

# 01 Regulation of cell cycle :-

a) cell cycle does not occur in unchecked manner. The progression of the cell are checked by regulatory molecules. It includes the detection and repair of genetic damage as well as prevention of uncontrolled cell division.

There are two key classes of regulatory molecules that determine a cell's proper progress through the cell cycle. These are

02 Sunday

a) cyclins

b) cyclin dependent kinases (cdk)

The nobel prize in physiology or medicine

Who looks outside. Who looks inside, awakes. - Carl Jung

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2) 2001 was awarded jointly to Leland H. Hartwell, Tim Hunt and Sir Paul M. Nurse for their discoveries of key regulators of the cell cycle.

### Regulatory Molecules :-

Cyclins cyclindependent kinases

G<sub>1</sub> cyclins (D cyclins) G<sub>1</sub> cdk (cdk 4)

S-phase cyclins (cyclins E and A) S-phase cdk (cdk 2)

M-phase cyclins (B-cyclins) M-phase cdk (cdk 1)

- These levels in the cell rise and fall with the stages of the cycle.
- Their levels in the cell remain stable.
- Remain inactive.

- Bind to the appropriate cyclin in order to be activated.

In absence of clearly defined goal, we become strangely loyal to performing daily acts of trivia.

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04

Wk 14 • 94th Day  
TUESDAY

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17  
18 19 20 21 22 23 24 25 26 27 28 29 30  
S S M T W T F S S M T W T F S S M

• Their functions is to

(3)

provide phosphate groups to

a no. of proteins that

control processes in the

cell cycle.



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It matters not what you are...

Phase of cell cycle	Cyclin	cdk	cyclin-cdk complex	function.
G <sub>1</sub>	Cyclin D	cdk 4	G <sub>1</sub> cyclin - Cdk	inhibits Rb protein and signals the cell to prepare the chromosome for replication.
S	Cyclin E and cyclin A	cdk 2	S phase cyclin - S phase cdk	Activates DNA replication.
G <sub>2</sub>	Cyclin B	Cdk 1	Mitotic cyclin - M phase Cdk	Activates mitosis

Table - 1. Cyclin - cyclin dependent kinases (cdk) complex formed during cell cycle regulation and their functions.

### 3) Cell cycle Check points :-

cell cycle check points are used by

The cell to monitor and regulate the progress of the cell cycle. The cell cannot proceed to the next phase until checkpoint requirements have been met.

Three main checkpoints are :-

1) G<sub>1</sub>/S checkpoint (before cell enters S phase)

2. G<sub>2</sub>/M checkpoint (after S phase)

3) APC / c Checkpoint (during Mitosis) → Between metaphase & Anaphase

The true meaning of life is to plant trees, under whose shade you do not expect to sit.

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SATURDAY

08

(6) 1) G<sub>1</sub>/S checkpoint (before cell enters S phase)

- checks for cell size → cytoplasm/nucleus ratio
- checks for nutrients → enzymes for DNA repl<sup>n</sup>
- checks for DNA damage
- checks for all the preparations (all proteins, ATP etc. requires in S phase)

(C/N ratio)

→ checks whether S phase cyclins and cdk complex is activated to initiate DNA replication.

Then the cell passes to next S phase ÷

09 Sunday

2) G<sub>2</sub>/M checkpoint (after S phase)

- checks for proper DNA replication
- checks for all the preparations (all

It matters not what you are thought to be, but what you are.

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(A) proteins, ATP etc. required in M phase

→ checks for Tubulin synthesis

→ checks whether M phase cyclins and cdk complex is activated to initiate mitosis.

Then the cell passes to next M phase.

3) APC/C check point (during Mitosis) ↓

→ Arrangement of chromosome on equatorial plane (check)

→ Ato' Check the attachment of microtubule -> to the kinetochore of chromosome

→ Proper alignment and microtubule assembly.

A leader is a dealer in hope. - Napoleon Bonaparte

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⑧ All the checkpoints require the services of a complex of proteins. The levels of these proteins are increased in damaged cells. They allow time to repair DNA by blocking the cell cycle. p53 is one such protein which

senses DNA damage and can halt progression of the cell cycle in G<sub>1</sub> phase by blocking the activity of cdk 2 until damage can be repaired. If the damage is so

severe that it can not be repaired, then the cell ~~destructs~~ destroys itself by Apoptosis. In case of damage to DNA

after S phase, the action of Cdk 1 is

Most of the shadows of this life are caused by our standing in our own sunshine. - Ralph Waldo Emerson

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19) Inhibited, thus stopping progression of the cell from G<sub>2</sub> to Mitosis.



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He who conquers others is strong, he who conquers himself

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