

Recombinant DNA: Part I. Genetic Engineering

US275 Scientific Ethics
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The genes passed from parent to offspring determine the characteristics of the child.

- Heredity
- Offspring
 - will look more similar to close relatives
 - than to the general population



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Living organisms have changed dramatically over generations.

- Domestication of species occurred through artificial selection
 - selected breeding for desired traits



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Selective breeding transformed teosinte's few fruitcases (left) into modern corn's rows of exposed kernels. (Wikimedia Commons)

The many breeds of dogs are also an example of artificial selection

- descended from wolves
 - multiple goals
 - hunters
 - herders
 - companions



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A mule is the hybrid offspring of a male donkey and a female horse.

- Chromosomes
 - Horse: 2 sets of 32
 - Donkey: 2 sets of 31
 - Mule: mismatched, sterile
- Mule
 - faster and more intelligent than donkey
 - more patient and long-lived than horse

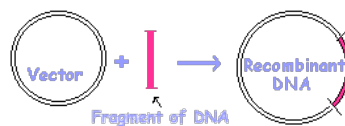


Grey Mule
Wikimedia Commons

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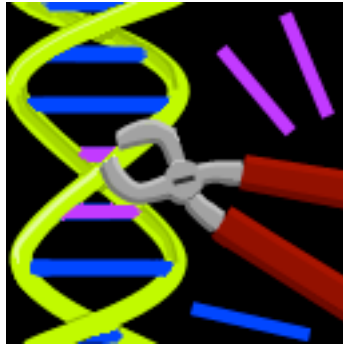
Recombinant DNA is “re-combining” DNA between two or more sources

- The creation of new combinations of DNA
- not normally found together in nature



Genetic Engineering is the process of forming recombinant DNA

- Isolation and manipulation of DNA
 - Basis of genetic analysis
 - applications in medicine, agriculture, and industry



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Restriction enzymes allow for cutting DNA into fragments at specific sites.

- Most cut at specific palindromic sites
 - same on both DNA strands
 - but in opposite directions

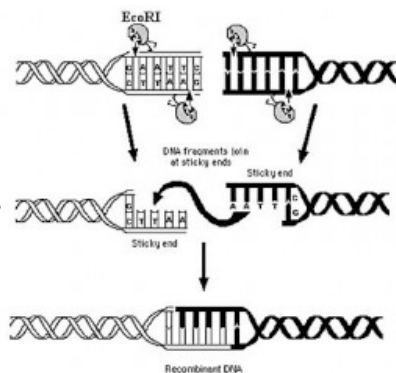


EcoRI restriction enzyme recognition site
Wikimedia Commons

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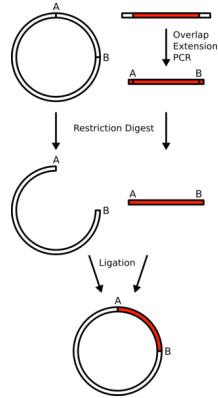
Restriction enzymes cut DNA in specific patterns.

- staggered cuts
 - leaving "sticky ends"



Cloning vectors are used to “carry” DNA sequences

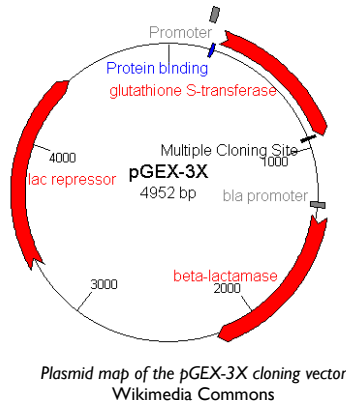
- replicate in host cell
- have a selection marker



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Bacterial plasmids are small, circular DNA molecules used as cloning vectors.

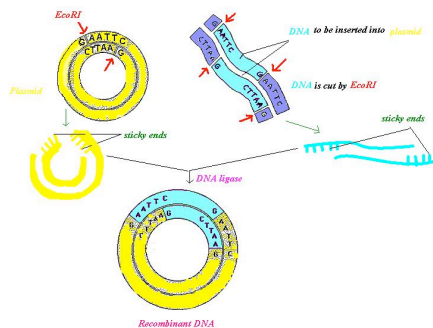
- extra, independent “chromosomes”
- self-replicating
- often carry antibiotic resistance genes



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Put pieces of DNA together to form a complete molecule

- mix fragments
 - they will naturally anneal
- seal them together
 - Enzyme ligase seals fragments together

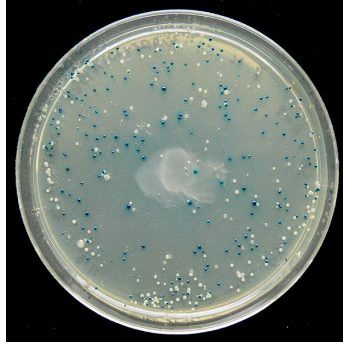


Recombinant DNA
Wikimedia Commons

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Only some complete molecules will have the DNA sequence we are looking for.

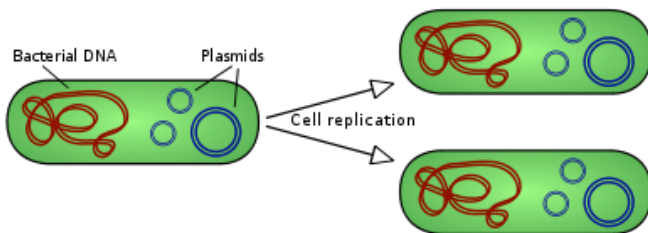
- Selection by antibiotic resistance
- protein characteristics
 - cause blue precipitate to form



Blue white screen. Agar plate with blue and white bacterial colonies. Wikimedia Commons

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DNA clone is a sequence of DNA that is copied in a host cell.



- can generate many copies
- often can express the genes

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TO BE CONTINUED

in part II: Recombinant DNA:
Examples of Genetic Engineering

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Any Questions?

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<http://www.vippitbullkennels.com/images/animated-question-mark.gif>