Heavy metal AND

Metal flux

$$\frac{\mathrm{d}met_1}{\mathrm{d}t} = \frac{K_{cat\,met1\,in}\,MntH\;met_{1\,out}}{k_{m\,met1\,in} + met_{1\,out}} - \frac{k_{cat\,met1\,out}\,CadA\;met_1}{k_{m\,met1\,out} + met_1}$$

$$\frac{\mathrm{d}met_2}{\mathrm{d}t} = \frac{K_{cat\,met2\,in}\,MntH\;met_{2\,out}}{k_{m\,met2\,in} + met_{2\,out}} - \frac{k_{cat\,met2\,out}\,ArsB\;met_2}{k_{m\,met2\,out} + met_2}$$

ArsR and CzrA production

$$\frac{\mathrm{d}Rna_{ArsR}}{\mathrm{d}t} = \beta_{transc\,ArsR}\left(\frac{1}{1+(\frac{ArsR^*}{K_{a\,ArsR}})^n}\right) - \alpha_{Rna\,ArsR}\;Rna_{ArsR}$$

$$\frac{\mathrm{d}ArsR}{\mathrm{d}t} = \beta_{transl\,ArsR}\;Rna_{ArsR} - \alpha_{ArsR}\;ArsR$$

$$ArsR^* = \frac{ArsR}{1+(\frac{arabinose}{K_{a\,arabinose}})^n}$$

$$\frac{\mathrm{d}Rna_{CzrA}}{\mathrm{d}t} = \frac{V_{max\,CzrA}\,Met_1}{K_{m\,CzrA} + Met_1} - \alpha_{RnaCzrA}\;Rna_{CzrA}$$

$$\frac{\mathrm{d}CzrA}{\mathrm{d}t} = \beta_{transl\,CzrA}\left(Rna_{CzrA}\right) - \alpha_{CzrA}\;CzrA$$

l $$CzrA^* = \frac{CzrA}{1+(\frac{met_1}{K_{a\,met1}})^n}$$

CadA y ArsB transporter

$$\frac{\mathrm{d}Rna_{CadA}}{\mathrm{d}t} = \beta_{transc\,CadA}\left(\frac{1}{1+(\frac{CzrA^*}{K_{CzrA}})^n}\right) - \alpha_{Rna\,CadA}\;Rna_{CadA}$$

$$\frac{\mathrm{d}\,CadA}{\mathrm{d}t} = \beta_{transl\,CadA}\;Rna_{CadA} - \alpha_{CadA}\;CadA$$

$$\frac{\mathrm{d}Rna_{ArsB}}{\mathrm{d}t} = \beta_{transc\,ArsB}\left(\frac{1}{1+(\frac{ArsR*}{K_{a\,ArsR}})^n}\right) - \alpha_{Rna\,ArsB}\;Rna_{ArsB}$$

$$\frac{\mathrm{d}ArsB}{\mathrm{d}t} = \beta_{transl\,ArsB}\;Rna_{ArsB} - \alpha_{ArsB}\;ArsB$$

AND output P4/LasR

$$\frac{\mathrm{d}Rna_{P4}}{\mathrm{d}t} = \beta_{transc\,P4}\left(\frac{1}{1+(\frac{CzrA^*}{K_{a\,Czra}})^n}\right)\left(\frac{1}{1+(\frac{ArsR^*}{K_{a\,ArsR}})^n}\right) - \alpha_{Rna\,P4}\;Rna_{P4}$$

$$\frac{\mathrm{d}P4}{\mathrm{d}t} = \beta_{\,transl\,P4}\;Rna_{P4} - \alpha_{P4}\;P4$$

$$\frac{\mathrm{d}Rna_{LasR}}{\mathrm{d}t} = \beta_{transc\,LasR}\left(\frac{1}{1+(\frac{CzrA^*}{K_{a\,Czra}})^n}\right)\left(\frac{1}{1+(\frac{ArsR^*}{K_{a\,ArsR}})^n}\right) - \alpha_{Rna\,LasR}\;Rna_{LasR}$$

$$\frac{\mathrm{d}LasR}{\mathrm{d}t} = \beta_{transl\,LasR}\;Rna_{LasR} - \alpha_{LasR}\;LasR$$

Sweet AND

Sugar uptake

$$\frac{\mathrm{d}\,arabinose}{\mathrm{d}t} = \frac{\beta_{upt\,arabinose}\,AraE\;arabinose}{K_{m\,AraE} + AraE} - \frac{K_{cat\,AraA}\,AraA\;\;arabinose}{arabinose + K_{m\,AraA}}$$

$$\frac{\mathrm{d}\,xylose}{\mathrm{d}t} = \frac{\beta_{upt\,arabinose}\,AraE\;arabinose\,/}{K_{m\,AraE} + AraE} - \frac{K_{cat\,XylA}\;\;XylA\;\;xylose}{(\,xylose + K_{m\,XylA}}$$

