

Protocol S2: Time-simulation model of the FA β -oxidation.

Kinetic model

Definitions of the various functions

CPT1[sf_, V_, Kms1_, Kms2_, Kmp1_, Kmp2_, Ki1_, Keq_, S1_,

$$S2_, P1_, P2_, I1_, n_] := \frac{sf * V * \left(\frac{S1 * S2}{Kms1 * Kms2} - \frac{P1 * P2}{Kms1 * Kms2 * Keq} \right)}{\left(1 + \frac{S1}{Kms1} + \frac{P1}{Kmp1} + \left(\frac{I1}{Ki1} \right)^n \right) * \left(1 + \frac{S2}{Kms2} + \frac{P2}{Kmp2} \right)}$$

CACT[Vf_, Vr_, Kms1_, Kms2_, Kmp1_,

Kmp2_, Kis1_, Kip2_, Keq_, S1_, S2_, P1_, P2_] :=

$$\frac{Vf * \left(S1 * S2 - \frac{P1 * P2}{Keq} \right)}{S1 * S2 + Kms2 * S1 + Kms1 * S2 * \left(1 + \frac{P2}{Kip2} \right) + \frac{Vf}{Vr * Keq} * \left(Kmp2 * P1 * \left(1 + \frac{S1}{Kis1} \right) + P2 * (Kmp1 + P1) \right)}$$

CPT2[sf_, V_, Kms1_, Kms2_, Kms3_, Kms4_, Kms5_, Kms6_, Kms7_, Kms8_,
Kmp1_, Kmp2_, Kmp3_, Kmp4_, Kmp5_, Kmp6_, Kmp7_, Kmp8_, Keq_, S1_, S2_,
S3_, S4_, S5_, S6_, S7_, S8_, P1_, P2_, P3_, P4_, P5_, P6_, P7_, P8_] :=

$$\left(sf * V * \left(\frac{S1 * S8}{Kms1 * Kms8} - \frac{P1 * P8}{Kms1 * Kms8 * Keq} \right) \right) / \left(\left(1 + \frac{S1}{Kms1} + \frac{P1}{Kmp1} + \frac{S2}{Kms2} + \frac{P2}{Kmp2} + \frac{S3}{Kms3} + \frac{P3}{Kmp3} + \frac{S4}{Kms4} + \frac{P4}{Kmp4} + \frac{S5}{Kms5} + \frac{P5}{Kmp5} + \frac{S6}{Kms6} + \frac{P6}{Kmp6} + \frac{S7}{Kms7} + \frac{P7}{Kmp7} \right) * \left(1 + \frac{S8}{Kms8} + \frac{P8}{Kmp8} \right) \right)$$

VLCAD[sf_, V_, Kms1_, Kms2_, Kms3_, Kms4_, Kmp1_, Kmp2_,

Kmp3_, Kmp4_, Keq_, S1_, S2_, S3_, S4_, P1_, P2_, P3_, P4_] :=

$$\frac{sf * V * \left(\frac{S1 * (S4 - P4)}{Kms1 * Kms4} - \frac{P1 * P4}{Kms1 * Kms4 * Keq} \right)}{\left(1 + \frac{S1}{Kms1} + \frac{P1}{Kmp1} + \frac{S2}{Kms2} + \frac{P2}{Kmp2} + \frac{S3}{Kms3} + \frac{P3}{Kmp3} \right) * \left(1 + \frac{(S4 - P4)}{Kms4} + \frac{P4}{Kmp4} \right)}$$

LCAD[sf_, V_, Kms1_, Kms2_, Kms3_, Kms4_, Kms5_, Kms6_, Kmp1_, Kmp2_, Kmp3_, Kmp4_,
Kmp5_, Kmp6_, Keq_, S1_, S2_, S3_, S4_, S5_, S6_, P1_, P2_, P3_, P4_, P5_, P6_] :=

$$\frac{sf * V * \left(\frac{S1 * (S6 - P6)}{Kms1 * Kms6} - \frac{P1 * P6}{Kms1 * Kms6 * Keq} \right)}{\left(1 + \frac{S1}{Kms1} + \frac{P1}{Kmp1} + \frac{S2}{Kms2} + \frac{P2}{Kmp2} + \frac{S3}{Kms3} + \frac{P3}{Kmp3} + \frac{S4}{Kms4} + \frac{P4}{Kmp4} + \frac{S5}{Kms5} + \frac{P5}{Kmp5} \right) * \left(1 + \frac{(S6 - P6)}{Kms6} + \frac{P6}{Kmp6} \right)}$$

MCAD[sf_, V_, Kms1_, Kms2_, Kms3_, Kms4_, Kms5_, Kms6_, Kmp1_, Kmp2_, Kmp3_, Kmp4_,
Kmp5_, Kmp6_, Keq_, S1_, S2_, S3_, S4_, S5_, S6_, P1_, P2_, P3_, P4_, P5_, P6_] :=

$$\frac{sf * V * \left(\frac{S1 * (S6 - P6)}{Kms1 * Kms6} - \frac{P1 * P6}{Kms1 * Kms6 * Keq} \right)}{\left(1 + \frac{S1}{Kms1} + \frac{P1}{Kmp1} + \frac{S2}{Kms2} + \frac{P2}{Kmp2} + \frac{S3}{Kms3} + \frac{P3}{Kmp3} + \frac{S4}{Kms4} + \frac{P4}{Kmp4} + \frac{S5}{Kms5} + \frac{P5}{Kmp5} \right) * \left(1 + \frac{(S6 - P6)}{Kms6} + \frac{P6}{Kmp6} \right)}$$

SCAD[sf_, V_, Kms1_, Kms2_, Kms3_, Kmp1_, Kmp2_, Kmp3_, Keq_, S1_, S2_,

$$S3_, P1_, P2_, P3_] := \frac{sf * V * \left(\frac{S1 * (S3 - P3)}{Kms1 * Kms3} - \frac{P1 * P3}{Kms1 * Kms3 * Keq} \right)}{\left(1 + \frac{S1}{Kms1} + \frac{P1}{Kmp1} + \frac{S2}{Kms2} + \frac{P2}{Kmp2} \right) * \left(1 + \frac{(S3 - P3)}{Kms3} + \frac{P3}{Kmp3} \right)}$$

CROT[sf_, V_, Kms1_, Kms2_, Kms3_, Kms4_, Kms5_, Kms6_, Kms7_,
Kmp1_, Kmp2_, Kmp3_, Kmp4_, Kmp5_, Kmp6_, Kmp7_, Ki1_, Keq_, S1_, S2_,
S3_, S4_, S5_, S6_, S7_, P1_, P2_, P3_, P4_, P5_, P6_, P7_, I1_] :=

$$\frac{sf * V * \left(\frac{S1}{Kms1} - \frac{P1}{Kms1 * Keq} \right)}{1 + \frac{S1}{Kms1} + \frac{P1}{Kmp1} + \frac{S2}{Kms2} + \frac{P2}{Kmp2} + \frac{S3}{Kms3} + \frac{P3}{Kmp3} + \frac{S4}{Kms4} + \frac{P4}{Kmp4} + \frac{S5}{Kms5} + \frac{P5}{Kmp5} + \frac{S6}{Kms6} + \frac{P6}{Kmp6} + \frac{S7}{Kms7} + \frac{P7}{Kmp7} + \frac{I1}{Ki1}}$$

MSCHAD[sf_, V_, Kms1_, Kms2_, Kms3_, Kms4_, Kms5_, Kms6_, Kms7_, Kms8_,
Kmp1_, Kmp2_, Kmp3_, Kmp4_, Kmp5_, Kmp6_, Kmp7_, Kmp8_, Keq_, S1_, S2_,
S3_, S4_, S5_, S6_, S7_, S8_, P1_, P2_, P3_, P4_, P5_, P6_, P7_, P8_] :=

$$\left(sf * V * \left(\frac{S1 * (S8 - P8)}{Kms1 * Kms8} - \frac{P1 * P8}{Kms1 * Kms8 * Keq} \right) \right) / \left(\left(1 + \frac{S1}{Kms1} + \frac{P1}{Kmp1} + \frac{S2}{Kms2} + \frac{P2}{Kmp2} + \frac{S3}{Kms3} + \frac{P3}{Kmp3} + \frac{S4}{Kms4} + \frac{P4}{Kmp4} + \frac{S5}{Kms5} + \frac{P5}{Kmp5} + \frac{S6}{Kms6} + \frac{P6}{Kmp6} + \frac{S7}{Kms7} + \frac{P7}{Kmp7} \right) * \left(1 + \frac{(S8 - P8)}{Kms8} + \frac{P8}{Kmp8} \right) \right)$$

MCKATA[sf_, V_, Kms1_, Kms2_, Kms3_, Kms4_, Kms5_, Kms6_, Kms7_, Kms8_,
Kmp1_, Kmp2_, Kmp3_, Kmp4_, Kmp5_, Kmp6_, Kmp7_, Kmp8_, Keq_, S1_, S2_,
S3_, S4_, S5_, S6_, S7_, S8_, P1_, P2_, P3_, P4_, P5_, P6_, P7_, P8_] :=

$$\left(sf * V * \left(\frac{S1 * S8}{Kms1 * Kms8} - \frac{P1 * P8}{Kms1 * Kms8 * Keq} \right) \right) / \left(\left(1 + \frac{S1}{Kms1} + \frac{P1}{Kmp1} + \frac{S2}{Kms2} + \frac{P2}{Kmp2} + \frac{S3}{Kms3} + \frac{P3}{Kmp3} + \frac{S4}{Kms4} + \frac{P4}{Kmp4} + \frac{S5}{Kms5} + \frac{P5}{Kmp5} + \frac{S6}{Kms6} + \frac{P6}{Kmp6} + \frac{S7}{Kms7} + \frac{P7}{Kmp7} + \frac{P8}{Kmp8} \right) * \left(1 + \frac{S8}{Kms8} + \frac{P8}{Kmp8} \right) \right)$$

MCKATB[sf_, V_, Kms1_, Kms2_, Kms3_, Kms4_, Kms5_, Kms6_, Kms7_, Kms8_,
Kmp1_, Kmp2_, Kmp3_, Kmp4_, Kmp5_, Kmp6_, Kmp7_, Kmp8_, Keq_, S1_, S2_,
S3_, S4_, S5_, S6_, S7_, S8_, P1_, P2_, P3_, P4_, P5_, P6_, P7_, P8_] :=

$$\left(sf * V * \left(\frac{S1 * S8}{Kms1 * Kms8} - \frac{P8 * P8}{Kms1 * Kms8 * Keq} \right) \right) / \left(\left(1 + \frac{S1}{Kms1} + \frac{P1}{Kmp1} + \frac{S2}{Kms2} + \frac{P2}{Kmp2} + \frac{S3}{Kms3} + \frac{P3}{Kmp3} + \frac{S4}{Kms4} + \frac{P4}{Kmp4} + \frac{S5}{Kms5} + \frac{P5}{Kmp5} + \frac{S6}{Kms6} + \frac{P6}{Kmp6} + \frac{S7}{Kms7} + \frac{P7}{Kmp7} + \frac{P8}{Kmp8} \right) * \left(1 + \frac{S8}{Kms8} + \frac{P8}{Kmp8} \right) \right)$$

```

MTP[sf_, V_, Kms1_, Kms2_, Kms3_, Kms4_, Kms5_, Kms7_, Kms8_, Kmp1_,
    Kmp2_, Kmp3_, Kmp4_, Kmp5_, Kmp6_, Kmp7_, Kmp8_, Ki1_, Keq_, S1_, S2_,
    S3_, S4_, S5_, S7_, S8_, P1_, P2_, P3_, P4_, P5_, P6_, P7_, P8_, I1_] :=
  (sf * V * (
    (S1 * (S7 - P7) * S8 / (Kms1 * Kms7 * Kms8) - P1 * P7 * P8 / (Kms1 * Kms7 * Kms8 * Keq))
  )) /
  (
    (
      (1 + S1/Kms1 + P1/Kmp1 + S2/Kms2 + P2/Kmp2 + S3/Kms3 + P3/Kmp3 + S4/Kms4 + P4/Kmp4 + S5/Kms5 +
        P5/Kmp5 + P6/Kmp6 + I1/Ki1) *
      (1 + (S7 - P7)/Kms7 + P7/Kmp7) *
      (1 + S8/Kms8 + P8/Kmp8)
    )
  )

RES[Ks_, S_, K1_] := Ks * (S - K1)

