Ecuaciones deterministas del sistema de QS de *P. aeruginosa*

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Esquema del circuito
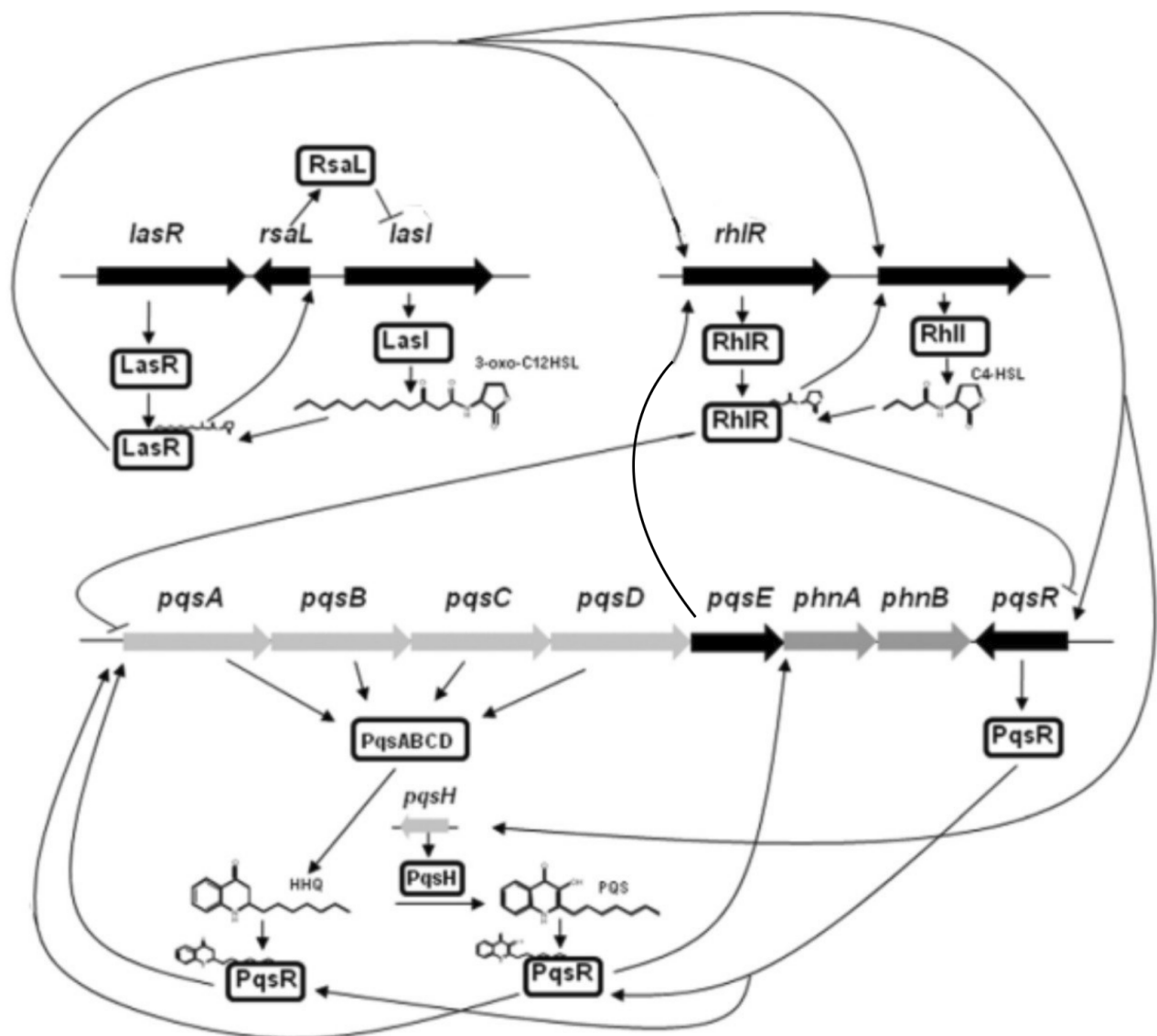

Figura 1: Representación esquemática del circuito de QS de *P. aeruginosa*.

