

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

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## Esquema del circuito

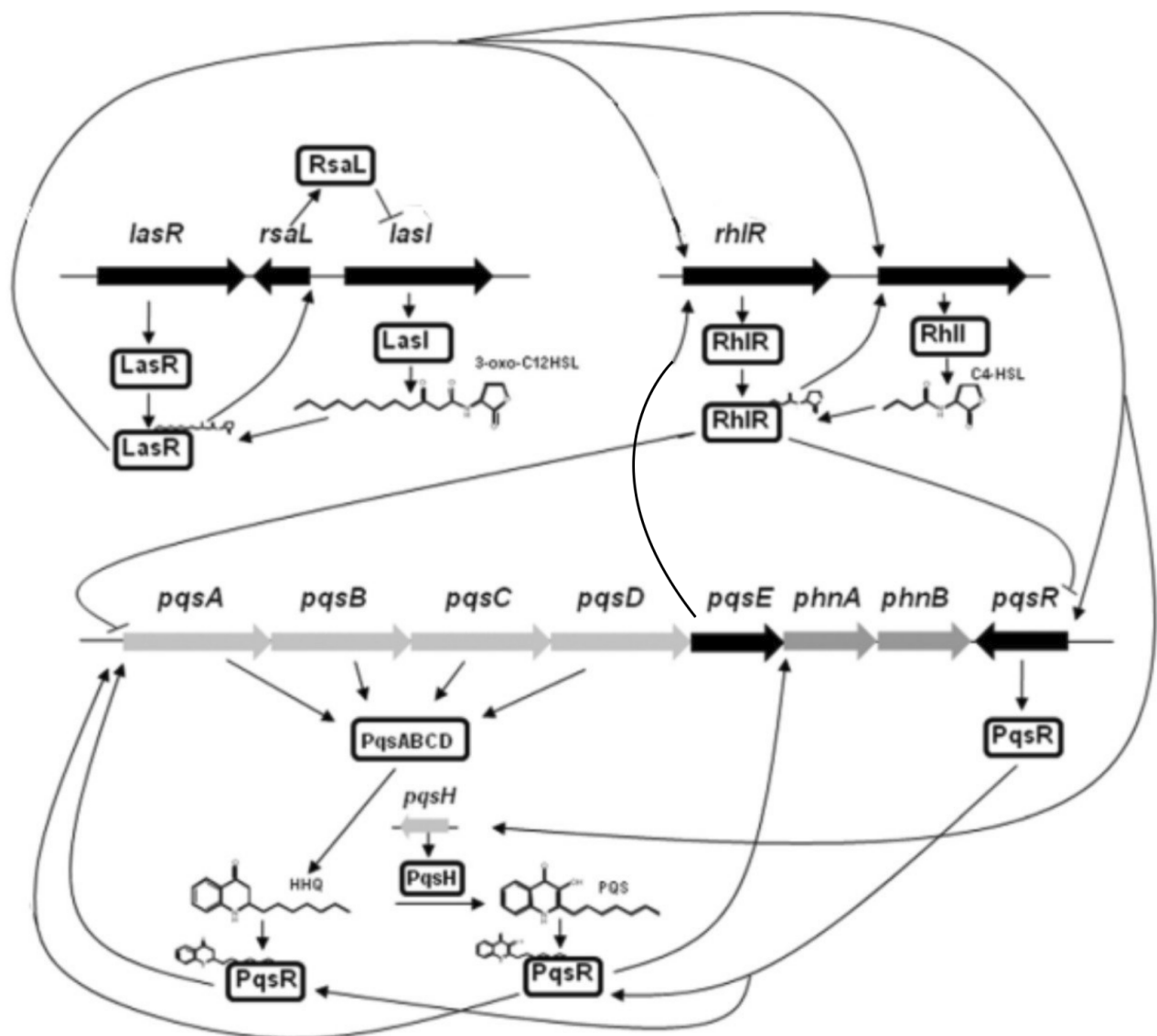


Figura 1: Representación esquemática del circuito de QS de *P. aeruginosa*.

# Ecuaciones deterministas

## LasR/LasI

$$[las\dot{R}] = \kappa_{lasR} - [lasR]\gamma_{lasR} \quad (1)$$

$$[Las\dot{R}] = [lasR]\kappa_{LasR} + [LasR\cdot AI_1]\sigma_{LasR\cdot AI_1} - [AI_1][LasR]\kappa_{LasR\cdot AI_1} - [LasR]\gamma_{LasR} \quad (2)$$

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

$$[Las\dot{I}] = [lasI]\kappa_{LasI} - [LasI]\gamma_{LasI} \quad (4)$$

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

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

$$[Las\dot{R}\cdot AI_1] = [AI_1][LasR]\kappa_{LasR\cdot AI_1} - [LasR\cdot AI_1](\gamma_{LasR\cdot AI_1} + \sigma_{LasR\cdot AI_1}) \quad (7)$$

## LasR/LasI y RhIR/RhII

$$[las\dot{R}] = \kappa_{lasR} - [lasR]\gamma_{lasR} \quad (1)$$

$$[Las\dot{R}] = [lasR]\kappa_{LasR} + [LasR \cdot AI_1]\sigma_{LasR \cdot AI_1} - [AI_1][LasR]\kappa_{LasR \cdot AI_1} - [LasR]\gamma_{LasR} \quad (2)$$