```

Define the differential equations

```

Odes = {
  C16AcylCarCYT'[t] == (vcpt1C16 - vcactC16) / VCYT,
  C16AcylCarMAT'[t] == (vcactC16 - vcpt2C16) / VMAT,
  C16AcylCoAMAT'[t] == (vcpt2C16 - vvlcadc16 - vlcadc16) / VMAT,
  C16EnoylCoAMAT'[t] == (vvlcadc16 + vlcadc16 - vcrotC16 - vmtpC16) / VMAT,
  C16HydroxyacylCoAMAT'[t] == (vcrotC16 - vmschadC16) / VMAT,
  C16KetoacylCoAMAT'[t] == (vmschadC16 - vmckatC16) / VMAT,
  C14AcylCarCYT'[t] == (-vcactC14) / VCYT,
  C14AcylCarMAT'[t] == (vcactC14 - vcpt2C14) / VMAT,
  C14AcylCoAMAT'[t] == (vcpt2C14 + vmtpC16 + vmckatC16 - vvlcadc14 - vlcadc14) / VMAT,
  C14EnoylCoAMAT'[t] == (vvlcadc14 + vlcadc14 - vcrotC14 - vmtpC14) / VMAT,
  C14HydroxyacylCoAMAT'[t] == (vcrotC14 - vmschadC14) / VMAT,
  C14KetoacylCoAMAT'[t] == (vmschadC14 - vmckatC14) / VMAT,
  C12AcylCarCYT'[t] == (-vcactC12) / VCYT,
  C12AcylCarMAT'[t] == (vcactC12 - vcpt2C12) / VMAT,
  C12AcylCoAMAT'[t] == 1 / VMAT,
  (vcpt2C12 + vmtpC14 + vmckatC14 - vvlcadc12 - vlcadc12 - vmcadC12),
  C12EnoylCoAMAT'[t] == (vvlcadc12 + vlcadc12 + vmcadC12 - vcrotC12 - vmtpC12) / VMAT,
}

```

$$\begin{aligned}
C12HydroxyacylCoAMAT'[t] &= \frac{vcrotC12 - vmschadC12}{VMAT}, \\
C12KetoacylCoAMAT'[t] &= \frac{vmschadC12 - vmckatC12}{VMAT}, \\
C10AcylCarCYT'[t] &= \frac{-vcactC10}{VCYT}, \\
C10AcylCarMAT'[t] &= \frac{vcactC10 - vcpt2C10}{VMAT}, \\
C10AcylCoAMAT'[t] &= \frac{vcpt2C10 + vmtpC12 + vmckatC12 - vlcadC10 - vmcadC10}{VMAT}, \\
C10EnoylCoAMAT'[t] &= \frac{vlcadC10 + vmcadC10 - vcrotC10 - vmtpC10}{VMAT}, \\
C10HydroxyacylCoAMAT'[t] &= \frac{vcrotC10 - vmschadC10}{VMAT}, \\
C10KetoacylCoAMAT'[t] &= \frac{vmschadC10 - vmckatC10}{VMAT}, \\
C8AcylCarCYT'[t] &= \frac{-vcactC8}{VCYT}, \\
C8AcylCarMAT'[t] &= \frac{vcactC8 - vcpt2C8}{VMAT}, \\
C8AcylCoAMAT'[t] &= \frac{vcpt2C8 + vmtpC10 + vmckatC10 - vlcadC8 - vmcadC8}{VMAT}, \\
C8EnoylCoAMAT'[t] &= \frac{vlcadC8 + vmcadC8 - vcrotC8 - vmtpC8}{VMAT}, \\
C8HydroxyacylCoAMAT'[t] &= \frac{vcrotC8 - vmschadC8}{VMAT}, \\
C8KetoacylCoAMAT'[t] &= \frac{vmschadC8 - vmckatC8}{VMAT}, \\
C6AcylCarCYT'[t] &= \frac{-vcactC6}{VCYT}, \\
C6AcylCarMAT'[t] &= \frac{vcactC6 - vcpt2C6}{VMAT}, \\
C6AcylCoAMAT'[t] &= \frac{vcpt2C6 + vmtpC8 + vmckatC8 - vmcadC6 - vscadC6}{VMAT}, \\
C6EnoylCoAMAT'[t] &= \frac{vmcadC6 + vscadC6 - vcrotC6}{VMAT}, \\
C6HydroxyacylCoAMAT'[t] &= \frac{vcrotC6 - vmschadC6}{VMAT}, \\
C6KetoacylCoAMAT'[t] &= \frac{vmschadC6 - vmckatC6}{VMAT}, \\
C4AcylCarCYT'[t] &= \frac{-vcactC4}{VCYT}, \\
C4AcylCarMAT'[t] &= \frac{vcactC4 - vcpt2C4}{VMAT}, \\
C4AcylCoAMAT'[t] &= \frac{vcpt2C4 + vmckatC6 - vmcadC4 - vscadC4}{VMAT}, \\
C4EnoylCoAMAT'[t] &= \frac{vmcadC4 + vscadC4 - vcrotC4}{VMAT},
\end{aligned}$$

$$\begin{aligned}
C4HydroxyacylCoAMAT'[t] &= \frac{vcrotC4 - vmschadC4}{VMAT}, \\
C4AcetoacylCoAMAT'[t] &= \frac{vmschadC4 - vmckatC4}{VMAT}, \\
AcetylCoAMAT'[t] &= \\
&\frac{1}{VMAT} (vmtpC16 + vmckatC16 + vmtpC14 + vmckatC14 + vmtpC12 + vmckatC12 + vmtpC10 + \\
&\quad vmckatC10 + vmtpC8 + vmckatC8 + vmckatC6 + 2 * vmckatC4 - vacesink), \\
FADHMAT'[t] &= \frac{1}{VMAT} (vvlcadC16 + vvlcadC14 + vvlcadC12 + vlcadC16 + \\
&\quad vlcadC14 + vlcadC12 + vlcadC10 + vlcadC8 + vmcadC12 + vmcadC10 + \\
&\quad vmcadC8 + vmcadC6 + vmcadC4 + vscadC6 + vscadC4 - vfadhsink), \\
NADHMAT'[t] &= \frac{1}{VMAT} (vmtpC16 + vmtpC14 + vmtpC12 + vmtpC10 + vmtpC8 + \\
&\quad vmschadC16 + vmschadC14 + vmschadC12 + vmschadC10 + \\
&\quad vmschadC8 + vmschadC6 + vmschadC4 - vnadhsink) \};
\end{aligned}$$

```

RateEqs = {vcpt1C16 → CPT1[sfcpt1C16, Vcpt1, Kmcpt1C16AcylCoACYT, Kmcpt1CarCYT,
  Kmcpt1C16AcylCarCYT, Kmcpt1CoACYT, Kicpt1MalCoACYT, Keqcpt1,
  C16AcylCoACYT, CarCYT, C16AcylCarCYT[t], CoACYT, MalCoACYT, ncpt1],
vcactC16 → CACT[Vfcact, Vrcact, KmcactC16AcylCarCYT, KmcactCarMAT,
  KmcactC16AcylCarMAT, KmcactCarCYT, KicactC16AcylCarCYT, KicactCarCYT,
  Keqcact, C16AcylCarCYT[t], CarMAT, C16AcylCarMAT[t], CarCYT],
vcactC14 → CACT[Vfcact, Vrcact, KmcactC14AcylCarCYT, KmcactCarMAT,
  KmcactC14AcylCarMAT, KmcactCarCYT, KicactC14AcylCarCYT, KicactCarCYT,
  Keqcact, C14AcylCarCYT[t], CarMAT, C14AcylCarMAT[t], CarCYT],
vcactC12 → CACT[Vfcact, Vrcact, KmcactC12AcylCarCYT, KmcactCarMAT,
  KmcactC12AcylCarMAT, KmcactCarCYT, KicactC12AcylCarCYT, KicactCarCYT,
  Keqcact, C12AcylCarCYT[t], CarMAT, C12AcylCarMAT[t], CarCYT],
vcactC10 → CACT[Vfcact, Vrcact, KmcactC10AcylCarCYT, KmcactCarMAT,
  KmcactC10AcylCarMAT, KmcactCarCYT, KicactC10AcylCarCYT, KicactCarCYT,
  Keqcact, C10AcylCarCYT[t], CarMAT, C10AcylCarMAT[t], CarCYT],
vcactC8 → CACT[Vfcact, Vrcact, KmcactC8AcylCarCYT, KmcactCarMAT,
  KmcactC8AcylCarMAT, KmcactCarCYT, KicactC8AcylCarCYT, KicactCarCYT,
  Keqcact, C8AcylCarCYT[t], CarMAT, C8AcylCarMAT[t], CarCYT],
vcactC6 → CACT[Vfcact, Vrcact, KmcactC6AcylCarCYT, KmcactCarMAT,
  KmcactC6AcylCarMAT, KmcactCarCYT, KicactC6AcylCarCYT, KicactCarCYT,
  Keqcact, C6AcylCarCYT[t], CarMAT, C6AcylCarMAT[t], CarCYT],
vcactC4 → CACT[Vfcact, Vrcact, KmcactC4AcylCarCYT, KmcactCarMAT,
  KmcactC4AcylCarMAT, KmcactCarCYT, KicactC4AcylCarCYT, KicactCarCYT,
  Keqcact, C4AcylCarCYT[t], CarMAT, C4AcylCarMAT[t], CarCYT],
vcpt2C16 → CPT2[sfcpt2C16, Vcpt2, Kmcpt2C16AcylCarMAT, Kmcpt2C14AcylCarMAT,
  Kmcpt2C12AcylCarMAT, Kmcpt2C10AcylCarMAT, Kmcpt2C8AcylCarMAT,
  Kmcpt2C6AcylCarMAT, Kmcpt2C4AcylCarMAT, Kmcpt2CoAMAT,
  Kmcpt2C16AcylCoAMAT, Kmcpt2C14AcylCoAMAT, Kmcpt2C12AcylCoAMAT,
  Kmcpt2C10AcylCoAMAT, Kmcpt2C8AcylCoAMAT, Kmcpt2C6AcylCoAMAT,
  Kmcpt2C4AcylCoAMAT, Kmcpt2CarMAT, Keqcpt2, C16AcylCarMAT[t],
  C14AcylCarMAT[t], C12AcylCarMAT[t], C10AcylCarMAT[t], C8AcylCarMAT[t],
  C6AcylCarMAT[t], C4AcylCarMAT[t], CoAMAT, C16AcylCoAMAT[t],
  C14AcylCoAMAT[t], C12AcylCoAMAT[t], C10AcylCoAMAT[t],
  C8AcylCoAMAT[t], C6AcylCoAMAT[t], C4AcylCoAMAT[t], CarMAT],
vcpt2C14 → CPT2[sfcpt2C14, Vcpt2, Kmcpt2C14AcylCarMAT, Kmcpt2C16AcylCarMAT,

