

Hello students, today we will be  
covering a paper titled Molecular  
Biology and Paper code is MI C10 four.

We will be covering unit to replication  
of the name of the module is  
models of replication in prokaryotes  
and eukaryotes rolling circle.

Sigma and data.

The number of the module is 13.

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The outline of the PPT is models  
of replication in prokaryotes,  
their application,  
rolling circle or Sigma replication.

At the end of the ppt the students  
will be able to learn model  
of replication in prokaryotes,  
data replication,

Sigma or rolling circle replication.

Basically there are two models

of replication in prokaryotes.

One is theta replication.

And the other one is Sigma or rolling circle replication

theta replication is bidirectional

sigma replication is uni directional.

Let us start with the theta

model of replication.

As I said before the theta replication  
model of replication is bidirectional.

In circular DNA, bidirectional replication from an origin forms an intermediate structure resembling the Greek letter theta ( $\theta$ ).

Blow-up shows dual replication forks in the circular chromosome.

Steps involved in theta model of replication:

The replication of chromosomal DNA begins at origin of replication.

Synthesis of DNA occurs at the replication fork, the place at which the DNA helix is unwound and each strand is replicated.

Two replication forks move outward from the origin until they have copied the whole replicon (genome that contains an origin that is replicated as a unit).

When the replication forks move around the circular chromosomes, a structure is formed which is shaped like the Greek letter theta ( $\theta$ ).

Because the bacterial chromosome is a single replicon, the forks meet on the other side and two separate chromosomes are released.

Replication of DNA: the sigma structure (Rolling circle replication)

Rolling circle replication is a mechanism used by some plasmids and viruses, of replicating circular DNA, which starts by nicking and unrolling one strand. For a single-stranded genome, this is preceded by using the still-circular strand as a template for DNA synthesis; for a double-stranded genome, the unrolled strand is used as a template for DNA synthesis.

Rolling circle replication is unidirectional. It takes place in Plasmid and Bacteriophages.

Steps involved in sigma model of replication:

The one strand of d/s DNA is nicked and rolls out (therefore it is named rolling circle) [The one strand that rolls, acts as a template for the synthesis of new strand].

Nick occurs at the origin of replication by a sequence specific endonuclease enzyme producing a free 3'-OH (hydroxyl) and 5'-PO<sub>4</sub> (phosphate) ends.

3'-hydroxyl (OH) end is extended by replication enzymes and it lengthened.

The growing point continues around the circular DNA template.

5' end of the strand is displaced to form an ever-lengthening tail.

A single-stranded tail, often composed of more than one genome copy, is generated can be converted to the double-stranded form by synthesis of a complementary strand.

References which I have used for the content are

Prescott Microbiology book

and the other one is broke  
Biology of microorganisms.

Thank you.