$$\frac{\mathrm{d}\left([\mathrm{InR}]\cdot V\_\mathrm{cellsurface}\right)}{\mathrm{d}t} = -\left(\mathrm{k1}\cdot[\mathrm{Ins}]\cdot V\_\mathrm{extracellular}\cdot[\mathrm{InR}]\cdot V\_\mathrm{cellsurface}\right) + \left(\mathrm{kminus1}\cdot[\mathrm{Ins\_InR}]\cdot V\_\mathrm{cellsurface}\right) + V\_\mathrm{cellsurface}\cdot\left(\mathrm{kminus3}\cdot[\mathrm{PTP1B}]\cdot V\_\mathrm{cytoplasm}\cdot[\mathrm{Ins\_InR\_P}]\right) - \left(\mathrm{k4}\cdot[\mathrm{InR}]\cdot V\_\mathrm{cellsurface}\right) + \left(\mathrm{kminus4}\cdot[\mathrm{cytoplasm\_InR}]\cdot V\_\mathrm{cytoplasm}\right)$$

$$\frac{\mathrm{d}\left([\mathrm{Ins\_InR}]\cdot V\_\mathrm{cellsurface}\right)}{\mathrm{d}t} = +\left(\mathrm{k1}\cdot[\mathrm{Ins}]\cdot V\_\mathrm{extracellular}\cdot[\mathrm{InR}]\cdot V\_\mathrm{cellsurface}\right) - \left(\mathrm{kminus1}\cdot[\mathrm{Ins\_InR}]\cdot V\_\mathrm{cellsurface}\right) - V\_\mathrm{cellsurface}\cdot\left(\mathrm{k3}\cdot[\mathrm{Ins\_InR}]\right)$$

$$\frac{\mathrm{d}\left([\mathrm{Ins\_InR\_P}]\cdot V\_\mathrm{cellsurface}\right)}{\mathrm{d}t} = -\left(\mathrm{k4prime}\cdot[\mathrm{Ins\_InR\_P}]\cdot V\_\mathrm{cellsurface}\right) + \left(\mathrm{kminus4prime}\cdot[\mathrm{cytoplasm\_Ins\_InR\_P}]\cdot V\_\mathrm{cytoplasm}\right) + V\_\mathrm{cellsurface}\cdot\left(\mathrm{k3}\cdot[\mathrm{Ins\_InR}]\right) - \left(\mathrm{k2}\cdot[\mathrm{Ins}]\cdot V\_\mathrm{extracellular}\cdot[\mathrm{Ins\_InR\_P}]\cdot V\_\mathrm{cellsurface}\right) + \left(\mathrm{kminus2}\cdot[\mathrm{Ins\_2\_InR\_P}]\cdot V\_\mathrm{cellsurface}\right) - V\_\mathrm{cellsurface}\cdot\left(\mathrm{kminus3}\cdot[\mathrm{PTP1B}]\cdot V\_\mathrm{cytoplasm}\cdot[\mathrm{Ins\_InR\_P}]\right)$$

$$\frac{\mathrm{d}\left([\mathrm{Ins\_2\_InR\_P}]\cdot V\_\mathrm{cellsurface}\right)}{\mathrm{d}t} = +\left(\mathrm{k2}\cdot[\mathrm{Ins}]\cdot V\_\mathrm{extracellular}\cdot[\mathrm{Ins\_InR\_P}]\cdot V\_\mathrm{cellsurface}\right) - \left(\mathrm{kminus2}\cdot[\mathrm{Ins\_2\_InR\_P}]\cdot V\_\mathrm{cellsurface}\right) - \left(\mathrm{k4prime}\cdot[\mathrm{Ins\_2\_InR\_P}]\cdot V\_\mathrm{cellsurface}\right) + \left(\mathrm{kminus4prime}\cdot[\mathrm{cytoplasm\_Ins\_2\_InR\_P}]\cdot V\_\mathrm{cytoplasm}\right)$$

$$\frac{\mathrm{d}\left([\mathrm{cytoplasm\_InR}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} = +V\_\mathrm{cytoplasm}\cdot\left(\mathrm{k6}\cdot[\mathrm{PTP1B}]\cdot[\mathrm{cytoplasm\_Ins\_2\_InR\_P}]\cdot V\_\mathrm{cytoplasm}\right) + V\_\mathrm{cytoplasm}\cdot\left(\mathrm{k6}\cdot[\mathrm{PTP1B}]\cdot[\mathrm{cytoplasm\_Ins\_InR\_P}]\cdot V\_\mathrm{cytoplasm}\right) + V\_\mathrm{cytoplasm}\cdot\left([\mathrm{cytoplasm\_RNA\_InR}]\cdot 2.46\right) - V\_\mathrm{cytoplasm}\cdot\left(0.0044\cdot[\mathrm{cytoplasm\_InR}]\right) + \left(\mathrm{k4}\cdot[\mathrm{InR}]\cdot V\_\mathrm{cellsurface}\right) - \left(\mathrm{kminus4}\cdot[\mathrm{cytoplasm\_InR}]\cdot V\_\mathrm{cytoplasm}\right)$$

$$\frac{\mathrm{d}\left([\mathrm{cytoplasm\_Ins\_2\_InR\_P}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} = -V\_\mathrm{cytoplasm}\cdot\left(\mathrm{k6}\cdot[\mathrm{PTP1B}]\cdot[\mathrm{cytoplasm\_Ins\_2\_InR\_P}]\cdot V\_\mathrm{cytoplasm}\right) + \left(\mathrm{k4prime}\cdot[\mathrm{Ins\_2\_InR\_P}]\cdot V\_\mathrm{cellsurface}\right) - \left(\mathrm{kminus4prime}\cdot[\mathrm{cytoplasm\_Ins\_2\_InR\_P}]\cdot V\_\mathrm{cytoplasm}\right)$$

$$\frac{\mathrm{d}\left([\mathrm{cytoplasm\_Ins\_InR\_P}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} = +\left(\mathrm{k4prime}\cdot[\mathrm{Ins\_InR\_P}]\cdot V\_\mathrm{cellsurface}\right) - \left(\mathrm{kminus4prime}\cdot[\mathrm{cytoplasm\_Ins\_InR\_P}]\cdot V\_\mathrm{cytoplasm}\right) - V\_\mathrm{cytoplasm}\cdot\left(\mathrm{k6}\cdot[\mathrm{PTP1B}]\cdot[\mathrm{cytoplasm\_Ins\_InR\_P}]\cdot V\_\mathrm{cytoplasm}\right)$$

$$[\mathrm{InR\_tot}] = +\frac{\mathrm{InR.ParticleNumber} + \mathrm{Ins\_InR.ParticleNumber} + \mathrm{Ins\_InR\_P.ParticleNumber} + \mathrm{Ins\_2\_InR\_P.ParticleNumber}}{V\_\mathrm{cytoplasm}} + \frac{\mathrm{cytoplasm\_InR.ParticleNumber} + \mathrm{cytoplasm\_Ins\_2\_InR\_P.ParticleNumber} + \mathrm{cytoplasm\_Ins\_InR\_P.ParticleNumber}}{V\_\mathrm{cytoplasm}}$$

$$[\mathrm{InR\_bound}] = \frac{\mathrm{Ins\_2\_InR\_P.ParticleNumber} + \mathrm{Ins\_InR\_P.ParticleNumber} + \mathrm{Ins\_InR.ParticleNumber}}{V\_\mathrm{cytoplasm}}$$

$$[\mathrm{InR\_active}] = \frac{\mathrm{Ins\_2\_InR\_P.ParticleNumber} + \mathrm{Ins\_InR\_P.ParticleNumber}}{V\_\mathrm{cytoplasm}}$$

