



Types of Expression Vectors

What is expression vector?



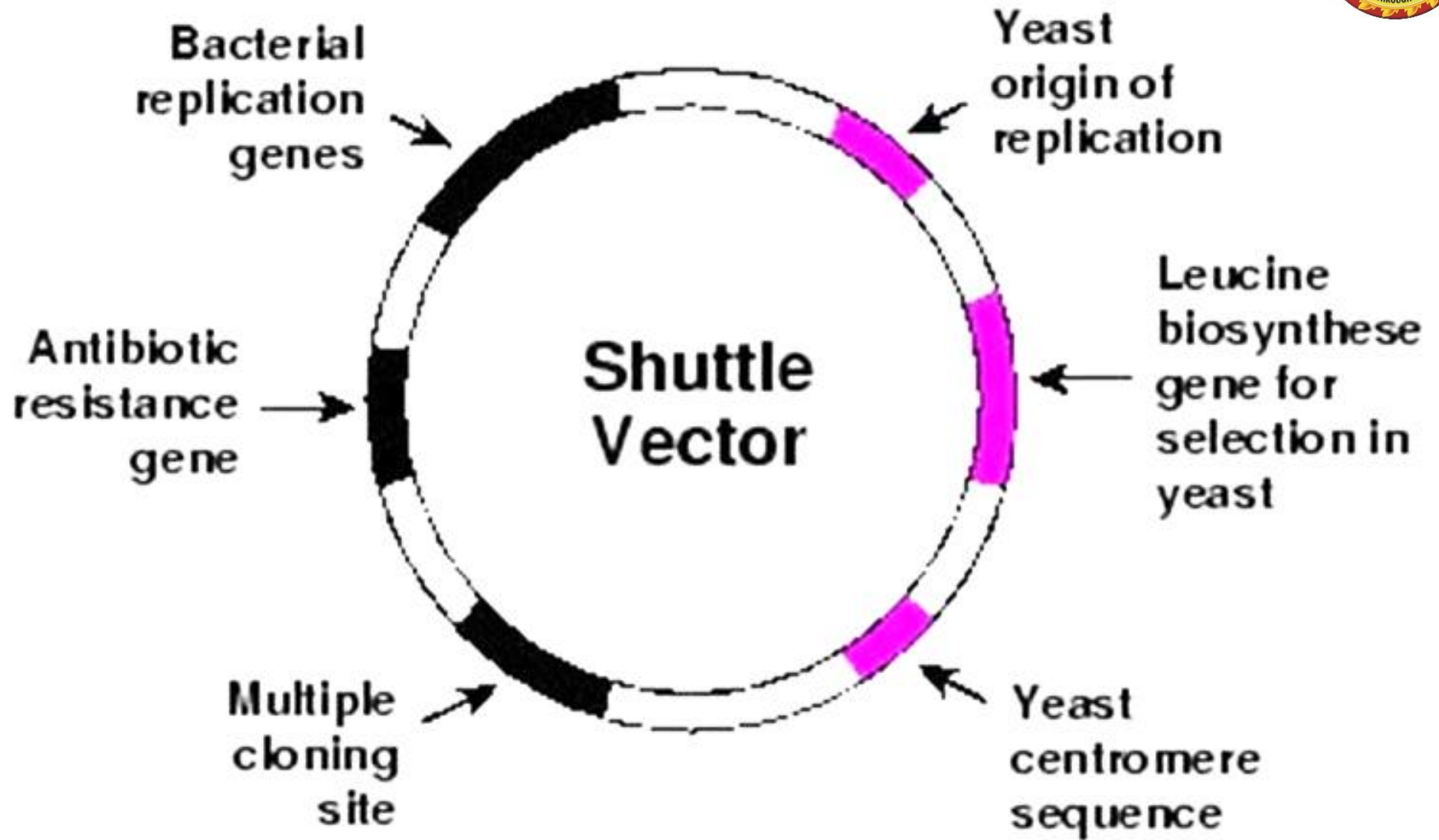
- ❑ Vectors that allow the construction of gene fusions that replace native promoter of a gene with another promoter.
- ❑ It allows the expression of cloned genes to express the coded protein.
- ❑ Protein expressions can be achieved through the use of promoters and expression cassettes and other regulatory sequences in the vectors.
- ❑ These vectors are used for transformation to generate transgenic plants, animals or microbes where cloned gene expressed to give the product.

