

**TABLE 12-1** Properties of DNA Polymerases

<i>E. coli</i>	I	II	III			
Polymerization: 5' → 3'	+	+	+			
Exonuclease activity:						
3' → 5'	+	+	+			
5' → 3'	+	-	-			
Synthesis from:						
Intact DNA	-	-	-			
Primed single strands	+	-	-			
Primed single strands plus single-strand-binding protein	+	-	+			
In vitro chain elongation rate (nucleotides per minute)	600	?	30,000			
Molecules present per cell	400	?	10-20			
Mutation lethal?	+	-	+			
	Mammalian Cells*					
	$\alpha$	$\beta^{\dagger}$	$\gamma$	$\delta$	$\epsilon$	
Polymerization: 5' → 3'	+	+	+	+	+	
Exonuclease proofreading activity: <sup>‡</sup> 3' → 5'	-	-	+	+	+	
Synthesis from:						
RNA primer	+	-	-	+	?	
DNA primer	+	+	+	+	+	
Associated DNA primase	+	-	-	-	-	
Sensitive to aphidicolin (inhibitor of cell DNA synthesis)	+	-	-	+	+	
Cell location:						
Nuclei	+	+	-	+	+	
Mitochondria	-	-	+	-	-	

\*Yeast DNA polymerase I, II, and III are equivalent to polymerase  $\alpha$ ,  $\beta$ , and  $\delta$ , respectively. I and III are essential for cell viability.

<sup>†</sup>Polymerase  $\beta$  is most active on DNA molecules with gaps of about 20 nucleotides and is thought to play a role in DNA repair.

<sup>‡</sup>FEN1 is the eukaryotic 5' → 3' exonuclease that removes RNA primers; it is similar in structure and function to the domain of *E. coli* polymerase I that contains the 5' → 3' exonuclease activity.