$$\frac{\mathrm{d}\left([\mathrm{IRS1}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} = -V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\frac{\mathrm{k7}\cdot[\mathrm{IRS1}]\cdot([\mathrm{Ins\_2\_InR\_P}]\cdot V\_\mathrm{cellsurface} + [\mathrm{Ins\_InR\_P}]\cdot V\_\mathrm{cellsurface})}{\mathrm{IRp}}\right) + V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\mathrm{kminus7a}\cdot[\mathrm{PTP1B}]\cdot[\mathrm{IRS1\_TyrP}]\cdot V\_\mathrm{cytoplasm}\right) - V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\mathrm{k2psp}\cdot[\mathrm{IRS1}]\cdot[\mathrm{PKC\_P}]\cdot V\_\mathrm{cytoplasm}\right) + V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\mathrm{kminus7b}\cdot[\mathrm{PP2A}]\cdot[\mathrm{IRS1\_PolySerP}]\cdot V\_\mathrm{cytoplasm}\right) + V\_\mathrm{cytoplasm}\cdot\left(\frac{\mathrm{k\_irs1\_basal\_syn}}{V\_\mathrm{cytoplasm}}\right) - V\_\mathrm{cytoplasm}\cdot\left(\mathrm{k\_irs1\_basal\_degr}\cdot[\mathrm{IRS1}]\right) - V\_\mathrm{cytoplasm}\cdot\left(\frac{\mathrm{kcat51}\cdot[\mathrm{IRS1}]\cdot[\mathrm{IKK\_P}]\cdot V\_\mathrm{cytoplasm}}{\mathrm{Km51} + [\mathrm{IRS1}]\cdot V\_\mathrm{cytoplasm}}\right) - V\_\mathrm{cytoplasm}\cdot\left(\frac{\mathrm{kcat52}\cdot[\mathrm{IRS1}]\cdot[\mathrm{JNK\_P}]\cdot V\_\mathrm{cytoplasm}}{\mathrm{Km52} + [\mathrm{IRS1}]\cdot V\_\mathrm{cytoplasm}}\right)$$

$$\frac{\mathrm{d}\left([\mathrm{IRS1\_TyrP}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} = +V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\frac{\mathrm{k7}\cdot[\mathrm{IRS1}]\cdot([\mathrm{Ins\_2\_InR\_P}]\cdot V\_\mathrm{cellsurface} + [\mathrm{Ins\_InR\_P}]\cdot V\_\mathrm{cellsurface})}{\mathrm{IRp}}\right) - V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\mathrm{kminus7a}\cdot[\mathrm{PTP1B}]\cdot[\mathrm{IRS1\_TyrP}]\cdot V\_\mathrm{cytoplasm}\right) - V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\mathrm{k2psp}\cdot[\mathrm{IRS1\_TyrP}]\cdot[\mathrm{PKC\_P}]\cdot V\_\mathrm{cytoplasm}\right) + V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\mathrm{kminus7b}\cdot[\mathrm{PP2A}]\cdot[\mathrm{IRS1\_TyrP\_PolySerP}]\cdot V\_\mathrm{cytoplasm}\right) - V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\mathrm{k8}\cdot[\mathrm{IRS1\_TyrP}]\cdot[\mathrm{PI3K}]\cdot V\_\mathrm{cytoplasm}\right) + V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\mathrm{kminus8}\cdot[\mathrm{IRS1\_TyrP\_PI3K}]\right) - V\_\mathrm{cytoplasm}\cdot\left(\mathrm{k\_irs1\_basal\_degr}\cdot[\mathrm{IRS1\_TyrP}]\right)$$

$$\frac{\mathrm{d}\left([\mathrm{IRS1\_PolySerP}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} = +V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\mathrm{k2psp}\cdot[\mathrm{IRS1}]\cdot[\mathrm{PKC\_P}]\cdot V\_\mathrm{cytoplasm}\right) - V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\mathrm{kminus7b}\cdot[\mathrm{PP2A}]\cdot[\mathrm{IRS1\_PolySerP}]\cdot V\_\mathrm{cytoplasm}\right) - V\_\mathrm{cytoplasm}\cdot\left(\mathrm{k\_irs1\_polyserp\_degr}\cdot[\mathrm{IRS1\_PolySerP}]\right) + V\_\mathrm{cytoplasm}\cdot\left(\frac{\mathrm{kcat51}\cdot[\mathrm{IRS1}]\cdot[\mathrm{IKK\_P}]\cdot V\_\mathrm{cytoplasm}}{\mathrm{Km51} + [\mathrm{IRS1}]\cdot V\_\mathrm{cytoplasm}}\right) + V\_\mathrm{cytoplasm}\cdot\left(\frac{\mathrm{kcat52}\cdot[\mathrm{IRS1}]\cdot[\mathrm{JNK\_P}]\cdot V\_\mathrm{cytoplasm}}{\mathrm{Km52} + [\mathrm{IRS1}]\cdot V\_\mathrm{cytoplasm}}\right)$$

$$\frac{\mathrm{d}\left([\mathrm{IRS1\_TyrP\_PolySerP}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} = +V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\mathrm{k2psp}\cdot[\mathrm{IRS1\_TyrP}]\cdot[\mathrm{PKC\_P}]\cdot V\_\mathrm{cytoplasm}\right) - V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\mathrm{kminus7b}\cdot[\mathrm{PP2A}]\cdot[\mathrm{IRS1\_TyrP\_PolySerP}]\cdot V\_\mathrm{cytoplasm}\right) - V\_\mathrm{cytoplasm}\cdot\left(\mathrm{k\_irs1\_polyserp\_degr}\cdot[\mathrm{IRS1\_TyrP\_PolySerP}]\right)$$

$$[\mathrm{IRS\_total}] = \frac{\mathrm{IRS1.ParticleNumber} + \mathrm{IRS1\_TyrP.ParticleNumber} + \mathrm{IRS1\_PolySerP.ParticleNumber} + \mathrm{IRS1\_TyrP\_PolySerP.ParticleNumber}}{V\_\mathrm{cytoplasm}}$$

$$\frac{\mathrm{d}\left([\mathrm{PI3K}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} = -V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\mathrm{k8}\cdot[\mathrm{IRS1\_TyrP}]\cdot[\mathrm{PI3K}]\cdot V\_\mathrm{cytoplasm}\right) + V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\mathrm{kminus8}\cdot[\mathrm{IRS1\_TyrP\_PI3K}]\right)$$

$$\frac{\mathrm{d}\left([\mathrm{IRS1\_TyrP\_PI3K}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} = +V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\mathrm{k8}\cdot[\mathrm{IRS1\_TyrP}]\cdot[\mathrm{PI3K}]\cdot V\_\mathrm{cytoplasm}\right) - V\_\mathrm{cytoplasm}\cdot\left(\mathrm{cyto\_vol}\cdot\mathrm{kminus8}\cdot[\mathrm{IRS1\_TyrP\_PI3K}]\right)$$

$$\frac{\mathrm{d}\left([\mathrm{PI345P3}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} = +V\_\mathrm{cytoplasm}\cdot\left(\left(\mathrm{k9\_basal} + \mathrm{k9}\cdot[\mathrm{IRS1\_TyrP\_PI3K}]\cdot V\_\mathrm{cytoplasm}\right)\cdot[\mathrm{PIP2}]\right) - V\_\mathrm{cytoplasm}\cdot\left(\left(\mathrm{kminus9\_basal} + \mathrm{kminus9}\cdot[\mathrm{PTEN}]\cdot V\_\mathrm{cytoplasm}\right)\cdot[\mathrm{PI345P3}]\right)$$

