

Cutting Sites Encyclopedia Article

Cutting Sites

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Cutting Sites

Restriction enzymes selectively cut **DNA**. The sites at which restriction **enzymes** act are called cutting sites or restriction sites. The first restriction enzyme, isolated from the bacterium *Haemophilus influenzae* in 1968, was called HindIII (restriction enzymes names often include a Roman numeral designation). Since then over 900 restriction enzymes have been discovered.

These enzymes, also called restriction endonucleases, cut DNA into smaller pieces in a very specific fashion. A restriction enzyme usually recognizes a specific sequence of **bases** in the DNA. Different restriction enzymes recognize different sequences and they are specific for different sequences. Judicious **selection** of enzymes and comparison of the patterns of DNA fragments can provide much information about the sequence of the DNA.

Most cutting sites are a four, six, or eight-base palindromic sequence (i.e., the bases along one DNA strand and their complimentary bases on the other strand). This site is called the recognition sequence. Most enzymes cut the DNA at the recognition sequence, so the recognition sequence and cutting site are identical. A few enzymes cut the DNA nearby, but not at, the recognition site. This distinction can become important if the cut DNA is to be used in a recombinant DNA construction. Different endonucleases produce different sets of cuts, but one endonuclease will always cut a particular base sequence the same way, no matter what DNA molecule it is acting on.

Not all cutting sites are cut symmetrically, leaving blunt ends on both the cut strands. For example, the enzyme EcoRI (derived from *Escherichia coli* RY13) cuts at the recognition site to produce two DNA fragments, each with a protruding base at one end. These "sticky ends" are prone to bind with another unpaired length of DNA having a complimentary base at its sticky end. This phenomenon allows the **recombination** of DNA molecules (i.e., DNA molecules composed of DNA from different sources). The ability to create recombinant DNA spawned the multi-billion dollar **biotechnology** industry.