Biotechnology

Restriction enzymes

Restriction enzymes are endonucleases that cleave DNA sequence-specifically.

They were discovered when researchers wanted to find out how bacteria protect themselves from viral intruders.

When foreign DNA is introduced into a bacterium (e.g., via a phage infection) it is dissected into dysfunctional segments by restriction enzyme.

Bacteria possess a DNA-modifying enzyme, which methylates DNA in those places where their own restriction enzyme would cut the DNA.

There are about 1000 individual restriction endonucleases. The enzyme is named according to a letter derived from the name of the bacterial species the enzyme was isolated from.

EcoRI, for example, stands for an enzyme that has been isolated from Escherichia coli.

If more than one restriction enzyme has been isolated from the same bacterial species, they carry additional Roman numerals.

The enzymes HaeI and HaeII have both been isolated from Haemophilus aegypticus.

Restriction enzymes recognize specific sequences of 4–8 bp in double-stranded DNA, cleaving their phosphodiester bonds.

The recognized site has a central symmetrical structure and are called palindromes: give an identical reading whether you look at them from the left or right: you will end up with the same information

There are three types of restriction endonucleases (types I, II, and III).

Types I : cuts DNA as far as 1000 base-pairs away from recognition site. Usually large enzymes with many subunits.

Type 2: Most commonly used in biotechnology. They can cu at desired site.

Type III enzymes, the cutting site lies at a known distance of up to 14 nucleotides from the DNA-binding site. The recognition sequence does not necessarily need to be a palindrome.

The cleavage of DNA either results in blunt ends or sticky ends