Ecuaciones deterministas

LasR/LasI

$$[\dot{lasR}] = \kappa_{lasR} - [lasR]\gamma_{lasR} \tag{1}$$

$$[\dot{LasR}] = [lasR]\kappa_{LasR} + [LasR{\cdot}AI_1]\sigma_{LasR{\cdot}AI1} - [AI_1][LasR]\mu_{LasR{\cdot}AI1} - [LasR]\gamma_{LasR} \tag{2}$$

$$[\dot{lasI}] = \alpha_{lasI} + \frac{\beta_{lasI}}{1 + \left(\frac{[LasR{\cdot}AI_1]}{K_1}\right)^{h_1}} - [lasI]\gamma_{lasI} \tag{3}$$

$$[\dot{LasI}] = [lasI]\kappa_{LasI} - [LasI]\gamma_{LasI} \tag{4}$$

$$[\dot{AI_1}] = [LasI]\kappa_{AI1} + [LasR{\cdot}AI_1]\sigma_{LasR{\cdot}AI1} - [AI_1][LasR]\mu_{LasR{\cdot}AI1} - (d(AI_1 - AI_{1ext})) - [AI_1]\gamma_{AI1} \tag{5}$$

$$[\dot{AI_{1ext}}] = (N \cdot d(AI_1 - AI_{1ext})) - [AI_{1ext}](\gamma_{AI1ext} + d_{away}) \tag{6}$$

$$[\dot{LasR{\cdot}AI_1}] = [AI_1][LasR]\mu_{LasR{\cdot}AI1} - [LasR{\cdot}AI_1](\sigma_{LasR{\cdot}AI1} + \gamma_{LasR{\cdot}AI1}) \tag{7}$$

LasR/LasI y RhlR/RhlI

$$[\dot{lasR}] = \kappa_{lasR} - [lasR]\gamma_{lasR} \tag{1}$$

$$[\dot{LasR}] = [lasR]\kappa_{LasR} + [LasR{\cdot}AI_1]\sigma_{LasR{\cdot}AI1} - [AI_1][LasR]\mu_{LasR{\cdot}AI1} - [LasR]\gamma_{LasR} \tag{2}$$

$$[\dot{lasI}] = \alpha_{lasI} + \frac{\beta_{lasI}}{1 + \left(\frac{[LasR{\cdot}AI_1]}{K_1}\right)^{h_1}} - [lasI]\gamma_{lasI} \tag{3}$$

$$[\dot{LasI}] = [lasI]\kappa_{LasI} - [LasI]\gamma_{LasI} \tag{4}$$

$$[\dot{AI_1}] = [LasI]\kappa_{AI1} + [LasR{\cdot}AI_1]\sigma_{LasR{\cdot}AI1} - [AI_1][LasR]\mu_{LasR{\cdot}AI1} - (d(AI_1 - AI_{1ext})) - [AI_1]\gamma_{AI1} \tag{5}$$

$$[\dot{AI_{1ext}}] = (N \cdot d(AI_1 - AI_{1ext})) - [AI_{1ext}](\gamma_{AI1ext} + d_{away}) \tag{6}$$

$$[\dot{LasR{\cdot}AI_1}] = [AI_1][LasR]\mu_{LasR{\cdot}AI1} - [LasR{\cdot}AI_1](\sigma_{LasR{\cdot}AI1} + \gamma_{LasR{\cdot}AI1}) \tag{7}$$

$$[\dot{rhlR}] = \alpha_{rhlR} + \frac{\beta_{rhlR}}{1 + \left(\frac{[LasR{\cdot}AI_1]}{K_2}\right)^{h_2}} - [rhlR]\gamma_{rhlR} \tag{8}$$

$$[\dot{RhlR}] = [rhlR]\kappa_{RhlR} + [RhlR \cdot AI_2]\sigma_{RhlR{\cdot}AI2} - [AI_2][RhlR]\mu_{RhlR{\cdot}AI2} - [RhlR]\gamma_{RhlR} \tag{9}$$

$$[\dot{rhlI}] = \alpha_{rhlI} + \frac{\beta_{rhlI}}{1 + \left(\frac{[LasR{\cdot}AI_1]}{K_3}\right)^{h_3}} + \frac{\beta_{rhlI}}{1 + \left(\frac{[RhlR{\cdot}AI_2]}{K_4}\right)^{h_4}} - [rhlI]\gamma_{rhlI} \tag{10}$$

$$[\dot{RhlI}] = [rhlI]\kappa_{RhlI} - [RhlI]\gamma_{RhlI} \tag{11}$$

$$[\dot{AI_2}] = [RhlI]\kappa_{AI2} + [RhlR{\cdot}AI_2]\sigma_{RhlR{\cdot}AI2} - [AI_2][RhlR]\mu_{RhlR{\cdot}AI2} - (d(AI_2 - AI_{2ext})) - [AI_2]\gamma_{AI2} \tag{12}$$

$$[\dot{AI_{2ext}}] = (N \cdot d(AI_2 - AI_{2ext})) - [AI_{2ext}](\gamma_{AI2ext} + d_{away}) \tag{13}$$

$$[\dot{RhlR{\cdot}AI_2}] = [AI_2][RhlR]\mu_{RhlR{\cdot}AI2} - [RhlR{\cdot}AI_2](\sigma_{RhlR{\cdot}AI2} + \gamma_{RhlR{\cdot}AI2}) \tag{14}$$

