

Table S3

New or modified reactions and ODE equations for the alternative models

Interaction between ComW and a late <i>com</i> gene product ComZ prevents ComW activity	
New reactions	
Synthesis of ComZ	$\text{ComX}_{\text{act}} \rightarrow \text{ComX}_{\text{ina}} + \text{ComZ}$
Inhibition of active form of ComW	$\text{ComW}_{\text{act}} + \text{ComZ} \rightarrow \text{ComW}_{\text{ina}}$
New ODEs	
$\frac{d[\text{ComZ}]}{dt} = v_{\text{max}_{\text{ComZ}}} * \frac{[\text{ComX}_{\text{act}}]^z}{[\text{ComX}_{\text{act}}]^z + K_{\text{ComZ}}^z} - \omega_2 * [\text{ComZ}] * [\text{ComW}_{\text{act}}] - \gamma_{\text{ComZ}} * [\text{ComZ}]$	
$\frac{d[\text{ComW}_{\text{act}}]}{dt} = v_{\text{max}_{\text{ComW}}} \frac{[(\text{ComE} \sim \text{P})_D]^w}{[(\text{ComE} \sim \text{P})_D]^w + K_{\text{ComW}}^w} - \omega_2 * [\text{ComZ}] * [\text{ComW}_{\text{act}}] - \gamma_{\text{ComW}} * [\text{ComW}_{\text{ina}}]$	
$\frac{d[\text{ComW}_{\text{ina}}]}{dt} = \omega_2 * [\text{ComZ}] * [\text{ComW}_{\text{act}}] - \gamma_{\text{ComW}} * [\text{ComW}_{\text{ina}}]$	
$[\text{ComW}]_{\text{total}} = [\text{ComW}_{\text{ina}}] + [\text{ComW}_{\text{act}}]$	
Competition between ComW and a late <i>com</i> gene product ComZ for the inactive form of ComX impairs the formation of the active form of ComX	
New reactions	
Synthesis of ComZ	$\text{ComX}_{\text{act}} \rightarrow \text{ComX}_{\text{ina}} + \text{ComZ}$
Inhibition of ComX activation	$\text{ComX}_{\text{ina}} + \text{ComW} + \text{ComZ} \rightarrow \text{ComX}_{\text{act}} + \text{ComW} + \text{ComZ}$
New ODEs	
$\frac{d[\text{ComZ}]}{dt} = v_{\text{max}_{\text{ComZ}}} * \frac{[\text{ComX}_{\text{act}}]^z}{[\text{ComX}_{\text{act}}]^z + K_{\text{ComZ}}^z} - \gamma_{\text{ComZ}} * [\text{ComZ}]$	
$\begin{aligned} \frac{d[\text{ComX}_{\text{act}}]}{dt} = & v_{\text{max}_{\text{ComX}_{\text{act}}}} * \frac{[\text{ComW}_{\text{act}}]^j}{[\text{ComW}_{\text{act}}]^j + K_{\text{ComX}_{\text{act}}}} * \left(1 - \frac{[\text{ComZ}]^k}{[\text{ComZ}]^k + K_{i_{\text{ComX}_{\text{act}}-\text{ComZ}}}} \right) * [\text{ComX}_{\text{ina}}] \\ & - v_{\text{max}_{\text{DprA}}} * \frac{[\text{ComX}_{\text{act}}]^d}{[\text{ComX}_{\text{act}}]^d + K_{\text{DprA}}^d} - v_{\text{max}_{\text{SsbB}}} * \frac{[\text{ComX}_{\text{act}}]^s}{[\text{ComX}_{\text{act}}]^s + K_{\text{SsbB}}^s} \\ & - v_{\text{max}_{\text{ComZ}}} * \frac{[\text{ComX}_{\text{act}}]^z}{[\text{ComX}_{\text{act}}]^z + K_{\text{ComZ}}^z} - \gamma_{\text{ComX}} * [\text{ComX}_{\text{act}}] \end{aligned}$	
$\begin{aligned} \frac{d[\text{ComX}_{\text{ina}}]}{dt} = & v_{\text{max}_{\text{ComX}}} * \frac{[(\text{ComE} \sim \text{P})_D]^x}{[(\text{ComE} \sim \text{P})_D]^x + K_{\text{ComX}}^x} + v_{\text{max}_{\text{DprA}}} * \frac{[\text{ComX}_{\text{act}}]^d}{[\text{ComX}_{\text{act}}]^d + K_{\text{DprA}}^d} \\ & + v_{\text{max}_{\text{SsbB}}} * \frac{[\text{ComX}_{\text{act}}]^s}{[\text{ComX}_{\text{act}}]^s + K_{\text{SsbB}}^s} + v_{\text{max}_{\text{ComZ}}} * \frac{[\text{ComX}_{\text{act}}]^z}{[\text{ComX}_{\text{act}}]^z + K_{\text{ComZ}}^z} \\ & - v_{\text{max}_{\text{ComX}_{\text{act}}}} * \frac{[\text{ComW}_{\text{act}}]^j}{[\text{ComW}_{\text{act}}]^j + K_{\text{ComX}_{\text{act}}}} * \left(1 - \frac{[\text{ComZ}]^k}{[\text{ComZ}]^k + K_{i_{\text{ComX}_{\text{act}}-\text{ComZ}}}} \right) * [\text{ComX}_{\text{ina}}] \\ & - \gamma_{\text{ComX}} * [\text{ComX}_{\text{ina}}] \end{aligned}$	
Competition between the active form of ComX and a late <i>com</i> gene product ComZ for RNA polymerase binding	
New reactions	
Synthesis of ComZ	$\text{ComX}_{\text{act}} \rightarrow \text{ComX}_{\text{ina}} + \text{ComZ}$
Synthesis of SsbB	$\text{ComX}_{\text{act}} + \text{ComZ} \rightarrow \text{ComX}_{\text{ina}} + \text{SsbB} + \text{ComZ}$
Synthesis of DprA	$\text{ComX}_{\text{act}} + \text{ComZ} \rightarrow \text{ComX}_{\text{ina}} + \text{DprA} + \text{ComZ}$
New ODEs	
$\frac{d[\text{ComZ}]}{dt} = \beta_{\text{ComZ}} + v_{\text{max}_{\text{ComZ}}} * \frac{[\text{ComX}_{\text{act}}]^z}{[\text{ComX}_{\text{act}}]^z + K_{\text{ComZ}}^z} \left(1 - \frac{[\text{ComZ}]^i}{[\text{ComZ}]^i + K_{i_{\text{ComZ}-\text{ComZ}}}} \right) - \gamma_{\text{ComZ}} * [\text{ComZ}]$	
$\frac{d[\text{SsbB}]}{dt} = v_{\text{max}_{\text{SsbB}}} * \frac{[\text{ComX}_{\text{act}}]^s}{[\text{ComX}_{\text{act}}]^s + K_{\text{SsbB}}^s} \left(1 - \frac{[\text{ComZ}]^i}{[\text{ComZ}]^i + K_{i_{\text{ComZ}-\text{SsbB}}}} \right) - \gamma_{\text{SsbB}} * [\text{SsbB}]$	

