BIO-494

Scientific project design in drug discovery

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Cursus	Sem.	Type
Bioengineering	MA1, MA3	Opt.
Life Sciences Engineering	MA1	Opt.
Sciences du vivant	MA1, MA3	Opt.

Language of teaching	English
Credits	5
Withdrawal	Unauthorized
Session	Winter
Semester	Fall
Exam	During the semester
Workload	150h
Weeks	14
Hours	**5 weekly**
Courses	2 weekly
Exercises	3 weekly
Number of positions	**10**

Il n'est pas autorisé de se retirer de cette matière après le délai d'inscription.

Remark

only one registration per student to a scientific thinking course

Summary

The goal of this course is to instruct the student how fundamental scientific knowledge can be applied for drug discovery and development. We will demonstrate these principles with examples, including obesity, diabetes, and atherosclerosis.

Content

General principles of drug development [target-based versus whole cell-based screens, target identification, target validation, screening, hit to lead optimization, rational drug design, process research, efficacy, toxicity / safety, preclinical & clinical development, ,..

- Use of animal models and human genetics in drug discovery
- The business environment [markets, patients/consumers, competitors]
- Project management [sponsors, stake-holders and their expectations, checkpoints, milestones, execution]
- Commercialization [business plan, regulatory, product launch, Intellectual property]
- Pathophysiology and therapeutic strategies for disorders of energy balance and mitochondrial function [fasting-feeding cycles, nutrition, hormonal control of energy homeostasis, obesity, diagnosis, pathogenesis, prevention and treatments]
- Pathophysiology and therapeutic strategies for cardio-metabolic diseases [type-2 diabetes, atherosclerotic heart disease, lipid homeostasis, chronic inflammation, diagnosis, pathogenesis, prevention and treatment]
- Case studies

Keywords

Drug discovery
Drug development
Drug targets
Screening
ADME/T
Drug-drug interactions Pharmacology

Learning Prerequisites

Required courses

Bachelor in Life Sciences, Physical Sciences, Pharmacology or equivalent

Recommended courses

Physiology
Chemistry
Biochemistry
Pharmacology

Important concepts to start the course

History of chemotherapy and the design of randomised clinical trials. Nature of drug targets and the mechanisms of action of some commonly used drugs and antibiotics. Hit-finding, hit-to-lead and lead optimisation towards a candidate drug.

Learning Outcomes

By the end of the course, the student must be able to:

- Explain concept of combination therapy
- Assess / Evaluate the effect of comorbidities
- Estimate pharmacological properties using in vitro ADME/T
- Explore possible drug-drug interactions
- Propose new combination therapies to treat comorbidities
- Discuss current drugs and their effects
- Estimate the economic impact
- Report potential societal value

Transversal skills

- Use a work methodology appropriate to the task.
- Access and evaluate appropriate sources of information.
- Communicate effectively with professionals from other disciplines.
- Give feedback (critique) in an appropriate fashion.
- Manage priorities.
- Make an oral presentation.
- Write a literature review which assesses the state of the art.
- Plan and carry out activities in a way which makes optimal use of available time and other resources.

Teaching methods

After ex-cathedra introduction sessions, detailing the pathophysiology of some common metabolic diseases, the teaching proceeds with weekly sessions of office hours and group work in close collaboration with the teacher. Scientific publications will be analyzed by individual students and presented to the group.

Expected student activities

Database searches
Literature reviews
Analysis of scientific articles
Presentation of salient points
Discussion of findings in a more general context

Assessment methods

- Continual assessment during the semester.

- Written Project.
- Oral defense of the project and questions on course work.

Resources

Bibliography

- Corey E.J., Czako B., Kurti L. Molecules and Medicines (2007)
- Kenakin T.P. A pharmacology primer, theory, applications and methods (Third Edition, 2009)
- Kasper D.L, Braunwald, E., Fauci A.S., Hauser S.L., Longo D.L. Jameson, J.L. Harrison,s Principles of Internal Medicine (17th Edition, 2008)
- Brunton L.L., et al. Goodman & Gilman,s: The pharmacological basis of therapeutics (12th Edition, 2011)

Ressources en bibliothèque

- Molecules and Medicines / Corey
- Goodman & Gilman's: The pharmacological basis of therapeutics / Brunton
- Harrison's Principles of Internal Medicine / Kasper
- A pharmacology primer, theory, applications and methods / Kenakin

Prerequisite for

Masters