

## Insertion versus replacement in gene targeting

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*Physcomitrella patens* exhibits high frequencies of gene targeting when transformed with DNA constructs containing genomic sequences. Targeted gene replacement resulting from homologous recombination between each end of a targeting construct and the targeted locus occurs when either single or multiple targeting vectors are delivered. In the latter instance simultaneous, multiple independent integration of different transgenes occurs at the targeted loci. In both single gene and “batch” transformations, DNA can also be found to undergo targeted insertion, integrating at one end of the targeted locus by homologous recombination with one flanking sequence of the vector accompanied by an apparent non-homologous end-joining event at the other.

We have show that insertion occurs as a consequence of concatenation of the transforming DNA, *in planta*, prior to integration, followed by homologous recombination between a single site in the genomic target and two of its repeated homologues in the concatenated vector. We present a model for both replacement and insertion based on current understanding of the mechanism of double strand break repair.

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