Types of expression vectors



1. Shuttle vectors

- Shuttle vector is that which can replicate in the cells of more than one organism.
- These vectors have great importance in the genetic manipulations of industrially important species.
- Shuttle vectors can exploit gene manipulation procedures of different hosts.
- The first shuttle vector that became popular and introduced the idea of such interchangeable vectors is the one that could be used in both E.coli and yeast.
- Examples: SV40, Yeast Shuttle Vector



Typical structure map of a Shuttle vector.

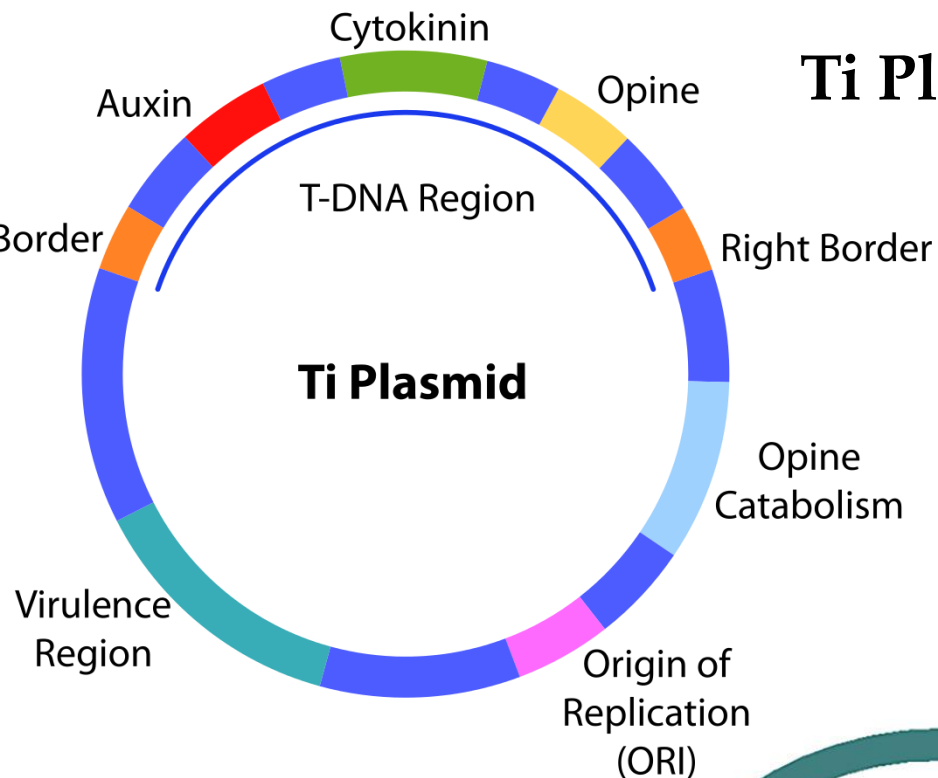


2. Ti/Ri Plasmids

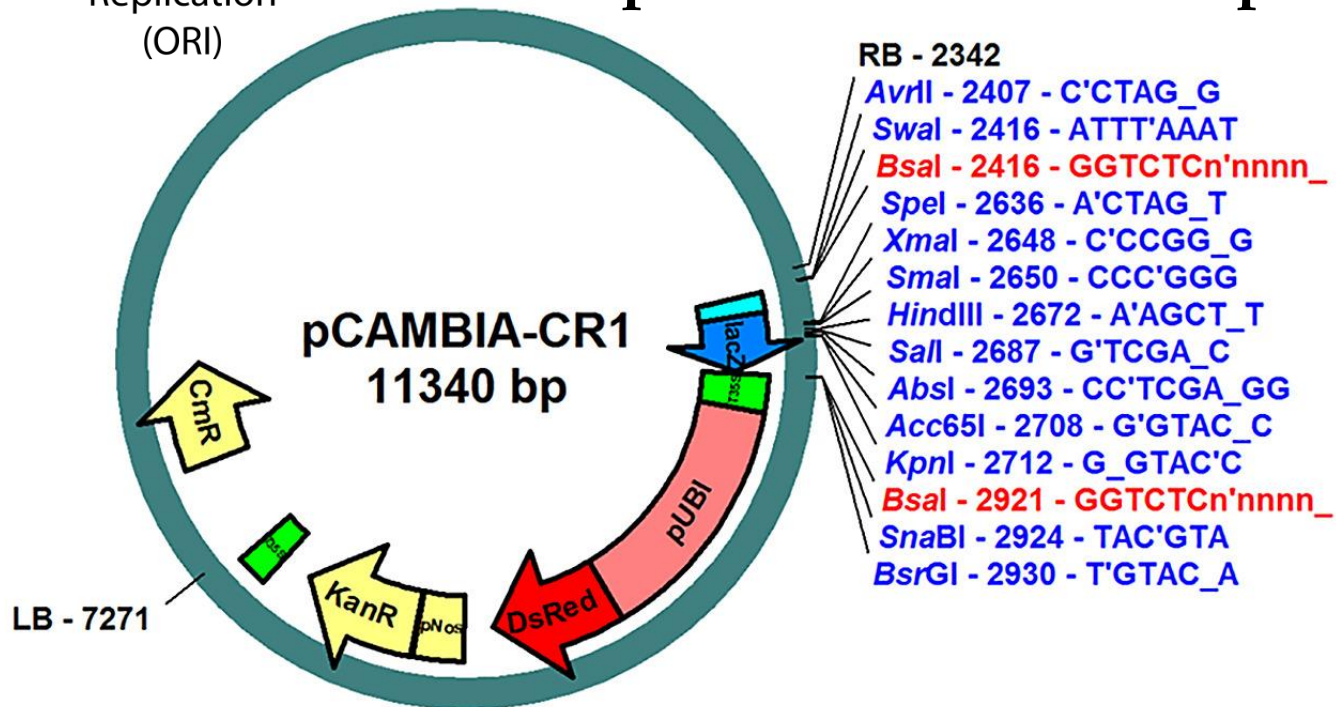
- Ti or Ri plasmids are large, circular double stranded DNA molecules from *Agrobacterium* bacteria.
- A part of the plasmid, called T-DNA carries the genes coding for the synthesis of unusual amino acids called opines, which is important for the bacteria.
- T-DNA can be transferred to the plant cells, where it becomes integrated into plant nuclear DNA.
- This ability of the T-DNA is exploited in all the synthetic T-DNA or Ti-plasmid based vectors.
- Examples: pGV3850, pCAMBIA



Ti Plasmid structure



pCAMBIA vector map



Viral vectors/ Vectors for animal cells



1. SV40

- Replicons analogous to bacterial plasmids are not found in animal cells. Instead, some viruses are used to develop the vectors for animal cells.
- The first mammalian cell viral vector to be developed was based on the simian virus 40 (SV40).
