



### Compartment

### Code

Metabolized	metb
GI Tract	gitx
Liver	livr
Fat	fatx
Slowly Perfused	slop
Rapidly Perfused	rapp
Arterial Blood	artb
Venous Blood	venb

General (where "x" is one of these codes)

$A_x$  = amount (mg)

$C_x$  = concentration (mg/L)  $(= \frac{A_x}{V_x})$

$V_x$  = volume (L)

$Q_x$  = blood flow (L/h)

$P_x$  = partition coefficient x: blood (dimensionless)

### Other Parameters

$M_{max}$  = maximum metabolic clearance rate (mg/h)

$M_{kmm}$  = Michaelis-Menten metabolic clearance coeff. (mg/L)

$M_{kfo}$  = first-order metabolic clearance rate ( $h^{-1}$ )

$G_{kfo}$  = first-order absorption from GI tract ( $h^{-1}$ )

$Q_{card}$  = cardiac output (L/h)

Michaelis-Menten Metabolism

First-Order Metabolism

$$\frac{d}{dt} A_{metb} = M_{max} \cdot \frac{(C_{liver} / P_{liver})}{M_{kmm} + (C_{liver} / P_{liver})} + M_{kfo} \cdot \left( \frac{C_{liver}}{P_{liver}} \right) \cdot V_{liver}$$

$$= \text{"RAM"}$$

$$\frac{d}{dt} A_{gitx} = - G_{kfo} \cdot A_{gitx} = - \text{"RAO"}$$

$$\frac{d}{dt} A_{liver} = Q_{liver} \left( C_{artb} - \frac{C_{liver}}{P_{liver}} \right) - RAM + RAO$$

$$\frac{d}{dt} A_{fatx} = Q_{fatx} \left( C_{artb} - \frac{C_{fatx}}{P_{fatx}} \right)$$

$$\frac{d}{dt} A_{slop} = Q_{slop} \left( C_{artb} - \frac{C_{slop}}{P_{slop}} \right)$$

$$\frac{d}{dt} A_{rapp} = Q_{rapp} \left( C_{artb} - \frac{C_{rapp}}{P_{rapp}} \right)$$

$$\frac{d}{dt} A_{artb} = Q_{card} \cdot C_{venb} - (Q_{liver} + Q_{fatx} + Q_{slop} + Q_{rapp}) \cdot C_{artb}$$

$$\frac{d}{dt} A_{venb} = Q_{liver} \frac{C_{liver}}{P_{liver}} + Q_{fatx} \frac{C_{fatx}}{P_{fatx}} + Q_{slop} \frac{C_{slop}}{P_{slop}} + Q_{rapp} \frac{C_{rapp}}{P_{rapp}} - Q_{card} \cdot C_{venb}$$