

XENOBIOCHEMISTRY

Lecture syllabus

- 1st week:** Introduction to Xenobiochemistry. Interdisciplinary position of Xenobiochemistry. Importance of Xenobiochemistry for Pharmaceutical Sciences. Endobiotics and xenobiotics. **(Dr. Andrea Balažová)**
- 2nd week:** Major pathways of drug biotransformation – Phase I and Phase II. Phase I enzymes: monooxygenase systems, terminal oxygenases, cytochromes P450, mechanism of oxygenation by cytochrome P450; microsomal MFO systems – isoenzymes and their specificity. Flavin-containing monooxygenases, FMO isoenzymes, the mechanism of oxygenation by FMO, and monoamine oxidases. **(Dr. Andrea Balažová)**
- 3rd week:** Phase I enzymes – reductases, classification, substrate specificity. Hydrolases – mechanisms of hydrolysis of esters, thioesters, amides, and epoxides. Hydrolysis of cocaine and of conjugates formed in Phase II of biotransformation. **(Dr. Andrea Balažová)**
- 4th week:** Phase II enzymes: Glucuronidation, sulfonation, and conjugation with glutathione. Examples of drugs **(Dr. Andrea Balažová)**
- 5th week:** Phase II enzymes: Acetylation, methylation, and conjugation with amino acids. Examples of drugs. Drug transporters. **(Dr. Andrea Balažová)**
- 6th week:** Regulation of drug-metabolising enzymes: inhibition and induction of biotransformation enzymes and their consequences.
- 7th week:** Regulation of drug-metabolising enzymes: effect of epigenetic factors on the activity of biotransformation enzymes. **(Dr. Andrea Balažová)**
- 8th week:** Factors affecting the biotransformation of xenobiotics: effect of circadian rhythms on biotransformation processes. **(Dr. Ema Balažová)**
- 9th week:** Factors affecting the biotransformation of xenobiotics: intra- and interspecific variability. **(Dr. Andrea Balažová)**
- 10th week:** Pharmacogenomics and personalised medicine in xenobiochemistry. **(Dr. Ema Balažová)**
- 11th week:** Drug toxicity. Mechanisms of drug resistance. **(Dr. Andrea Balažová)**
- 12th week:** Biotransformation of xenobiotics in extrahepatic tissues and organs. Importance of intestinal microflora in biotransformation processes. **(Dr. Andrea Balažová)**
- 13th week:** Metabolism of xenobiotics in plants. Classification of pollutants and their impact on the human organism. **(Dr. Andrea Balažová)**
- 14th week:** Xenobiochemistry review: an integrated view of xenobiotic biotransformation (from molecule to patient and environment). **(Dr. Andrea Balažová)**

Laboratory practices - syllabus

10th week: Determination of liver microsomal marker: C-hydroxylation of aniline.
Presentation of seminary reports. (**Dr. Andrea Balažová, Dr. Ema Balažová**)

11th week: Determination of liver microsomal marker: N-demethylation of amidopyrine.
Presentation of seminary reports. (**Dr. Andrea Balažová, Dr. Ema Balažová**)

Conditions for admission to the final exam:

1. Attendance at all practicals.
2. Submission of a seminar report on an assigned topic.
3. The exam will be organised in written form