Replication strategy of phi x 174

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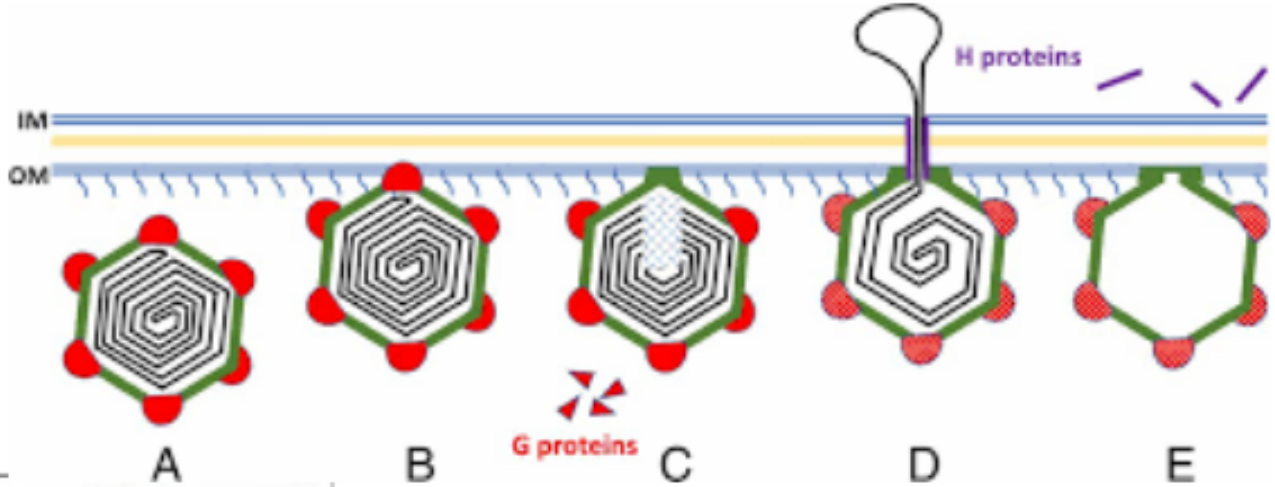
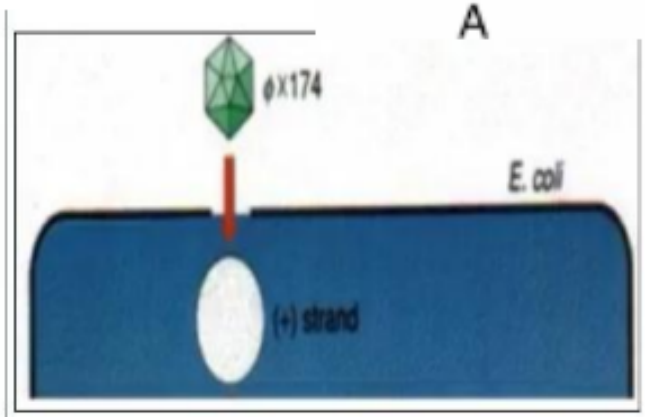
- Phi X 174 is a virus that infects the bacterium E. coli Hence phi X 174 is a bacteriophage.
- Family : Microviridae
- Genus : Microvirus
- The capsid is icosahedral.
- This bacteriophage has a [+] sense circular single-stranded DNA genome of 5,386 nucleotides.
- It is encoded with 10 genes but generates 11 proteins. This is because of overlapping gene.
- Microviridae provided the first evidence of overlapping genes.
- Studies on replication of these phages led to the discovery of rolling circle replication.

ATTACHMENT OF PHAGE ΦX174

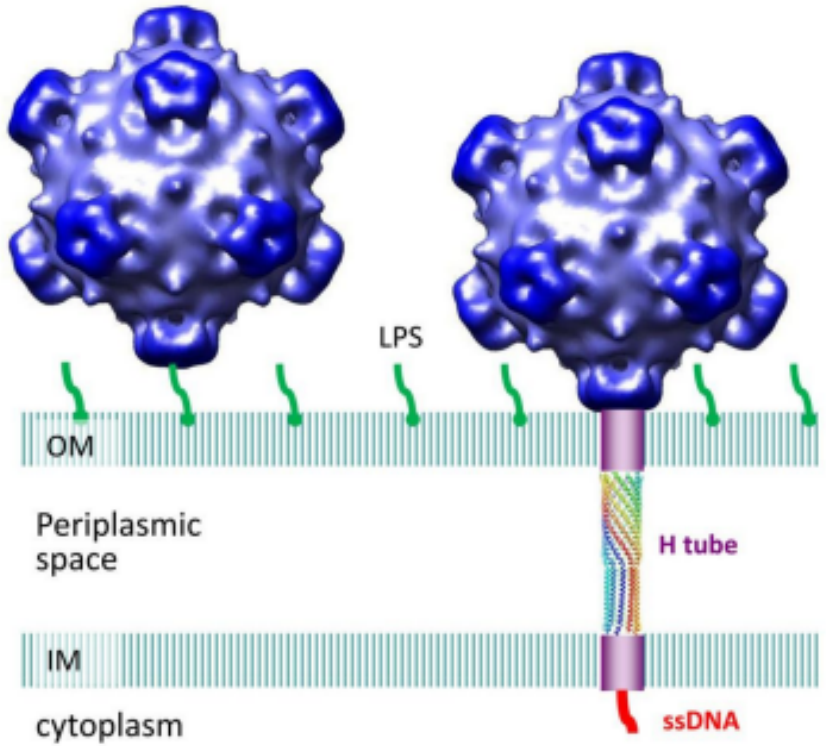
Phage φX174 recognizes the receptor **lipopolysaccharide** in the outer membrane of rough strains of ***Enterobacteriaceae*** , such as ***E.coli*** and ***Salmonella typhimurium*** , by the minor coat protein H.





