بسم الله الرحمن الرحيم

مادة البيو من أسهل وامتع المواد في هذا العالم

لذلك قررنا ان نجعلها أسهل للجميع

شعارنا :دعونا سويا نفك السوبر كويل

* تعريف بالمذكرة :

- شاملة لجميع المواضيع . (كاملة)

- تركيز على النقاط الهامة .

- جداول تسهل عملية الحفظ .

- أسئلة عامة .

(الحلم أصبح حقيقة)

Team leader : مجهول

Team group :

أبو يسرا

Blue eye

Dr.noop

Ocean

والشكر للجنود المجهولين الذين فضلوا عدم ذكر أسمائهم

* Prokaryotic DNA synthesis (REPLICATION) :

* Semiconservative Replication :

- When the two strands of the DNA double helix are separated, each can serve as a template for the replicationof a new complementary strand.

- Each of the individual parental strandsremains intact in one of the two new Duplexes . (T) . (important)

- (i.e. one of the parental strands is conserved in each of the two new dublexes) .

A. Separation of the two complementory DNA strands:

- Before the replication , separation of the two parental strands must occur first why ?
  Because polymerases use only single – sranded DNA .

You will have a question in this schedule studied hard

Prokaryotes	Eukaryotes
DNA replication begins at **single** , unique nucleotide sequences (this site is called **origin of replication**)	-In eukaryotes , replication begins at **multiple** sites along the DNA helix this is referred to as **short consensus sequence** (exclusively composed of **AT base pairs**) **- multiple origins of replication .**
Slower replicating than eukaryotes	**Rapidly replicating**

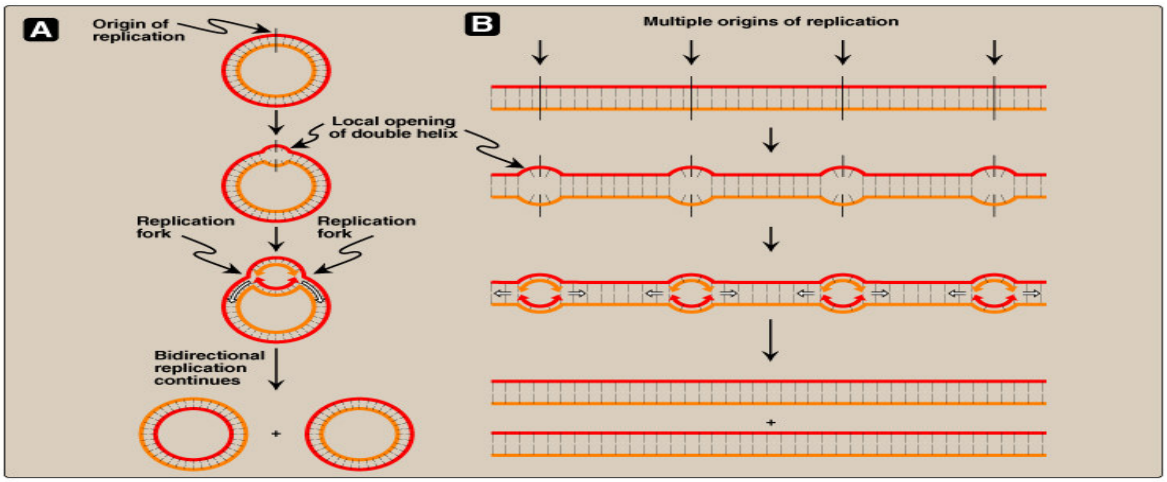

Figure 29.9
Replication of DNA: origins and replication forks. A. Small prokaryotic circular DNA. B. Very long eukaryotic DNA.

C. Formation of the replication fork :

- As the two strands unwind & separate they form a V where active synthesis occurs , this region is called replication fork
- replication fork moves along the DNA molecule as synthesis occurs in both direction (bidirectional)

1. proteins required for DNA strand separation :

✓ called **prepriming** complex & include :

(AT least two question from this schedule)

DNAA protein	Single-stranded DNA-binding(SSB) proteins	DNA helicases
• 20 to 50 monomers bind to specific nucleotide sequences at origin of replication **(which rich in AT base)** • ATP is required • Cause double stranded DNA to melt (separate) & , forming **localized** regions of single stranded DNA .	• Also called helix-destabilizing proteins • Bind only to **single**(هام stranded DNA • Bind **cooperatively**هام (binding of one molecule make it easier for binding of additional molecules) • Are **not enzyme هام** (but shift the equilibrium between single & double stranded DNA in the direction of single stranded form) • Functions of SSB proteins: I. Keep the two strands of DNA separated in the area of replication origin (prevent reformation of double-helix II. Protect the DNA from nucleases (that cleave single stranded DNA)	• Bind to **single stranded** DNA near the replication fork , then move to neighboring double stranded region , & unwinding the strands • **ATP is required** **(be careful DNA helicase Bind to single strand)** (I never seen an exam without this question)

* Solving the problem of supercoils☺ :

◙ **Positive** supercoils (supertwist) in the region of DNA **ahead** (be careful not before) of the replication fork interfere with further unwinding of double helix .