$$[\dot{p}] = \alpha_p + \frac{\beta_p}{1 + \left(\frac{[RhlR{\cdot}AI_2]}{K_5}\right)^{h_5}} - [p]\gamma_p \tag{15}$$

$$[\dot{P}] = [p]\kappa_P - [P]\gamma_P \tag{16}$$

Sistema completo

$$[\dot{lasR}] = \kappa_{lasR} - [lasR]\gamma_{lasR} \tag{1}$$

$$[\dot{LasR}] = [lasR]\kappa_{LasR} + [LasR{\cdot}AI_1]\sigma_{LasR{\cdot}AI1} - [AI_1][LasR]\mu_{LasR{\cdot}AI1} - [LasR]\gamma_{LasR} \tag{2}$$

$$[\dot{lasI}] = \alpha_{lasI} + \frac{\beta_{lasI}}{1 + \left(\frac{[LasR{\cdot}AI_1]}{K_1}\right)^{h_1}} - [lasI]\gamma_{lasI} \tag{3}$$

$$[\dot{LasI}] = [lasI]\kappa_{LasI} - [LasI]\gamma_{LasI} \tag{4}$$

$$[\dot{AI_1}] = [LasI]\kappa_{AI1} + [LasR{\cdot}AI_1]\sigma_{LasR{\cdot}AI1} - [AI_1][LasR]\mu_{LasR{\cdot}AI1} - (d(AI_1 - AI_{1ext})) - [AI_1]\gamma_{AI1} \tag{5}$$

$$[\dot{AI_{1ext}}] = (N \cdot d(AI_1 - AI_{1ext})) - [AI_{1ext}](\gamma_{AI1ext} + d_{away}) \tag{6}$$

$$[\dot{LasR{\cdot}AI_1}] = [AI_1][LasR]\mu_{LasR{\cdot}AI1} - [LasR{\cdot}AI_1](\sigma_{LasR{\cdot}AI1} + \gamma_{LasR{\cdot}AI1}) \tag{7}$$

$$[\dot{rhlR}] = \alpha_{rhlR} + \frac{\beta_{rhlR}}{1 + \left(\frac{[LasR{\cdot}AI_1]}{K_2}\right)^{h_2}} - [rhlR]\gamma_{rhlR} \tag{8}$$

$$[\dot{RhlR}] = [rhlR]\kappa_{RhlR} + [RhlR \cdot AI_2]\sigma_{RhlR{\cdot}AI2} - [AI_2][RhlR]\mu_{RhlR{\cdot}AI2} - [RhlR]\gamma_{RhlR} \tag{9}$$

$$[\dot{rhlI}] = \alpha_{rhlI} + \frac{\beta_{rhlI}}{1 + \left(\frac{[LasR{\cdot}AI_1]}{K_3}\right)^{h_3}} + \frac{\beta_{rhlI}}{1 + \left(\frac{[RhlR{\cdot}AI_2]}{K_4}\right)^{h_4}} + \frac{\beta_{rhlI}}{1 + \left(\frac{[RhlR{\cdot}PqsE]}{K_5}\right)^{h_5}} - [rhlI]\gamma_{rhlI} \tag{10}$$

$$[\dot{RhlI}] = [rhlI]\kappa_{RhlI} - [RhlI]\gamma_{RhlI} \tag{11}$$

$$[\dot{AI_2}] = [RhlI]\kappa_{AI2} + [RhlR{\cdot}AI_2]\sigma_{RhlR{\cdot}AI2} - [AI_2][RhlR]\mu_{RhlR{\cdot}AI2} - (d(AI_2 - AI_{2ext})) - [AI_2]\gamma_{AI2} \tag{12}$$

$$[\dot{AI_{2ext}}] = (N \cdot d(AI_2 - AI_{2ext})) - [AI_{2ext}](\gamma_{AI2ext} + d_{away}) \tag{13}$$

$$[\dot{RhlR{\cdot}AI_2}] = [AI_2][RhlR]\mu_{RhlR{\cdot}AI2} - [RhlR{\cdot}AI_2](\sigma_{RhlR{\cdot}AI2} + \gamma_{RhlR{\cdot}AI2}) \tag{14}$$

$$[\dot{pqsR}] = \alpha_{pqsR} + \frac{\beta_{pqsR}}{1 + \left(\frac{[LasR{\cdot}AI_1]}{K_6}\right)^{h_6}} + \frac{\beta_{pqsR}}{1 + \left(\frac{[RhlR{\cdot}AI_2]}{K_7}\right)^{h_7}} - [pqsR]\gamma_{pqsR} \tag{15}$$

$$[\dot{PqsR}] = [pqsR]\kappa_{PqsR} + [PqsR{\cdot}PQS]\sigma_{PqsR{\cdot}PQS} - [PQS][PqsR]\kappa_{PqsR{\cdot}PQS} - [PqsR]\gamma_{PqsR} \tag{16}$$