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

$$[Las\dot{I}] = [lasI]\kappa_{LasI} - [LasI]\gamma_{LasI} \quad (4)$$

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

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

$$[Las\dot{R} \cdot AI_1] = [AI_1][LasR]\kappa_{LasR \cdot AI_1} - [LasR \cdot AI_1](\gamma_{LasR \cdot AI_1} + \sigma_{LasR \cdot AI_1}) \quad (7)$$

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

$$[RhI\dot{R}] = [rhlR]\kappa_{RhIR} + [RhIR \cdot AI_2]\sigma_{RhIR \cdot AI_2} - [AI_2][RhIR]\kappa_{RhIR \cdot AI_2} - [RhIR]\gamma_{RhIR} \quad (9)$$

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

$$[RhI\dot{I}] = [rhlI]\kappa_{RhII} - [RhII]\gamma_{RhII} \quad (11)$$

$$[AI_2\dot{I}] = [RhII]\kappa_{AI_2} + [RhIR \cdot AI_2]\sigma_{RhIR \cdot AI_2} - (d(AI_2 - AI_{2ext})) - [AI_2]\gamma_{AI_2} \quad (12)$$

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

$$[RhI\dot{R} \cdot AI_2] = [AI_2][RhIR]\kappa_{RhIR \cdot AI_2} - [RhIR \cdot AI_2](\gamma_{RhIR \cdot AI_2} + \sigma_{RhIR \cdot AI_2}) \quad (14)$$

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

$$[\dot{P}] = [p]\kappa_P - [P]\gamma_P \quad (16)$$

## Sistema completo

$$[l\dot{a}sR] = \kappa_{lasR} - [lasR]\gamma_{lasR} \quad (1)$$

$$[L\dot{a}sR] = [lasR]\kappa_{LasR} + [LasR \cdot AI_1]\sigma_{LasR \cdot AI_1} - [AI_1][LasR]\kappa_{LasR \cdot AI_1} - [LasR]\gamma_{LasR} \quad (2)$$

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

$$[L\dot{a}sI] = [lasI]\kappa_{LasI} - [LasI]\gamma_{LasI} \quad (4)$$

$$[A\dot{I}_1] = [LasI]\kappa_{AI_1} + [LasR \cdot AI_1]\sigma_{LasR \cdot AI_1} - (d(AI_1 - AI_{1ext})) - [AI_1]\gamma_{AI_1} \quad (5)$$

$$[A\dot{I}_{1ext}] = (N \cdot d(AI_1 - AI_{1ext})) - [AI_{1ext}](\gamma_{AI_{1ext}} + d_{away}) \quad (6)$$

$$[Las\dot{R} \cdot AI_1] = [AI_1][LasR]\kappa_{LasR \cdot AI_1} - [LasR \cdot AI_1](\gamma_{LasR \cdot AI_1} + \sigma_{LasR \cdot AI_1}) \quad (7)$$

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

$$[R\dot{h}lR] = [rhlR]\kappa_{RhlR} + [RhlR \cdot AI_2]\sigma_{RhlR \cdot AI_2} - [AI_2][RhlR]\kappa_{RhlR \cdot AI_2} - [RhlR]\gamma_{RhlR} \quad (9)$$

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

$$[R\dot{h}lI] = [rhlI]\kappa_{RhlI} - [RhlI]\gamma_{RhlI} \quad (11)$$

$$[A\dot{I}_2] = [RhlI]\kappa_{AI_2} + [RhlR \cdot AI_2]\sigma_{RhlR \cdot AI_2} - (d(AI_2 - AI_{2ext})) - [AI_2]\gamma_{AI_2} \quad (12)$$

$$[A\dot{I}_{2ext}] = (N \cdot d(AI_2 - AI_{2ext})) - [AI_{2ext}](\gamma_{AI_{2ext}} + d_{away}) \quad (13)$$

$$[Rhl\dot{R} \cdot AI_2] = [AI_2][RhlR]\kappa_{RhlR \cdot AI_2} - [RhlR \cdot AI_2](\gamma_{RhlR \cdot AI_2} + \sigma_{RhlR \cdot AI_2}) \quad (14)$$

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

$$[P\dot{q}sR] = [pqsR]\kappa_{PqsR} + [PqsR \cdot PQS]\sigma_{PqsR \cdot PQS} - [PQS][PqsR]\kappa_{PqsR \cdot PQS} - [PqsR]\gamma_{PqsR} \quad (16)$$

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

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

$$[Pqs\dot{E}] = [pqsABCDE]\kappa_{PqsE} + [RhIR\cdot PqsE]\sigma_{RhIR\cdot PqsE} - [PqsE][RhIR]\kappa_{RhIR\cdot PqsE} - [PqsE]\gamma_{PqsE} \quad (19)$$

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

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

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

$$[RhIR\cdot\dot{P}qsE] = [PqsE][RhIR]\kappa_{RhIR\cdot PqsE} - [RhIR\cdot PqsE](\gamma_{RhIR\cdot PqsE} + \sigma_{RhIR\cdot PqsE}) \quad (23)$$

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

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