The Impact of Host Factors on Tn10 Transposition: The Story Unfolds

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Transposons are mobile DNA elements. They are highly abundant in most organisms and impact significantly on the organisms in which they reside. Not surprisingly host proteins are often involved in regulating DNA transposition reactions. For example, in bacteria Tn10 transposition is modulated by the nucleoid binding protein IHF. This host protein helps in the assembly of the Tn10 recombination complex (or transpososome). It does so by creating a bend at each transposon end sequence. This permits the transposase protein to contact the end sequence at two distinct sites and to stabilize this sequence in a folded conformation. However, the transposon ends must be unfolded at a later stage to permit the capture of a target site for an intermolecular strand transfer event – it is thought that one of the folded transposon arms blocks the entry of an intermolecular target DNA into the transpososome. If IHF is not ejected, and the transposon arm is not unfolded, the transposon ends are constrained in such a way that primarily intramolecular strand transfer events occur. The predominant intramolecular transposition product is an unknotted transposon inversion circle.

A screen for additional host factors that participate in bacterial DNA transposition has revealed that a second nucleoid binding protein called H-NS also plays an important role in Tn10 transposition. We provide evidence that H-NS acts in opposition to IHF to unfold the transposon ends in preparation for intermolecular target capture. We show that H-NS has a high affinity for the folded form of the transpososome and upon binding induces transpososome unfolding. H-NS also binds with a high affinity to a pre-formed target capture complex. It is known that target capture in Tn10 transposition involves bending of the target DNA, and given the known preference of H-NS to bind bent DNA structures, we speculate that H-NS binding to target DNA may serve to stabilize the target capture complex. Importantly, addition of H-NS to an in vitro Tn10 transposition reaction significantly increase the amount of intermolecular transposition product observed. The mechanism by which H-NS facilitates the unfolding of the Tn10 transpososome is currently being investigated. The involvement of two highly abundant nucleoid binding proteins in Tn10 transposition provides an excellent example of how a mobile element has co-evolved with its host.