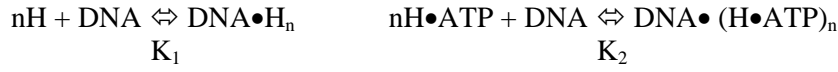


APPENDIX

In the DNA-binding step, helicase (H) can bind to DNA in either the free or the ATP-bound form:



$$\text{with } K_1 = \frac{[DNA][H]^n}{[DNA \bullet H_n]} \quad (4) \quad \text{and } K_2 = \frac{[DNA][H \bullet ATP]^n}{[DNA \bullet (H \bullet ATP)_n]} \quad (5)$$

The conservation relationship for DNA substrate can be written as:

$$[DNA]_{\text{total}} = [DNA] + [DNA \bullet H_n] + [DNA \bullet (H \bullet ATP)_n] \quad (6)$$

ATP can bind to the DNA-free or the DNA-bound helicase:



$$\text{with } K_3 = \frac{[H][ATP]}{[H \bullet ATP]} \quad (7) \quad \text{and } K_4 = \frac{[DNA \bullet H_n][ATP]^n}{[DNA \bullet (H \bullet ATP)_n]} \quad (8)$$

Eq. 6 can be simplified, because $[DNA] \rightarrow \varepsilon$ under conditions compatible with cooperative DNA-binding (excess of helicase over DNA):

$$[DNA]_{\text{total}} = [DNA \bullet H_n] + [DNA \bullet (H \bullet ATP)_n] \quad (9)$$

Eq. 8 and 9 can be rearranged as:

$$[DNA]_{\text{total}} = [DNA \bullet (H \bullet ATP)_n] \left(1 + \frac{K_4}{[ATP]^n}\right) \quad (10)$$

The initial rate of DNA unwinding (v) is then given by:

$$v = \frac{k[DNA]_{\text{total}}[ATP]^n}{K_4 + [ATP]^n} \quad (11)$$

where k is the catalytic rate constant.