

Integrative Biology 2016: The foldback inter coil DNA- Byung-Dong Kim- Seoul National University

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Abstract

Foldback inter coil (FBI) DNA is a completely unique and temporary configuration of duplex DNA that includes 4 practical parts: Foldback head, inter coil stem, inter coil blunt quit tail and heteroduplexes. FBI DNA became first observed in uncommon TEM configurations of pearl millet mt DNA and became examined out for its feasibility with the aid of using area-filling version of DNA. FBI DNA is shaped with the aid of using foldback bending at one place of a duplex DNA, to steer the flanking anti-parallel double helixes to intertwine in every different principal groove to shape an inter coil. Repeat sequences withinside the inter coil make 4-stranded base pairing. Base flipping of the repeats results in heteroduplexes formation and homologous recombination. This diffused transformation of the double helix into FBI DNA shape is instrumental in mediating 4 principal DNA-DNA transactions, namely, α deletion with the aid of using direct repeats, Ω web page-particular inversion with the aid of using inverted repeats, FBI tip insertion in webpage-particular insertion and non-homologous quit becoming a member of and hole filling (EHEJ-GF) in transposition. Most significantly, FBI DNA transfiguration into heteroduplexes gives a powerful mechanism of paranemic separation of daughter strands after DNA replication which in any other case might get caught after unwinding a plectonemic double helix DNA on the replication fork.

Biochemical and bioinformatics evidences withinside the literature that aid the FBI DNA for the inevitable presence and running withinside the actual biology may be presented. Put collectively, attention of the dynamic and numerous transformations of the FBI DNA shape might permit a brand-new knowledge of numerous DNA function, their interplay at genome stage and at cell differentiation. Suggestions for destiny studies techniques might be discussed. Foldback inter coil (FBI) DNA is shaped with the aid of using the folding lower back at one factor of a non-helical parallel tune of double-stranded DNA at as sharp as 180° and the intertwining of double helixes inside every different principal groove to shape an inter coil with a diameter of 2.2 nm.

FBI DNA has been counselled to mediate intra-molecular homologous recombination of a deletion and inversion. Inter-molecular homologous recombination, referred to as web page-particular insertion, on the opposite hand, is mediated with the aid of using the direct perpendicular method of the FBI DNA tip, because the attP web page, onto the goal DNA, because the attB web page. Transposition of DNA transposons entails the pairing of terminal inverted repeats and 5-7-bp tandem goal duplication. FBI DNA configuration efficiently explains easy in addition to replicative transposition, alongside the involvement of an enhancer detail. The majority of numerous retro transposable factors that hire a goal web page duplication mechanism is likewise counselled to comply with the FBI DNA-mediated perpendicular insertion of the paired inter coil ends with the aid of using non-homologous quit-becoming a member of, collectively with hole filling.

A genome-extensive angle of transposable factors in mild of FBI DNA is discussed. The transposable detail (TE) became first defined with the aid of using McClintock as a controlling detail that jumps from one role to some other withinside the maize chromosome withinside the mid- 1940s, lengthy earlier than the invention with the aid of using Watson and Crick of the double helix shape of DNA as a genetic detail. It became a time whilst, after the rediscovery of Mendel's Law of Heredity in 1900, the cytogenetic look at of chromosomes became at the vanguard of genetics and whilst genes have been concept to be beads on a string positioned at the chromosome. It became withinside the overdue Nineteen Seventies and early Eighties whilst insertion series (IS) factors and transposons (Tn) have been observed and observed to be much like McClintock's controlling factors, and her AC/DS factors have been showed on the DNA series stage as a TE. Salient functions of DNA transposable factors (dTEs), which include terminal inverted repeats (TIRs), goal web page duplication (TSD), the transposase gene, and easy and replicative transposition mechanisms were properly installed with the aid of using great molecular biology and biochemistry studies. Then, unfashionable transposable factors (rTEs), which include lengthy terminal repeat (LTR)-retrotransposons, non-LTR-retrotransposons, and different unfashionable-factors,

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have been being delivered to the repertoire because the Eighties to make the image numerous and complicated.

Many new households of TEs are being delivered, mainly from eukaryotes, even with the aid of using computational screening within the post-genome era, which has necessitated a brand-new type primarily based totally on their systems and mechanisms of transposition. The presence of foldback inter coil (FBI) DNA became first mentioned with the aid of using Kim in 1985 and proven with the aid of using a area filling version to mediate intra-molecular homologous recombination of inversions and deletions. It became in addition proven in 1987 that FBI DNA can mediate inter-molecular DNA rearrangements, together with web page-particular insertions, on the foldback tip and DNA transpositional integration on the inter coil quit of the indifferent dTE. It may be tested on this assessment how FBI DNA mediation of transposition may be prolonged to exceptional training and households of rTEs. This assessment will reduce replica descriptions and attention at the mechanistic functions which are applicable to the utility of FBI DNA to the mechanisms of DNA transposition. TSD serves as a not unusual place landmark of harmony on transposition mechanisms for each dTEs and rTEs. The handiest exception up to now is the Helitron superfamily, which lacks TSD and employs a rolling circle replication version. As lengthy as a TSD is generated at some point of TE integration into the host chromosome, it shows that the instantaneously intermediate of integration is in a double-stranded DNA shape, regardless of RNA or single-stranded DNA being the preliminary intermediate.

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