High yield

Pharmacokinetics 4

Kidney: most important organ for excretion

EXCRETION OF DRUGS

- Glomerular filtration
- Proximal convoluted tubules (PCT)
- Distal convoluted tubules

1-Glomerular filtration

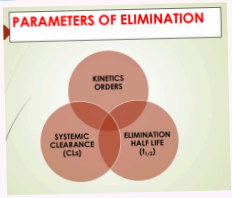
➢ All free drug molecules whose size is less than the glomerular pores are filtered into Bowman's capsule.

2-Proximal convoluted tubules (PCT)

Active secretion occurs either through
- acid carrier e.g. for penicillin, probenicid, salicylic acid.
- basic carrier for amphetamine and quinine.

3-Distal convoluted tubules (DCT)

- Lipophilic drugs may be reabsorbed back to systemic circulation.
- Alkalinization of urine keeps acidic drugs ionized and increases their excretion.
- Acidification of urine keeps basic drugs ionized and increases their excretion.



KINETICS ORDERS

First order kinetics

Zero order kinetics

Other sites of excretion:

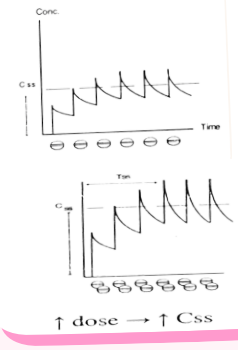
➢Bile: e.g. Doxycycline, Azithromycin.
➢Lungs e.g. Volatile anesthetics.
➢Saliva e.g. Iodides.
➢Sweat e.g Rifampicin.
➢Milk: this is important in lactating mothers.

If u can dream it , u can do it!

High yield

Pharmacokinetics 4

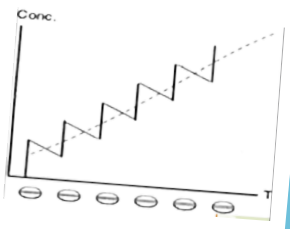
First order kinetics (most drugs):



- Rate of elimination is directly proportionate to the blood concentration of drugs (constant percentage of the drug is eliminated per unit of time)
- Constant "t1/2"
- Repeated dosing increases drug concentration and accordingly the rate of elimination increases till the rate of administration equals the rate of elimination.
- Css can be reached after 4-5 t1/2
- Css is directly proportionate to the dose.

Zero order kinetics (phenytion and salicylate

- Rate of drug elimination is constant i.e. constant amount of drug is eliminated per unit of time.
- "t1/2" (half life) is not constant.
- No Css is reached by repeated dosing.
- Any change of the dose may cause toxicity.
- Some drugs follow 1st order kinetics in small dose and zero order kinetic at large doses i.e. the elimination mechanism is said to be saturated (saturation kinetics).



Factors affecting elimination "t1/2":

- State of eliminating organs i.e. liver & kidney function.
- Delivery of drugs to the eliminating organs: affected by plasma protein binding and Vd of the drug.

Importance of elimination T1/2:

- It determines the dosage interval (T).
- It indicates time required to attain Css (about 4-5 t1/2):
- If "t1/2"is very short (minutes), the drug should be given by IV infusion [dopamine].
- If "t1/2"is long [digoxin], the drug should be administered in loading dose followed by maintenance dose

ELIMINATION HALF LIFE (t1/2)

- It is the time required to reduce the plasma concentration of the drug to half the initial concentration (the time required for drug concentration to be changed by 50%).
- T1/2 =0.7Vd/CLs

Systemic clearance

- It is the volume of fluid cleared from the drug per unit of time.
- Systemic CLs = Renal clearance (CLr) + non- renal clearance (CLnr)

Significance of clearance:

- Calculation of the maintenance dose
- Loading dose: The dose required to achieve a desired plasma concentration (desired Css) rapidly, followed by routine maintenance dose.
  Loading dose = Vd ×TC
- Maintenance dose: The dose given to maintain the desired Css.
  Maintenance dose = CLs ×TC (Target concentration).

لعلّك تنتظر كلمةً تُهدّئ قلبك؟

أو رسالةً تُطمئن صدرك، أو آيةً تُشعل همّتك، أو فكرةً توضّح غايتك، لعلّك من كثرة المحاولات تَعِبت، ومن شدّة المكابَدات اهتَرأت! لا بأس، جئت أهمس لك: [إِنَّا لَا نُضِيعُ أَجْرَ مَنْ أَحْسَنَ عَمَلًا] كُلّ شعورٍ مؤلم، وجرحٍ عميق، وخطوةٍ صادقة، ومحاولةٍ دائمة، لن تضيع! ما دُمتَ صادقًا، لَو لَم تَرَ النّتائج اليوم، تقطف ثمرة الصّبر غدًا

Done by : Boshra Alqudah