



FIGURE 7.10

Mechanism of DNA unwinding by topoisomerase I.

conformations, resembling an open clamp in the absence of ATP and a closed clamp in the presence of ATP. The open conformation can bind two segments of DNA, forming the pre-cleavage complex. One of these segments will be nicked by the enzyme (G segment), and another will be transported (T segment). Afterwards, two ATP molecules are bound, leading to the dimerization of the ATPase domains and hence to a conformational change from the open to the closed clamp structure. The nucleophilic reactions that break both strands of the G segment of DNA then take place, generating the post-cleavage complex. This allows the passage of the T segment through the gap thus produced, which requires the hydrolysis of one molecule of ATP. The broken ends of the G segment are then ligated, and the remaining ATP molecule is hydrolyzed. Upon dissociation of the two ADP molecules from ATP hydrolysis, the T segment is transported through the opening at the C-terminal part of the enzyme, which is then closed. Finally, the enzyme returns to the open clamp conformation, liberating the G segment.