

# Molecular Rewrite Operation by Mung Bean Nuclease

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We present an improved method of implementing the molecular rewrite operation on DNA strands using the Mung bean nuclease[1]. Common DNA computing operations – matching, selection, extraction – are mainly focused on to manipulate the determined DNA sequence in various ways. However, research on the control of partial sequences on the DNA strand is lacking. In silicon based computing, the rewrite operation is essential for loading various programs and data to the memory. In the same way, this operation could be applied to DNA based computing, which could potentially expand the scale of research in this area. It is possible to conduct the rewrite operation in DNA computational experiments using existing techniques such as, site-directed mutagenesis or replacement using restriction enzymes[2,3]. However, these techniques contain many experimental constraints for the rewrite operation to be fully implemented. Thus a different approach is required. Here, we introduce the use of the Mung bean nuclease, found to have many advantages for conducting the rewrite operation in DNA.

Mung bean nuclease is a single-strand specific endonuclease. This nuclease is very similar to the S1 nuclease, but unlike the S1 nuclease, the Mung bean nuclease does not cleave nicked DNA. Using this property, we demonstrate that rewriting a partial sequence of the target DNA strand is possible. The rewrite operation proposed in this study is carried out in the following steps; First, attach the mold DNA containing the complimentary sequence of the final DNA sequence of interest. Second, add the shield DNA to bind and thus protect the mold DNA from the nuclease function. Third, use the Mung bean nuclease to remove the incorrect part of the target DNA. The rewrite operation was verified through the series of small-scale wet lab experiments.

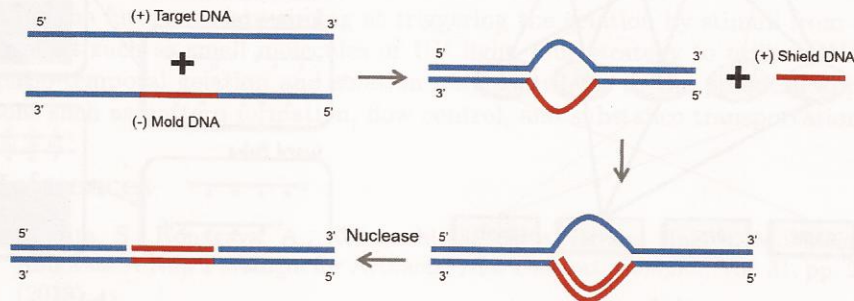


Figure 1. Overall steps about molecular rewrite operation

## Reference

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