$$\frac{d[DprA]}{dt} = v_{max_{DprA}} * \frac{[ComX_{act}]^d}{[ComX_{act}]^d + K_{DprA}^d} * \left(1 - \frac{[ComZ]^u}{[ComZ]^u + Ki_{ComZ_DprA}^u}\right) - 2 * k_{on_DprA_EP} * [DprA]^2 * [(ComE \sim P)_D] - \gamma_{DprA} * [DprA]$$

$$\begin{aligned} \frac{d[ComX_{act}]}{dt} = & \omega_1 * [ComW] * [ComX_{ina}] - v_{max_{DprA}} * \frac{[ComX_{act}]^d}{[ComX_{act}]^d + K_{DprA}^d} * \left(1 - \frac{[ComZ]^u}{[ComZ]^u + Ki_{ComZ_DprA}^u}\right) \\ & - v_{max_{SsbB}} * \frac{[ComX_{act}]^s}{[ComX_{act}]^s + K_{SsbB}^s} * \left(1 - \frac{[ComZ]^i}{[ComZ]^i + Ki_{ComZ_SsbB}^i}\right) \\ & - v_{max_{ComZ}} * \frac{[ComX_{act}]^z}{[ComX_{act}]^z + K_{ComZ}^z} * \left(1 - \frac{[ComZ]^i}{[ComZ]^i + Ki_{ComZ_ComZ}^i}\right) - \gamma_{ComX} * [ComX_{act}] \end{aligned}$$

$$\begin{aligned} \frac{d[ComX_{ina}]}{dt} = & v_{max_{ComX}} * \frac{[(ComE \sim P)_D]^x}{[(ComE \sim P)_D]^x + K_{ComX}^x} - \omega_1 * [ComW] * [ComX_{ina}] \\ & + v_{max_{DprA}} * \frac{[ComX_{act}]^d}{[ComX_{act}]^d + K_{DprA}^d} * \left(1 - \frac{[ComZ]^u}{[ComZ]^u + Ki_{ComZ_DprA}^u}\right) \\ & + v_{max_{SsbB}} * \frac{[ComX_{act}]^s}{[ComX_{act}]^s + K_{SsbB}^s} * \left(1 - \frac{[ComZ]^i}{[ComZ]^i + Ki_{ComZ_SsbB}^i}\right) \\ & + v_{max_{ComZ}} * \frac{[ComX_{act}]^z}{[ComX_{act}]^z + K_{ComZ}^z} * \left(1 - \frac{[ComZ]^i}{[ComZ]^i + Ki_{ComZ_ComZ}^i}\right) - \gamma_{ComX} * [ComX_{ina}] \end{aligned}$$