$$
\begin{aligned}
\frac{\mathrm{d}\left([\mathrm{PIP2}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= -V\_\mathrm{cytoplasm}\cdot((\mathrm{k9\_basal}+\mathrm{k9}\cdot[\mathrm{IRS1\_TyrP\_PI3K}]\cdot V\_\mathrm{cytoplasm})\cdot[\mathrm{PIP2}])\\
&\quad +V\_\mathrm{cytoplasm}\cdot((\mathrm{kminus9\_basal}+\mathrm{kminus9}\cdot[\mathrm{PTEN}]\cdot V\_\mathrm{cytoplasm})\cdot[\mathrm{PI345P3}])\\
[\mathrm{PI345P3\_mol}] &= \frac{\mathrm{sc\_pip}\cdot\mathrm{PI345P3.ParticleNumber}}{V\_\mathrm{cytoplasm}}\\
[\mathrm{PIP2\_mol}] &= \frac{\mathrm{sc\_pip}\cdot\mathrm{PIP2.ParticleNumber}}{V\_\mathrm{cytoplasm}}\\
\frac{\mathrm{d}\left([\mathrm{Akt}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= -V\_\mathrm{cytoplasm}\cdot\left(\mathrm{k11}\cdot[\mathrm{Akt}]\cdot\begin{cases}[\mathrm{PI345P3}]\cdot V\_\mathrm{cytoplasm}-\mathrm{pip3\_basal} & \text{if } [\mathrm{PI345P3}]\cdot V\_\mathrm{cytoplasm}>\mathrm{pip3\_basal}\\ 0 & \text{otherwise}\end{cases}\right)\\
&\quad +V\_\mathrm{cytoplasm}\cdot(\mathrm{kminus11}\cdot[\mathrm{PP2A}]\cdot[\mathrm{Akt\_P2}]\cdot V\_\mathrm{cytoplasm})\\
\frac{\mathrm{d}\left([\mathrm{Akt\_P2}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= +V\_\mathrm{cytoplasm}\cdot\left(\mathrm{k11}\cdot[\mathrm{Akt}]\cdot\begin{cases}[\mathrm{PI345P3}]\cdot V\_\mathrm{cytoplasm}-\mathrm{pip3\_basal} & \text{if } [\mathrm{PI345P3}]\cdot V\_\mathrm{cytoplasm}>\mathrm{pip3\_basal}\\ 0 & \text{otherwise}\end{cases}\right)\\
&\quad -V\_\mathrm{cytoplasm}\cdot(\mathrm{kminus11}\cdot[\mathrm{PP2A}]\cdot[\mathrm{Akt\_P2}]\cdot V\_\mathrm{cytoplasm})\\
\frac{\mathrm{d}\left([\mathrm{PKC}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= -V\_\mathrm{cytoplasm}\cdot\left(\mathrm{k12}\cdot[\mathrm{PKC}]\cdot\begin{cases}[\mathrm{PI345P3}]\cdot V\_\mathrm{cytoplasm}-\mathrm{pip3\_basal} & \text{if } [\mathrm{PI345P3}]\cdot V\_\mathrm{cytoplasm}>\mathrm{pip3\_basal}\\ 0 & \text{otherwise}\end{cases}\right)\\
&\quad +V\_\mathrm{cytoplasm}\cdot(\mathrm{kminus12}\cdot[\mathrm{PP2A}]\cdot[\mathrm{PKC\_P}]\cdot V\_\mathrm{cytoplasm})\\
\frac{\mathrm{d}\left([\mathrm{PKC\_P}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= +V\_\mathrm{cytoplasm}\cdot\left(\mathrm{k12}\cdot[\mathrm{PKC}]\cdot\begin{cases}[\mathrm{PI345P3}]\cdot V\_\mathrm{cytoplasm}-\mathrm{pip3\_basal} & \text{if } [\mathrm{PI345P3}]\cdot V\_\mathrm{cytoplasm}>\mathrm{pip3\_basal}\\ 0 & \text{otherwise}\end{cases}\right)\\
&\quad -V\_\mathrm{cytoplasm}\cdot(\mathrm{kminus12}\cdot[\mathrm{PP2A}]\cdot[\mathrm{PKC\_P}]\cdot V\_\mathrm{cytoplasm})\\
\frac{\mathrm{d}\left([\mathrm{AS160}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= -V\_\mathrm{cytoplasm}\cdot(\mathrm{kr16a}\cdot[\mathrm{Akt\_P2}]\cdot[\mathrm{AS160}]\cdot V\_\mathrm{cytoplasm})\\
&\quad +V\_\mathrm{cytoplasm}\cdot(\mathrm{kminusr16a}\cdot[\mathrm{PP2A}]\cdot[\mathrm{AS160\_P}]\cdot V\_\mathrm{cytoplasm})\\
\frac{\mathrm{d}\left([\mathrm{AS160\_P}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= +V\_\mathrm{cytoplasm}\cdot(\mathrm{kr16a}\cdot[\mathrm{Akt\_P2}]\cdot[\mathrm{AS160}]\cdot V\_\mathrm{cytoplasm})\\
&\quad -V\_\mathrm{cytoplasm}\cdot(\mathrm{kminusr16a}\cdot[\mathrm{PP2A}]\cdot[\mathrm{AS160\_P}]\cdot V\_\mathrm{cytoplasm})\\
\frac{\mathrm{d}\left([\mathrm{cellsurface\_GLUT4}]\cdot V\_\mathrm{cellsurface}\right)}{\mathrm{d}t} &= +((\mathrm{k13\_basal}+\mathrm{k13}\cdot[\mathrm{AS160\_P}]\cdot V\_\mathrm{cytoplasm})\cdot[\mathrm{cytoplasm\_GLUT4}]\cdot V\_\mathrm{cytoplasm})\\
&\quad -(\mathrm{kminus13}\cdot[\mathrm{cellsurface\_GLUT4}]\cdot V\_\mathrm{cellsurface})\\
\frac{\mathrm{d}\left([\mathrm{cytoplasm\_GLUT4}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= -((\mathrm{k13\_basal}+\mathrm{k13}\cdot[\mathrm{AS160\_P}]\cdot V\_\mathrm{cytoplasm})\cdot[\mathrm{cytoplasm\_GLUT4}]\cdot V\_\mathrm{cytoplasm})\\
&\quad +(\mathrm{kminus13}\cdot[\mathrm{cellsurface\_GLUT4}]\cdot V\_\mathrm{cellsurface})
\end{aligned}
$$

