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Report

Switching from Cut-and-Paste to Replicative Tn7 Transposition

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Abstract

The bacterial transposon Tn7 usually moves through a cut-and-paste mechanism whereby the transposon is excised from a donor site and joined to a target site to form a simple insertion. The transposon was converted to a replicative element that generated plasmid fusions in vitro and cointegrate products in vivo. This switch was a consequence of the separation of 5′- and 3′-end processing reactions of Tn7 transposition as demonstrated by the consequences of a single amino acid alteration in an element-encoded protein essential for normal cut-and-paste transposition. The mutation specifically blocked cleavage of the 5′ strand at each transposon end without disturbing the breakage and joining on the 3′ strand, producing a fusion (the Shapiro Intermediate) that resulted in replicative transposition. The ability of Tn7 recombination products to serve as substrates for both the limited gap repair required to complete cut-and-paste transposition and the extensive DNA replication involved in cointegrate formation suggests a remarkable plasticity in Tn7′s recruitment of host repair and replication functions.