```

Kmcpt2C12AcylCarMAT, Kmcpt2C10AcylCarMAT, Kmcpt2C8AcylCarMAT,
 Kmcpt2C6AcylCarMAT, Kmcpt2C4AcylCoAMAT, Kmcpt2CoAMAT,
 Kmcpt2C14AcylCoAMAT, Kmcpt2C16AcylCoAMAT, Kmcpt2C12AcylCoAMAT,
 Kmcpt2C10AcylCoAMAT, Kmcpt2C8AcylCoAMAT, Kmcpt2C6AcylCoAMAT,
 Kmcpt2C4AcylCoAMAT, Kmcpt2CarMAT, Keqcpt2, C14AcylCarMAT[t],
 C16AcylCarMAT[t], C12AcylCarMAT[t], C10AcylCarMAT[t], C8AcylCarMAT[t],
 C6AcylCarMAT[t], C4AcylCarMAT[t], CoAMAT, C14AcylCoAMAT[t],
 C16AcylCoAMAT[t], C12AcylCoAMAT[t], C10AcylCoAMAT[t],
 C8AcylCoAMAT[t], C6AcylCoAMAT[t], C4AcylCoAMAT[t], CarMAT],
 vcpt2C12 → CPT2[sfcpt2C12, Vcpt2, Kmcpt2C12AcylCarMAT, Kmcpt2C16AcylCarMAT,
 Kmcpt2C14AcylCarMAT, Kmcpt2C10AcylCarMAT, Kmcpt2C8AcylCarMAT,
 Kmcpt2C6AcylCarMAT, Kmcpt2C4AcylCarMAT, Kmcpt2CoAMAT,
 Kmcpt2C12AcylCoAMAT, Kmcpt2C16AcylCoAMAT, Kmcpt2C14AcylCoAMAT,
 Kmcpt2C10AcylCoAMAT, Kmcpt2C8AcylCoAMAT, Kmcpt2C6AcylCoAMAT,
 Kmcpt2C4AcylCoAMAT, Kmcpt2CarMAT, Keqcpt2, C12AcylCarMAT[t],
 C16AcylCarMAT[t], C14AcylCarMAT[t], C10AcylCarMAT[t], C8AcylCarMAT[t],
 C6AcylCarMAT[t], C4AcylCarMAT[t], CoAMAT, C12AcylCoAMAT[t],
 C16AcylCoAMAT[t], C14AcylCoAMAT[t], C10AcylCoAMAT[t],
 C8AcylCoAMAT[t], C6AcylCoAMAT[t], C4AcylCoAMAT[t], CarMAT],
 vcpt2C10 → CPT2[sfcpt2C10, Vcpt2, Kmcpt2C10AcylCarMAT, Kmcpt2C16AcylCarMAT,
 Kmcpt2C14AcylCarMAT, Kmcpt2C12AcylCarMAT, Kmcpt2C8AcylCarMAT,
 Kmcpt2C6AcylCarMAT, Kmcpt2C4AcylCarMAT, Kmcpt2CoAMAT,
 Kmcpt2C10AcylCoAMAT, Kmcpt2C16AcylCoAMAT, Kmcpt2C14AcylCoAMAT,
 Kmcpt2C12AcylCoAMAT, Kmcpt2C8AcylCoAMAT, Kmcpt2C6AcylCoAMAT,
 Kmcpt2C4AcylCoAMAT, Kmcpt2CarMAT, Keqcpt2, C10AcylCarMAT[t],
 C16AcylCarMAT[t], C14AcylCarMAT[t], C12AcylCarMAT[t], C8AcylCarMAT[t],
 C6AcylCarMAT[t], C4AcylCarMAT[t], CoAMAT, C10AcylCoAMAT[t],
 C16AcylCoAMAT[t], C14AcylCoAMAT[t], C12AcylCoAMAT[t],
 C8AcylCoAMAT[t], C6AcylCoAMAT[t], C4AcylCoAMAT[t], CarMAT],
 vcpt2C8 → CPT2[sfcpt2C8, Vcpt2, Kmcpt2C8AcylCarMAT, Kmcpt2C16AcylCarMAT,
 Kmcpt2C14AcylCarMAT, Kmcpt2C12AcylCarMAT, Kmcpt2C10AcylCarMAT,
 Kmcpt2C6AcylCarMAT, Kmcpt2C4AcylCarMAT, Kmcpt2CoAMAT,
 Kmcpt2C8AcylCoAMAT, Kmcpt2C16AcylCoAMAT, Kmcpt2C14AcylCoAMAT,
 Kmcpt2C12AcylCoAMAT, Kmcpt2C10AcylCoAMAT, Kmcpt2C6AcylCoAMAT,
 Kmcpt2C4AcylCoAMAT, Kmcpt2CarMAT, Keqcpt2, C8AcylCarMAT[t],
 C16AcylCarMAT[t], C14AcylCarMAT[t], C12AcylCarMAT[t],
 C10AcylCarMAT[t], C6AcylCarMAT[t], C4AcylCarMAT[t], CoAMAT,
 C8AcylCoAMAT[t], C16AcylCoAMAT[t], C14AcylCoAMAT[t], C12AcylCoAMAT[t],
 C10AcylCoAMAT[t], C6AcylCoAMAT[t], C4AcylCoAMAT[t], CarMAT],
 vcpt2C6 → CPT2[sfcpt2C6, Vcpt2, Kmcpt2C6AcylCarMAT, Kmcpt2C16AcylCarMAT,
 Kmcpt2C14AcylCarMAT, Kmcpt2C12AcylCarMAT, Kmcpt2C10AcylCarMAT,
 Kmcpt2C8AcylCarMAT, Kmcpt2C4AcylCarMAT, Kmcpt2CoAMAT,
 Kmcpt2C6AcylCoAMAT, Kmcpt2C16AcylCoAMAT, Kmcpt2C14AcylCoAMAT,
 Kmcpt2C12AcylCoAMAT, Kmcpt2C10AcylCoAMAT, Kmcpt2C8AcylCoAMAT,
 Kmcpt2C4AcylCoAMAT, Kmcpt2CarMAT, Keqcpt2, C6AcylCarMAT[t],
 C16AcylCarMAT[t], C14AcylCarMAT[t], C12AcylCarMAT[t],
 C10AcylCarMAT[t], C8AcylCarMAT[t], C4AcylCarMAT[t], CoAMAT,
 C6AcylCoAMAT[t], C16AcylCoAMAT[t], C14AcylCoAMAT[t], C12AcylCoAMAT[t],
 C10AcylCoAMAT[t], C8AcylCoAMAT[t], C4AcylCoAMAT[t], CarMAT],
 vcpt2C4 → CPT2[sfcpt2C4, Vcpt2, Kmcpt2C4AcylCarMAT, Kmcpt2C16AcylCarMAT,
 Kmcpt2C14AcylCarMAT, Kmcpt2C12AcylCarMAT, Kmcpt2C10AcylCarMAT,
 Kmcpt2C8AcylCarMAT, Kmcpt2C6AcylCarMAT, Kmcpt2CoAMAT,
 Kmcpt2C4AcylCoAMAT, Kmcpt2C16AcylCoAMAT, Kmcpt2C14AcylCoAMAT,

Kmcpt2C12AcylCoAMAT, Kmcpt2C10AcylCoAMAT, Kmcpt2C8AcylCoAMAT,
 Kmcpt2C6AcylCoAMAT, Kmcpt2CarMAT, Keqcpt2, C4AcylCarMAT[t],
 C16AcylCarMAT[t], C14AcylCarMAT[t], C12AcylCarMAT[t],
 C10AcylCarMAT[t], C8AcylCarMAT[t], C6AcylCarMAT[t], CoAMAT,
 C4AcylCoAMAT[t], C16AcylCoAMAT[t], C14AcylCoAMAT[t], C12AcylCoAMAT[t],
 C10AcylCoAMAT[t], C8AcylCoAMAT[t], C6AcylCoAMAT[t], CarMAT],
 vvlcadC16 → VLCAD[sfvlcadC16, Vvlcad, KmvlcadC16AcylCoAMAT,
 KmvlcadC14AcylCoAMAT, KmvlcadC12AcylCoAMAT, KmvlcadFAD,
 KmvlcadC16EnoylCoAMAT, KmvlcadC14EnoylCoAMAT,
 KmvlcadC12EnoylCoAMAT, KmvlcadFADH, Keqvlcad, C16AcylCoAMAT[t],
 C14AcylCoAMAT[t], C12AcylCoAMAT[t], FADtMAT, C16EnoylCoAMAT[t],
 C14EnoylCoAMAT[t], C12EnoylCoAMAT[t], FADHMAT[t]],
 vvlcadC14 → VLCAD[sfvlcadC14, Vvlcad, KmvlcadC14AcylCoAMAT,
 KmvlcadC16AcylCoAMAT, KmvlcadC12AcylCoAMAT, KmvlcadFAD,
 KmvlcadC14EnoylCoAMAT, KmvlcadC16EnoylCoAMAT,
 KmvlcadC12EnoylCoAMAT, KmvlcadFADH, Keqvlcad, C14AcylCoAMAT[t],
 C16AcylCoAMAT[t], C12AcylCoAMAT[t], FADtMAT, C14EnoylCoAMAT[t],
 C16EnoylCoAMAT[t], C12EnoylCoAMAT[t], FADHMAT[t]],
 vvlcadC12 → VLCAD[sfvlcadC12, Vvlcad, KmvlcadC12AcylCoAMAT,
 KmvlcadC16AcylCoAMAT, KmvlcadC14AcylCoAMAT, KmvlcadFAD,
 KmvlcadC12EnoylCoAMAT, KmvlcadC16EnoylCoAMAT,
 KmvlcadC14EnoylCoAMAT, KmvlcadFADH, Keqvlcad, C12AcylCoAMAT[t],
 C16AcylCoAMAT[t], C14AcylCoAMAT[t], FADtMAT, C12EnoylCoAMAT[t],
 C16EnoylCoAMAT[t], C14EnoylCoAMAT[t], FADHMAT[t]],
 vlcadC16 → LCAD[sfvcadC16, Vlcad, KmlcadC16AcylCoAMAT, KmlcadC14AcylCoAMAT,
 KmlcadC12AcylCoAMAT, KmlcadC10AcylCoAMAT, KmlcadC8AcylCoAMAT, KmlcadFAD,
 KmlcadC16EnoylCoAMAT, KmlcadC14EnoylCoAMAT, KmlcadC12EnoylCoAMAT,
 KmlcadC10EnoylCoAMAT, KmlcadC8EnoylCoAMAT, KmlcadFADH, Keqlcad,
 C16AcylCoAMAT[t], C14AcylCoAMAT[t], C12AcylCoAMAT[t], C10AcylCoAMAT[t],
 C8AcylCoAMAT[t], FADtMAT, C16EnoylCoAMAT[t], C14EnoylCoAMAT[t],
 C12EnoylCoAMAT[t], C10EnoylCoAMAT[t], C8EnoylCoAMAT[t], FADHMAT[t]],
 vlcadC14 → LCAD[sfvcadC14, Vlcad, KmlcadC14AcylCoAMAT, KmlcadC16AcylCoAMAT,
 KmlcadC12AcylCoAMAT, KmlcadC10AcylCoAMAT, KmlcadC8AcylCoAMAT, KmlcadFAD,
 KmlcadC14EnoylCoAMAT, KmlcadC16EnoylCoAMAT, KmlcadC12EnoylCoAMAT,
 KmlcadC10EnoylCoAMAT, KmlcadC8EnoylCoAMAT, KmlcadFADH, Keqlcad,
 C14AcylCoAMAT[t], C16AcylCoAMAT[t], C12AcylCoAMAT[t], C10AcylCoAMAT[t],
 C8AcylCoAMAT[t], FADtMAT, C14EnoylCoAMAT[t], C16EnoylCoAMAT[t],
 C12EnoylCoAMAT[t], C10EnoylCoAMAT[t], C8EnoylCoAMAT[t], FADHMAT[t]],
 vlcadC12 → LCAD[sfvcadC12, Vlcad, KmlcadC12AcylCoAMAT, KmlcadC16AcylCoAMAT,
 KmlcadC14AcylCoAMAT, KmlcadC10AcylCoAMAT, KmlcadC8AcylCoAMAT, KmlcadFAD,
 KmlcadC12EnoylCoAMAT, KmlcadC16EnoylCoAMAT, KmlcadC14EnoylCoAMAT,
 KmlcadC10EnoylCoAMAT, KmlcadC8EnoylCoAMAT, KmlcadFADH, Keqlcad,
 C12AcylCoAMAT[t], C16AcylCoAMAT[t], C14AcylCoAMAT[t], C10AcylCoAMAT[t],
 C8AcylCoAMAT[t], FADtMAT, C14EnoylCoAMAT[t], C16EnoylCoAMAT[t],
 C14EnoylCoAMAT[t], C10EnoylCoAMAT[t], C8EnoylCoAMAT[t], FADHMAT[t]],
 vlcadC10 → LCAD[sfvcadC10, Vlcad, KmlcadC10AcylCoAMAT, KmlcadC16AcylCoAMAT,
 KmlcadC14AcylCoAMAT, KmlcadC12AcylCoAMAT, KmlcadC8AcylCoAMAT, KmlcadFAD,
 KmlcadC10EnoylCoAMAT, KmlcadC16EnoylCoAMAT, KmlcadC14EnoylCoAMAT,
 KmlcadC12EnoylCoAMAT, KmlcadC8EnoylCoAMAT, KmlcadFADH, Keqlcad,
 C10AcylCoAMAT[t], C16AcylCoAMAT[t], C14AcylCoAMAT[t], C12AcylCoAMAT[t],
 C8AcylCoAMAT[t], FADtMAT, C10EnoylCoAMAT[t], C16EnoylCoAMAT[t],
 C14EnoylCoAMAT[t], C12EnoylCoAMAT[t], C8EnoylCoAMAT[t], FADHMAT[t]],
 vlcadC8 → LCAD[sfvcadC8, Vlcad, KmlcadC8AcylCoAMAT, KmlcadC16AcylCoAMAT,

