**Current Status and Challenges in Genome Editing**

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Genome editing tools such as ZFNs, TALENs, and CRISPR-Cas9/Cas12/Cas13 derived RNA-guided endonucleases have been broadly used for biomedical research, biotechnology, and plant transformation. CRISPR nucleases are widely exploited due to the ease of use and inexpensive cost; researchers can induce gene editing at different sites by simply altering guide RNAs. Ultimately, the Nobel Prize in Chemistry 2020 was awarded for discovering one of gene technology's sharpest tools. However, CRISPR-mediated DNA double-stranded breaks (DSBs) frequently cause unexpected large chromosomal deletions or genomic rearrangements, and also induce the p53-mediated DNA damage response. In parallel, new genome editing tools are constantly being developed. DNA base editing tools, including cytosine base editors (CBEs) and adenine base editors (ABEs), enable the direct conversion of DNA bases without producing DNA DSBs were developed. Furthermore, a prime editor (PE) that enables generating small insertion and deletion in addition to substitution of several nucleotides at target sites, was recently developed. While the gene editing mechanism is different for each tool, all tools have been developed based on the CRISPR effectors. Here I present current trends in genome editing tools along with on-going studies of my group such as development of web-based programs in CRISPR RGEN Tools ([www.rgenome.net](http://www.rgenome.net)), protein engineering for enhancing specificity of base editors, and versatile application of genome editing tools for plant transformation and therapeutic gene correction *in vivo* and *ex vivo*.