

DNA合成的忠实性机制

谢兆辉

德州学院生物系, 山东省高校生物技术与生物资源利用重点实验室, 山东德州 253023

XIE Zhao-Hui

Key University Laboratory of Biotechnology and Utilization of Bio-resource of Shandong, Department of Biology, Dezhou University, Dezhou 253023, China

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摘要 DNA的忠实性合成对于基因组稳定和物种延续至关重要, 否则可能会产生严重的后果。DNA合成具有极高的忠实性, 这主要基于3个步骤: (1)基于氢键、碱基对构象或其他因素的核苷酸选择; (2)基于3' → 5' 外切酶活性的校对, 方式有顺式校对和反式校对, 可以去掉错误掺入的核苷酸; (3)基于错配修复、切除修复、同源重组修复和跨损伤DNA合成的修复过程, 可以纠正逃过校对的错误核苷酸。由于DNA聚合酶不仅可以作为抗病毒或抗癌药物的靶标, 而且其忠实性还与抗药性或药物副作用有关, 所以深入研究DNA合成的忠实性具有重要的意义。文章主要论述了DNA合成的忠实性机制, 并对DNA聚合酶的应用前景做了展望。

关键词: [DNA合成](#) [忠实性](#) [核苷酸选择](#) [校对](#) [DNA修复](#)

Abstract: Accurate DNA synthesis is vital to maintain genome stability and ensure propagation of species. Synthetic errors have far reaching consequences. Therefore, DNA synthesis is remarkably accurate. The high fidelity is mainly achieved through three steps: ① nucleotide selection, which is based on hydrogen, base pair shape, or some other elements; ② 3' → 5' exonuclease proofreading, which removes mis-incorporated nucleotides in cis or trans; ③ repair process, which could correct mismatched nucleotides escaping from proofreading, such as mismatch repair, excision repair, homologous recombination repair, and translesion DNA synthesis. Because all polymerases are suitable targets for anticancer or antiviral drugs, their fidelity is involved in drug resistance and side effects. Understanding the molecular basis of synthesis fidelity is of vital importance. In this review, the fidelity mechanisms of DNA synthesis will be discussed in detail. Furthermore, their application perspective was discussed.

Keywords: [DNA synthesis](#), [fidelity](#), [nucleotide selection](#), [proofreading](#), [DNA repair](#)

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通讯作者 谢兆辉 Email: xiezh0523@163.com




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