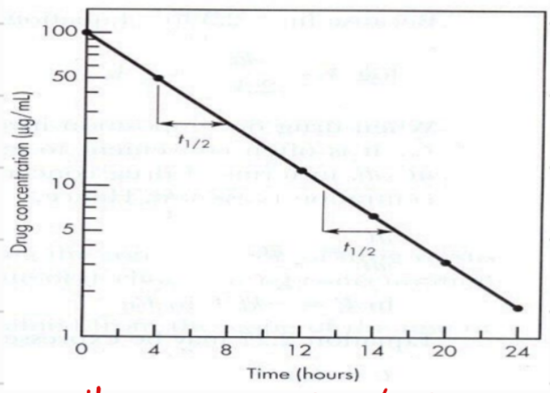
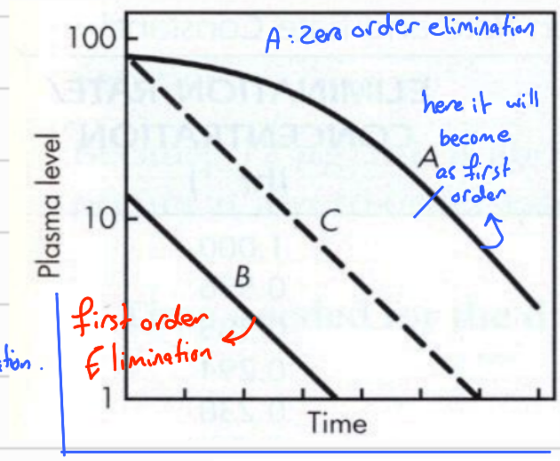
this Color means it is my understanding (عبدي ، الفكري)

* first order Drug Elimination
- it is occures when the rate of elimination is directly proportinal to the amount of drug in the body.
- Occures in many drugs at theraputic concentrations
- Constant fraction of the drug is eliminated per time
- the elimination rate constant is disegnated as k and the Unit is fraction per time (1/time)



* the y axis is logartmeic scale so it will never be zero

* Zero-Order Drug Elimination
- Saturable elimination, occure with few drugs as aspirine, phenytoin, ethanol (as in alcoholic drinks)
- Elimination rate is not proportional to drug amount
- Constant Amount is removed per Unit time because the Saturation of elimination.

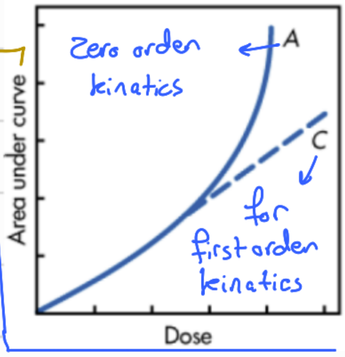


$$\text{Rate of elimination} = \frac{V_{max} \cdot C}{K_m + C}$$

V_{max} → maximal capacity of elimination

K_m ← Drug Conc where the elimination rate is 50 % of V_{max}

Area under the curve represent Bio availability



*now we talk about first order kinatics

* flow dependent Drug Elimination → some Drugs are cleared very rapidly by the organ of elimination (liver) so most of the drug perfusing the Organ is eliminated By first pass effect, and the rate of elimination determined By the hepatic Blood flow. This drug property called high extraction ratio.

* Half lif of elimination ($t\frac{1}{2}$): is the time required for the amount of drug in the Body or plasma Conc. of Drug to drop by 50 %

* in this Case it is Constant and not related to the dose

it will never reach 100 % eliminal because you deal with percentage not an amount.

Half-lives	% of drug removed
1	50
2	75
3	87.5
4	93.75

* After 4 Half lives, most of the drug will be eliminated from the body

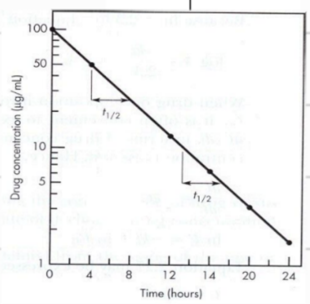
* $k \times t\frac{1}{2} = 0.693$ → for all first order elimination.