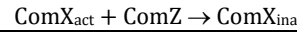
Inhibition of the active form of ComX by a late com gene product ComZ

New reactions

Synthesis of ComZ



Inhibition of ComX



New ODEs

$$\frac{d[ComZ]}{dt} = v_{max_{ComZ}} * \frac{[ComX_{act}]^z}{[ComX_{act}]^z + K_{ComZ}^z} - \omega_2 * [ComZ] * [ComX_{act}] - \gamma_{ComZ} * [ComZ]$$

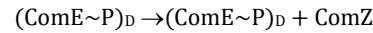
$$\begin{aligned} \frac{d[ComX_{act}]}{dt} = & \omega_1 * [ComW] * [ComX_{ina}] - \omega_2 * [ComX_{act}] * [ComZ] - v_{max_{DprA}} * \frac{[ComX_{act}]^d}{[ComX_{act}]^d + K_{DprA}^d} \\ & - v_{max_{SsbB}} * \frac{[ComX_{act}]^s}{[ComX_{act}]^s + K_{SsbB}^s} - v_{max_{ComZ}} * \frac{[ComX_{act}]^z}{[ComX_{act}]^z + K_{ComZ}^z} - \gamma_{ComX} * [ComX_{act}] \end{aligned}$$

$$\begin{aligned} \frac{d[ComX_{ina}]}{dt} = & v_{max_{ComX}} * \frac{[(ComE \sim P)_D]^x}{[(ComE \sim P)_D]^x + K_{ComX}^x} + v_{max_{DprA}} * \frac{[ComX_{act}]^d}{[ComX_{act}]^d + K_{DprA}^d} \\ & + v_{max_{SsbB}} * \frac{[ComX_{act}]^s}{[ComX_{act}]^s + K_{SsbB}^s} + v_{max_{ComZ}} * \frac{[ComX_{act}]^z}{[ComX_{act}]^z + K_{ComZ}^z} \\ & + \omega_2 * [ComX_{act}] * [ComZ] - \omega_1 * [ComW] * [ComX_{ina}] - \gamma_{ComX} * [ComX_{ina}] \end{aligned}$$

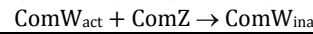
Interaction between ComW and an early com gene product ComZ impairs ComW activity

New reactions

Synthesis of ComZ



Inhibition of active ComW



New ODEs

$$\frac{d[ComZ]}{dt} = v_{max_{ComZ}} * \frac{[ComE \sim P]^z}{[ComE \sim P]^z + K_{ComZ}^z} - \omega_2 * [ComZ] * [ComW_{act}] - \gamma_{ComZ} * [ComZ]$$

$$\frac{d[ComW_{act}]}{dt} = v_{max_{ComW}} * \frac{[(ComE \sim P)_D]^w}{[(ComE \sim P)_D]^w + K_{ComW}^w} - \omega_2 * [ComZ] * [ComW_{act}] - \gamma_{ComW} * [ComW_{act}]$$

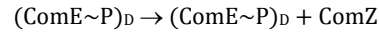
$$\frac{d[ComW_{ina}]}{dt} = \omega_2 * [ComZ] * [ComW_{act}] - \gamma_{ComW} * [ComW_{ina}]$$

$$[ComW_{total}] = [ComW_{ina}] + [ComW_{act}]$$

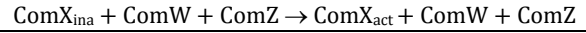
Competition between ComW and an early *com* gene product ComZ for the inactive form of ComX impairs the formation of the active form of ComX

New reactions

Synthesis of ComZ



Inhibition of ComX activation



New ODEs

$$\frac{d[\text{ComZ}]}{dt} = v_{\text{max}_{\text{ComZ}}} * \frac{[\text{ComE} \sim \text{P}]^Z}{[\text{ComE} \sim \text{P}]^Z + K_{\text{ComZ}}^Z} - \gamma_{\text{ComZ}} * [\text{ComZ}]$$

