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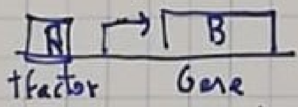

How R affects B

$$D + R \underset{k_{off}}{\overset{k_{on}}{\rightleftharpoons}} [DR]$$

dissociation constant

$$K_d = \frac{k_{off}}{k_{on}}$$

$$\frac{k_{on}}{k_{off}} = \frac{[DR]}{D \cdot R} \rightarrow k_{on} D R = k_{off} [DR]$$

$$D_t = D + [DR] \rightarrow D = D_t - [DR]$$

$$\rightarrow k_{on}(D_t - [DR]) \cdot R = k_{off} [DR] \rightarrow$$

$$\rightarrow k_{on} D_t \cdot R - k_{on} [DR] \cdot R = k_{off} [DR] \rightarrow k_{on} D_t R = [DR](k_{off} + k_{on} R) \rightarrow$$

$$\rightarrow \frac{k_{on} D_t R}{k_{off} + k_{on} R} = [DR] \rightarrow [DR] = \frac{k_{on} D_t R}{k_{off} + k_{on} R} \cdot \frac{1/k_{on}}{1/k_{on}} \rightarrow [DR] = \frac{D_t R}{\frac{k_{off}}{k_{on}} + R} \rightarrow$$

$$\rightarrow \text{dissociation constant } \left(k = \frac{k_{off}}{k_{on}}\right) \rightarrow \left[[DR] = \frac{D_t R}{k_d + R} \right] \rightarrow$$

$$\rightarrow \left[\frac{[DR]}{D_t} = \frac{R}{k_d + R} \right]$$

i) acts as monomer

$$\frac{dB}{dt} = \beta \cdot \frac{[D]}{D_t} \rightarrow \beta \left(1 - \frac{[DR]}{D_t} \right) \rightarrow \beta \left(1 - \frac{R}{k_d + R} \right) \rightarrow \beta \left(\frac{k_d + R - R}{k_d + R} \right) \rightarrow$$

$$\rightarrow \beta \left(\frac{k_d}{k_d + R} \right) \rightarrow \frac{\beta k_d}{k_d + R} = \left[\frac{\beta}{1 + R/k_d} \right] \rightarrow \text{repressor as monomer}$$

ii) acts as n-mer

$$D + R^n \rightleftharpoons [DR_n] \qquad k_d^n = \frac{k_{off}^n}{k_{on}^n} \rightarrow [DR_n] = \frac{D_t R^n}{k_d^n + R^n} \rightarrow$$

$$\rightarrow \frac{[DR_n]}{D_t} = \frac{R^n}{k_d^n + R^n}$$

the deduction works the same with the acting repressor

$$\frac{dB}{dt} = \beta \cdot \frac{[D]}{D_t} \rightarrow \frac{\beta k_d^n}{k_d^n + R^n} = \left[\frac{\beta}{1 + (R/k_d)^n} \right] \rightarrow \text{repressor as n-mer}$$