

TU02 Infectiology

ECTS: 5

Second term

Head: Marion Lussignol

Learning objectives

The courses and personal work in infectiology will reinforce the basic knowledge of students on viruses, bacteria, parasites and fungi biology, as well as the host response and the strategies developed for the control of the main infectious diseases.

Program

Virology, Bacteriology, Parasitology and Medical Mycology (Lectures: 27h, Tutorials: 6h)

A- Virology

- Basic knowledge in virology
- Virus-host interactions
- Update on various viruses worldwide: human immunodeficiency virus (HIV), hepatitis viruses (HBV, HCV), herpes viruses, coronaviruses and influenza viruses (virus structure, multiplication cycle, diagnosis, pathologies and associated symptoms)
- Major human arboviruses and tropical viral diseases (virus structure, multiplication cycle, diagnosis, pathologies and associated symptoms)

Tutorials

- Work 1 (by binomial): 1 virus, 1 pathology (related to student home countries) (15 min presentation and 15 min discussion / questions)
- publication analysis : tutorial on a step-by-step analysis of a virology publications

B- Bacteriology

- Structure of the bacterial surface
 - Bacterial morphology and cell wall. Lysozyme resistance, capsule, peptidoglycan, S-layer, spores
 - Lipopolysaccharide and flagella
- Bacterial genetics and gene regulation
 - Gene support and gene transfer
 - Gene regulation. Transcriptional regulation, operon, regulon, transcriptional attenuation, ncRNA, riboswitches, posttranscriptional regulation, quorum sensing
- Bacterial toxins
 - Classification, mechanisms of action and regulation
- Bacterial spore
 - Anatomy and regulation
- Host response
 - Innate and adaptive host immune response, mucosal response

C- Parasitology and medical mycology

- Biological diversity of parasites, life cycles and environmental risks
- Vector control
- Environmental risks from existing and emerging parasites
- Mechanism of action of antiparasitic drugs
- Biological diversity of fungi of medical importance
- Mechanism of action of antifungal drugs

Tutorials

Analyses of scientific articles by binomial with 15 min presentation and 15 min discussion/questions

Competences

- Thorough knowledge of the basic knowledge in infectiology (virology, bacteriology, parasitology and mycology) in order to understand the strategies developed to control infectious diseases and to overcome drug resistance
- Understanding of the main issues about the needs to discover new therapeutic molecules, to improve the prevention and the diagnosis
- Critical analysis of literature documents
- Relational, collaborative, and communication skills (written and oral)

Bibliography

- Carroll K.C., Pfaller M.A. Manual of Clinical Microbiology. Edited by K.C. Carroll, M. A. Pfaller. Twelfth Edition, 2019
- A. Sails, Y-W. Tang. Current and Emerging Technologies for the Diagnosis of Microbial Infections. Volume 42, 2015
- Fields Virology, Lippincott Williams & Wilkins, 6th edition, 2015
- KD Chatterjee. Parasitology (Protozoology and Helminthology), CBS; 13th Edition, 2015
- Textbook of Medical Mycology, Jagdish Chander, Jaypee Brothers Medical Publishers; 4th edition, 2018

Assessment

Session 1:

Virology: 27 % written exam+ 10% continuous assessment

Bacteriology: 26 % written exam

Parasitology: 27% written exam, 10% continuous assessment

Session 2:

20% of continuous assessment (we keep the grade) + 80% written/oral exam (depending on the number of students).

TU07 The medicinal chemist's toolbox I

ECTS: 5

Second term

Head: Sandrine Delarue-Cochin

Learning objectives

- Knowledge of the main strategies developed in drug discovery.
- Knowledge enhancement of organic chemistry teachings initiated during the bachelor's degree.
- Application of organic chemistry to the synthesis of natural and synthetic drugs.

Program (Lectures 28 h and Tutorials 4 h)

A- Introduction (4 h)

- Main strategies of drug discovery for synthetic drugs and natural products

B- Refresher training (3 h)

- Basics of reactivity in organic chemistry

C- Fundamental approaches for the synthesis of natural and synthetic drugs (14 h)

- C-C bond formation: interest in medicinal chemistry
- C-N and C-O bond formation: interest in medicinal chemistry.

D- (Hetero)aromatics in medicinal and natural product chemistry (7 h)

- Selective functionalization of aromatic and heteroaromatic derivatives: interest in medicinal chemistry

E- Tutorial (4 h)

- Exercises

Competences

Mastering theoretical basic skills in organic chemistry allowing the design and synthesis of natural and synthetic compounds as well as understanding the interest of introducing different functions for medicinal chemistry.

Bibliography

A document including basics in chemistry will be provided to the student before the beginning of the courses.

Recommended book on organic chemistry:

- for a basic view: Foundation of organic chemistry (Oxford chemistry Primers)

- for a comprehensive view: Organic Chemistry: Structure and Function of
K. P. C. Vollhardt

Assessment

Session 1

100% Written exam

Session 2

100% Written exam

TU11 Pharmacology/Toxicology 1

ECTS: 5

Second term

Head: Saadia Kerdine-Römer

Learning objectives

Introduce to the students the general notions in pharmacology and toxicology and the main *in vitro* and *in vivo* experimental methods and strategies developed in toxicology, pre-clinical pharmacology (cardiovascular, central nervous system), pharmacokinetics and clinical pharmacology.

Program (Lectures 12 h, Tutorials 12h)

A- Generalities (x h)

- Metabolism, generalities in pharmacology, generalities in toxicology, animal experiments (classical models, transgenic mice), definition of the 3Rs

B- In vivo models (x h)

- Pharmacology models: neurodegenerative pathologies (study methods, parameters, relationships with the clinic), Anxious and depressive disorders (study methods, parameters, relationships with the clinic), cardiovascular models.
- Toxicology models: methodologies in reprotoxicology and immunotoxicology; Carcinogenesis methodologies, methodologies in cardiology.
- Pharmacokinetics

C- In vitro models (x h)

- Development of an alternative method; cell lines, 3D models, chips; cellular models in pharmacology and toxicology; AOP.

D- Tutored project (x h)

- A poster will be developed and presented orally

Competences

- Knowledge of the general principles and parameters of pharmacology, toxicology and pharmacokinetics applied to health products
- Knowledge of the evaluation models in pharmacology and toxicology
- Critical analysis of bibliographic experimental data related to pharmacology, toxicology and pharmacokinetics

Bibliography

- Casarett & Doull's Toxicology: The Basic Science of Poisons (C.D. Klassen)
- Principles and Methods of Toxicology (A.W. Hayes, C.L. Kruger)
- The Pharmacological Basis of Therapeutics (Goodman & Gilman, Ed. McGraw-Hill) 2017

Assessment

Session 1

Written exam (60%), continuous assessment (10%), tutored project (30%)

Session 2

100% Written exam

For the RU01 Symposium preparation,

The idea is the preparation of a 2-days symposium that will take place on June 28-29th 2027. The students will work altogether for the programme of the 2 days, make the invitation of the guest speakers, look for fundings, do the communication, etc. We started small when the master opened, last year we got more participants as we opened it in EUGLOH and we got students presenting posters from the different EUGLOH partners. We got funding also from EUGLOH. The 2 things, important for us, are really to internationalize this symposium and we have all our M2 students who have to present their research work during the symposium as they are assessed. For the remaining things, it is quite open.