$$
\begin{aligned}
\frac{\mathrm{d}\left([\mathrm{PTEN}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= -V\_\mathrm{cytoplasm}\cdot(\mathrm{k31f}\cdot[\mathrm{PTEN}]\cdot[\mathrm{ROS}]\cdot V\_\mathrm{cytoplasm})\\
&\quad +V\_\mathrm{cytoplasm}\cdot(\mathrm{k31r}\cdot[\mathrm{PTEN\_ox}]\cdot[\mathrm{GSH}]\cdot V\_\mathrm{cytoplasm})\\
\frac{\mathrm{d}\left([\mathrm{PTP1B\_ox}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= +V\_\mathrm{cytoplasm}\cdot(\mathrm{k30f}\cdot[\mathrm{PTP1B}]\cdot[\mathrm{ROS}]\cdot V\_\mathrm{cytoplasm})\\
&\quad -V\_\mathrm{cytoplasm}\cdot(\mathrm{k30r}\cdot[\mathrm{PTP1B\_ox}]\cdot[\mathrm{GSH}]\cdot V\_\mathrm{cytoplasm})\\
[\mathrm{PTP1B\_plus\_PTP1B\_ox}] &= \frac{\mathrm{PTP1B.ParticleNumber}+\mathrm{PTP1B\_ox.ParticleNumber}}{V\_\mathrm{cytoplasm}}\\
\frac{\mathrm{d}\left([\mathrm{PTEN\_ox}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= +V\_\mathrm{cytoplasm}\cdot(\mathrm{k31f}\cdot[\mathrm{PTEN}]\cdot[\mathrm{ROS}]\cdot V\_\mathrm{cytoplasm})\\
&\quad -V\_\mathrm{cytoplasm}\cdot(\mathrm{k31r}\cdot[\mathrm{PTEN\_ox}]\cdot[\mathrm{GSH}]\cdot V\_\mathrm{cytoplasm})\\
\frac{\mathrm{d}\left([\mathrm{PTP1B}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= -V\_\mathrm{cytoplasm}\cdot(\mathrm{k30f}\cdot[\mathrm{PTP1B}]\cdot[\mathrm{ROS}]\cdot V\_\mathrm{cytoplasm})\\
&\quad +V\_\mathrm{cytoplasm}\cdot(\mathrm{k30r}\cdot[\mathrm{PTP1B\_ox}]\cdot[\mathrm{GSH}]\cdot V\_\mathrm{cytoplasm})\\
[\mathrm{PTEN\_plus\_PTEN\_ox}] &= \frac{\mathrm{PTEN.ParticleNumber}+\mathrm{PTEN\_ox.ParticleNumber}}{V\_\mathrm{cytoplasm}}\\
\frac{\mathrm{d}\left([\mathrm{ROS}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= +V\_\mathrm{cytoplasm}\cdot(\mathrm{k35f}\cdot[\mathrm{NOX}])\\
&\quad -V\_\mathrm{cytoplasm}\cdot(\mathrm{k35r}\cdot[\mathrm{ROS}]\cdot[\mathrm{cytoplasm\_SOD2}]\cdot V\_\mathrm{cytoplasm})\\
&\quad +V\_\mathrm{cytoplasm}\cdot(\mathrm{k36f}\cdot[\mathrm{Mt}])\\
&\quad +(\mathrm{k\_ros\_perm}\cdot[\mathrm{extracellular\_ROS}]\cdot V\_\mathrm{extracellular})\\
&\quad -\left(\mathrm{k\_ros\_perm}\cdot\frac{V\_\mathrm{extracellular}}{V\_\mathrm{cytoplasm}}\cdot[\mathrm{ROS}]\cdot V\_\mathrm{cytoplasm}\right)\\
\frac{\mathrm{d}\left([\mathrm{GSH}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= -V\_\mathrm{cytoplasm}\cdot(\mathrm{k38f}\cdot[\mathrm{GSH}]\cdot[\mathrm{ROS}]\cdot V\_\mathrm{cytoplasm})\\
&\quad +V\_\mathrm{cytoplasm}\cdot(\mathrm{k38r}\cdot[\mathrm{GSSG}])\\
\frac{\mathrm{d}\left([\mathrm{GSSG}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= +V\_\mathrm{cytoplasm}\cdot(\mathrm{k38f}\cdot[\mathrm{GSH}]\cdot[\mathrm{ROS}]\cdot V\_\mathrm{cytoplasm})\\
&\quad -V\_\mathrm{cytoplasm}\cdot(\mathrm{k38r}\cdot[\mathrm{GSSG}])\\
\frac{\mathrm{d}\left([\mathrm{cytoplasm\_SOD2}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= +V\_\mathrm{cytoplasm}\cdot([\mathrm{cytoplasm\_RNA\_SOD2}]\cdot 1.23)\\
&\quad -V\_\mathrm{cytoplasm}\cdot(0.0019\cdot[\mathrm{cytoplasm\_SOD2}])\\
\frac{\mathrm{d}\left([\mathrm{NOX\_inact}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= -(\mathrm{k34f}\cdot[\mathrm{NOX\_inact}]\cdot V\_\mathrm{cytoplasm}\cdot[\mathrm{Ins}]\cdot V\_\mathrm{extracellular})\\
&\quad +V\_\mathrm{cytoplasm}\cdot(\mathrm{k34r2}\cdot[\mathrm{NOX}])\\
&\quad +V\_\mathrm{cytoplasm}\cdot(\mathrm{k34r3}\cdot[\mathrm{NOX\_deact}]\cdot[\mathrm{NOX\_deact}]\cdot V\_\mathrm{cytoplasm})\\
\frac{\mathrm{d}\left([\mathrm{NOX}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= +(\mathrm{k34f}\cdot[\mathrm{NOX\_inact}]\cdot V\_\mathrm{cytoplasm}\cdot[\mathrm{Ins}]\cdot V\_\mathrm{extracellular})\\
&\quad -V\_\mathrm{cytoplasm}\cdot(\mathrm{k34r1}\cdot[\mathrm{NOX}]\cdot[\mathrm{NOX}]\cdot V\_\mathrm{cytoplasm})\\
&\quad -V\_\mathrm{cytoplasm}\cdot(\mathrm{k34r2}\cdot[\mathrm{NOX}])\\
\frac{\mathrm{d}\left([\mathrm{NOX\_deact}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= +V\_\mathrm{cytoplasm}\cdot(\mathrm{k34r1}\cdot[\mathrm{NOX}]\cdot[\mathrm{NOX}]\cdot V\_\mathrm{cytoplasm})\\
&\quad -V\_\mathrm{cytoplasm}\cdot(\mathrm{k34r3}\cdot[\mathrm{NOX\_deact}]\cdot[\mathrm{NOX\_deact}]\cdot V\_\mathrm{cytoplasm})\\
[\mathrm{NOX\_total}] &= \frac{\mathrm{NOX\_inact.ParticleNumber}+\mathrm{NOX.ParticleNumber}+\mathrm{NOX\_deact.ParticleNumber}}{V\_\mathrm{cytoplasm}}\\
\frac{\mathrm{d}\left([\mathrm{JNK\_P}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= +V\_\mathrm{cytoplasm}\cdot(\mathrm{k42f}\cdot\mathrm{alpha\_ox}\cdot[\mathrm{JNK}]\cdot[\mathrm{ROS}]\cdot V\_\mathrm{cytoplasm})\\
&\quad -V\_\mathrm{cytoplasm}\cdot(\mathrm{k42r}\cdot[\mathrm{JNK\_P}]\cdot[\mathrm{DUSP}]\cdot V\_\mathrm{cytoplasm})\\
\frac{\mathrm{d}\left([\mathrm{IKK\_P}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= +V\_\mathrm{cytoplasm}\cdot(\mathrm{k43f}\cdot[\mathrm{IKK}]\cdot[\mathrm{ROS}]\cdot V\_\mathrm{cytoplasm})\\
&\quad -V\_\mathrm{cytoplasm}\cdot(\mathrm{k43r}\cdot[\mathrm{IKK\_P}]\cdot[\mathrm{DUSP}]\cdot V\_\mathrm{cytoplasm})\\
\frac{\mathrm{d}\left([\mathrm{JNK}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= -V\_\mathrm{cytoplasm}\cdot(\mathrm{k42f}\cdot\mathrm{alpha\_ox}\cdot[\mathrm{JNK}]\cdot[\mathrm{ROS}]\cdot V\_\mathrm{cytoplasm})\\
&\quad +V\_\mathrm{cytoplasm}\cdot(\mathrm{k42r}\cdot[\mathrm{JNK\_P}]\cdot[\mathrm{DUSP}]\cdot V\_\mathrm{cytoplasm})\\
[\mathrm{JNK\_plus\_JNK\_P}] &= \frac{\mathrm{JNK.ParticleNumber}+\mathrm{JNK\_P.ParticleNumber}}{V\_\mathrm{cytoplasm}}\\
\frac{\mathrm{d}\left([\mathrm{IKK}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= -V\_\mathrm{cytoplasm}\cdot(\mathrm{k43f}\cdot[\mathrm{IKK}]\cdot[\mathrm{ROS}]\cdot V\_\mathrm{cytoplasm})\\
&\quad +V\_\mathrm{cytoplasm}\cdot(\mathrm{k43r}\cdot[\mathrm{IKK\_P}]\cdot[\mathrm{DUSP}]\cdot V\_\mathrm{cytoplasm})\\
[\mathrm{IKK\_plus\_IKK\_P}] &= \frac{\mathrm{IKK.ParticleNumber}+\mathrm{IKK\_P.ParticleNumber}}{V\_\mathrm{cytoplasm}}\\
\frac{\mathrm{d}\left([\mathrm{DUSP}]\cdot V\_\mathrm{cytoplasm}\right)}{\mathrm{d}t} &= -V\_\mathrm{cytoplasm}\cdot(\mathrm{k32f}\cdot[\mathrm{DUSP}]\cdot[\mathrm{ROS}]\cdot V\_\mathrm{cytoplasm})\\
&\quad +V\_\mathrm{cytoplasm}\cdot(\mathrm{k32r}\cdot[\mathrm{DUSP\_ox}]\cdot[\mathrm{GSH}]\cdot V\_\mathrm{cytoplasm})
\end{aligned}
$$