- Recombinant SV40 vectors (rSV40) are good candidates for gene transfer, as they display some unique features.
- They can efficiently transduce both resting and dividing cells, deliver persistent transgene expression to a wide range of cell types, and are nonimmunogenic.
- Present disadvantages of rSV40 vectors include a small cloning capacity and the possible risks related to random integration of the viral genome into the host genome.



2. Adeno virus

- Adenovirus can be used as vector for stable and transient expression.
- This virus bearing foreign DNA can be used to produce the foreign protein in many different cell types, but gene expression is usually transient because the viral DNA does not integrate into the host genome.
- Most vectors derived from the adenoviral genome are replication deficient, however, highly efficient at getting DNA into cells.
- They are capable of containing DNA inserts upto about 8kbp in size and can infect both replicating and differentiating cells.
- The disadvantage of adenoviral vector is that expression is transient since the viral DNA does not integrate into the host.



2. Bovine papilloma virus

- Bovine papilloma virus (BPV-1) DNA replicates exclusively as an extrachromosomal molecule in virally induced tumors as well as in transformed mouse fibroblasts in culture.
- The complete viral genome or a 69% HindIII BamHI fragment thereof have been used as vectors to introduce cloned prokaryotic or eukaryotic genes into mammalian cells in culture.
- These recombinant molecules replicate as multicopy plasmids in stably transformed cells.