ENTRY OF PHAGE ΦX174 GENOME

- The terminal spike protein, **gp H** spans the capsid. The outer part recognizes the **LPS receptor**. The inner part of the H protein is responsible for the injection of genome into the host cell.
- At least one H protein enters into the host cell with the viral DNA.



Replication of ϕX174

- Replication of ϕX174 genome occurs in 3 stage

Stage 1

- Synthesis of (-) strand complementary to the (+) strand of to form the replicative form (RF) by host enzymes.

Replication of ϕX174

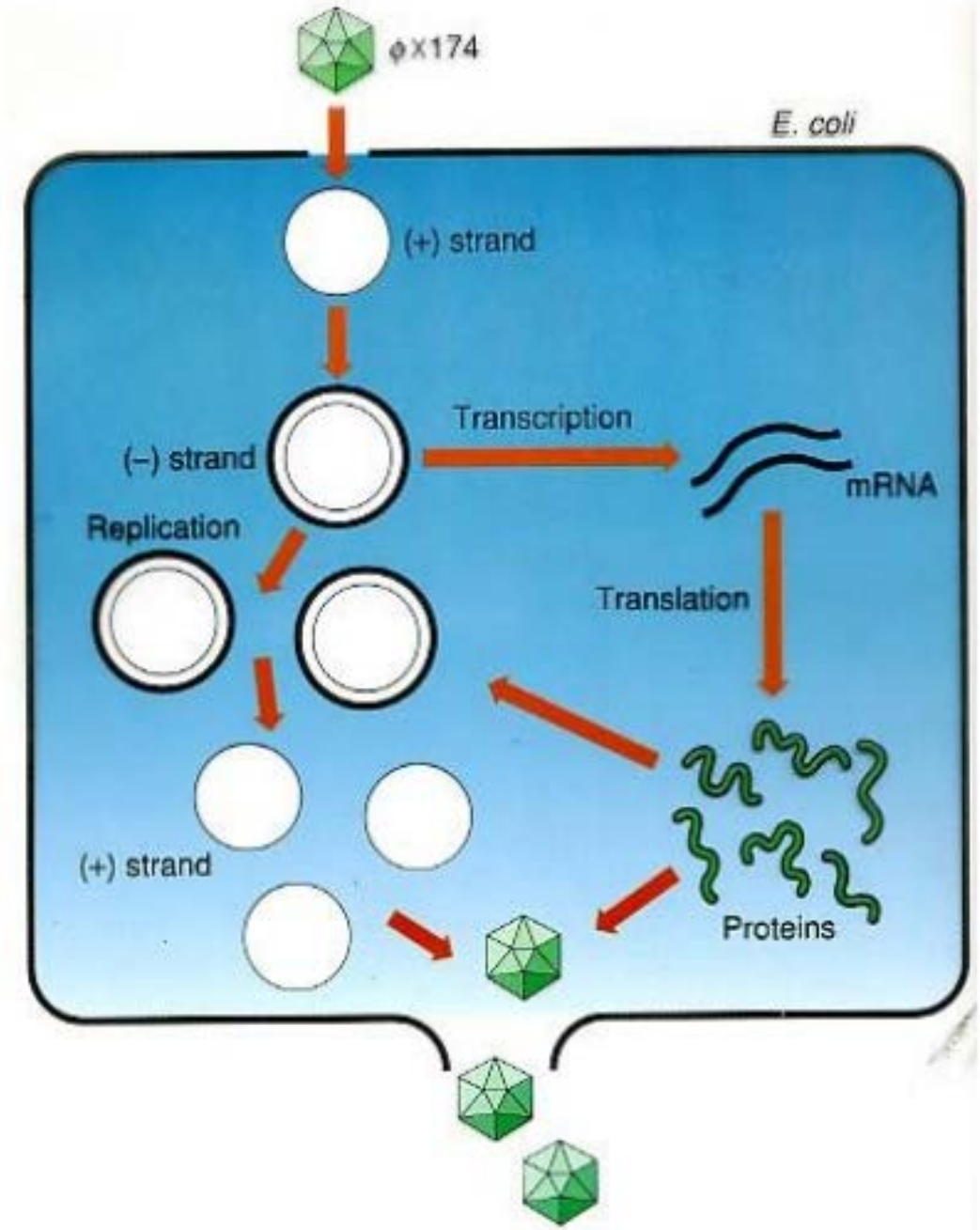
Stage 2

- Replication of the RF involves rolling circle replication and requires phage encoded protein A to synthesize new plus strands. These then serve as a templates for minus strand synthesis to generate the new RFs.

Replication of ϕX174

Stage 3

- Asymmetric replication of progeny ssDNA plus strand.
- RF synthesis continuous until sufficient structural proteins have been synthesized and assembled into empty precursor particle.
- Then lysis of host cell.


ϕX174
E. coli
(+) strand
(–) strand
Transcription
mRNA
Replication
Translation
(+) strand
Proteins