**Ch25**

2. Heavy Isotope Analysis of DNA Replication

In the first generation, all of DNA are hybrid DNA (15N-14N), and the total DNA is twofold increase in population. In the second generation, semiconservative replication produce half of DNA is light DNA, the other half is hybrid DNA. In the third generation, the hybrid DNA produce half of light DNA and half of hybrid DNA again, whereas light DNA just produce light DNA. In this case, the molar ratio is 1/8.

4. Base Composition of DNAs Made from Single- Stranded Templates

A = T: (24.7% + 32.7%)/2= 28.7%

C = G: (24.1% + 18.5%)/2 = 21.3%

The assumption is that both templates is completely replicated.

5. DNA Replication

(a) The radioactivity might be found in the precipitate, but is much lower than before. Because lack of one kind of nucleotide block the synthesis of DNA when the nucleotide is demand. So, the synthesis reaction stops in the position. However, some fragment without this kind of nucleotide may be synthesis.

(b) Yes. In this condition, DNA synthesis won’t be block. So, dTTP will be incorporated in new strain of DNA.

(c) No. In the DNA synthesis reaction, γ and β phosphate will be release in the surrounding, that won’t be incorporated in DNA.

8. Leading and Lagging Strands

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Leading Strands | Lagging Strands |
| Primer | A fragment of RNA, provide the 3’ termini to link nucleotides. | At the beginning of synthesis | In every synthesis term of Okazaki fragment. |
| DNA polymerase III | Synthesis long fragments of DNA | The whole chain of new DNA | Every Okazaki fragments |
| DNA ligase | Link the 3’termini to the 5’ phosphate group | Don’t need | need |
| DNA polymerase I | Degrade RNA primer and synthesis small fragment of DNA to fulfill the gap. | Don’t need | Need |
| dNTP | The material of DNA synthesis | Need | Need |

10. Fidelity of Replication of DNA

Leading strand:

1) The 3’-5’ endonuclease activity of DNA polymerase III.

2) The complementary pairing of bases.

Lagging strand:

I think the fidelity of lagging chain is lower than leading strand. The reactions occur during the synthesis of lagging chain is much more complex in leading chain, which brings more opportunities to produce mistakes.

12. The Ames Test

1) This colonies arise in the absence of histidine because the mutation of DNA makes the bacteria could synthesis histidine again.

2) This phenomenon means that the bacteria have much higher rate of mutation with the existence of 2-aminoanthracene, which indicate 2-aminoanthracene is a kind of mutagenic agent (makes DNA easier to mutate).

3) 2-aminoanthracene induce the mutation of DNA in human cells, and some of which could turn to cancer cell.