$$\frac{\mathrm{d}\left([\text{DUSP\_ox}]\cdot V\text{\_cytoplasm}\right)}{\mathrm{d}t} = +V\text{\_cytoplasm}\cdot(\text{k32f}\cdot[\text{DUSP}]\cdot[\text{ROS}]\cdot V\text{\_cytoplasm})$$
$$-V\text{\_cytoplasm}\cdot(\text{k32r}\cdot[\text{DUSP\_ox}]\cdot[\text{GSH}]\cdot V\text{\_cytoplasm})$$

$$[\text{DUSP\_plus\_DUSP\_ox}] = \frac{\text{DUSP.ParticleNumber} + \text{DUSP\_ox.ParticleNumber}}{V\text{\_cytoplasm}}$$

$$\frac{\mathrm{d}\left([\text{degr\_Foxo1}]\cdot V\text{\_cytoplasm}\right)}{\mathrm{d}t} = +V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}]\cdot[\text{Proteasome}]\cdot V\text{\_cytoplasm}\cdot 0.0001)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]\cdot[\text{Proteasome}]\cdot V\text{\_cytoplasm}\cdot 0.0001)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]\cdot[\text{Proteasome}]\cdot V\text{\_cytoplasm}\cdot 0.0001)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}]\cdot[\text{Proteasome}]\cdot V\text{\_cytoplasm}\cdot 0.0001)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}]\cdot[\text{Proteasome}]\cdot V\text{\_cytoplasm}\cdot 0.0001)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}]\cdot[\text{Proteasome}]\cdot V\text{\_cytoplasm}\cdot 0.0001)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}]\cdot[\text{Proteasome}]\cdot V\text{\_cytoplasm}\cdot 0.0001)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}]\cdot[\text{Proteasome}]\cdot V\text{\_cytoplasm}\cdot 0.0001)$$

$$\frac{\mathrm{d}\left([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]\cdot V\text{\_cytoplasm}\right)}{\mathrm{d}t} = -V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]\cdot[\text{Akt\_P2}]\cdot V\text{\_cytoplasm}\cdot 0.0003)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]\cdot[\text{SGK}]\cdot V\text{\_cytoplasm}\cdot 0.0003)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]\cdot[\text{IKK\_P}]\cdot V\text{\_cytoplasm}\cdot \text{by\_ikk\_phos\_factor}\cdot 5e-05)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]\cdot[\text{JNK\_P}]\cdot V\text{\_cytoplasm}\cdot \text{by\_jnk\_phos\_factor}\cdot 5e-05)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]\cdot[\text{SCF}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$+V\text{\_cytoplasm}\cdot([\text{E2F1}]\cdot 0.0055)$$
$$-([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]\cdot V\text{\_cytoplasm}\cdot 0.181818)$$
$$+([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]\cdot V\text{\_nucleus}\cdot 0.055)$$

$$\frac{\mathrm{d}\left([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}]\cdot V\text{\_cytoplasm}\right)}{\mathrm{d}t} = -V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}]\cdot[\text{Akt\_P2}]\cdot V\text{\_cytoplasm}\cdot 0.0003)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}]\cdot[\text{SGK}]\cdot V\text{\_cytoplasm}\cdot 0.0003)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}]\cdot[\text{IKK\_P}]\cdot V\text{\_cytoplasm}\cdot \text{by\_ikk\_phos\_factor}\cdot 5e-05)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}]\cdot[\text{JNK\_P}]\cdot V\text{\_cytoplasm}\cdot \text{by\_jnk\_phos\_factor}\cdot 5e-05)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]\cdot[\text{SCF}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}]\cdot[\text{Proteasome}]\cdot V\text{\_cytoplasm}\cdot 0.0001)$$
$$-([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}]\cdot V\text{\_cytoplasm}\cdot 0.181818)$$
$$+([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}]\cdot V\text{\_nucleus}\cdot 0.055)$$

$$\frac{\mathrm{d}\left([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}]\cdot V\text{\_cytoplasm}\right)}{\mathrm{d}t} = -V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}]\cdot[\text{Akt\_P2}]\cdot V\text{\_cytoplasm}\cdot 0.0003)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}]\cdot[\text{SGK}]\cdot V\text{\_cytoplasm}\cdot 0.0003)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}]\cdot[\text{IKK\_P}]\cdot V\text{\_cytoplasm}\cdot \text{by\_ikk\_phos\_factor}\cdot 5e-05)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]\cdot[\text{JNK\_P}]\cdot V\text{\_cytoplasm}\cdot \text{by\_jnk\_phos\_factor}\cdot 5e-05)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}]\cdot[\text{SCF}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$-([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}]\cdot V\text{\_cytoplasm}\cdot 1.81818)$$
$$+([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}]\cdot V\text{\_nucleus}\cdot 0.0055)$$

$$\frac{\mathrm{d}\left([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]\cdot V\text{\_cytoplasm}\right)}{\mathrm{d}t} = -V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]\cdot[\text{Akt\_P2}]\cdot V\text{\_cytoplasm}\cdot 0.0003)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]\cdot[\text{SGK}]\cdot V\text{\_cytoplasm}\cdot 0.0003)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]\cdot[\text{IKK\_P}]\cdot V\text{\_cytoplasm}\cdot \text{by\_ikk\_phos\_factor}\cdot 5e-05)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}]\cdot[\text{JNK\_P}]\cdot V\text{\_cytoplasm}\cdot \text{by\_jnk\_phos\_factor}\cdot 5e-05)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}]\cdot[\text{SCF}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]\cdot[\text{Proteasome}]\cdot V\text{\_cytoplasm}\cdot 0.0001)$$
$$-([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]\cdot V\text{\_cytoplasm}\cdot 1.81818)$$
$$+([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]\cdot V\text{\_nucleus}\cdot 0.0055)$$

$$\frac{\mathrm{d}\left([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]\cdot V\text{\_cytoplasm}\right)}{\mathrm{d}t} = -V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]\cdot[\text{Akt\_P2}]\cdot V\text{\_cytoplasm}\cdot 0.0003)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]\cdot[\text{SGK}]\cdot V\text{\_cytoplasm}\cdot 0.0003)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]\cdot[\text{IKK\_P}]\cdot V\text{\_cytoplasm}\cdot \text{by\_ikk\_phos\_factor}\cdot 5e-05)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]\cdot[\text{JNK\_P}]\cdot V\text{\_cytoplasm}\cdot \text{by\_jnk\_phos\_factor}\cdot 5e-05)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]\cdot[\text{SCF}]\cdot V\text{\_cytoplasm}\cdot 2.2e-05)$$
$$-([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]\cdot V\text{\_cytoplasm}\cdot 0.0909091)$$
$$+([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]\cdot V\text{\_nucleus}\cdot 0.55)$$

$$\frac{\mathrm{d}\left([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]\cdot V\text{\_cytoplasm}\right)}{\mathrm{d}t} = -V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]\cdot[\text{Akt\_P2}]\cdot V\text{\_cytoplasm}\cdot 0.0003)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]\cdot[\text{SGK}]\cdot V\text{\_cytoplasm}\cdot 0.0003)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}]\cdot[\text{IKK\_P}]\cdot V\text{\_cytoplasm}\cdot \text{by\_ikk\_phos\_factor}\cdot 5e-05)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]\cdot[\text{JNK\_P}]\cdot V\text{\_cytoplasm}\cdot \text{by\_jnk\_phos\_factor}\cdot 5e-05)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}]\cdot[\text{PP2A}]\cdot V\text{\_cytoplasm}\cdot 1e-06)$$
$$+V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]\cdot[\text{SCF}]\cdot V\text{\_cytoplasm}\cdot 2.2e-05)$$
$$-V\text{\_cytoplasm}\cdot([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]\cdot[\text{Proteasome}]\cdot V\text{\_cytoplasm}\cdot 0.0001)$$
$$-([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]\cdot V\text{\_cytoplasm}\cdot 0.0909091)$$
$$+([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]\cdot V\text{\_nucleus}\cdot 0.55)$$

