**Learning unit: Basics of pharmacokinetics**

**Impact of the learning unit:**

To gain knowledge of pharmacokinetics, together with knowledge of the mechanism of action of drugs, and to select an appropriate drug administration route, dosage form, and dose of the drug. This will enable students to predict changes in the effect of the drug due to various factors such as comorbidities, age, sex or concomitant medications.

**Important terms**

movement of drug molecules across biological membranes within the body

 diffusion through the phospho-lipid bilayer

 diffusion through membrane pores

 carrier-mediated transport

 facilitated transport

 active transporters

binding of drugs to plasma proteins

pharmacokinetic processes

pharmacokinetic parameters

 primary

 secondary

invasion of drug

drug absorption

maximum concentration of drug achieved in plasma (cmax)

time needed to achieve maximum plasma concentration (tmax)

bioavailability (F)

absolute

relative

 bioequivalence

area under the curve (AUC)

absorption rate constant (ka)

pre-systemic elimination

 first-pass effect

P-glycoprotein

 cytochrome P450

distribution of drugs

rate of distribution

distribution equilibrium

volume of distribution (Vd)

redistribution

drug elimination

clearance (Cl)

elimination rate constant (ke)

half-life (T1/2)

1st order kinetics (linear kinetics)

zero order kinetics (non-linear kinetics, saturation kinetics)

drug metabolism

phase 1 reactions

phase 2 reactions

cytochrome P450

induction of P450

inhibition of P450

genetic polymorphism of biotransformation enzymes

biodegradation and bioactivation of drugs and prodrugs

drug excretion

alteration of excretion

renal excretion

glomerular filtration

tubular secretion

tubular reabsorption

liver excretion

enterohepatic recirculation

factors affecting pharmacokinetic processes

pharmacokinetic interactions

**Learning outcomes**

Students will know the principles of drug molecule movement across the cell barriers in the body

Students understand individual pharmacokinetic processes and know which pharmacokinetic parameter they describe

Students know and can explain the principles of linear and non-linear pharmacokinetics

Students can predict basic pharmacokinetic interactions and understand their mechanism.

Students can calculate the dose of a drug based on the required plasma concentration, distribution volume and bioavailability.

Students can calculate time needed to eliminate the drug based on T1/2.

**Study materials:**

Rang & Dale’s pharmacology: Chapters 8,9,10 (pp. 101-131)

Handouts and lecture No. 3