REPLICATION IN PROKARYOTES

Q.How replicon and replication units is related to each other?

Individual units of replication are called replicons, each of which contains a replication origin. Replication starts at the origin and continues until the entire replicon has been replicated. Bacterial chromosomes have a single replication origin, whereas eukaryotic chromosomes contain many.

Q.What do you mean by ɵ replication?

A common type of replication that takes place in circular DNA, such as that found in *E. coli* and other bacteria, is called **theta replication**, because it generates a structure that resembles the Greek letter theta (ɵ). It progresses in the following steps—

i)In theta replication, double-stranded DNA begins to unwind at the replication origin, producing single-stranded nucleotide strands that then serve as templates on which new DNA can be synthesized (**Figure 1).**

ii)The unwinding of the double helix generates a loop, termed a replication bubble. Unwinding may be at one or both ends of the bubble, making it progressively larger.

iii)DNA replication on both of the template strands is simultaneous with unwinding. The point of unwinding, where the two single nucleotide strands separate from the double-stranded DNA helix, is called a **replication fork**.

Q.What is bidirectional replication?

If there are two replication forks, one at each end of the replication bubble, the forks proceed outward in both directions in a process called **bidirectional replication**, simultaneously unwinding and replicating the DNA until they eventually meet. If a single replication fork is present, it proceeds around the entire circle to produce two complete circular DNA molecules, each consisting of one old and one new nucleotide strand.

Q.Explain rolling circle replication.

i)Rolling-circle replication takes place in some viruses and in the **F factor** (a small circle of extra-chromosomal DNA that controls mating, discussed in of E. coli. This form of replication is initiated by a break in one of the nucleotide strands that creates a 3′-OH group and a 5′-phosphate group. (**Figure2**)

ii) New nucleotides are added to the 3′ end of the broken strand, with the inner (unbroken) strand used as a template.

iii)As new nucleotides are added to the 3′ end, the 5′ end of the broken strand is displaced from the template, rolling out like thread being pulled off a spool. The 3′ end grows around the circle, giving rise to the name rolling-circle model.

iv)The replication fork may continue around the circle a number of times, producing several linked copies of the same sequence. With each revolution around the circle, the growing 3′ end displaces the nucleotide strand synthesized in the preceding revolution. Eventually, the linear DNA molecule is cleaved from the circle, resulting in a double-stranded circular DNA molecule and a single-stranded lin-ear DNA molecule.

v)The linear molecule circularizes either before or after serving as a template for the synthesis of a complementary strand.

Q.Distinguish between theta replication and rolling circle replication / Q. Distinguish between rolling circle replication and eukaryotic replication (Figure3)

Replication model	DNA template	Breakage of nucleotide strand	Number of replicons	Unidirectional or bidirectional	Products
Theta	Circular	No	1	Uni/bidirectional	Two circular molecule
Rolling circle	Circular	Yes	1	Unidirectional	One circular molecule and one linear molecule that may circularize
Linear eukaryotic	Linear	No	many	Bidirectional	Two linear molecules