AraR and XylR TF production

$$\frac{\mathrm{d}\,Rna_{AraR}}{\mathrm{d}t} = \beta_{transcAraR}\,(\frac{1}{1+(\frac{AraR^*}{K_{AraR}})^n}) - \alpha_{Rna\,AraR}\;\;Rna_{AraR}$$

$$\frac{\mathrm{d}AraR}{\mathrm{d}t} = \beta_{transl\,AraR}\;\;Rna_{AraR} - \alpha_{AraR}\;\;AraR$$

$$AraR^* = \frac{AraR}{1+(\frac{arabinose}{K_{arabinose}})^n}$$

$$\frac{\mathrm{d}Rna_{XylR}}{\mathrm{d}t} = \beta_{transc\,XylR}\,(1+q_{xylR}\,xylose\,) + beta_{transc\,XylR\,Pveg} - \alpha_{Rna\,XylR}\;\;Rna_{XylR}$$

$$\frac{\mathrm{d}XylR}{\mathrm{d}t} = \beta_{transl\,XylR}(Rna_{XylR}) - \alpha_{XylR}\;\;XylR$$

$$XylR^* = \frac{XylR}{1+(\frac{xylose}{K_{xylose}})^n}$$

Transport and metabolism proteins

$$\frac{\mathrm{d}Rna_{AraA}}{\mathrm{d}t} = \beta_{transc\,AraA}\,\frac{1}{(1+(\frac{AraR*}{K_{a\,AraR}})^n)} - \alpha_{Rna\,AraA}\;\;Rna\_AraA$$

$$\frac{\mathrm{d}Rna_{AraE}}{\mathrm{d}t} = \beta_{transc\,AraE}\,(\frac{1}{1+(\frac{AraR^*}{K_{a\,AraR}})^n}) - \alpha_{Rna\,AraE}\,Rna_{AraE}$$

$$\frac{\mathrm{d}Rna_{XylA}}{\mathrm{d}t} = \beta_{transc\,XylA}\,\frac{1}{(1+(\frac{XylR*}{K_{a\,XylR}})^n)} - \alpha_{Rna\,XylA}\;\;Rna_{XylA}$$

$$\frac{\mathrm{d}XylA}{\mathrm{d}t} = \beta_{transl\,XylA}\;\;Rna_{XylA} - \alpha_{XylA}\;\;XylA$$

$$\frac{\mathrm{d}Rna_{AraC}}{\mathrm{d}t} = \beta_{transc\,AraC} - \alpha_{Rna\,AraC}\;\;Rna_{AraC}$$

$$\frac{\mathrm{d}AraC}{\mathrm{d}t} = \beta_{transl\,AraC}\;\;Rna_{AraC} - \alpha_{AraC}\;\;AraC$$

LasR/P4 expression

$$\frac{\mathrm{d}Rna_{LasR}}{\mathrm{d}t} = \beta_{transc\,LasR}\,\frac{arabinose^n}{K^n_{a\,arabinose} + arabinose^n}\,(\frac{1}{1+(\frac{XylR^*}{K_{a\,XylR}})^n}) - \alpha_{Rna\,LasR}\;\;Rna_{LasR}$$

$$\frac{\mathrm{d}LasR}{\mathrm{d}t} = \beta_{transl\,LasR}\ Rna_{LasR}\ -\ \alpha_{LasR}\ LasR$$

$$\frac{\mathrm{d}Rna_{P4}}{\mathrm{d}t} = \beta_{transc\,P4}\,(\frac{1}{1+(\frac{AraC*}{K_{a\ AraC}})^n})\,(\frac{1}{1+(\frac{XylR*}{K_{XylR}})^n}) -\ \alpha_{Rna\,P4}\ Rna_{P4}$$

$$\frac{\mathrm{d}P4}{\mathrm{d}t} = \beta_{transl\,P4}\ Rna_{P4}\ -\ \alpha_{P4}\ P4$$

OR

$$\frac{\mathrm{d}Rna_{GusA}}{\mathrm{d}t} = \beta_{GusA\,P4}(\frac{(1+(\frac{P4}{K_{P4}})^n\omega)}{1+(\frac{P4}{K_{P4}})^n}) + \beta_{GusA\,LasR}\ (\frac{(1+(\frac{LasR}{K_{LasR}})^n\varphi)}{1+(\frac{LasR}{K_{LasR}})^n}) - \alpha_{Rna\,GusA}\,Rna_{GusA}$$

$$\frac{\mathrm{d}GusA}{\mathrm{d}t} = \beta_{transl\,GusA}\ Rna_{GusA}\ -\ \alpha_{GusA}\ GusA$$