KmlcadC14AcylCoAMAT, KmlcadC12AcylCoAMAT, KmlcadC10AcylCoAMAT, KmlcadFAD,
 KmlcadC8EnoylCoAMAT, KmlcadC16EnoylCoAMAT, KmlcadC14EnoylCoAMAT,
 KmlcadC12EnoylCoAMAT, KmlcadC10EnoylCoAMAT, KmlcadFADH, Keqlcad,
 C8AcylCoAMAT[t], C16AcylCoAMAT[t], C14AcylCoAMAT[t], C12AcylCoAMAT[t],
 C10AcylCoAMAT[t], FADtMAT, C8EnoylCoAMAT[t], C16EnoylCoAMAT[t],
 C14EnoylCoAMAT[t], C12EnoylCoAMAT[t], C10EnoylCoAMAT[t], FADHMAT[t]],
 vmcadC12 → MCAD[sfmcadC12, Vmcad, KmmcadC12AcylCoAMAT, KmmcadC10AcylCoAMAT,
 KmmcadC8AcylCoAMAT, KmmcadC6AcylCoAMAT, KmmcadC4AcylCoAMAT, KmmcadFAD,
 KmmcadC12EnoylCoAMAT, KmmcadC10EnoylCoAMAT, KmmcadC8EnoylCoAMAT,
 KmmcadC6EnoylCoAMAT, KmmcadC4EnoylCoAMAT, KmmcadFADH, Keqmcad,
 C12AcylCoAMAT[t], C10AcylCoAMAT[t], C8AcylCoAMAT[t], C6AcylCoAMAT[t],
 C4AcylCoAMAT[t], FADtMAT, C12EnoylCoAMAT[t], C10EnoylCoAMAT[t],
 C8EnoylCoAMAT[t], C6EnoylCoAMAT[t], C4EnoylCoAMAT[t], FADHMAT[t]],
 vmcadC10 → MCAD[sfmcadC10, Vmcad, KmmcadC10AcylCoAMAT, KmmcadC12AcylCoAMAT,
 KmmcadC8AcylCoAMAT, KmmcadC6AcylCoAMAT, KmmcadC4AcylCoAMAT, KmmcadFAD,
 KmmcadC10EnoylCoAMAT, KmmcadC12EnoylCoAMAT, KmmcadC8EnoylCoAMAT,
 KmmcadC6EnoylCoAMAT, KmmcadC4EnoylCoAMAT, KmmcadFADH, Keqmcad,
 C10AcylCoAMAT[t], C12AcylCoAMAT[t], C8AcylCoAMAT[t], C6AcylCoAMAT[t],
 C4AcylCoAMAT[t], FADtMAT, C10EnoylCoAMAT[t], C12EnoylCoAMAT[t],
 C8EnoylCoAMAT[t], C6EnoylCoAMAT[t], C4EnoylCoAMAT[t], FADHMAT[t]],
 vmcadC8 → MCAD[sfmcadC8, Vmcad, KmmcadC8AcylCoAMAT, KmmcadC12AcylCoAMAT,
 KmmcadC10AcylCoAMAT, KmmcadC6AcylCoAMAT, KmmcadC4AcylCoAMAT, KmmcadFAD,
 KmmcadC8EnoylCoAMAT, KmmcadC12EnoylCoAMAT, KmmcadC10EnoylCoAMAT,
 KmmcadC6EnoylCoAMAT, KmmcadC4EnoylCoAMAT, KmmcadFADH, Keqmcad,
 C8AcylCoAMAT[t], C12AcylCoAMAT[t], C10AcylCoAMAT[t], C6AcylCoAMAT[t],
 C4AcylCoAMAT[t], FADtMAT, C8EnoylCoAMAT[t], C12EnoylCoAMAT[t],
 C10EnoylCoAMAT[t], C6EnoylCoAMAT[t], C4EnoylCoAMAT[t], FADHMAT[t]],
 vmcadC6 → MCAD[sfmcadC6, Vmcad, KmmcadC6AcylCoAMAT, KmmcadC12AcylCoAMAT,
 KmmcadC10AcylCoAMAT, KmmcadC8AcylCoAMAT, KmmcadC4AcylCoAMAT, KmmcadFAD,
 KmmcadC6EnoylCoAMAT, KmmcadC12EnoylCoAMAT, KmmcadC10EnoylCoAMAT,
 KmmcadC8EnoylCoAMAT, KmmcadC4EnoylCoAMAT, KmmcadFADH, Keqmcad,
 C6AcylCoAMAT[t], C12AcylCoAMAT[t], C10AcylCoAMAT[t], C8AcylCoAMAT[t],
 C4AcylCoAMAT[t], FADtMAT, C6EnoylCoAMAT[t], C12EnoylCoAMAT[t],
 C10EnoylCoAMAT[t], C8EnoylCoAMAT[t], C4EnoylCoAMAT[t], FADHMAT[t]],
 vmcadC4 → MCAD[sfmcadC4, Vmcad, KmmcadC4AcylCoAMAT, KmmcadC12AcylCoAMAT,
 KmmcadC10AcylCoAMAT, KmmcadC8AcylCoAMAT, KmmcadC6AcylCoAMAT, KmmcadFAD,
 KmmcadC4EnoylCoAMAT, KmmcadC12EnoylCoAMAT, KmmcadC10EnoylCoAMAT,
 KmmcadC8EnoylCoAMAT, KmmcadC6EnoylCoAMAT, KmmcadFADH, Keqmcad,
 C4AcylCoAMAT[t], C12AcylCoAMAT[t], C10AcylCoAMAT[t], C8AcylCoAMAT[t],
 C6AcylCoAMAT[t], FADtMAT, C4EnoylCoAMAT[t], C12EnoylCoAMAT[t],
 C10EnoylCoAMAT[t], C8EnoylCoAMAT[t], C6EnoylCoAMAT[t], FADHMAT[t]],
 vscadC6 → SCAD[sfscadC6, Vscad, KmscadC6AcylCoAMAT, KmscadC4AcylCoAMAT,
 KmscadFAD, KmscadC6EnoylCoAMAT, KmscadC4EnoylCoAMAT,
 KmscadFADH, Keqscad, C6AcylCoAMAT[t], C4AcylCoAMAT[t],
 FADtMAT, C6EnoylCoAMAT[t], C4EnoylCoAMAT[t], FADHMAT[t]],
 vscadC4 → SCAD[sfscadC4, Vscad, KmscadC4AcylCoAMAT, KmscadC6AcylCoAMAT,
 KmscadFAD, KmscadC4EnoylCoAMAT, KmscadC6EnoylCoAMAT,
 KmscadFADH, Keqscad, C4AcylCoAMAT[t], C6AcylCoAMAT[t],
 FADtMAT, C4EnoylCoAMAT[t], C6EnoylCoAMAT[t], FADHMAT[t]],
 vcrotC16 → CROT[sfcrotC16, Vcrot, KmcrotC16EnoylCoAMAT, KmcrotC14EnoylCoAMAT,
 KmcrotC12EnoylCoAMAT, KmcrotC10EnoylCoAMAT, KmcrotC8EnoylCoAMAT,
 KmcrotC6EnoylCoAMAT, KmcrotC4EnoylCoAMAT, KmcrotC16HydroxyacylCoAMAT,
 KmcrotC14HydroxyacylCoAMAT, KmcrotC12HydroxyacylCoAMAT,

[illegible]