DNA topoisomerases

are responsible for removing these supercoils

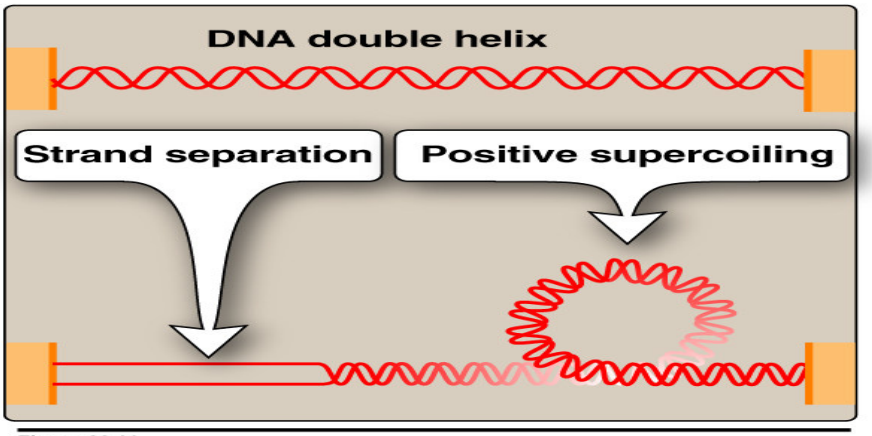

Figure 29.11
Positive supercoiling resulting from DNA strand separation.

DNA topoisomerases I	DNA topoisomerases II
• Reversibly cut **a single strand** of double helix . (MCQ)(NOT double) - **(by nuclease then ligase)** (هام جدا) * nuclease (strand – cutting) * ligase (strand resealing)	-cuts **double** strands - causes a second stretch of the DNA double helix to pass through the break & finally , reseals the break .
• **They do not require ATP** (but store the energy from cleaving of phosphdiester bond)	USE ATP
• Reliving (relaxing) of: ✓ Negative supercoils in **prokaryotic** DNA (e.g. in E. coli) ✓ Negative & positive supercoils in **eukaryotic** DNA	- Relax both **positive & negative supercoils** -Required for separation of interlocked molecules of DNA following a chromosomal replication **(in prokaryotes & eukaryotes)**
-Transient " **nick** " in one DNA Strand (NOT Both strand) (MCQ) - the intact DNA –strand is passed through the break before resealed .	**- DNA gyrase : (لا يخلو منه اختبار)** a) A type II topoisomerase b)found in *E.coli* c) Introduce negative supercoils d)into relaxed circular DNA e)(to facilitates future replication of DNA) f) Use ATP . - **Antimicrobial agents** (bacteria DNA gyrase), quinolones (as ciprofloxacin) - **Anticancer agents : etoposide (target human topoisomerase 11)**

- **Negative supercoils :** contain fewer turns of helix than relaxed DNA.
- Positive supercoils : contain more turns of helix than relaxed DNA.

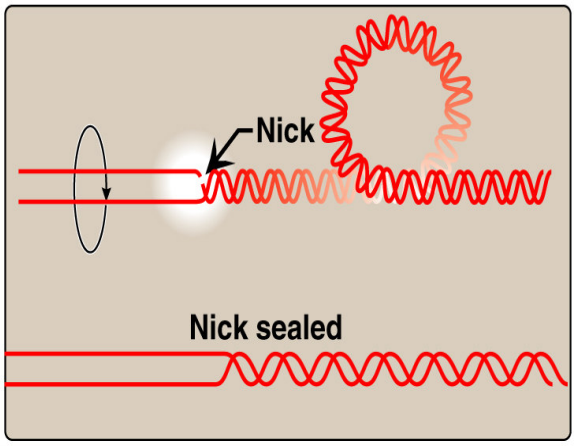

Figure 29.12
Action of type I DNA topoisomerases.

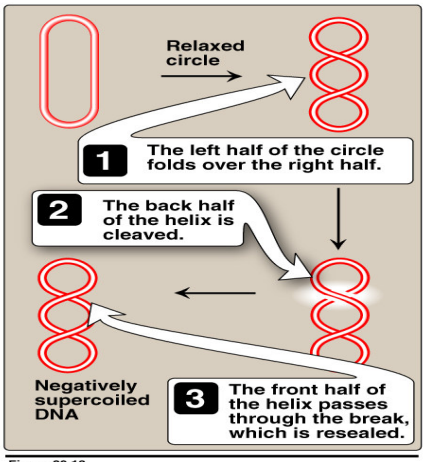

Figure 29.13
Action of *type II DNA topoisomerase.*

D. Direction of DNA replication:

- DNA polymerases (that responsible for of DNA template are):
  - ✓ Only read parental nucleotide sequences in 3′→5′ direction
  - ✓ They synthesized the new DNA in 5′→ 3′ antiparallel direction

■ **So, beginning with one prenatal double helix, the two newly synthesized DNA must grow in opposite directions:**

1- One in 5`- 3` direction towards the replication fork
2- One in 5`- 3` direction away from the replication fork.

1. Leading strand:

- copied in 5′→ 3′ direction , toward the replication fork
- synthesized almost continuously (MCQ)

2. *Lagging strand:*

- copied in 5′→ 3′ direction , away from the replication fork
- synthesized discontinuously with small fragments of DNA near the replication fork , is called okazaki fragments (MCQ)
- note : okazaki fragments are eventually joined to become a single continuous strand