

Problem 1: Mitogenic response to EGF binding

a). free surface receptor: $\frac{dR_s}{dt} = -k_f LR_s + k_r R_s^* - k_e R_s + v_s + k_{rec} R_{i,rec}$

bound surface receptor: $\frac{dR_s^*}{dt} = k_f LR_s - k_r R_s^* - k_e^* R_s^* + k_{rec} R_{i,rec}^*$

total internal receptor: $\frac{dR_i^T}{dt} = k_e R_s + k_e^* R_s^* - k_{deg} R_i^T$

$$R_i^T = R_i + R_i^* - R_{i,rec} - R_{i,rec}^*$$

internal active receptor: $\frac{dR_i^*}{dt} = k_e^* R_s^* - k_{deg} R_i^* - k_{rec} R_{i,rec}^*$

internal inactive receptor: $\frac{dR_i}{dt} = k_e R_s - k_{deg} R_i - k_{rec} R_{i,rec}$

$R_{i,rec}$: internal inactive receptor get recycled

$R_{i,rec}^*$: internal active receptor recycled to surface.

According to the balances above, this additional process will influence the max. conc. of active receptors. The max. total conc. of active receptor will increase.