KmcrotC8EnoylCoAMAT, KmcrotC4EnoylCoAMAT, KmcrotC6HydroxyacylCoAMAT,
 KmcrotC16HydroxyacylCoAMAT, KmcrotC14HydroxyacylCoAMAT,
 KmcrotC12HydroxyacylCoAMAT, KmcrotC10HydroxyacylCoAMAT,
 KmcrotC8HydroxyacylCoAMAT, KmcrotC4HydroxyacylCoAMAT,
 KicrotC4AcetoacylCoA, Keqcrot, C6EnoylCoAMAT[t], C16EnoylCoAMAT[t],
 C14EnoylCoAMAT[t], C12EnoylCoAMAT[t], C10EnoylCoAMAT[t], C8EnoylCoAMAT[t],
 C4EnoylCoAMAT[t], C6HydroxyacylCoAMAT[t], C16HydroxyacylCoAMAT[t],
 C14HydroxyacylCoAMAT[t], C12HydroxyacylCoAMAT[t], C10HydroxyacylCoAMAT[t],
 C8HydroxyacylCoAMAT[t], C4HydroxyacylCoAMAT[t], C4AcetoacylCoAMAT[t]],
 vcrotC4 → CROT[sfcrotC4, Vcrot, KmcrotC4EnoylCoAMAT, KmcrotC16EnoylCoAMAT,
 KmcrotC14EnoylCoAMAT, KmcrotC12EnoylCoAMAT, KmcrotC10EnoylCoAMAT,
 KmcrotC8EnoylCoAMAT, KmcrotC6EnoylCoAMAT, KmcrotC4HydroxyacylCoAMAT,
 KmcrotC16HydroxyacylCoAMAT, KmcrotC14HydroxyacylCoAMAT,
 KmcrotC12HydroxyacylCoAMAT, KmcrotC10HydroxyacylCoAMAT,
 KmcrotC8HydroxyacylCoAMAT, KmcrotC6HydroxyacylCoAMAT,
 KicrotC4AcetoacylCoA, Keqcrot, C4EnoylCoAMAT[t], C16EnoylCoAMAT[t],
 C14EnoylCoAMAT[t], C12EnoylCoAMAT[t], C10EnoylCoAMAT[t], C8EnoylCoAMAT[t],
 C6EnoylCoAMAT[t], C4HydroxyacylCoAMAT[t], C16HydroxyacylCoAMAT[t],
 C14HydroxyacylCoAMAT[t], C12HydroxyacylCoAMAT[t], C10HydroxyacylCoAMAT[t],
 C8HydroxyacylCoAMAT[t], C6HydroxyacylCoAMAT[t], C4AcetoacylCoAMAT[t]],
 vmschadC16 → MSCHAD[sfmschadC16, Vmschad, KmmschadC16HydroxyacylCoAMAT,
 KmmschadC14HydroxyacylCoAMAT, KmmschadC12HydroxyacylCoAMAT,
 KmmschadC10HydroxyacylCoAMAT, KmmschadC8HydroxyacylCoAMAT,
 KmmschadC6HydroxyacylCoAMAT, KmmschadC4HydroxyacylCoAMAT,
 KmmschadNADMAT, KmmschadC16KetoacylCoAMAT, KmmschadC14KetoacylCoAMAT,
 KmmschadC12KetoacylCoAMAT, KmmschadC10KetoacylCoAMAT,
 KmmschadC8KetoacylCoAMAT, KmmschadC6KetoacylCoAMAT,
 KmmschadC4AcetoacylCoAMAT, KmmschadNADHMAT, Keqmschad,
 C16HydroxyacylCoAMAT[t], C14HydroxyacylCoAMAT[t],
 C12HydroxyacylCoAMAT[t], C10HydroxyacylCoAMAT[t],
 C8HydroxyacylCoAMAT[t], C6HydroxyacylCoAMAT[t], C4HydroxyacylCoAMAT[t],
 NADtMAT, C16KetoacylCoAMAT[t], C14KetoacylCoAMAT[t],
 C12KetoacylCoAMAT[t], C10KetoacylCoAMAT[t], C8KetoacylCoAMAT[t],
 C6KetoacylCoAMAT[t], C4AcetoacylCoAMAT[t], NADHMAT[t]],
 vmschadC14 → MSCHAD[sfmschadC14, Vmschad, KmmschadC14HydroxyacylCoAMAT,
 KmmschadC16HydroxyacylCoAMAT, KmmschadC12HydroxyacylCoAMAT,
 KmmschadC10HydroxyacylCoAMAT, KmmschadC8HydroxyacylCoAMAT,
 KmmschadC6HydroxyacylCoAMAT, KmmschadC4HydroxyacylCoAMAT,
 KmmschadNADMAT, KmmschadC14KetoacylCoAMAT, KmmschadC16KetoacylCoAMAT,
 KmmschadC12KetoacylCoAMAT, KmmschadC10KetoacylCoAMAT,
 KmmschadC8KetoacylCoAMAT, KmmschadC6KetoacylCoAMAT,
 KmmschadC4AcetoacylCoAMAT, KmmschadNADHMAT, Keqmschad,
 C14HydroxyacylCoAMAT[t], C16HydroxyacylCoAMAT[t],
 C12HydroxyacylCoAMAT[t], C10HydroxyacylCoAMAT[t],
 C8HydroxyacylCoAMAT[t], C6HydroxyacylCoAMAT[t], C4HydroxyacylCoAMAT[t],
 NADtMAT, C14KetoacylCoAMAT[t], C16KetoacylCoAMAT[t],
 C12KetoacylCoAMAT[t], C10KetoacylCoAMAT[t], C8KetoacylCoAMAT[t],
 C6KetoacylCoAMAT[t], C4AcetoacylCoAMAT[t], NADHMAT[t]],
 vmschadC12 → MSCHAD[sfmschadC12, Vmschad, KmmschadC12HydroxyacylCoAMAT,
 KmmschadC16HydroxyacylCoAMAT, KmmschadC14HydroxyacylCoAMAT,
 KmmschadC10HydroxyacylCoAMAT, KmmschadC8HydroxyacylCoAMAT,
 KmmschadC6HydroxyacylCoAMAT, KmmschadC4HydroxyacylCoAMAT,
 KmmschadNADMAT, KmmschadC12KetoacylCoAMAT, KmmschadC16KetoacylCoAMAT,

KmmschadC14KetoacylCoAMAT, KmmschadC10KetoacylCoAMAT,
 KmmschadC8KetoacylCoAMAT, KmmschadC6KetoacylCoAMAT,
 KmmschadC4AcetoacylCoAMAT, KmmschadNADHMAT, Keqmschad,
 C12HydroxyacylCoAMAT[t], C16HydroxyacylCoAMAT[t],
 C14HydroxyacylCoAMAT[t], C10HydroxyacylCoAMAT[t],
 C8HydroxyacylCoAMAT[t], C6HydroxyacylCoAMAT[t], C4HydroxyacylCoAMAT[t],
 NADtMAT, C12KetoacylCoAMAT[t], C16KetoacylCoAMAT[t],
 C14KetoacylCoAMAT[t], C10KetoacylCoAMAT[t], C8KetoacylCoAMAT[t],
 C6KetoacylCoAMAT[t], C4AcetoacylCoAMAT[t], NADHMAT[t]],
 vmschadC10 → MSCHAD[sfmschadC10, Vmschad, KmmschadC10HydroxyacylCoAMAT,
 KmmschadC16HydroxyacylCoAMAT, KmmschadC14HydroxyacylCoAMAT,
 KmmschadC12HydroxyacylCoAMAT, KmmschadC8HydroxyacylCoAMAT,
 KmmschadC6HydroxyacylCoAMAT, KmmschadC4HydroxyacylCoAMAT,
 KmmschadNADMAT, KmmschadC10KetoacylCoAMAT, KmmschadC16KetoacylCoAMAT,
 KmmschadC14KetoacylCoAMAT, KmmschadC12KetoacylCoAMAT,
 KmmschadC8KetoacylCoAMAT, KmmschadC6KetoacylCoAMAT,
 KmmschadC4AcetoacylCoAMAT, KmmschadNADHMAT, Keqmschad,
 C10HydroxyacylCoAMAT[t], C16HydroxyacylCoAMAT[t],
 C14HydroxyacylCoAMAT[t], C12HydroxyacylCoAMAT[t],
 C8HydroxyacylCoAMAT[t], C6HydroxyacylCoAMAT[t], C4HydroxyacylCoAMAT[t],
 NADtMAT, C10KetoacylCoAMAT[t], C16KetoacylCoAMAT[t],
 C14KetoacylCoAMAT[t], C12KetoacylCoAMAT[t], C8KetoacylCoAMAT[t],
 C6KetoacylCoAMAT[t], C4AcetoacylCoAMAT[t], NADHMAT[t]],
 vmschadC8 → MSCHAD[sfmschadC8, Vmschad, KmmschadC8HydroxyacylCoAMAT,
 KmmschadC16HydroxyacylCoAMAT, KmmschadC14HydroxyacylCoAMAT,
 KmmschadC12HydroxyacylCoAMAT, KmmschadC10HydroxyacylCoAMAT,
 KmmschadC6HydroxyacylCoAMAT, KmmschadC4HydroxyacylCoAMAT,
 KmmschadNADMAT, KmmschadC8KetoacylCoAMAT, KmmschadC16KetoacylCoAMAT,
 KmmschadC14KetoacylCoAMAT, KmmschadC12KetoacylCoAMAT,
 KmmschadC10KetoacylCoAMAT, KmmschadC6KetoacylCoAMAT,
 KmmschadC4AcetoacylCoAMAT, KmmschadNADHMAT, Keqmschad,
 C8HydroxyacylCoAMAT[t], C16HydroxyacylCoAMAT[t],
 C14HydroxyacylCoAMAT[t], C12HydroxyacylCoAMAT[t],
 C10HydroxyacylCoAMAT[t], C6HydroxyacylCoAMAT[t], C4HydroxyacylCoAMAT[t],
 NADtMAT, C8KetoacylCoAMAT[t], C16KetoacylCoAMAT[t],
 C14KetoacylCoAMAT[t], C12KetoacylCoAMAT[t], C10KetoacylCoAMAT[t],
 C6KetoacylCoAMAT[t], C4AcetoacylCoAMAT[t], NADHMAT[t]],
 vmschadC6 → MSCHAD[sfmschadC6, Vmschad, KmmschadC6HydroxyacylCoAMAT,
 KmmschadC16HydroxyacylCoAMAT, KmmschadC14HydroxyacylCoAMAT,
 KmmschadC12HydroxyacylCoAMAT, KmmschadC10HydroxyacylCoAMAT,
 KmmschadC8HydroxyacylCoAMAT, KmmschadC4HydroxyacylCoAMAT,
 KmmschadNADMAT, KmmschadC6KetoacylCoAMAT, KmmschadC16KetoacylCoAMAT,
 KmmschadC14KetoacylCoAMAT, KmmschadC12KetoacylCoAMAT,
 KmmschadC10KetoacylCoAMAT, KmmschadC8KetoacylCoAMAT,
 KmmschadC4AcetoacylCoAMAT, KmmschadNADHMAT, Keqmschad,
 C6HydroxyacylCoAMAT[t], C16HydroxyacylCoAMAT[t],
 C14HydroxyacylCoAMAT[t], C12HydroxyacylCoAMAT[t],
 C10HydroxyacylCoAMAT[t], C8HydroxyacylCoAMAT[t], C4HydroxyacylCoAMAT[t],
 NADtMAT, C6KetoacylCoAMAT[t], C16KetoacylCoAMAT[t],
 C14KetoacylCoAMAT[t], C12KetoacylCoAMAT[t], C10KetoacylCoAMAT[t],
 C8KetoacylCoAMAT[t], C4AcetoacylCoAMAT[t], NADHMAT[t]],
 vmschadC4 → MSCHAD[sfmschadC4, Vmschad, KmmschadC4HydroxyacylCoAMAT,
 KmmschadC16HydroxyacylCoAMAT, KmmschadC14HydroxyacylCoAMAT,