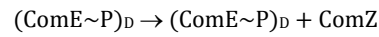
$$\begin{aligned} \frac{d[\text{ComX}_{\text{act}}]}{dt} = & v_{\text{max}_{\text{ComX}_{\text{act}}}} * \frac{[\text{ComW}_{\text{act}}]^J}{[\text{ComW}_{\text{act}}]^J + K_{\text{ComX}_{\text{act}}}} * \left(1 - \frac{[\text{ComZ}]^k}{[\text{ComZ}]^k + K_{\text{ComX}_{\text{act-ComZ}}}}\right) * [\text{ComX}_{\text{ina}}] \\ & - v_{\text{max}_{\text{DprA}}} * \frac{[\text{ComX}_{\text{act}}]^d}{[\text{ComX}_{\text{act}}]^d + K_{\text{DprA}}^d} - v_{\text{max}_{\text{SsbB}}} * \frac{[\text{ComX}_{\text{act}}]^s}{[\text{ComX}_{\text{act}}]^s + K_{\text{SsbB}}^s} - \gamma_{\text{ComX}} * [\text{ComX}_{\text{act}}] \end{aligned}$$

$$\begin{aligned} \frac{d[\text{ComX}_{\text{ina}}]}{dt} = & v_{\text{max}_{\text{ComX}}} * \frac{[(\text{ComE} \sim \text{P})_{\text{D}}]^x}{[(\text{ComE} \sim \text{P})_{\text{D}}]^x + K_{\text{ComX}}^x} + v_{\text{max}_{\text{DprA}}} * \frac{[\text{ComX}_{\text{act}}]^d}{[\text{ComX}_{\text{act}}]^d + K_{\text{DprA}}^d} \\ & + v_{\text{max}_{\text{SsbB}}} * \frac{[\text{ComX}_{\text{act}}]^s}{[\text{ComX}_{\text{act}}]^s + K_{\text{SsbB}}^s} - \gamma_{\text{ComX}} * [\text{ComX}_{\text{ina}}] \\ & - v_{\text{max}_{\text{ComX}_{\text{act}}}} * \frac{[\text{ComW}_{\text{act}}]^J}{[\text{ComW}_{\text{act}}]^J + K_{\text{ComX}_{\text{act}}}} * \left(1 - \frac{[\text{ComZ}]^k}{[\text{ComZ}]^k + K_{\text{ComX}_{\text{act-ComZ}}}}\right) * [\text{ComX}_{\text{ina}}] \end{aligned}$$

Competition between the active form of ComX and an early *com* gene product ComZ for RNA polymerase binding

New Reactions

Synthesis of ComZ



Synthesis of SsbB



Synthesis of DprA



New ODEs

$$\frac{d[\text{ComZ}]}{dt} = \beta_{\text{ComZ}} + v_{\text{max}_{\text{ComZ}}} * \frac{[\text{ComE} \sim \text{P}]^Z}{[\text{ComE} \sim \text{P}]^Z + K_{\text{ComZ}}^Z} - \gamma_{\text{ComZ}} * [\text{ComZ}]$$

$$\frac{d[\text{SsbB}]}{dt} = v_{\text{max}_{\text{SsbB}}} * \frac{[\text{ComX}_{\text{act}}]^s}{[\text{ComX}_{\text{act}}]^s + K_{\text{SsbB}}^s} * \left(1 - \frac{[\text{ComZ}]^i}{[\text{ComZ}]^i + K_{\text{ComZ_SsbB}}^i}\right) - \gamma_{\text{SsbB}} * [\text{SsbB}]$$

$$\begin{aligned} \frac{d[\text{DprA}]}{dt} = & v_{\text{max}_{\text{DprA}}} * \frac{[\text{ComX}_{\text{act}}]^d}{[\text{ComX}_{\text{act}}]^d + K_{\text{DprA}}^d} * \left(1 - \frac{[\text{ComZ}]^u}{[\text{ComZ}]^u + K_{\text{ComZ_DprA}}^u}\right) \\ & - 2 * k_{\text{on_DprA_EP}} * [\text{DprA}]^2 * [(\text{ComE} \sim \text{P})_{\text{D}}] - \gamma_{\text{DprA}} * [\text{DprA}] \end{aligned}$$

