

BIO-494

Scientific project design in drug discovery

Auwerx Johan

Cursus	Sem.	Type
Life Sciences Engineering	MA1, MA3	Opt.

Language of teaching	English
Credits	4
Withdrawal Session	Unauthorized Winter
Semester	Fall
Exam	During the semester
Workload	120h
Weeks	14
Hours	4 weekly
Lecture	1 weekly
Exercises	3 weekly
Number of positions	10

It is not allowed to withdraw from this subject after the registration deadline.

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 virtual screening, in vitro screening, lead optimization and clinical trials.

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 mitochondrial and neuro-muscular function [fasting-feeding cycles, nutrition, hormonal control of energy homeostasis, obesity, diagnosis, frailty, sarcopenia, Alzheimer disease, pathogenesis, prevention and treatments]
- * Pathophysiology and therapeutic strategies for selected target diseases
- * Case studies

Keywords

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

Learning Prerequisites**Recommended courses**

Physiology
Chemistry
Biochemistry
Pharmacology

Important concepts to start the course

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

Learning Outcomes

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

- Propose new combination therapies to treat comorbidities

Transversal skills

- Plan and carry out activities in a way which makes optimal use of available time and other resources.

Teaching methods

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. A druggable target relevant for a specific disease will then be selected by the group of students. Students will work in small groups to develop a complete strategy to design, select and optimize a candidate drug.

Expected student activities

Database searches
Literature reviews
Analysis of scientific articles
Team discussion with the teaching assistants during the class hours
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., Czado 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, Principles of Internal Medicine (17th Edition, 2008)
- * Brunton L.L., et al. Goodman & Gilman, The pharmacological basis of therapeutics (12th Edition, 2011)
- * Shimasaki C, Biotechnology Entrepreneurship - leading, managing, and commercializing Innovative technologies (2nd Edition, 2020)

Ressources en bibliothèque

- Shimasaki. Biotechnology Entrepreneurship - leading, managing, and commercializing Innovative
- Brunton. Goodman & Gilman,s The pharmacological basis of therapeutics
- Corey. Molecules and Medicines
- Kasper Principles of Internal Medicine
- Kenakin. A pharmacology primer, theory, applications and methods

Moodle Link

- <https://go.epfl.ch/BIO-494>