Table S2

Rate reaction laws

Reaction	Equation	Kinetic rate law
ComAB synthesis	$\beta_{ComAB} + vmax_{ComAB} \frac{[(ComE{\sim}P)_D]}{[(ComE{\sim}P)_D] + K_{ComE{\sim}P\_AB} * \left(1 + \frac{[ComE]^e}{Ki_{ComE\_AB}{}^e}\right)}$	Competitive inhibition
ComAB degradation	$\gamma_{ComAB} * [ComAB]$	Mass action
pre-CSP synthesis	$\beta_{ComCDE} + vmax_{ComCDE} \frac{[(ComE{\sim}P)_D]}{[(ComE{\sim}P)_D] + K_{ComE{\sim}P} * \left(1 + \frac{[ComE]^e}{Ki_{ComE}{}^e}\right)}$	Competitive inhibition
pre-CSP maturation and CSP export	$\varepsilon * [ComAB] * [preCSP]$	Mass action
pre-CSP degradation	$\gamma_{preCSP} * [preCSP]$	Mass action
CSP degradation	$\gamma_{CSP} * [CSP]$	Mass action
ComE synthesis	$\beta_{ComCDE} + vmax_{ComCDE} \frac{[(ComE{\sim}P)_D]}{[(ComE{\sim}P)_D] + K_{ComE{\sim}P} * \left(1 + \frac{[ComE]^e}{Ki_{ComE}{}^e}\right)}$	Competitive inhibition
ComE degradation	$\gamma_{ComE} * [ComE]$	Mass action
ComD synthesis	$\beta_{ComCDE} + vmax_{ComCDE} \frac{[(ComE{\sim}P)_D]}{[(ComE{\sim}P)_D] + K_{ComE{\sim}P} * \left(1 + \frac{[ComE]^e}{Ki_{ComE}{}^e}\right)}$	Competitive inhibition
Dimerization of ComD	$k_{on\_D} * [ComD]^2$	Mass action
ComD dimer dissociation	$k_{off\_D} * [(ComD)_D]$	Mass action
Basal autophosphorylation of ComD	$\alpha_{auto} * [(ComD)_D]$	Mass action
CSP-induced autophosphorylation of ComD	$vmax_{act} * \frac{[CSP]}{[CSP] + K_{act}} * [(ComD)_D]$	Michaelis-Menten
ComD degradation	$\gamma_{ComD} * [ComD]$	Mass action
Degradation of the inactive form of the CSP-bound dimer of ComD	$\gamma_{ComD} * [(ComD\_consumed)_D]$	Mass action
ComE transphosphorylation	$\lambda * [ComE]^2 * [(ComD_{act})_D]$	Mass action
ComE~P dephosphorylation	$\rho * [(ComE{\sim}P)_D]$	Mass action
ComX synthesis as an inactive form	$vmax_{ComX} * \frac{[(ComE{\sim}P)_D]^x}{[(ComE{\sim}P)_D]^x + K_{ComX}{}^x}$	Hill function (cooperativity)
ComW synthesis	$vmax_{ComW} * \frac{[(ComE{\sim}P)_D]^w}{[(ComE{\sim}P)_D]^w + K_{ComW}{}^w}$	Hill function (cooperativity)
ComX activation	$\omega_1 * [ComW] * [ComX_{ina}]$	Mass action
ComW degradation	$\gamma_{ComW} * [ComW]$	Mass action
Inactive form of ComX degradation	$\gamma_{ComX} * [ComX_{ina}]$	Mass action
Active form of ComX degradation	$\gamma_{ComX} * [ComX_{act}]$	Mass action
SsbB synthesis	$vmax_{SsbB} * \frac{[ComX_{act}]^s}{[ComX_{act}]^s + K_{SsbB}{}^s}$	Hill function (cooperativity)
SsbB degradation	$\gamma_{SsbB} * [SsbB]$	Mass action
DprA synthesis	$vmax_{DprA} * \frac{[ComX_{act}]^d}{[ComX_{act}]^d + K_{DprA}{}^d}$	Hill function (cooperativity)
DprA degradation	$\gamma_{DprA} * [DprA]$	Mass action
Formation of the DprA-ComE~P complex	$2 * k_{on\_DprA\_EP} * [DprA]^2 * [(ComE{\sim}P)_D]$	Mass action
Degradation of the DprA-ComE~P complex	$\gamma_{DprA} * [(DprA\_ComE{\sim}P)_D]$	Mass action
ComZ synthesis	$vmax_{ComZ} * \frac{[ComX_{act}]^z}{[ComX_{act}]^z + K_{ComZ}{}^z}$	Hill function (cooperativity)
ComZ degradation	$\gamma_{ComZ} * [ComZ]$	Mass action
ComZ and ComW interaction	$\omega_2 * [ComZ] * [ComW_{act}]$	Mass action