KmmschadC12HydroxyacylCoAMAT, KmmschadC10HydroxyacylCoAMAT,
 KmmschadC8HydroxyacylCoAMAT, KmmschadC6HydroxyacylCoAMAT,
 KmmschadNADMAT, KmmschadC4AcetoacylCoAMAT, KmmschadC16KetoacylCoAMAT,
 KmmschadC14KetoacylCoAMAT, KmmschadC12KetoacylCoAMAT,
 KmmschadC10KetoacylCoAMAT, KmmschadC8KetoacylCoAMAT,
 KmmschadC6KetoacylCoAMAT, KmmschadNADHMAT, Keqmschad,
 C4HydroxyacylCoAMAT[t], C16HydroxyacylCoAMAT[t],
 C14HydroxyacylCoAMAT[t], C12HydroxyacylCoAMAT[t],
 C10HydroxyacylCoAMAT[t], C8HydroxyacylCoAMAT[t], C6HydroxyacylCoAMAT[t],
 NADtMAT, C4AcetoacylCoAMAT[t], C16KetoacylCoAMAT[t],
 C14KetoacylCoAMAT[t], C12KetoacylCoAMAT[t], C10KetoacylCoAMAT[t],
 C8KetoacylCoAMAT[t], C6KetoacylCoAMAT[t], NADHMAT[t]],
 vmckatC16 → MCKATA[sfmckatC16, Vmckat, KmmckatC16KetoacylCoAMAT,
 KmmckatC14KetoacylCoAMAT, KmmckatC12KetoacylCoAMAT,
 KmmckatC10KetoacylCoAMAT, KmmckatC8KetoacylCoAMAT,
 KmmckatC6KetoacylCoAMAT, KmmckatC4AcetoacylCoAMAT, KmmckatCoAMAT,
 KmmckatC14AcylCoAMAT, KmmckatC16AcylCoAMAT, KmmckatC12AcylCoAMAT,
 KmmckatC10AcylCoAMAT, KmmckatC8AcylCoAMAT, KmmckatC6AcylCoAMAT,
 KmmckatC4AcylCoAMAT, KmmckatAcetylCoAMAT, Keqmckat, C16KetoacylCoAMAT[t],
 C14KetoacylCoAMAT[t], C12KetoacylCoAMAT[t], C10KetoacylCoAMAT[t],
 C8KetoacylCoAMAT[t], C6KetoacylCoAMAT[t], C4AcetoacylCoAMAT[t], CoAMAT,
 C14AcylCoAMAT[t], C16AcylCoAMAT[t], C12AcylCoAMAT[t], C10AcylCoAMAT[t],
 C8AcylCoAMAT[t], C6AcylCoAMAT[t], C4AcylCoAMAT[t], AcetylCoAMAT[t]],
 vmckatC14 → MCKATA[sfmckatC14, Vmckat, KmmckatC14KetoacylCoAMAT,
 KmmckatC16KetoacylCoAMAT, KmmckatC12KetoacylCoAMAT,
 KmmckatC10KetoacylCoAMAT, KmmckatC8KetoacylCoAMAT,
 KmmckatC6KetoacylCoAMAT, KmmckatC4AcetoacylCoAMAT, KmmckatCoAMAT,
 KmmckatC12AcylCoAMAT, KmmckatC16AcylCoAMAT, KmmckatC14AcylCoAMAT,
 KmmckatC10AcylCoAMAT, KmmckatC8AcylCoAMAT, KmmckatC6AcylCoAMAT,
 KmmckatC4AcylCoAMAT, KmmckatAcetylCoAMAT, Keqmckat, C14KetoacylCoAMAT[t],
 C16KetoacylCoAMAT[t], C12KetoacylCoAMAT[t], C10KetoacylCoAMAT[t],
 C8KetoacylCoAMAT[t], C6KetoacylCoAMAT[t], C4AcetoacylCoAMAT[t], CoAMAT,
 C12AcylCoAMAT[t], C16AcylCoAMAT[t], C14AcylCoAMAT[t], C10AcylCoAMAT[t],
 C8AcylCoAMAT[t], C6AcylCoAMAT[t], C4AcylCoAMAT[t], AcetylCoAMAT[t]],
 vmckatC12 → MCKATA[sfmckatC12, Vmckat, KmmckatC12KetoacylCoAMAT,
 KmmckatC16KetoacylCoAMAT, KmmckatC14KetoacylCoAMAT,
 KmmckatC10KetoacylCoAMAT, KmmckatC8KetoacylCoAMAT,
 KmmckatC6KetoacylCoAMAT, KmmckatC4AcetoacylCoAMAT, KmmckatCoAMAT,
 KmmckatC10AcylCoAMAT, KmmckatC16AcylCoAMAT, KmmckatC14AcylCoAMAT,
 KmmckatC12AcylCoAMAT, KmmckatC8AcylCoAMAT, KmmckatC6AcylCoAMAT,
 KmmckatC4AcylCoAMAT, KmmckatAcetylCoAMAT, Keqmckat, C12KetoacylCoAMAT[t],
 C16KetoacylCoAMAT[t], C14KetoacylCoAMAT[t], C10KetoacylCoAMAT[t],
 C8KetoacylCoAMAT[t], C6KetoacylCoAMAT[t], C4AcetoacylCoAMAT[t], CoAMAT,
 C10AcylCoAMAT[t], C16AcylCoAMAT[t], C14AcylCoAMAT[t], C12AcylCoAMAT[t],
 C8AcylCoAMAT[t], C6AcylCoAMAT[t], C4AcylCoAMAT[t], AcetylCoAMAT[t]],
 vmckatC10 → MCKATA[sfmckatC10, Vmckat, KmmckatC10KetoacylCoAMAT,
 KmmckatC16KetoacylCoAMAT, KmmckatC14KetoacylCoAMAT,
 KmmckatC12KetoacylCoAMAT, KmmckatC8KetoacylCoAMAT,
 KmmckatC6KetoacylCoAMAT, KmmckatC4AcetoacylCoAMAT, KmmckatCoAMAT,
 KmmckatC8AcylCoAMAT, KmmckatC16AcylCoAMAT, KmmckatC14AcylCoAMAT,
 KmmckatC12AcylCoAMAT, KmmckatC10AcylCoAMAT, KmmckatC6AcylCoAMAT,
 KmmckatC4AcylCoAMAT, KmmckatAcetylCoAMAT, Keqmckat, C10KetoacylCoAMAT[t],
 C16KetoacylCoAMAT[t], C14KetoacylCoAMAT[t], C12KetoacylCoAMAT[t],

C8KetoacylCoAMAT[t], C6KetoacylCoAMAT[t], C4AcetoacylCoAMAT[t], CoAMAT,
 C8AcylCoAMAT[t], C16AcylCoAMAT[t], C14AcylCoAMAT[t], C12AcylCoAMAT[t],
 C10AcylCoAMAT[t], C6AcylCoAMAT[t], C4AcylCoAMAT[t], AcetylCoAMAT[t]],
 vmckatC8 → MCKATA[sfmckatC8, Vmckat, KmmckatC8KetoacylCoAMAT,
 KmmckatC16KetoacylCoAMAT, KmmckatC14KetoacylCoAMAT,
 KmmckatC12KetoacylCoAMAT, KmmckatC10KetoacylCoAMAT,
 KmmckatC6KetoacylCoAMAT, KmmckatC4AcetoacylCoAMAT, KmmckatCoAMAT,
 KmmckatC6AcylCoAMAT, KmmckatC16AcylCoAMAT, KmmckatC14AcylCoAMAT,
 KmmckatC12AcylCoAMAT, KmmckatC10AcylCoAMAT, KmmckatC8AcylCoAMAT,
 KmmckatC4AcylCoAMAT, KmmckatAcetylCoAMAT, Keqmckat, C8KetoacylCoAMAT[t],
 C16KetoacylCoAMAT[t], C14KetoacylCoAMAT[t], C12KetoacylCoAMAT[t],
 C10KetoacylCoAMAT[t], C6KetoacylCoAMAT[t], C4AcetoacylCoAMAT[t], CoAMAT,
 C6AcylCoAMAT[t], C16AcylCoAMAT[t], C14AcylCoAMAT[t], C12AcylCoAMAT[t],
 C10AcylCoAMAT[t], C8AcylCoAMAT[t], C4AcylCoAMAT[t], AcetylCoAMAT[t]],
 vmckatC6 → MCKATA[sfmckatC6, Vmckat, KmmckatC6KetoacylCoAMAT,
 KmmckatC16KetoacylCoAMAT, KmmckatC14KetoacylCoAMAT,
 KmmckatC12KetoacylCoAMAT, KmmckatC10KetoacylCoAMAT,
 KmmckatC8KetoacylCoAMAT, KmmckatC4AcetoacylCoAMAT, KmmckatCoAMAT,
 KmmckatC4AcylCoAMAT, KmmckatC16AcylCoAMAT, KmmckatC14AcylCoAMAT,
 KmmckatC12AcylCoAMAT, KmmckatC10AcylCoAMAT, KmmckatC8AcylCoAMAT,
 KmmckatC6AcylCoAMAT, KmmckatAcetylCoAMAT, Keqmckat, C6KetoacylCoAMAT[t],
 C16KetoacylCoAMAT[t], C14KetoacylCoAMAT[t], C12KetoacylCoAMAT[t],
 C10KetoacylCoAMAT[t], C8KetoacylCoAMAT[t], C4AcetoacylCoAMAT[t], CoAMAT,
 C4AcylCoAMAT[t], C16AcylCoAMAT[t], C14AcylCoAMAT[t], C12AcylCoAMAT[t],
 C10AcylCoAMAT[t], C8AcylCoAMAT[t], C6AcylCoAMAT[t], AcetylCoAMAT[t]],
 vmckatC4 → MCKATB[sfmckatC4, Vmckat, KmmckatC4AcetoacylCoAMAT,
 KmmckatC16KetoacylCoAMAT, KmmckatC14KetoacylCoAMAT,
 KmmckatC12KetoacylCoAMAT, KmmckatC10KetoacylCoAMAT,
 KmmckatC8KetoacylCoAMAT, KmmckatC6KetoacylCoAMAT, KmmckatCoAMAT,
 KmmckatC4AcylCoAMAT, KmmckatC16AcylCoAMAT, KmmckatC14AcylCoAMAT,
 KmmckatC12AcylCoAMAT, KmmckatC10AcylCoAMAT, KmmckatC8AcylCoAMAT,
 KmmckatC6AcylCoAMAT, KmmckatAcetylCoAMAT, Keqmckat, C4AcetoacylCoAMAT[t],
 C16KetoacylCoAMAT[t], C14KetoacylCoAMAT[t], C12KetoacylCoAMAT[t],
 C10KetoacylCoAMAT[t], C8KetoacylCoAMAT[t], C6KetoacylCoAMAT[t], CoAMAT,
 C4AcylCoAMAT[t], C16AcylCoAMAT[t], C14AcylCoAMAT[t], C12AcylCoAMAT[t],
 C10AcylCoAMAT[t], C8AcylCoAMAT[t], C6AcylCoAMAT[t], AcetylCoAMAT[t]],
 vmtpC16 → MTP[sfmtpC16, Vmtp, KmmtpC16EnoylCoAMAT, KmmtpC14EnoylCoAMAT,
 KmmtpC12EnoylCoAMAT, KmmtpC10EnoylCoAMAT, KmmtpC8EnoylCoAMAT,
 KmmtpNADMAT, KmmtpCoAMAT, KmmtpC14AcylCoAMAT, KmmtpC16AcylCoAMAT,
 KmmtpC12AcylCoAMAT, KmmtpC10AcylCoAMAT, KmmtpC8AcylCoAMAT,
 KmmtpC6AcylCoAMAT, KmmtpNADHMAT, KmmtpAcetylCoAMAT, KicrotC4AcetoacylCoA,
 Keqmtp, C16EnoylCoAMAT[t], C14EnoylCoAMAT[t], C12EnoylCoAMAT[t],
 C10EnoylCoAMAT[t], C8EnoylCoAMAT[t], NADtMAT, CoAMAT, C14AcylCoAMAT[t],
 C16AcylCoAMAT[t], C12AcylCoAMAT[t], C10AcylCoAMAT[t], C8AcylCoAMAT[t],
 C6AcylCoAMAT[t], NADHMAT[t], AcetylCoAMAT[t], C4AcetoacylCoAMAT[t]],
 vmtpC14 → MTP[sfmtpC14, Vmtp, KmmtpC14EnoylCoAMAT, KmmtpC16EnoylCoAMAT,
 KmmtpC12EnoylCoAMAT, KmmtpC10EnoylCoAMAT, KmmtpC8EnoylCoAMAT,
 KmmtpNADMAT, KmmtpCoAMAT, KmmtpC12AcylCoAMAT, KmmtpC16AcylCoAMAT,
 KmmtpC14AcylCoAMAT, KmmtpC10AcylCoAMAT, KmmtpC8AcylCoAMAT,
 KmmtpC6AcylCoAMAT, KmmtpNADHMAT, KmmtpAcetylCoAMAT, KicrotC4AcetoacylCoA,
 Keqmtp, C14EnoylCoAMAT[t], C16EnoylCoAMAT[t], C12EnoylCoAMAT[t],
 C10EnoylCoAMAT[t], C8EnoylCoAMAT[t], NADtMAT, CoAMAT, C12AcylCoAMAT[t],
 C16AcylCoAMAT[t], C14AcylCoAMAT[t], C10AcylCoAMAT[t], C8AcylCoAMAT[t],

```

C6AcylCoAMAT[t], NADHMAT[t], AcetylCoAMAT[t], C4AcetoacylCoAMAT[t]],
vmtpC12 → MTP[sfmpC12, Vmtp, KmmtC12EnoylCoAMAT, KmmtC16EnoylCoAMAT,
KmmtC14EnoylCoAMAT, KmmtC10EnoylCoAMAT, KmmtC8EnoylCoAMAT,
KmmtPNADMAT, KmmtCoAMAT, KmmtC10AcylCoAMAT, KmmtC16AcylCoAMAT,
KmmtC14AcylCoAMAT, KmmtC12AcylCoAMAT, KmmtC8AcylCoAMAT,
KmmtC6AcylCoAMAT, KmmtPNADHMAT, KmmtAcetylCoAMAT, KicrotC4AcetoacylCoA,
Keqmt, C12EnoylCoAMAT[t], C16EnoylCoAMAT[t], C14EnoylCoAMAT[t],
C10EnoylCoAMAT[t], C8EnoylCoAMAT[t], NADtMAT, CoAMAT, C10AcylCoAMAT[t],
C16AcylCoAMAT[t], C14AcylCoAMAT[t], C12AcylCoAMAT[t], C8AcylCoAMAT[t],
C6AcylCoAMAT[t], NADHMAT[t], AcetylCoAMAT[t], C4AcetoacylCoAMAT[t]],
vmtpC10 → MTP[sfmpC10, Vmtp, KmmtC10EnoylCoAMAT, KmmtC16EnoylCoAMAT,
KmmtC14EnoylCoAMAT, KmmtC12EnoylCoAMAT, KmmtC8EnoylCoAMAT,
KmmtPNADMAT, KmmtCoAMAT, KmmtC8AcylCoAMAT, KmmtC16AcylCoAMAT,
KmmtC14AcylCoAMAT, KmmtC12AcylCoAMAT, KmmtC10AcylCoAMAT,
KmmtC6AcylCoAMAT, KmmtPNADHMAT, KmmtAcetylCoAMAT, KicrotC4AcetoacylCoA,
Keqmt, C10EnoylCoAMAT[t], C16EnoylCoAMAT[t], C14EnoylCoAMAT[t],
C12EnoylCoAMAT[t], C8EnoylCoAMAT[t], NADtMAT, CoAMAT, C8AcylCoAMAT[t],
C16AcylCoAMAT[t], C14AcylCoAMAT[t], C12AcylCoAMAT[t], C10AcylCoAMAT[t],
C6AcylCoAMAT[t], NADHMAT[t], AcetylCoAMAT[t], C4AcetoacylCoAMAT[t]],
vmtpC8 → MTP[sfmpC8, Vmtp, KmmtC8EnoylCoAMAT, KmmtC16EnoylCoAMAT,
KmmtC14EnoylCoAMAT, KmmtC12EnoylCoAMAT, KmmtC10EnoylCoAMAT,
KmmtPNADMAT, KmmtCoAMAT, KmmtC6AcylCoAMAT, KmmtC16AcylCoAMAT,
KmmtC14AcylCoAMAT, KmmtC12AcylCoAMAT, KmmtC10AcylCoAMAT,
KmmtC8AcylCoAMAT, KmmtPNADHMAT, KmmtAcetylCoAMAT, KicrotC4AcetoacylCoA,
Keqmt, C8EnoylCoAMAT[t], C16EnoylCoAMAT[t], C14EnoylCoAMAT[t],
C12EnoylCoAMAT[t], C10EnoylCoAMAT[t], NADtMAT, CoAMAT, C6AcylCoAMAT[t],
C16AcylCoAMAT[t], C14AcylCoAMAT[t], C12AcylCoAMAT[t], C10AcylCoAMAT[t],
C8AcylCoAMAT[t], NADHMAT[t], AcetylCoAMAT[t], C4AcetoacylCoAMAT[t]],
vacesink → RES[Ksacesink, AcetylCoAMAT[t], Klacesink],
vfadhsink → RES[Ksfadhsink, FADHMAT[t], Klfadhsink],
vnadhsink → RES[Ksnadhsink, NADHMAT[t], Klnadhsink]];

CoAMATX = {CoAMAT → CoAMATt - C16AcylCoAMAT[t] - C16EnoylCoAMAT[t] -
C16HydroxyacylCoAMAT[t] - C16KetoacylCoAMAT[t] - C14AcylCoAMAT[t] -
C14EnoylCoAMAT[t] - C14HydroxyacylCoAMAT[t] - C14KetoacylCoAMAT[t] -
C12AcylCoAMAT[t] - C12EnoylCoAMAT[t] - C12HydroxyacylCoAMAT[t] -
C12KetoacylCoAMAT[t] - C10AcylCoAMAT[t] - C10EnoylCoAMAT[t] -
C10HydroxyacylCoAMAT[t] - C10KetoacylCoAMAT[t] - C8AcylCoAMAT[t] -
C8EnoylCoAMAT[t] - C8HydroxyacylCoAMAT[t] - C8KetoacylCoAMAT[t] -
C6AcylCoAMAT[t] - C6EnoylCoAMAT[t] - C6HydroxyacylCoAMAT[t] -
C6KetoacylCoAMAT[t] - C4AcylCoAMAT[t] - C4EnoylCoAMAT[t] -
C4HydroxyacylCoAMAT[t] - C4AcetoacylCoAMAT[t] - AcetylCoAMAT[t]};

Parm = {
sfcp1C16 → 1, Vcp1 → 0.012, Kmcpt1C16AcylCoACYT → 13.8,
Kmcpt1CarCYT → 125, Kmcpt1C16AcylCarCYT → 136, Kmcpt1CoACYT → 40.7,
Kicpt1MalCoACYT → 9.1, Keqcpt1 → 0.45, ncpt1 → 2.4799,
Vfcact → 0.42, Vrcact → 0.42, KmcactC16AcylCarCYT → 15,
KmcactC14AcylCarCYT → 15, KmcactC12AcylCarCYT → 15, KmcactC10AcylCarCYT → 15,
KmcactC8AcylCarCYT → 15, KmcactC6AcylCarCYT → 15, KmcactC4AcylCarCYT → 15,
KmcactCarMAT → 130, KmcactC16AcylCarMAT → 15, KmcactC14AcylCarMAT → 15,
KmcactC12AcylCarMAT → 15, KmcactC10AcylCarMAT → 15, KmcactC8AcylCarMAT → 15,
KmcactC6AcylCarMAT → 15, KmcactC4AcylCarMAT → 15, KmcactCarCYT → 130,

