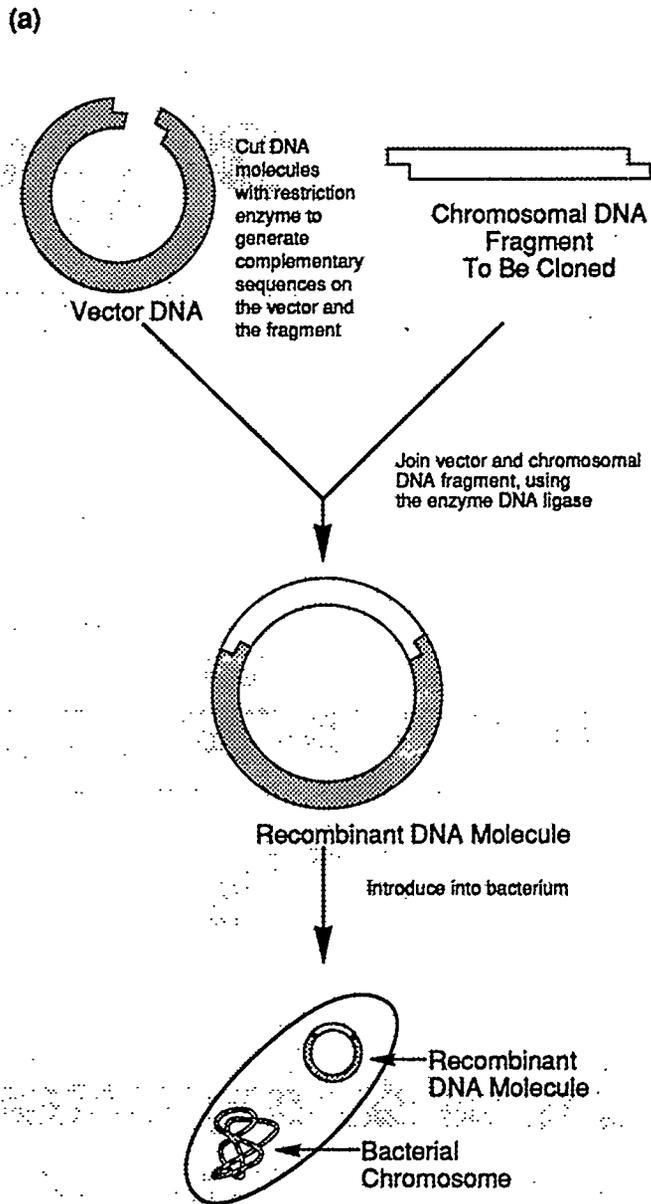


# DNA Amplification: Cloning and PCR

## Cloning (in vivo DNA amplification)

Cloning involves the use of recombinant DNA technology to propagate DNA fragments inside a foreign host. The fragments are usually isolated from chromosomes using restriction enzymes and then united with a carrier (a vector). Following introduction into suitable host cells, the DNA fragments can then be reproduced along with the host cell DNA. Vectors are DNA molecules originating from viruses, bacteria, and yeast cells. They accommodate various sizes of foreign DNA fragments ranging from 12,000 bp for bacterial vectors (plasmids and cosmids) to 1 Mb for yeast vectors [yeast artificial chromosomes (YACs)]. Bacteria are most often the hosts for these inserts, but yeast and mammalian cells are also used (a).

Cloning procedures provide unlimited material for experimental study. A random (unordered) set of cloned DNA fragments is called a library. Genomic libraries are sets of overlapping fragments encompassing an entire genome (b). Also available are chromosome-specific libraries, which consist of fragments derived from source DNA enriched for a particular chromosome. (See Separating Chromosomes box, p. 13.)



**(a) Cloning DNA in Plasmids.** By fragmenting DNA of any origin (human, animal, or plant) and inserting it in the DNA of rapidly reproducing foreign cells, billions of copies of a single gene or DNA segment can be produced in a very short time. DNA to be cloned is inserted into a plasmid (a small, self-replicating circular molecule of DNA) that is separate from chromosomal DNA. When the recombinant plasmid is introduced into bacteria, the newly inserted segment will be replicated along with the rest of the plasmid.