$$\frac{\mathrm{d}\left([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_cytoplasm}\right)}{\mathrm{d}t} = - V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 2.2e-05)$$
$$- ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_cytoplasm} \cdot 0.909091)$$
$$+ ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.055)$$

$$\frac{\mathrm{d}\left([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot V\text{\_cytoplasm}\right)}{\mathrm{d}t} = - V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 2.2e-05)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{Proteasome}] \cdot V\text{\_cytoplasm} \cdot 0.0001)$$
$$- ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot V\text{\_cytoplasm} \cdot 0.909091)$$
$$+ ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.055)$$

$$\frac{\mathrm{d}\left([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot V\text{\_cytoplasm}\right)}{\mathrm{d}t} = + V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 3e-06)$$
$$- ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot V\text{\_cytoplasm} \cdot 0.0181818)$$
$$+ ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.55)$$

$$\frac{\mathrm{d}\left([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot V\text{\_cytoplasm}\right)}{\mathrm{d}t} = + V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 3e-06)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{Proteasome}] \cdot V\text{\_cytoplasm} \cdot 0.0001)$$
$$- ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot V\text{\_cytoplasm} \cdot 0.0181818)$$
$$+ ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.55)$$

$$\frac{\mathrm{d}\left([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot V\text{\_cytoplasm}\right)}{\mathrm{d}t} = - ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot V\text{\_cytoplasm} \cdot 0.181818)$$
$$+ ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.055)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 3e-06)$$

$$\frac{\mathrm{d}\left([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot V\text{\_cytoplasm}\right)}{\mathrm{d}t} = - ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot V\text{\_cytoplasm} \cdot 0.181818)$$
$$+ ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.055)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 3e-06)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{Proteasome}] \cdot V\text{\_cytoplasm} \cdot 0.0001)$$

$$\frac{\mathrm{d}\left([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_cytoplasm}\right)}{\mathrm{d}t} = - ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_cytoplasm} \cdot 0.00909091)$$
$$+ ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_nucleus} \cdot 5.5)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)$$
$$- V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 6.6e-05)$$

$$\frac{\mathrm{d}\left([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_cytoplasm}\right)}{\mathrm{d}t} = - ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_cytoplasm} \cdot 0.00909091)$$
$$+ ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_nucleus} \cdot 5.5)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003)$$
$$+ V\text{\_cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003)$$

$$
\begin{aligned}
&&&- V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&- V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\_\text{cytoplasm} \cdot 6.6e-05)\\
&&&- V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{Proteasome}] \cdot V\_\text{cytoplasm} \cdot 0.0001)\\
\frac{\mathrm{d}\,([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot V\_\text{cytoplasm})}{\mathrm{d}t} &= &&- ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot V\_\text{cytoplasm} \cdot 0.0909091)\\
&&&+ ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot V\_\text{nucleus} \cdot 0.55)\\
&&&+ V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&+ V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{SGK}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&- V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&- V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&- V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\_\text{cytoplasm} \cdot 6.6e-05)\\
\frac{\mathrm{d}\,([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot V\_\text{cytoplasm})}{\mathrm{d}t} &= &&- ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot V\_\text{cytoplasm} \cdot 0.0909091)\\
&&&+ ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot V\_\text{nucleus} \cdot 0.55)\\
&&&+ V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&+ V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{SGK}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&- V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&- V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&- V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\_\text{cytoplasm} \cdot 6.6e-05)\\
&&&- V\_\text{cytoplasm} \cdot ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{Proteasome}] \cdot V\_\text{cytoplasm} \cdot 0.0001)\\
\frac{\mathrm{d}\,([\text{cytoplasm\_RNA\_InR}] \cdot V\_\text{cytoplasm})}{\mathrm{d}t} &= &&+ ([\text{nucleus\_RNA\_InR}] \cdot V\_\text{nucleus} \cdot 0.22)\\
&&&- V\_\text{cytoplasm} \cdot (5.622 \cdot [\text{cytoplasm\_RNA\_InR}])\\
\frac{\mathrm{d}\,([\text{cytoplasm\_RNA\_SOD2}] \cdot V\_\text{cytoplasm})}{\mathrm{d}t} &= &&+ ([\text{nucleus\_RNA\_SOD2}] \cdot V\_\text{nucleus} \cdot 0.22)\\
&&&- V\_\text{cytoplasm} \cdot (5.622 \cdot [\text{cytoplasm\_RNA\_SOD2}])\\
\frac{\mathrm{d}\,([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot V\_\text{nucleus})}{\mathrm{d}t} &= &&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{SGK}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&+ V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ ([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot V\_\text{cytoplasm} \cdot 0.181818)\\
&&&- ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot V\_\text{nucleus} \cdot 0.055)\\
&&&- ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot V\_\text{nucleus} \cdot 0.25)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.125)\\
\frac{\mathrm{d}\,([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot V\_\text{nucleus})}{\mathrm{d}t} &= &&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{SGK}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&+ V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ ([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot V\_\text{cytoplasm} \cdot 0.181818)\\
&&&- ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot V\_\text{nucleus} \cdot 0.055)\\
&&&- ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot V\_\text{nucleus} \cdot 0.25)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.125)\\
\frac{\mathrm{d}\,([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot V\_\text{nucleus})}{\mathrm{d}t} &= &&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{SGK}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&+ V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ ([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot V\_\text{cytoplasm} \cdot 1.81818)\\
&&&- ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot V\_\text{nucleus} \cdot 0.0055)\\
&&&- ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot V\_\text{nucleus} \cdot 0.25)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.125)\\
\frac{\mathrm{d}\,([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot V\_\text{nucleus})}{\mathrm{d}t} &= &&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{SGK}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&+ V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&- V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ V\_\text{nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ ([\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot V\_\text{cytoplasm} \cdot 1.81818)
\end{aligned}
$$

$$
\begin{aligned}
\frac{\mathrm{d}\left([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_nucleus}\right)}{\mathrm{d}t} = {} & - ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.0055) \\
& - ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.25) \\
& + ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot V\text{\_dnabound} \cdot 0.125) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 2.2e-05) \\
& + ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_cytoplasm} \cdot 0.0909091) \\
& - ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.55) \\
& - ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.25) \\
& + ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_dnabound} \cdot 0.125) \\
\frac{\mathrm{d}\left([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_nucleus}\right)}{\mathrm{d}t} = {} & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 2.2e-05) \\
& + ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_cytoplasm} \cdot 0.0909091) \\
& - ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.55) \\
& - ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.25) \\
& + ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_dnabound} \cdot 0.125) \\
\frac{\mathrm{d}\left([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_nucleus}\right)}{\mathrm{d}t} = {} & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 2.2e-05) \\
& + ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_cytoplasm} \cdot 0.909091) \\
& - ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.055) \\
& - ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.25) \\
& + ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_dnabound} \cdot 0.125) \\
\frac{\mathrm{d}\left([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot V\text{\_nucleus}\right)}{\mathrm{d}t} = {} & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 2.2e-05) \\
& + ([\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot V\text{\_cytoplasm} \cdot 0.909091) \\
& - ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.055) \\
& - ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.25) \\
& + ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot V\text{\_dnabound} \cdot 0.125) \\
\frac{\mathrm{d}\left([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot V\text{\_nucleus}\right)}{\mathrm{d}t} = {} & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 3e-06) \\
& + ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot V\text{\_cytoplasm} \cdot 0.0181818) \\
& - ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.55) \\
& - ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.125) \\
& + ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot V\text{\_dnabound} \cdot 0.125) \\
\frac{\mathrm{d}\left([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot V\text{\_nucleus}\right)}{\mathrm{d}t} = {} & + ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot V\text{\_dnabound} \cdot 0.125) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 3e-06) \\
& + ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot V\text{\_cytoplasm} \cdot 0.0181818) \\
& - ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.55) \\
& - ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.125) \\
\frac{\mathrm{d}\left([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot V\text{\_nucleus}\right)}{\mathrm{d}t} = {} & + ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot V\text{\_cytoplasm} \cdot 0.181818) \\
& - ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.055)
\end{aligned}
$$

