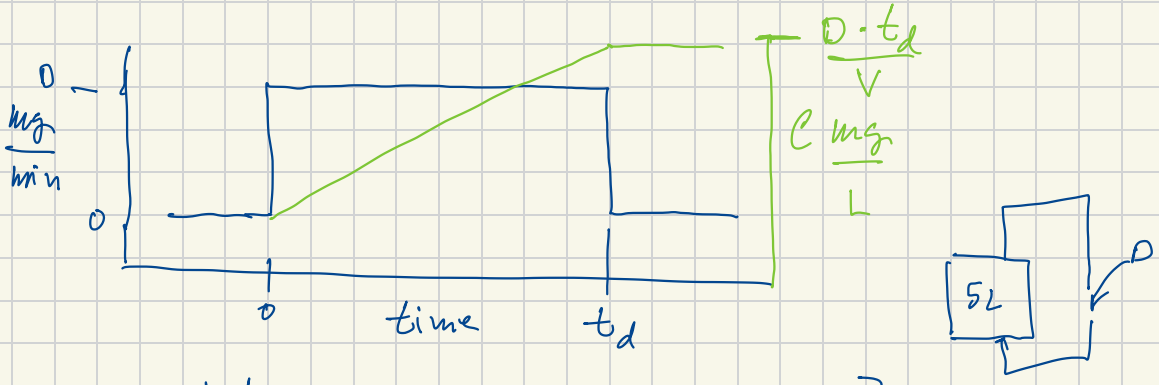



What is the concentration in blood?

$$\frac{dm}{dt} = D \qquad \frac{d\,m/V}{dt} = \frac{dC}{dt}$$

$$\frac{dC}{dt} = \frac{D}{V} \qquad C = \int \frac{D}{V} \cdot t \quad \text{Indefinite integral}$$

$$C(t) = \frac{D}{V} \cdot t \quad [=] \quad \frac{mg}{\cancel{min}} \cdot \frac{\cancel{min}}{L}$$

But the body can clear the toxin/drug ...

Include liver conversion with enzymes to eliminate the drug.

$$\frac{dm}{dt} = D - kc$$

$k$: rate constant; $c$: drug conc.; $D$: drug delivery rate or toxin

$$\frac{d\,m/V}{dt} = \frac{dc}{dt} = \frac{D}{V} - k'C \qquad \frac{k}{V} = k'$$

$$\frac{dC}{dt} = A - bC$$

Integrate by substitution

$$\int \frac{dx}{A - bx} = \int dt$$

$$z = A - bx$$

$$dz = -b\,dx$$

$$\int \frac{dz}{-bz} = -\frac{1}{b}\int \frac{1}{z} = -\frac{1}{b}\ln|z|$$

$$-\frac{1}{b}\ln|A - bx| + E = t$$

$$-\frac{1}{b}\ln|A-bx|+E=t$$

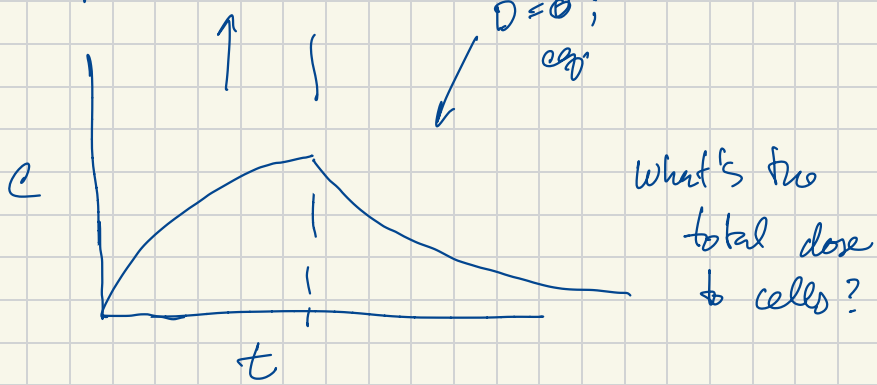
$$-\frac{1}{k'}\ln\left|\frac{D}{V}-k'C\right|+E=t$$

$$@\ t=0 \qquad C=0$$

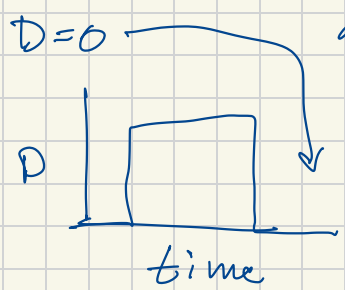
$$E=\frac{1}{k'}\ln\left|\frac{D}{V}\right|$$

$$\frac{1}{k'}\left[\ln\frac{D/V}{D/V-k'C}\right]=t$$

$$\frac{D/V}{\frac{D}{V}-k'C}=e^{k't}$$



What about the condition when after the dose, what is the concentration in the blood?




$$\frac{dC}{dt} = \frac{D}{V}^{0} - k'C$$

$$\int_{C_0}^{C} \frac{dC}{-k'C} = \int_{t_d}^{t} dt$$

$$-\frac{1}{k'}\left[\ln \frac{C}{C_0}\right] = t - t_d$$

$$C = C_0 e^{-k'(t-t_d)}$$