$$[pqsA\dot{B}CDE] = \alpha_{pqsABCDE} + \frac{\beta_{pqsABCDE}}{1 + \left(\frac{[RhlR \cdot AI_2]}{K_8}\right)^{h_8}} + \frac{\beta_{pqsABCDE}}{1 + \left(\frac{[PqsR \cdot PQS]}{K_9}\right)^{h_9}} - [pqsABCDE]\gamma_{pqsABCDE} \quad (17)$$

$$[Pqs\dot{A}BCD] = [pqsABCDE]\kappa_{PqsABCD} - [PqsABCD]\gamma_{PqsABCD} \quad (18)$$

$$[P\dot{q}sE] = [pqsABCDE]\kappa_{PqsE} + [RhlR \cdot PqsE]\sigma_{RhlR \cdot PqsE} - [PqsE][RhlR]\mu_{RhlR \cdot PqsE} - [PqsE]\gamma_{PqsE} \quad (19)$$

$$[P\dot{Q}S] = [PqsABCD]\kappa_{PQS} + [PqsR \cdot PQS]\sigma_{PqsR \cdot PQS} - [PQS][PqsR]\mu_{PqsR \cdot PQS} - (d(PQS - PQS_{ext})) - [PQS]\gamma_{PQS}$$
$$(20)$$

$$[P\dot{Q}S_{ext}] = (N \cdot d(PQS - PQS_{ext})) - [PQS_{ext}](\gamma_{PQSext} + d_{away}) \quad (21)$$

$$[PqsR\dot{\cdot}PQS] = [PQS][PqsR]\mu_{PqsR \cdot PQS} - [PqsR \cdot PQS](\sigma_{PqsR \cdot PQS} + \gamma_{PqsR \cdot PQS}) \quad (22)$$

$$[RhlR\dot{\cdot}PqsE] = [PqsE][RhlR]\mu_{RhlR \cdot PqsE} - [RhlR \cdot PqsE](\sigma_{RhlR \cdot PqsE} + \gamma_{RhlR \cdot PqsE}) \quad (23)$$

$$[\dot{p}] = \alpha_p + \frac{\beta_p}{1 + \left(\frac{[RhlR \cdot AI_2]}{K_{10}}\right)^{h_{10}}} - [p]\gamma_p \quad (24)$$

$$[\dot{P}] = [p]\kappa_P - [P]\gamma_P \quad (25)$$

LasR/LasI & RsaL

$$[\dot{lasR}] = \kappa_{lasR} - [lasR]\gamma_{lasR} \tag{1}$$

$$[\dot{LasR}] = [lasR]\kappa_{LasR} + [LasR{\cdot}AI_1]\sigma_{LasR{\cdot}AI1} - [AI_1][LasR]\mu_{LasR{\cdot}AI1} - [LasR]\gamma_{LasR} \tag{2}$$

$$[\dot{rsaL}] = \alpha_{rsaL} + \frac{\beta_{rsaL}}{1 + \left(\frac{[LasR{\cdot}AI_1]}{K_1}\right)^{h_1}} - [rsaL]\gamma_{rsaL} \tag{3}$$

$$[\dot{RsaL}] = [rsaL]\kappa_{RsaL} - [RsaL]\gamma_{RsaL} \tag{4}$$

$$[\dot{lasI}] = \alpha_{lasI} + \frac{\beta_{lasI}}{1 + \left(\frac{[LasR{\cdot}AI_1]}{K_2}\right)^{h_2}} + \frac{\beta_{lasI}}{1 + \left(\frac{[RsaL]}{K_3}\right)^{h_3}} - [lasI]\gamma_{lasI} \tag{5}$$

$$[\dot{LasI}] = [lasI]\kappa_{LasI} - [LasI]\gamma_{LasI} \tag{6}$$

$$[\dot{AI_1}] = [LasI]\kappa_{AI1} + [LasR{\cdot}AI_1]\sigma_{LasR{\cdot}AI1} - [AI_1][LasR]\mu_{LasR{\cdot}AI1} - (d(AI_1 - AI_{1ext})) - [AI_1]\gamma_{AI1} \tag{7}$$

$$[\dot{AI_{1ext}}] = (N \cdot d(AI_1 - AI_{1ext})) - [AI_{1ext}](\gamma_{AI1ext} + d_{away}) \tag{8}$$

$$[\dot{LasR{\cdot}AI_1}] = [AI_1][LasR]\mu_{LasR{\cdot}AI1} - [LasR{\cdot}AI_1](\sigma_{LasR{\cdot}AI1} + \gamma_{LasR{\cdot}AI1}) \tag{9}$$