Study Plan

Advanced Models for Predictive Toxicology

The course is structured into four modules to ensure a balanced coverage of lectures on theoretical and practical case-based discussions presented during a dedicated course with limited attendance. Each module includes a combination of lectures, interactive discussions, and short workshop sessions. In the end, the students are expected to orally present a group assignment consisting of a proposal for a research project.

Module 1. Advanced in vitro systems in safety assessment.

1. Beyond 2D cell cultures: how 3D models are changing the in vitro studies;
2. Spheroids and organoids: advantages and applications;
3. 3D in vitro skin tests: corrosion, irritation and sensitization tests;
4. 3D in vitro eye toxicity tests: the retina model;
5. Reproductive and developmental toxicity 3D in vitro tests;
6. Carcinogenicity and genotoxicity 3D in vitro tests;
7. Microphysiological systems and organ-on-a-chip: bridging in vitro and in vivo physiology.

Module 2. Emerging in vivo models.

1. Challenges of conventional animal models;
2. Zebrafish: a case study;
3. Humanized models: engrafted mice (e.g., immune-humanized, tissue-humanized);
4. Avatar models: patient-derived xenografts (PDX).

Module 3. Personalized and predictive toxicology.

1. Stem cells in drug development;
2. Patient-derived iPSCs for personalised toxicology;
3. Bioinformatic tools in safety assessment;
4. Data integration from non-clinical assays for prediction of clinical conditions.

Module 4. Student oral presentations of research project assignment.