

$$\begin{aligned}
& s \xrightarrow{1} s \\
& \text{Rtg}_{2\text{ina.c}} \xleftrightarrow[k2I]{\frac{ksV(s(t))^{ns}}{ksD^{ns}+(s(t))^{ns}}} \text{Rtg}_{2\text{act.c}} \\
& \text{Rtg}_{2\text{act.c}} + \text{Mks} \xleftrightarrow[kn2M]{k2M} \text{Rtg}_2\text{Mks}_c \\
& \text{Bmh} + \text{Mks} \xleftrightarrow[knBM]{kBM} \text{BmhMks} \\
& \text{Rtg}_{13\text{a.c}} \xrightarrow[k13ID+\text{BmhMks}(t)]{k13I+\frac{k13IV\text{BmhMks}(t)}{k13ID+\text{BmhMks}(t)}} \text{Rtg}_{13\text{i.c}} \\
& \text{Rtg}_{3\text{i.c}} \xleftrightarrow[k3I_c]{k3A_c} \text{Rtg}_{3\text{a.c}} \\
& \text{Rtg}_{3\text{a.n}} \xrightarrow{k3I_n} \text{Rtg}_{3\text{i.n}} \\
& \text{Rtg}_{1\text{c}} + \text{Rtg}_{3\text{a.c}} \xleftrightarrow[kn13_c]{k13_c} \text{Rtg}_{13\text{a.c}} \\
& \text{Rtg}_{1\text{c}} + \text{Rtg}_{3\text{i.c}} \xleftrightarrow[kn13_c]{k13_c} \text{Rtg}_{13\text{i.c}} \\
& \text{Rtg}_{1\text{n}} + \text{Rtg}_{3\text{a.n}} \xleftrightarrow[kn13_n]{k13_n} \text{Rtg}_{13\text{a.n}} \\
& \text{Rtg}_{1\text{n}} + \text{Rtg}_{3\text{i.n}} \xleftrightarrow[kn13_n]{k13_n} \text{Rtg}_{13\text{i.n}} \\
& \text{Rtg}_{1\text{c}} \xleftrightarrow[k1out]{k1in} \text{Rtg}_{1\text{n}} \\
& \text{Rtg}_{3\text{a.c}} \xleftrightarrow[k3outA]{k3inA} \text{Rtg}_{3\text{a.n}} \\
& \text{Rtg}_{3\text{i.c}} \xleftrightarrow[k3outI]{k3inI} \text{Rtg}_{3\text{i.n}}
\end{aligned}$$

$$\begin{aligned}
\frac{ds(t)}{dt} &= 0 \\
\frac{dRtg2_{ina\_c}(t)}{dt} &= -\frac{ksV(s(t))^{n_s}}{ksD^{n_s} + (s(t))^{n_s}}Rtg2_{ina\_c}(t) + k2IRtg2_{act\_c}(t) \\
\frac{dRtg2_{act\_c}(t)}{dt} &= \frac{ksV(s(t))^{n_s}}{ksD^{n_s} + (s(t))^{n_s}}Rtg2_{ina\_c}(t) - k2IRtg2_{act\_c}(t) - k2MRtg2_{act\_c}(t)Mks(t) + \\
\frac{dMks(t)}{dt} &= -k2MRtg2_{act\_c}(t)Mks(t) + kn2MRtg2Mks_c(t) - kBM Bmh(t)Mks(t) + \\
\frac{dRtg2Mks_c(t)}{dt} &= k2MRtg2_{act\_c}(t)Mks(t) - kn2MRtg2Mks_c(t) \\
\frac{dBmh(t)}{dt} &= -kBM Bmh(t)Mks(t) + knBM BmhMks(t) \\
\frac{dBmhMks(t)}{dt} &= kBM Bmh(t)Mks(t) - knBM BmhMks(t) \\
\frac{dRtg13_{a\_c}(t)}{dt} &= -\left(k13I + \frac{k13IVBmhMks(t)}{k13ID + BmhMks(t)}\right)Rtg13_{a\_c}(t) + k13_cRtg1\_c(t)Rtg3_{a\_c}(t) \\
\frac{dRtg13_{i\_c}(t)}{dt} &= \left(k13I + \frac{k13IVBmhMks(t)}{k13ID + BmhMks(t)}\right)Rtg13_{a\_c}(t) + k13_cRtg1\_c(t)Rtg3_{i\_c}(t) - \\
\frac{dRtg3_{i\_c}(t)}{dt} &= -k3A_cRtg3_{i\_c}(t) + k3I_cRtg3_{a\_c}(t) - k13_cRtg1\_c(t)Rtg3_{i\_c}(t) + kn13_cRtg13_{a\_c}(t) \\
\frac{dRtg3_{a\_c}(t)}{dt} &= k3A_cRtg3_{i\_c}(t) - k3I_cRtg3_{a\_c}(t) - k13_cRtg1\_c(t)Rtg3_{a\_c}(t) + kn13_cRtg13_{a\_c}(t) \\
\frac{dRtg3_{a\_n}(t)}{dt} &= -k3I_nRtg3_{a\_n}(t) - k13_nRtg1\_n(t)Rtg3_{a\_n}(t) + kn13_nRtg13_{a\_n}(t) + k3inIRtg3_{a\_n}(t) \\
\frac{dRtg3_{i\_n}(t)}{dt} &= k3I_nRtg3_{a\_n}(t) - k13_nRtg1\_n(t)Rtg3_{i\_n}(t) + kn13_nRtg13_{i\_n}(t) + k3inIRtg3_{i\_n}(t) \\
\frac{dRtg1_c(t)}{dt} &= -k13_cRtg1\_c(t)Rtg3_{a\_c}(t) + kn13_cRtg13_{a\_c}(t) - k13_cRtg1\_c(t)Rtg3_{i\_c}(t) + k13_cRtg1\_c(t)Rtg3_{n\_c}(t) \\
\frac{dRtg1_n(t)}{dt} &= -k13_nRtg1\_n(t)Rtg3_{a\_n}(t) + kn13_nRtg13_{a\_n}(t) - k13_nRtg1\_n(t)Rtg3_{i\_n}(t) + k13_nRtg1\_n(t)Rtg3_{n\_n}(t) \\
\frac{dRtg13_{a\_n}(t)}{dt} &= k13_nRtg1\_n(t)Rtg3_{a\_n}(t) - kn13_nRtg13_{a\_n}(t) \\
\frac{dRtg13_{i\_n}(t)}{dt} &= k13_nRtg1\_n(t)Rtg3_{i\_n}(t) - kn13_nRtg13_{i\_n}(t)
\end{aligned}$$