



Vectors for Genomic library in genetic engineering: Bacterial Artificial Chromosomes

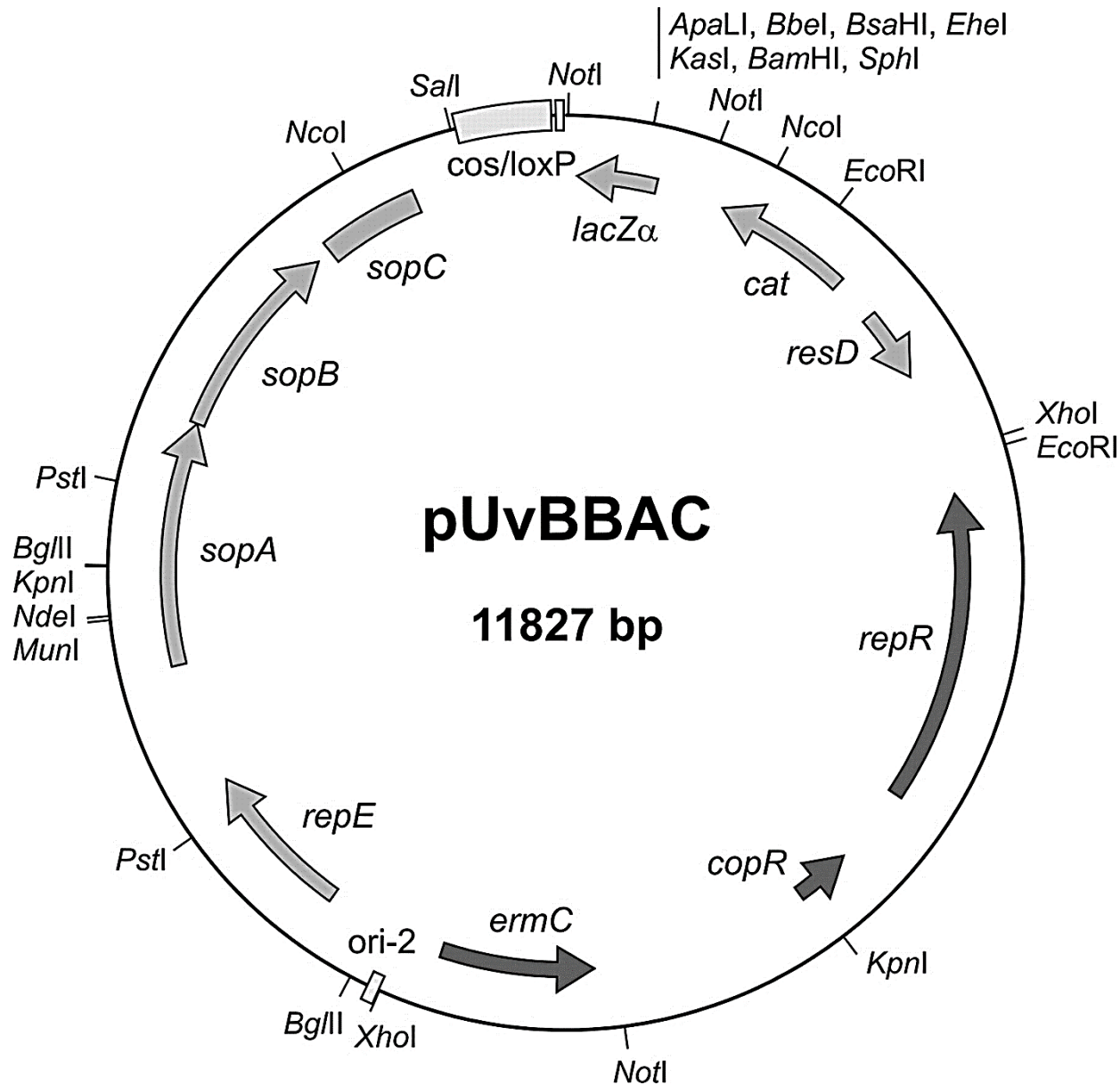
What is a Bacterial Artificial Chromosome?



- ❑ A bacterial artificial chromosome (BAC) is a DNA construct, based on a functional fertility plasmid (or F-plasmid), used for transforming and cloning in bacteria.
- ❑ F-plasmids play a crucial role because they contain partition genes that promote the even distribution of plasmids after bacterial cell division.
- ❑ The bacterial artificial chromosome's usual insert size is 150–350 kbp.
- ❑ BACs are often used to sequence the genome of organisms in genome projects, for example the Human Genome Project.



- ❑ A short piece of the organism's DNA is amplified as an insert in BACs, and then sequenced.
- ❑ Finally, the sequenced parts are rearranged in silico, resulting in the genomic sequence of the organism.
- ❑ BACs were replaced with faster and less laborious sequencing methods like whole genome shotgun sequencing and now more recently next-gen sequencing.



Typical structure map of a BAC vector.



Major gene components of BAC

repE

- ✓ It is responsible for plasmid replication and regulation of copy number.

parA and parB

- ✓ It is responsible for partitioning F plasmid DNA to daughter cells during division and ensures stable maintenance of the BAC.

Selectable marker

- ✓ It is responsible for antibiotic resistance.

Scorable marker

- ✓ It is responsible for blue/white selection (LacZ gene).

T7 & Sp6

- ✓ These are the phage promoters responsible for transcription of inserted genes.

Application of BAC



- ❑ Used in analysis of inherited or model diseases.
- ❑ Used to study neurological diseases such as Alzheimer's disease or as in the case of aneuploidy associated with Down syndrome.
- ❑ Used to study specific oncogenes associated with cancers.
- ❑ Used in cloning of several large genomes.
- ❑ Used in several sequencing projects including human genome sequencing.