

Recombinant DNA Lab

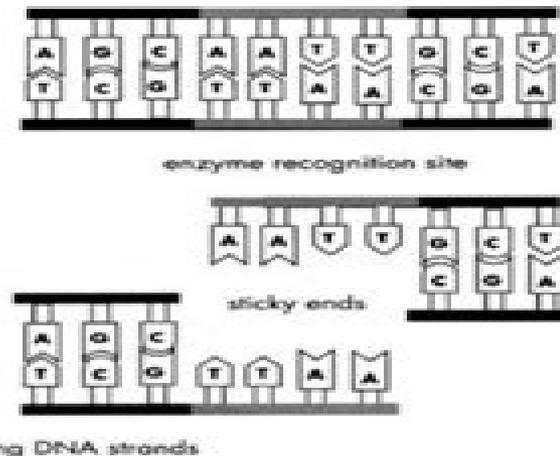
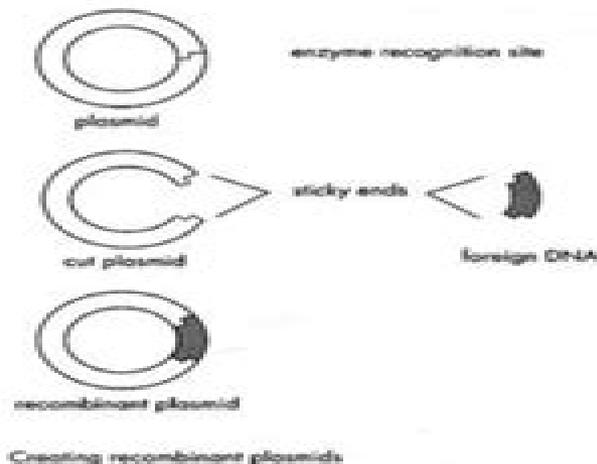
PURPOSE:

Understand the techniques used in recombinant DNA technology.
Understand how bacteria are used to produce insulin for diabetics.

BACKGROUND INFORMATION:

Recombinant DNA refers to DNA of one organism inserted into the DNA of another. A **Transformation** refers to the process of creating recombinant DNA. The major tools of recombinant DNA technology are bacterial enzymes called **restriction enzymes**. Each enzyme recognizes a short, specific nucleotide sequence in DNA molecules, and cuts the backbones of the molecules at that sequence. The result is a set of double-stranded DNA fragments with single-stranded ends, called "**sticky ends**." Sticky ends are not really sticky; however, the bases on the single stranded ends do easily form base pairs with the complementary bases on other DNA molecules. Thus, the sticky ends of DNA fragments can be used to join DNA pieces originating from different sources.

In order to be useful, the recombinant DNA molecules have to be made to replicate and function genetically within a cell. One method for doing this is to use plasmid DNA from bacteria. **Plasmids** are relatively small circular pieces of DNA found in bacteria. Small DNA fragments can be inserted into the plasmids, which are then introduced into bacterial cells. As the bacteria reproduce, so do the recombinant plasmids. The result is a bacterial colony in which the foreign gene has been cloned.



In 1978 Genentech in South San Francisco used this process to create recombinant insulin known as rInsulin, or Humulin®. **Insulin** is a hormone produced by the pancreas used to digest sugars. **Diabetes** occurs when the body does not produce enough, or properly responds to, insulin. Because insulin is a protein coded for by a gene, Genentech developed a process of inserting the gene for insulin into a bacterial plasmid, in turn tricking bacteria into growing large volumes of insulin for diabetic patients world wide. This discovery made Genentech one of the first biotech companies in the world, and one of the biggest and most influential even to this day.

MATERIALS: In addition to this handout, you will need scissors, tape, and the three colored handouts.

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Wenbin Ji

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