plant mitochondrial DNA (mtDNA) and reproduction of such structures with space-filling model of DNA a concept of foldback intercoil (FBI) DNA was developed. Foldback bending at one point of an unwound parallel duplex DNA can lead the flanking antiparallel double helix B-DNA intertwine in each other's major groove to form an intercoil. When a repeat sequence encounters its partner in the intercoil four-stranded base pairing can form and lead to heteroduplexes formation by base flipping. As tested by the space filling model based upon experimental documents in the literature, FBI DNA is shown to perform DNA-DNA transactions of short (about 7 bp) repeats; namely, α-deletion by direct repeats, Ω site-specific inversion by inverted repeats, FBI tip insertion in site-specific insertion and non-homologous end joining and gap filling (EHEJ-GF) in transposition. Rigid rod DNA can be interpreted in the context of the FBI DNA as reflection of cellular processes such as DNA replication and transcription, enhancer function and heteroduplexes formation by long repeats. DNA rearrangement in the genome is known to be one of the major causes of human genetic disorders and diseases. Massive accumulation of genome sequence data and comparative genomics reveal at the breakpoints not a single nucleotide but about 7 bp block of an overlapping breakpoint, which manifests the FBI DNA mechanism at work. Concerted presentations of such supporting evidences in the "World Congress of Human Genetics" would mark an epoch of "Genomic Revolution".

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