

# Good literature review about biology

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## Introduction of restriction enzymes

Restriction enzymes are highly diverse set of enzymes in bacteria that are used to identify specific 4- to 8-bp sequences referred to as restriction sites and cleave DNA strands internally at this site. These enzymes protect the bacteria from foreign DNA molecules such as those of phages. Restriction enzymes identify specific nucleotide sequences to differentiate between the “ domestic” and “ foreign” DNA. It attaches to the “ recognition site” and breaks both strands of the DNA (Kufe et al.). Restriction enzymes may include EcoRV, EcoRI, and HindIII. EcoRV belongs to the type II restriction/modification system from *Escherichia coli*. This system helps bacteria from protecting themselves from foreign DNA. The EcoRV restriction enzyme remains in solution as a dimer of similar subunits of 244 amino acids. The EcoRV restriction endonuclease cleaves DNA at the recognition site with the help of  $Mg^{2+}$ , which acts as cofactor. This enzyme along with cofactor works million times faster on the recognition sites as compared to other sites (Vipond, and Stephen 225). EcoRV (obtained from *E. coli*) cuts double-stranded DNA molecules of the virus having the sequence 5'-GATATC-3' (Berg, Tymoczko, and Stryer). EcoRI is also an endonuclease enzyme obtained from different strains of *E. coli*. It is also a part of the restriction/modification system. This enzyme acts on sequence 5' - GAATTC - 3' (Watson, and Watson James D 651) and makes staggering cuts in the two strands of DNA. HindIII is a type II site-specific deoxyribonuclease restriction enzyme obtained from *Haemophilus influenza*. It cleaves DNA at the sequence of AAGCTT. It has been reported that the mean spacing between

HindIII sites is nearly 4 kb (Griffiths et al.). These restriction enzymes are also helpful in cutting and manipulating plasmids.

Plasmid refers to the small circular inclusion in the cell consisting of a ring of DNA that is double-stranded but is not in a chromosome. It is capable of independent replication. These plasmids are naturally present in bacteria, yeast, and some other higher eukaryotic cells. Usually, plasmids have three important components; the origin of replication, a chosen marker gene, and an appropriate cloning site. Plasmids are of different sizes ranging from a few thousand base pairs to more than 100 kilobases. Plasmid DNA has the ability to divide before each cell division. Some bacterial plasmids are able to encode enzymes that are helpful in inactivation of antibiotics. These types of plasmids are among the major problems in therapeutic progress. Sometimes, plasmids are also referred to as “vectors” as they are able to take DNA from one generation to the next generation. Many of these plasmids also contain “transfer genes” that are able to produce proteins that work in the form of macromolecular tube, or pilus, and can help in the transfer of plasmid to the same or other related bacterial species resulting in rapid spread of drug-resistant bacteria in the health care environment such as in the hospital settings (Lodish et al.).

Restriction enzymes and plasmids are also used in the interesting field of genetic engineering that includes recombinant DNA technology and DNA cloning. E. coli plasmids are the most commonly used cloning vectors.

Sometimes, the length of plasmids is reduced in order to simplify working with them. Most of the plasmid vectors are about 3kb in length (Lodish et al.). In the present era, scientists have worked a lot on the plasmid clone

production due to easy availability of genome information and novel technologies.

## **Works Cited**

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