* half life is related to volume of distribution and drug clearance

$$CL = k \cdot V_d \Rightarrow t\tfrac{1}{2} = \frac{0.693 \times V_d}{CL}$$

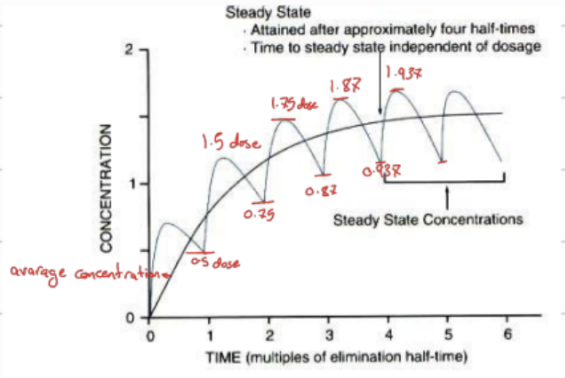
* there are 4 parameters of drugs

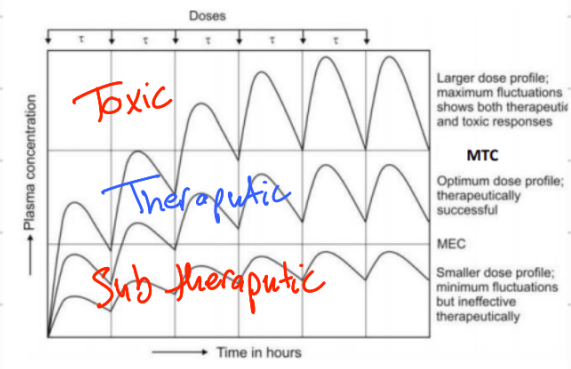
CL, Vd, $t\frac{1}{2}$, k

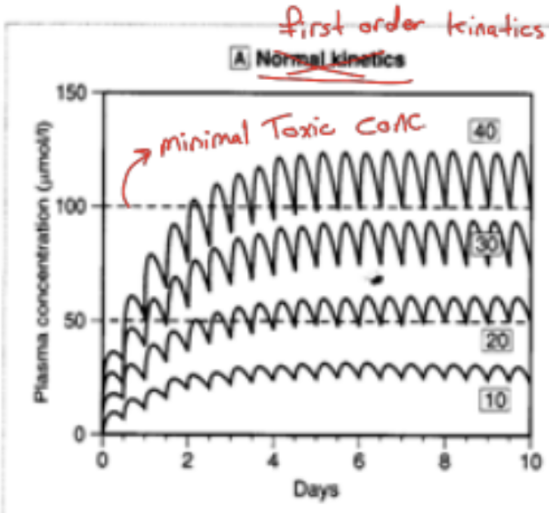


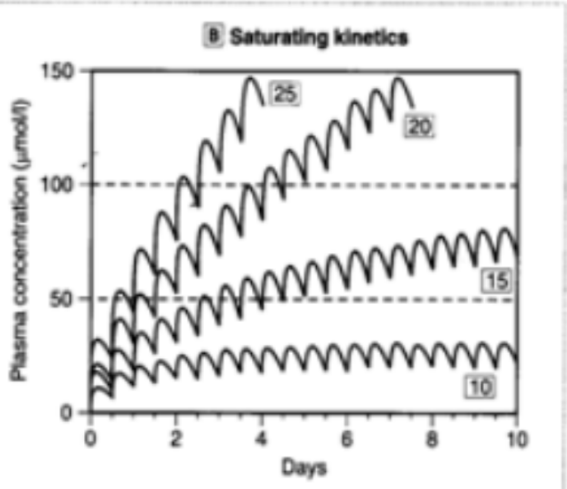
* in Zero-order elimination ⇒ Higher Conc. → longer Half life of elimination.
Dose and plasma conc. for drug under go zero order elimination ←

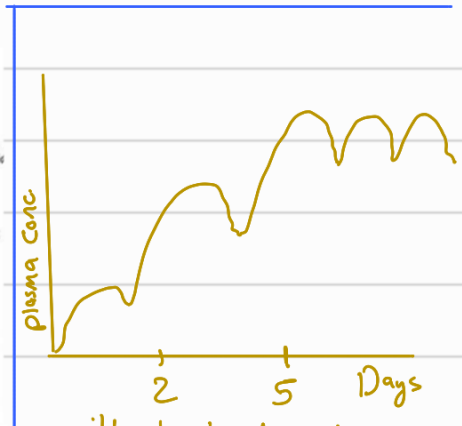
* Steady-State: Condition acheived following repeated drug administration
Simply it means state which drug is in static conc. in body حالة يكون فيها الدواء بتركيز ثابت
* it is occure when Dosing rate = eliminating rate
* in Steady-state a constant, trough and avarage drug conc. is acheived.
* it is acheived after 4 repeated half lives of adminstration.
* So our goal is to attain (Css) ⇒ steady-state conc. of drug in theraputic range not below it (sub theraputic) or toxic one.



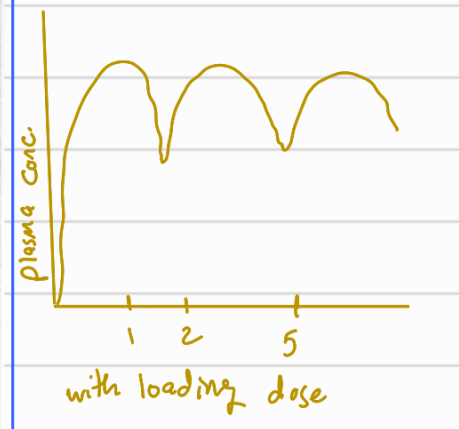








without loading dose



with loading dose

* Loading dose
• when the half life is too long, steady state will take along time to be acheived.
* So we may need to give a loading dose to acheive drug conc. within the theraputic range sooner.

$$LD = V_D \cdot C_{ss}$$

* Maintanance Dose
↳ to attain and maintain a desired Css of drug we need to adjust the dose so that, the drug adminstration is equal to the rate of drug elimination

$$MD = CL \cdot C_{ss}$$
↳ also called target conc.

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