

$$\frac{d}{dt}N_{\text{XB}} = -k_{\text{n-pT}}N_{\text{XB}} + k_{\text{p-nT}}P_{\text{XB}}$$

$$\begin{aligned}\frac{d}{dt}P_{\text{XB}} &= k_{\text{n-pT}}N_{\text{XB}} - (k_{\text{p-nT}} + f_{\text{appT}})P_{\text{XB}} \\ &\quad + g_{\text{appT}}XB_{\text{PreR}} + g_{\text{xbT}}XB_{\text{PostR}}\end{aligned}$$

$$\begin{aligned}\frac{d}{dt}XB_{\text{PreR}} &= f_{\text{appT}}P_{\text{XB}} - (g_{\text{appT}} + h_{\text{fT}})XB_{\text{PreR}} \\ &\quad + h_{\text{bT}}XB_{\text{PostR}}\end{aligned}$$

$$\frac{d}{dt}XB_{\text{PostR}} = h_{\text{fT}}XB_{\text{PreR}} - (h_{\text{bT}} + g_{\text{xbT}})XB_{\text{PostR}}$$