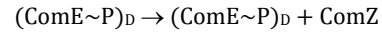
$$\begin{aligned} \frac{d[\text{ComX}_{\text{act}}]}{dt} = & \omega_1 * [\text{ComW}] * [\text{ComX}_{\text{ina}}] - v_{\text{max}_{\text{DprA}}} * \frac{[\text{ComX}_{\text{act}}]^d}{[\text{ComX}_{\text{act}}]^d + K_{\text{DprA}}^d} * \left(1 - \frac{[\text{ComZ}]^u}{[\text{ComZ}]^u + K_{\text{ComZ_DprA}}^u}\right) \\ & - v_{\text{max}_{\text{SsbB}}} * \frac{[\text{ComX}_{\text{act}}]^s}{[\text{ComX}_{\text{act}}]^s + K_{\text{SsbB}}^s} * \left(1 - \frac{[\text{ComZ}]^i}{[\text{ComZ}]^i + K_{\text{ComZ_SsbB}}^i}\right) - \gamma_{\text{ComX}} * [\text{ComX}_{\text{act}}] \end{aligned}$$

$$\begin{aligned} \frac{d[\text{ComX}_{\text{ina}}]}{dt} = & v_{\text{max}_{\text{ComX}}} * \frac{[(\text{ComE} \sim \text{P})_{\text{D}}]^x}{[(\text{ComE} \sim \text{P})_{\text{D}}]^x + K_{\text{ComX}}^x} - \omega_1 * [\text{ComW}] * [\text{ComX}_{\text{ina}}] \\ & + v_{\text{max}_{\text{DprA}}} * \frac{[\text{ComX}_{\text{act}}]^d}{[\text{ComX}_{\text{act}}]^d + K_{\text{DprA}}^d} * \left(1 - \frac{[\text{ComZ}]^u}{[\text{ComZ}]^u + K_{\text{ComZ_DprA}}^u}\right) \\ & + v_{\text{max}_{\text{SsbB}}} * \frac{[\text{ComX}_{\text{act}}]^s}{[\text{ComX}_{\text{act}}]^s + K_{\text{SsbB}}^s} * \left(1 - \frac{[\text{ComZ}]^i}{[\text{ComZ}]^i + K_{\text{ComZ_SsbB}}^i}\right) - \gamma_{\text{ComX}} * [\text{ComX}_{\text{ina}}] \end{aligned}$$

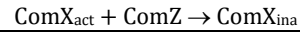
Inhibition of the active form of ComX by an early *com* gene product ComZ

New reactions

Synthesis of ComZ



Inhibition of ComX

**New ODEs**

$$\frac{d[\text{ComZ}]}{dt} = v_{\text{max}_{\text{comZ}}} * \frac{[\text{ComE} \sim \text{P}]^Z}{[\text{ComE} \sim \text{P}]^Z + K_{\text{ComZ}}} - \omega_2 * [\text{ComX}_{\text{act}}] * [\text{ComZ}] - \gamma_{\text{comZ}} * [\text{ComZ}]$$

$$\begin{aligned} \frac{d[\text{ComX}_{\text{act}}]}{dt} = & \omega_1 * [\text{ComW}] * [\text{ComX}_{\text{ina}}] - \omega_2 * [\text{ComX}_{\text{act}}] * [\text{ComZ}] - v_{\text{max}_{\text{DprA}}} * \frac{[\text{ComX}_{\text{act}}]^d}{[\text{ComX}_{\text{act}}]^d + K_{\text{DprA}}^d} \\ & - v_{\text{max}_{\text{SsbB}}} * \frac{[\text{ComX}_{\text{act}}]^s}{[\text{ComX}_{\text{act}}]^s + K_{\text{SsbB}}^s} - \gamma_{\text{ComX}} * [\text{ComX}_{\text{act}}] \end{aligned}$$

$$\begin{aligned} \frac{d[\text{ComX}_{\text{ina}}]}{dt} = & v_{\text{max}_{\text{ComX}}} * \frac{[(\text{ComE} \sim \text{P})_{\text{D}}]^x}{[(\text{ComE} \sim \text{P})_{\text{D}}]^x + K_{\text{ComX}}^x} + v_{\text{max}_{\text{DprA}}} * \frac{[\text{ComX}_{\text{act}}]^d}{[\text{ComX}_{\text{act}}]^d + K_{\text{DprA}}^d} \\ & + v_{\text{max}_{\text{SsbB}}} * \frac{[\text{ComX}_{\text{act}}]^s}{[\text{ComX}_{\text{act}}]^s + K_{\text{SsbB}}^s} + \omega_2 * [\text{ComX}_{\text{act}}] * [\text{ComZ}] - \omega_1 * [\text{ComW}] * [\text{ComX}_{\text{ina}}] \\ & - \gamma_{\text{ComX}} * [\text{ComX}_{\text{ina}}] \end{aligned}$$
