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Efficient genome editing using CRISPR-Cas9 and -Cpf1

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Programmable nucleases enable targeted genetic modifications in cultured cells, animals, and plants and are tools of great value in research, medicine, and biotechnology. These enzymes include zinc-finger nucleases, transcriptional activator-like effector nucleases, and RNA-guided engineered nucleases derived from the prokaryotic CRISPR/Cas system. Programmable nucleases produce site-specific DNA double-strand breaks, which enhance the efficiency of homologous recombination by at least two orders of magnitude3 and/or trigger error-prone nonhomologous end-joining, which leads to targeted mutagenesis. These programmable nucleases induce site-specific DNA cleavages in the genome, the repair of which via endogenous mechanisms leads to genome editing. I will present current progress toward the application of programmable nuclease-based genome editing technology.