DNA Replication Mechanism

Semiconservative Replication

- Each strand serves as template
- Two identical daughter DNA molecules
- Proven by Meselson-Stahl experiment

Key Enzymes

- **Helicase:**Unwinds DNA helix
- **Primase:**Synthesizes RNA primers
- **DNA Pol III:**Main replication (5'→3')
- **DNA Pol I:**Removes primers
- **Ligase:**Joins Okazaki fragments

Leading vs Lagging

- **Leading:**Continuous synthesis
- **Lagging:**Discontinuous (Okazaki)
- Fragment size: 1000-2000 nt

✓ Proofreading & Fidelity

- 3'→5' exonuclease activity
- Error rate: ~1 in 10^7 bases
- Mismatch repair systems

DNA Replication Fork - Detailed Mechanism