

plasmids and cosmids

plasmids

Joshua Lederberg The term

plasmid was first introduced by the

American molecular biologist

Joshua Lederberg in 1952.

* He won the 1958 Nobel Prize in physiology or medicine for discovering that bacteria can mate and exchange genes.

What is plasmids.

* Like other organisms bacteria use double stranded DNA as their genetic material. bacteria organize their DNA differently to more complex organisms.

* A plasmid is an DNA molecule that is separate from and can replicate independently of the chromosomal DNA.

* They are double stranded and in many cases circular.

* plasmids usually occur naturally in bacteria, but are

sometimes found in eukaryotic organisms

* A circular piece of autonomously replicating DNA

* originally evolved by bacteria.

* May express antibiotic resistance gene or be modified to express proteins of interest.

Bacterial plasmid

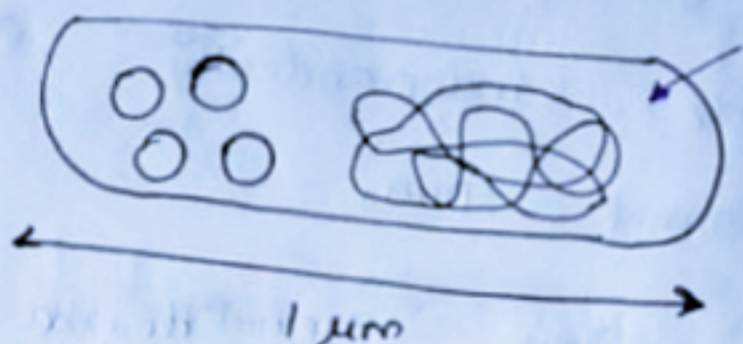
plasmids are small

Circular

pieces of

DNA

$\pm 5,000$ bp



E. coli

bacteria

have at least one

circular

chromosome

$\pm 3,000,000$ bp

1.3 mm

* plasmids are small (a few thousand base pairs) usually carry only one or a few genes and are circular have a single origin of replication.

Multiplication of plasmids

* plasmids are replicated by the same machinery that replicates the bacterial chromosome.

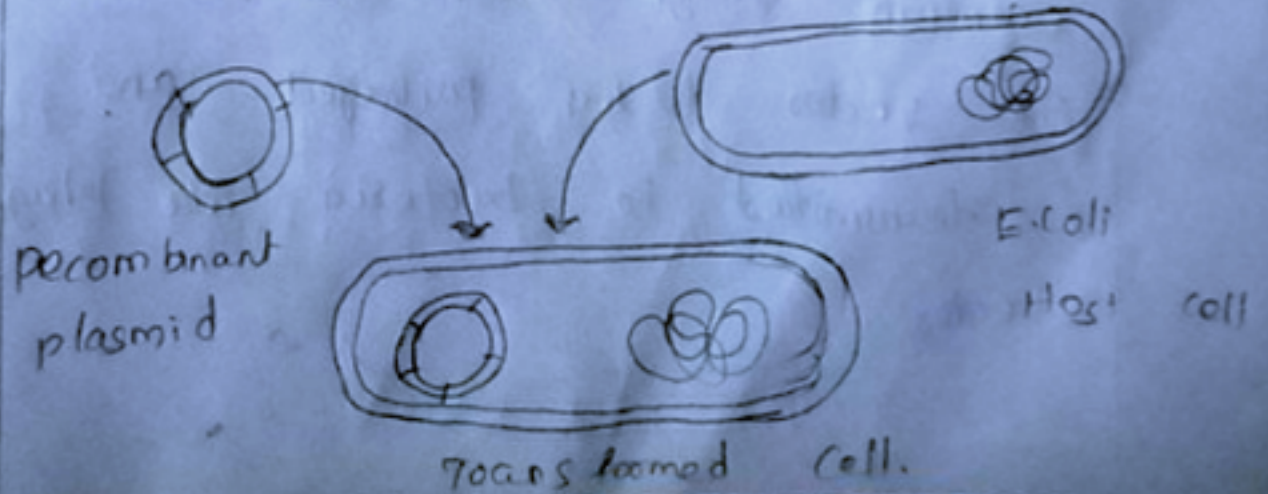
* other plasmids are copied at a high rate and a single cell may have 20 more of them.



Plasmids enter the bacteria with ease.

* Plasmids enter the bacterial cell with relative ease. This occurs in nature and may account for the rapid spread of antibiotic resistance in hospitals and elsewhere.

* Plasmids can be deliberately introduced into bacteria in the laboratory through forming the cell the recombinant.



Cosmid

* Cosmid are medium sized cloning vectors.

* The cloning capacity of these vectors is 35-45 kbp.

* Cosmid vectors are developed by combining the features of plasmid vectors and bacteriophage vectors.

* The first cosmid vector was described by Collins in 1978.

In Brief

* A cosmid is a plasmid that contains phage sequence that allows the vector to be packaged and transmitted to bacteria like phage vectors.

* Cosmid is a type of hybrid plasmid that contains

* cosmid (cos sites + plasmid = cosmids) DNA originally from the lambda phage.

Lambda genome:

* A linear DNA molecule, has a 12 base long single stranded complementary overhang at both.

* which emerge during the packaging process into phage particle through splitting of cos site.

Properties of cosmid vectors

* These are fused together to obtain the cosmid vectors approximately 200 bp

lambda sequence is cloned into cosmid vector

* A cosmid vector may have one or two cos sites.

* Cosmid vectors are used in construction of genomic libraries

* Cosmid vectors have cloning capacity up to 45 kbp.

* Cloning of foreign DNA in Cosmid vectors involves the following steps.

* Ligation of foreign DNA between two cos sites.

* Making a concatemeric DNA

* In vitro packaging to introduce the DNA into phage head to form the matured phage

* Introduction of the cloned DNA into E. coli by transduction

* After their entry into host cell the cosmid are maintained as plasmid