```

KicactC16AcylCarCYT → 56, KicactC14AcylCarCYT → 56, KicactC12AcylCarCYT → 56,
 KicactC10AcylCarCYT → 56, KicactC8AcylCarCYT → 56, KicactC6AcylCarCYT → 56,
 KicactC4AcylCarCYT → 56, KicactCarCYT → 200, Keqcact → 1,
 sfcpt2C16 → 0.85, sfcpt2C14 → 1, sfcpt2C12 → 0.95, sfcpt2C10 → 0.95,
 sfcpt2C8 → 0.35, sfcpt2C6 → 0.15, sfcpt2C4 → 0.01, Vcpt2 → 0.391,
 Kmcpt2C16AcylCarMAT → 51, Kmcpt2C14AcylCarMAT → 51, Kmcpt2C12AcylCarMAT → 51,
 Kmcpt2C10AcylCarMAT → 51, Kmcpt2C8AcylCarMAT → 51, Kmcpt2C6AcylCarMAT → 51,
 Kmcpt2C4AcylCarMAT → 51, Kmcpt2CoAMAT → 30, Kmcpt2C16AcylCoAMAT → 38,
 Kmcpt2C14AcylCoAMAT → 38, Kmcpt2C12AcylCoAMAT → 38,
 Kmcpt2C10AcylCoAMAT → 38, Kmcpt2C8AcylCoAMAT → 38, Kmcpt2C6AcylCoAMAT → 1000,
 Kmcpt2C4AcylCoAMAT → 1 000 000, Kmcpt2CarMAT → 350, Keqcpt2 → 2.22,
 sfvlcadC16 → 1, sfvlcadC14 → 0.42, sfvlcadC12 → 0.11, Vvlcad → 0.008,
 KmvlcadC16AcylCoAMAT → 6.5, KmvlcadC14AcylCoAMAT → 4,
 KmvlcadC12AcylCoAMAT → 2.7, KmvlcadFAD → 0.12,
 KmvlcadC16EnoylCoAMAT → 1.08, KmvlcadC14EnoylCoAMAT → 1.08,
 KmvlcadC12EnoylCoAMAT → 1.08, KmvlcadFADH → 24.2, Keqvlcad → 6,
 sflcadC16 → 0.9, sflcadC14 → 1, sflcadC12 → 0.9, sflcadC10 → 0.75,
 sflcadC8 → 0.4, Vlcad → 0.01, KmlcadC16AcylCoAMAT → 2.5,
 KmlcadC14AcylCoAMAT → 7.4, KmlcadC12AcylCoAMAT → 9,
 KmlcadC10AcylCoAMAT → 24.3, KmlcadC8AcylCoAMAT → 123, KmlcadFAD → 0.12,
 KmlcadC16EnoylCoAMAT → 1.08, KmlcadC14EnoylCoAMAT → 1.08,
 KmlcadC12EnoylCoAMAT → 1.08, KmlcadC10EnoylCoAMAT → 1.08,
 KmlcadC8EnoylCoAMAT → 1.08, KmlcadFADH → 24.2, Keqlcad → 6,
 sfmcadC12 → 0.38, sfmcadC10 → 0.8, sfmcadC8 → 0.87, sfmcadC6 → 1,
 sfmcadC4 → 0.12, Vmcad → 0.081, KmmcadC12AcylCoAMAT → 5.7,
 KmmcadC10AcylCoAMAT → 5.4, KmmcadC8AcylCoAMAT → 4,
 KmmcadC6AcylCoAMAT → 9.4, KmmcadC4AcylCoAMAT → 135, KmmcadFAD → 0.12,
 KmmcadC12EnoylCoAMAT → 1.08, KmmcadC10EnoylCoAMAT → 1.08,
 KmmcadC8EnoylCoAMAT → 1.08, KmmcadC6EnoylCoAMAT → 1.08,
 KmmcadC4EnoylCoAMAT → 1.08, KmmcadFADH → 24.2, Keqmcad → 6,
 sfscadC6 → 0.3, sfscadC4 → 1, Vscad → 0.081, KmscadC6AcylCoAMAT → 285,
 KmscadC4AcylCoAMAT → 10.7, KmscadFAD → 0.12, KmscadC6EnoylCoAMAT → 1.08,
 KmscadC4EnoylCoAMAT → 1.08, KmscadFADH → 24.2, Keqscad → 6,
 sfcrotC16 → 0.13, sfcrotC14 → 0.2, sfcrotC12 → 0.25, sfcrotC10 → 0.33,
 sfcrotC8 → 0.58, sfcrotC6 → 0.83, sfcrotC4 → 1, Vcrot → 3.6,
 KmcrotC16EnoylCoAMAT → 150, KmcrotC14EnoylCoAMAT → 100,
 KmcrotC12EnoylCoAMAT → 25, KmcrotC10EnoylCoAMAT → 25,
 KmcrotC8EnoylCoAMAT → 25, KmcrotC6EnoylCoAMAT → 25, KmcrotC4EnoylCoAMAT → 40,
 KmcrotC16HydroxyacylCoAMAT → 45, KmcrotC14HydroxyacylCoAMAT → 45,
 KmcrotC12HydroxyacylCoAMAT → 45, KmcrotC10HydroxyacylCoAMAT → 45,
 KmcrotC8HydroxyacylCoAMAT → 45, KmcrotC6HydroxyacylCoAMAT → 45,
 KmcrotC4HydroxyacylCoAMAT → 45, KicrotC4AcetoacylCoA → 1.6, Keqcrot → 3.13,
 sfmschadC16 → 0.6, sfmschadC14 → 0.5, sfmschadC12 → 0.43,
 sfmschadC10 → 0.64, sfmschadC8 → 0.89, sfmschadC6 → 1,
 sfmschadC4 → 0.67, Vmschad → 1, KmmschadC16HydroxyacylCoAMAT → 1.5,
 KmmschadC14HydroxyacylCoAMAT → 1.8, KmmschadC12HydroxyacylCoAMAT → 3.7,
 KmmschadC10HydroxyacylCoAMAT → 8.8, KmmschadC8HydroxyacylCoAMAT → 16.3,
 KmmschadC6HydroxyacylCoAMAT → 28.6, KmmschadC4HydroxyacylCoAMAT → 69.9,
 KmmschadNADMAT → 58.5, KmmschadC16KetoacylCoAMAT → 1.4,
 KmmschadC14KetoacylCoAMAT → 1.4, KmmschadC12KetoacylCoAMAT → 1.6,
 KmmschadC10KetoacylCoAMAT → 2.3, KmmschadC8KetoacylCoAMAT → 4.1,
 KmmschadC6KetoacylCoAMAT → 5.8, KmmschadC4AcetoacylCoAMAT → 16.9,
 KmmschadNADHMAT → 5.4, Keqmschad → 2.17×10^{-4} ,

```

sfmckatC16 → 0, sfmckatC14 → 0.2, sfmckatC12 → 0.38, sfmckatC10 → 0.65,
sfmckatC8 → 0.81, sfmckatC6 → 1, sfmckatC4 → 0.49, Vmckat → 0.377,
KmmckatC16KetoacylCoAMAT → 1.1, KmmckatC14KetoacylCoAMAT → 1.2,
KmmckatC12KetoacylCoAMAT → 1.3, KmmckatC10KetoacylCoAMAT → 2.1,
KmmckatC8KetoacylCoAMAT → 3.2, KmmckatC6KetoacylCoAMAT → 6.7,
KmmckatC4AcetoacylCoAMAT → 12.4, KmmckatCoAMAT → 26.6,
KmmckatC14AcylCoAMAT → 13.83, KmmckatC16AcylCoAMAT → 13.83,
KmmckatC12AcylCoAMAT → 13.83, KmmckatC10AcylCoAMAT → 13.83,
KmmckatC8AcylCoAMAT → 13.83, KmmckatC6AcylCoAMAT → 13.83,
KmmckatC4AcylCoAMAT → 13.83, KmmckatAcetylCoAMAT → 30, Keqmckat → 1051,
sfmtpC16 → 1, sfmtpC14 → 0.9, sfmtpC12 → 0.81, sfmtpC10 → 0.73,
sfmtpC8 → 0.34, Vmtp → 2.84, KmmtpC16EnoylCoAMAT → 25,
KmmtpC14EnoylCoAMAT → 25, KmmtpC12EnoylCoAMAT → 25,
KmmtpC10EnoylCoAMAT → 25, KmmtpC8EnoylCoAMAT → 25, KmmtpNADMAT → 60,
KmmtpCoAMAT → 30, KmmtpC14AcylCoAMAT → 13.83, KmmtpC16AcylCoAMAT → 13.83,
KmmtpC12AcylCoAMAT → 13.83, KmmtpC10AcylCoAMAT → 13.83,
KmmtpC8AcylCoAMAT → 13.83, KmmtpC6AcylCoAMAT → 13.83,
KmmtpNADHMAT → 50, KmmtpAcetylCoAMAT → 30, Keqmtp → 0.71,
Ksacesink → 6 000 000, Klacesink → 30, Ksfadhsink → 6 000 000,
Klfadhsink → 0.46, Ksnadhsink → 6 000 000, Klnadhsink → 16,
C16AcylCoACYT → x, CarCYT → 400, CoACYT → 140, MalCoACYT → 0,
CarMAT → 950, FADtMAT → 0.77, NADtMAT → 250, CoAMATt → 5000,
VCYT →  $10 * 10^{-3}$ , VMAT →  $1.8 * 10^{-6}$ };

