

GENTETIC RECOMBINATION IS THE BASE NATION: TECHNOLOGY

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Abstract

Genetic recombination is a fundamental biological process that serves as the foundation of modern biotechnology. It involves the exchange and rearrangement of genetic material, resulting in new combinations of genes that contribute to genetic diversity and improved biological traits. Advances in recombinant DNA technology have enabled scientists to manipulate genetic material for applications in medicine, agriculture, industry, and environmental conservation. The development of genetically modified organisms (GMOs), production of therapeutic proteins such as insulin, gene therapy, vaccine development, and genome editing technologies have all emerged from the principles of genetic recombination. This paper examines the mechanisms of genetic recombination, its role in molecular biology, and its significance in biotechnology. It also discusses recent technological advancements, including CRISPR-Cas systems, synthetic biology, and precision breeding, while highlighting ethical, environmental, and biosafety considerations. The study concludes that genetic recombination remains a cornerstone of biotechnology, driving scientific innovation and offering sustainable solutions to global challenges in healthcare, food security, and environmental management.

Keywords: Genetic Recombination, Biotechnology, Recombinant DNA Technology, Gene Therapy, CRISPR-Cas9, Genetic Engineering, Synthetic Biology, Genetically Modified Organisms (GMOs), Genome Editing, Molecular Biology.