$$
\begin{aligned}
& & & - ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.125) \\
& & & + ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot V\text{\_dnabound} \cdot 0.125) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 3e-06) \\
\frac{\mathrm{d}\,([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot V\text{\_nucleus})}{\mathrm{d}t} & = & & + ([\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot V\text{\_cytoplasm} \cdot 0.181818) \\
& & & - ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.055) \\
& & & - ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.125) \\
& & & + ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot V\text{\_dnabound} \cdot 0.125) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 3e-06) \\
\frac{\mathrm{d}\,([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_nucleus})}{\mathrm{d}t} & = & & + ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_cytoplasm} \cdot 0.00909091) \\
& & & - ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_nucleus} \cdot 5.5) \\
& & & - ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.125) \\
& & & + ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_dnabound} \cdot 0.125) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 6.6e-05) \\
\frac{\mathrm{d}\,([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_nucleus})}{\mathrm{d}t} & = & & + ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_cytoplasm} \cdot 0.00909091) \\
& & & - ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_nucleus} \cdot 5.5) \\
& & & - ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.125) \\
& & & + ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_dnabound} \cdot 0.125) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 6.6e-05) \\
\frac{\mathrm{d}\,([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_nucleus})}{\mathrm{d}t} & = & & + ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_cytoplasm} \cdot 0.0909091) \\
& & & - ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.55) \\
& & & - ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.125) \\
& & & + ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_dnabound} \cdot 0.125) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 6.6e-05) \\
\frac{\mathrm{d}\,([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot V\text{\_nucleus})}{\mathrm{d}t} & = & & + ([\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot V\text{\_cytoplasm} \cdot 0.0909091) \\
& & & - ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.55) \\
& & & - ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.125) \\
& & & + ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot V\text{\_dnabound} \cdot 0.125) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05) \\
& & & - V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06) \\
& & & + V\text{\_nucleus} \cdot ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 6.6e-05) \\
\frac{\mathrm{d}\,([\text{nucleus\_RNA\_InR}] \cdot V\text{\_nucleus})}{\mathrm{d}t} & = & & + ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot V\text{\_dnabound} \cdot 0.24) \\
& & & + ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot V\text{\_dnabound} \cdot 0.24) \\
& & & + ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot V\text{\_dnabound} \cdot 0.24) \\
& & & + ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot V\text{\_dnabound} \cdot 0.24) \\
& & & + ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_dnabound} \cdot 0.24) \\
& & & + ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_dnabound} \cdot 0.24) \\
& & & + ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_dnabound} \cdot 0.24)
\end{aligned}
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$$
\begin{aligned}
&&&+ ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.24)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.24)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.24)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.24)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.24)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.24)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.24)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.24)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.24)\\
&&&+ (5)\\
&&&- ([\text{nucleus\_RNA\_InR}] \cdot V\_\text{nucleus} \cdot 0.22)\\
\frac{\mathrm{d}\,([\text{nucleus\_RNA\_SOD2}] \cdot V\_\text{nucleus})}{\mathrm{d}t} &= &&+ ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.95)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.95)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.95)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.95)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.95)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.95)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.95)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.95)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.95)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.95)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.95)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.95)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.95)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.95)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.95)\\
&&&+ ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.95)\\
&&&+ (15)\\
&&&- ([\text{nucleus\_RNA\_SOD2}] \cdot V\_\text{nucleus} \cdot 0.22)\\
\frac{\mathrm{d}\,([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot V\_\text{dnabound})}{\mathrm{d}t} &= &&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{SGK}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot V\_\text{nucleus} \cdot 0.25)\\
&&&- ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.125)\\
\frac{\mathrm{d}\,([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot V\_\text{dnabound})}{\mathrm{d}t} &= &&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{SGK}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot V\_\text{nucleus} \cdot 0.25)\\
&&&- ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.125)\\
\frac{\mathrm{d}\,([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot V\_\text{dnabound})}{\mathrm{d}t} &= &&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{SGK}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot V\_\text{nucleus} \cdot 0.25)\\
&&&- ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.125)\\
\frac{\mathrm{d}\,([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot V\_\text{dnabound})}{\mathrm{d}t} &= &&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{SGK}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ ([\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot V\_\text{nucleus} \cdot 0.25)\\
&&&- ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.125)\\
\frac{\mathrm{d}\,([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot V\_\text{dnabound})}{\mathrm{d}t} &= &&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{SGK}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&&&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\_\text{cytoplasm} \cdot 2.2e-05)\\
&&&+ ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot V\_\text{nucleus} \cdot 0.25)
\end{aligned}
$$

$$
\begin{aligned}
&&&- ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_dnabound} \cdot 0.125)\\
\frac{\mathrm{d}([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_dnabound})}{\mathrm{d}t} &= &&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 2.2e-05)\\
&&&+ ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.25)\\
&&&- ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot V\text{\_dnabound} \cdot 0.125)\\
\frac{\mathrm{d}([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_dnabound})}{\mathrm{d}t} &= &&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 2.2e-05)\\
&&&+ ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.25)\\
&&&- ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot V\text{\_dnabound} \cdot 0.125)\\
\frac{\mathrm{d}([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot V\text{\_dnabound})}{\mathrm{d}t} &= &&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 2.2e-05)\\
&&&+ ([\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.25)\\
&&&- ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot V\text{\_dnabound} \cdot 0.125)\\
\frac{\mathrm{d}([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot V\text{\_dnabound})}{\mathrm{d}t} &= &&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 3e-06)\\
&&&+ ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.125)\\
&&&- ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot V\text{\_dnabound} \cdot 0.125)\\
\frac{\mathrm{d}([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot V\text{\_dnabound})}{\mathrm{d}t} &= &&- ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot V\text{\_dnabound} \cdot 0.125)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 3e-06)\\
&&&+ ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.125)\\
\frac{\mathrm{d}([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot V\text{\_dnabound})}{\mathrm{d}t} &= &&+ ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.125)\\
&&&- ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot V\text{\_dnabound} \cdot 0.125)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 3e-06)\\
\frac{\mathrm{d}([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot V\text{\_dnabound})}{\mathrm{d}t} &= &&+ ([\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot V\text{\_nucleus} \cdot 0.125)\\
&&&- ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot V\text{\_dnabound} \cdot 0.125)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\text{\_cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\text{\_cytoplasm} \cdot 3e-06)\\
\frac{\mathrm{d}([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_dnabound})}{\mathrm{d}t} &= &&+ ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_nucleus} \cdot 0.125)\\
&&&- ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot V\text{\_dnabound} \cdot 0.125)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\text{\_cytoplasm} \cdot 0.0003)\\
&&&+ V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot [\text{SGK}] \cdot V\text{\_cytoplasm} \cdot 0.0003)\\
&&&- V\text{\_dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\text{\_cytoplasm} \cdot 1e-06)
\end{aligned}
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\begin{aligned}
&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\_\text{cytoplasm} \cdot 6.6e-05)
\end{aligned}
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\begin{aligned}
\frac{\mathrm{d}\,([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot V\_\text{dnabound})}{\mathrm{d}t} = {}& + ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot V\_\text{nucleus} \cdot 0.125)\\
&- ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.125)\\
&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot [\text{SGK}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{SCF}] \cdot V\_\text{cytoplasm} \cdot 6.6e-05)
\end{aligned}
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\begin{aligned}
\frac{\mathrm{d}\,([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot V\_\text{dnabound})}{\mathrm{d}t} = {}& + ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot V\_\text{nucleus} \cdot 0.125)\\
&- ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot V\_\text{dnabound} \cdot 0.125)\\
&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{Akt\_P2}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot [\text{SGK}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot [\text{IKK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot [\text{JNK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\_\text{cytoplasm} \cdot 6.6e-05)
\end{aligned}
$$