```

```

InitialConditions = {
  C16AcylCarCYT[0] == 0.171, C16AcylCarMAT[0] == 0, C16AcylCoAMAT[0] == 0,
  C16EnoylCoAMAT[0] == 0, C16HydroxyacylCoAMAT[0] == 0, C16KetoacylCoAMAT[0] == 0,
  C14AcylCarCYT[0] == 0.023, C14AcylCarMAT[0] == 0, C14AcylCoAMAT[0] == 0,
  C14EnoylCoAMAT[0] == 0, C14HydroxyacylCoAMAT[0] == 0, C14KetoacylCoAMAT[0] == 0,
  C12AcylCarCYT[0] == 0.110, C12AcylCarMAT[0] == 0, C12AcylCoAMAT[0] == 0,
  C12EnoylCoAMAT[0] == 0, C12HydroxyacylCoAMAT[0] == 0, C12KetoacylCoAMAT[0] == 0,
  C10AcylCarCYT[0] == 0.019, C10AcylCarMAT[0] == 0, C10AcylCoAMAT[0] == 0,
  C10EnoylCoAMAT[0] == 0, C10HydroxyacylCoAMAT[0] == 0, C10KetoacylCoAMAT[0] == 0,
  C8AcylCarCYT[0] == 0.052, C8AcylCarMAT[0] == 0, C8AcylCoAMAT[0] == 0,
  C8EnoylCoAMAT[0] == 0, C8HydroxyacylCoAMAT[0] == 0, C8KetoacylCoAMAT[0] == 0,
  C6AcylCarCYT[0] == 0.017, C6AcylCarMAT[0] == 0, C6AcylCoAMAT[0] == 0,
  C6EnoylCoAMAT[0] == 0, C6HydroxyacylCoAMAT[0] == 0, C6KetoacylCoAMAT[0] == 0,
  C4AcylCarCYT[0] == 0.008, C4AcylCarMAT[0] == 0, C4AcylCoAMAT[0] == 0,
  C4EnoylCoAMAT[0] == 0, C4HydroxyacylCoAMAT[0] == 0, C4AcetoacylCoAMAT[0] == 0,
  AcetylCoAMAT[0] == 30, FADHMAT[0] == 0.46, NADHMAT[0] == 16};

```

```

Vars = {
  C16AcylCarCYT, C16AcylCarMAT, C16AcylCoAMAT,
  C16EnoylCoAMAT, C16HydroxyacylCoAMAT, C16KetoacylCoAMAT,
  C14AcylCarCYT, C14AcylCarMAT, C14AcylCoAMAT, C14EnoylCoAMAT,
  C14HydroxyacylCoAMAT, C14KetoacylCoAMAT,
  C12AcylCarCYT, C12AcylCarMAT, C12AcylCoAMAT, C12EnoylCoAMAT,
  C12HydroxyacylCoAMAT, C12KetoacylCoAMAT,
  C10AcylCarCYT, C10AcylCarMAT, C10AcylCoAMAT, C10EnoylCoAMAT,
  C10HydroxyacylCoAMAT, C10KetoacylCoAMAT,
  C8AcylCarCYT, C8AcylCarMAT, C8AcylCoAMAT, C8EnoylCoAMAT,
  C8HydroxyacylCoAMAT, C8KetoacylCoAMAT,
  C6AcylCarCYT, C6AcylCarMAT, C6AcylCoAMAT, C6EnoylCoAMAT,

```

```

C6HydroxyacylCoAMAT, C6KetoacylCoAMAT,
C4AcylCarCYT, C4AcylCarMAT, C4AcylCoAMAT, C4EnoylCoAMAT,
C4HydroxyacylCoAMAT, C4AcetoacylCoAMAT,
AcetylCoAMAT, FADHMAT, NADHMAT};

TableForm[Odes];
TableForm[RateEqs];
TableForm[Odes /. RateEqs /. CoAMATX /. Parm];
TableForm[RateEqs /. Parm];
TableForm[InitialConditions];

tsol = NDSolve[Join[Odes /. RateEqs /. CoAMATX /. Parm, InitialConditions] /.
  x → 26.8 * e-0.18*t, Vars, {t, 0, 30}];

```

Graphs metabolite concentrations

```

<< PlotLegends`

Plot1 = Plot[
  Evaluate[
    {C16AcylCarCYT[t], C14AcylCarCYT[t], C12AcylCarCYT[t], C10AcylCarCYT[t],
      C8AcylCarCYT[t], C6AcylCarCYT[t], C4AcylCarCYT[t]} /. tsol],
  {t, 0, 25}, PlotStyle → {{Red, Thick}, {Green, Thick}, {Blue, Thick},
    {Magenta, Thick}, {Cyan, Thick}, {Orange, Thick}, {Purple, Thick}},
  PlotLegend → {"C16AcylCarCYT", "C14AcylCarCYT", "C12AcylCarCYT",
    "C10AcylCarCYT", "C8AcylCarCYT", "C6AcylCarCYT",
    "C4AcylCarCYT"}, LegendPosition → {1, -0.5},
  PlotRange → All, Frame → True, FrameLabel →
    {"Time (min)", "Concentrations (μM)"},
  BaseStyle → {FontSize → 14, FontFamily → "Helvetica", FontWeight → "Bold"},
  FrameStyle → Thickness[0.005], ImageSize → Scaled[0.5]]

Plot2 = Plot[
  Evaluate[
    {CoAMATt - C16AcylCoAMAT[t] - C16EnoylCoAMAT[t] - C16HydroxyacylCoAMAT[t] -
      C16KetoacylCoAMAT[t] - C14AcylCoAMAT[t] - C14EnoylCoAMAT[t] -
      C14HydroxyacylCoAMAT[t] - C14KetoacylCoAMAT[t] - C12AcylCoAMAT[t] -
      C12EnoylCoAMAT[t] - C12HydroxyacylCoAMAT[t] - C12KetoacylCoAMAT[t] -
      C10AcylCoAMAT[t] - C10EnoylCoAMAT[t] - C10HydroxyacylCoAMAT[t] -
      C10KetoacylCoAMAT[t] - C8AcylCoAMAT[t] - C8EnoylCoAMAT[t] -
      C8HydroxyacylCoAMAT[t] - C8KetoacylCoAMAT[t] - C6AcylCoAMAT[t] -
      C6EnoylCoAMAT[t] - C6HydroxyacylCoAMAT[t] - C6KetoacylCoAMAT[t] -
      C4AcylCoAMAT[t] - C4EnoylCoAMAT[t] - C4HydroxyacylCoAMAT[t] -
      C4AcetoacylCoAMAT[t] - AcetylCoAMAT[t] /. RateEqs /. Parm} /. tsol],
  {t, 0, 25}, PlotStyle → {{Black, Thick}},
  PlotRange → {All, {0, 5000}}, Frame → True,
  FrameLabel → {"Time (min)", "Concentration (μM)"},
  BaseStyle → {FontSize → 14, FontFamily → "Helvetica", FontWeight → "Bold"},
  FrameStyle → Thickness[0.005], ImageSize → Scaled[0.5]]

```

Graphs rates

```

Plot11 = Plot[
  Evaluate[{(vnadhsink + vfadhsink) / 2 * 1000} /. RateEqs /. CoAMATX /. Parm /. tsol],
  {t, 0, 8}, PlotStyle → {{Black, Thick}},
  PlotLegend → {"vnadhsink"}, LegendPosition → {1, -0.5},
  PlotRange → {All, {0, 50}}, Frame → True,
  FrameLabel → {"Time (min)", "v (μmol/min/gProtein)"},
  BaseStyle → {FontSize → 14, FontFamily → "Helvetica", FontWeight → "Bold"},
  FrameStyle → Thickness[0.005], ImageSize → Scaled[0.5]]

TableForm[
  Table[{(vnadhsink + vfadhsink) / 2 * 1000 /. RateEqs /. CoAMATX /. Parm /. tsol},
    {t, 0, 8.24, 0.01}]]

TableForm[Table[{C16AcylCarCYT[t] /. tsol}, {t, 0, 24, 0.1}]]

TableForm[Table[{C14AcylCarCYT[t] /. tsol}, {t, 0, 24, 0.1}]]

TableForm[Table[{C12AcylCarCYT[t] /. tsol}, {t, 0, 24, 0.1}]]

TableForm[Table[{C10AcylCarCYT[t] /. tsol}, {t, 0, 24, 0.1}]]

TableForm[Table[{C8AcylCarCYT[t] /. tsol}, {t, 0, 24, 0.1}]]

TableForm[Table[{C6AcylCarCYT[t] /. tsol}, {t, 0, 24, 0.1}]]

TableForm[Table[{C4AcylCarCYT[t] /. tsol}, {t, 0, 24, 0.1}]]

```