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\begin{aligned}
\frac{\mathrm{d}\,([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot V\_\text{dnabound})}{\mathrm{d}t} = {}& + ([\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot V\_\text{nucleus} \cdot 0.125)\\
&- ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot V\_\text{dnabound} \cdot 0.125)\\
&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{Akt\_P2}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot [\text{SGK}] \cdot V\_\text{cytoplasm} \cdot 0.0003)\\
&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot [\text{IKK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_ikk\_phos\_factor} \cdot 5e-05)\\
&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot [\text{JNK\_P}] \cdot V\_\text{cytoplasm} \cdot \text{by\_jnk\_phos\_factor} \cdot 5e-05)\\
&- V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot [\text{PP2A}] \cdot V\_\text{cytoplasm} \cdot 1e-06)\\
&+ V\_\text{dnabound} \cdot ([\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot [\text{SCF}] \cdot V\_\text{cytoplasm} \cdot 6.6e-05)
\end{aligned}
$$

$$
\begin{aligned}
\text{insconc} &= \frac{\text{Ins.ParticleNumber}}{\text{navo} \cdot \text{vextracellular}}\\
\text{k\_ros\_perm} &= \text{ros\_perm} \cdot \text{membrane\_area}\\
\text{ros\_ext\_conc} &= \frac{\text{sc\_ros} \cdot \text{extracellular\_ROS.ParticleNumber}}{\text{navo} \cdot V\_\text{extracellular}}\\
\text{ros\_cyto\_conc} &= \frac{\text{sc\_ros} \cdot \text{ROS.ParticleNumber}}{\text{navo} \cdot V\_\text{cytoplasm}}\\
\text{rosconc} &= \frac{\text{ROS.ParticleNumber}}{\text{navo} \cdot \text{vcytoplasm}}\\
[\text{Foxo1\_Pa0\_tot}] &= \frac{\sum_{c\in(\text{cytoplasm,nucleus,dnabound}),\, i\in(0,1),\, j\in(0,1),\, k\in(0,1),\, l\in(0,1)} c\_\text{Foxo1\_Pa}i\_\text{Pd}j\_\text{Pe}k\_\text{pUb}l.\text{ParticleNumber} \cdot \delta(i)}{V\_\text{extracellular}}\\
[\text{Foxo1\_Pa1\_tot}] &= \frac{\sum_{c\in(\text{cytoplasm,nucleus,dnabound}),\, i\in(0,1),\, j\in(0,1),\, k\in(0,1),\, l\in(0,1)} c\_\text{Foxo1\_Pa}i\_\text{Pd}j\_\text{Pe}k\_\text{pUb}l.\text{ParticleNumber} \cdot \delta(i-1)}{V\_\text{extracellular}}\\
[\text{Foxo1\_Pd0\_tot}] &= \frac{\sum_{c\in(\text{cytoplasm,nucleus,dnabound}),\, i\in(0,1),\, j\in(0,1),\, k\in(0,1),\, l\in(0,1)} c\_\text{Foxo1\_Pa}i\_\text{Pd}j\_\text{Pe}k\_\text{pUb}l.\text{ParticleNumber} \cdot \delta(j)}{V\_\text{extracellular}}\\
[\text{Foxo1\_Pd1\_tot}] &= \frac{\sum_{c\in(\text{cytoplasm,nucleus,dnabound}),\, i\in(0,1),\, j\in(0,1),\, k\in(0,1),\, l\in(0,1)} c\_\text{Foxo1\_Pa}i\_\text{Pd}j\_\text{Pe}k\_\text{pUb}l.\text{ParticleNumber} \cdot \delta(j-1)}{V\_\text{extracellular}}\\
[\text{Foxo1\_Pe0\_tot}] &= \frac{\sum_{c\in(\text{cytoplasm,nucleus,dnabound}),\, i\in(0,1),\, j\in(0,1),\, k\in(0,1),\, l\in(0,1)} c\_\text{Foxo1\_Pa}i\_\text{Pd}j\_\text{Pe}k\_\text{pUb}l.\text{ParticleNumber} \cdot \delta(k)}{V\_\text{extracellular}}\\
[\text{Foxo1\_Pe1\_tot}] &= \frac{\sum_{c\in(\text{cytoplasm,nucleus,dnabound}),\, i\in(0,1),\, j\in(0,1),\, k\in(0,1),\, l\in(0,1)} c\_\text{Foxo1\_Pa}i\_\text{Pd}j\_\text{Pe}k\_\text{pUb}l.\text{ParticleNumber} \cdot \delta(k-1)}{V\_\text{extracellular}}\\
[\text{Foxo1\_pUb0\_tot}] &= \frac{\sum_{c\in(\text{cytoplasm,nucleus,dnabound}),\, i\in(0,1),\, j\in(0,1),\, k\in(0,1),\, l\in(0,1)} c\_\text{Foxo1\_Pa}i\_\text{Pd}j\_\text{Pe}k\_\text{pUb}l.\text{ParticleNumber} \cdot \delta(l)}{V\_\text{extracellular}}\\
[\text{Foxo1\_pUb1\_tot}] &= \frac{\sum_{c\in(\text{cytoplasm,nucleus,dnabound}),\, i\in(0,1),\, j\in(0,1),\, k\in(0,1),\, l\in(0,1)} c\_\text{Foxo1\_Pa}i\_\text{Pd}j\_\text{Pe}k\_\text{pUb}l.\text{ParticleNumber} \cdot \delta(l-1)}{V\_\text{extracellular}}\\
[\text{cytoplasm\_Foxo1\_tot}] &= \frac{\sum_{c\in(\text{cytoplasm,nucleus,dnabound}),\, i\in(0,1),\, j\in(0,1),\, k\in(0,1),\, l\in(0,1)} c\_\text{Foxo1\_Pa}i\_\text{Pd}j\_\text{Pe}k\_\text{pUb}l.\text{ParticleNumber} \cdot \delta(c=\text{cytoplasm})}{V\_\text{extracellular}}\\
[\text{nucleus\_Foxo1\_tot}] &= \frac{\sum_{c\in(\text{cytoplasm,nucleus,dnabound}),\, i\in(0,1),\, j\in(0,1),\, k\in(0,1),\, l\in(0,1)} c\_\text{Foxo1\_Pa}i\_\text{Pd}j\_\text{Pe}k\_\text{pUb}l.\text{ParticleNumber} \cdot \delta(c=\text{nucleus})}{V\_\text{extracellular}}\\
[\text{dnabound\_Foxo1\_tot}] &= \frac{\sum_{c\in(\text{cytoplasm,nucleus,dnabound}),\, i\in(0,1),\, j\in(0,1),\, k\in(0,1),\, l\in(0,1)} c\_\text{Foxo1\_Pa}i\_\text{Pd}j\_\text{Pe}k\_\text{pUb}l.\text{ParticleNumber} \cdot \delta(c=\text{dnabound})}{V\_\text{extracellular}}\\
[\text{Foxo1\_all}] &= \frac{\text{cytoplasm\_Foxo1\_tot.ParticleNumber} + \text{nucleus\_Foxo1\_tot.ParticleNumber} + \text{dnabound\_Foxo1\_tot.ParticleNumber}}{V\_\text{extracellular}}
\end{aligned}
$$