

5th Interdisciplinary Course on Antibiotics and Resistance (ICARe)

Octobre 16-24, 2021, Les Pensières, Annecy (France)

Course Director: P. Courvalin, Institut Pasteur

Scientific Advisors: M. Gilmore, Harvard Medical School, G. Wright, McMaster University

Scientific Committee: G. Challis, T. Dougherty, E. Duffy, D. Hughes, S. Lahiri, F. Lebreton, S. Lory, A. Myers, S. Projan, J. Rex, H.-G. Sahl, M.-W. Tan, U. Theuretzbacher

Objective: The emergence and spread of bacteria resistant to many drug classes seriously threaten all branches of modern medicine. There is currently no course providing advanced instruction on antibiotics and resistance. The specific goal of ICARe is to bring leaders in academics and industry together with trained scientists at the dawn of their careers. Cutting-edge approaches for the study of resistance and antibiotic discovery will be examined.

Course: The faculty, composed of 40 internationally recognized scientists and physicians who have made important contributions to antibiotic development, infectious diseases and resistance management will be in residence for a minimum of two days for informal interactions. Graduates will emerge with a state-of-the-art understanding of existing antibiotics: modes of action, mechanisms of resistance, approaches for mining chemical space, advancing hits to leads, the application of next generation nucleic acid-based technologies for antibiotic discovery and resistance detection. The course aims to build an international cadre of collaborative, well networked, and highly trained specialists.

Audience: ICARe is designed for assistant professors, post-doctoral and ID fellows, new scientists from diagnostic, pharmaceutical industry, or from biotech, either working in or contemplating entering the field of antibiotics. Decision-makers involved in the discovery, development, and approval of new antibiotics, in the elaboration of programs for better use of antibiotics and reducing the development of resistance. From both the public and private sectors. Attendance will be limited to 40 students.

Selection criteria: Participants will be selected by the Scientific Committee that will ensure that the participants reflect the global nature of the problem with a special attention to gender equality, according to their educational background, involvement in the field of antibiotics (research projects, scientific or industrial, which could be presented during the course are welcome), decision-making responsibility in the finding of new antibiotics and of their appropriate use

Format: The course will be administered over 9 days and will consist of formal instruction and hands-on bioinformatics.

Online registration:<http://icarecourse.org>

Deadline for application: July 14th, 2021

ICARe outline

Antibiotic resistance and discovery

Antibiotic resistance is a global and medical problem
Overview of antibiotic R&D: history and strategies
The socio-economic challenges of antibiotic discovery

Modes of action and mechanisms of resistance of existing classes

Cell wall: Structure, synthesis, and targets
Outer- and Inner-membrane: Structure and function
Penicillin-binding proteins, beta-lactams, beta-lactamases and inhibitors
Glyco-lipopeptides
Ribosome: Structure and function
 Antibiotics active against the large subunit
 Antibiotics active against the small subunit
Inhibitors of metabolism
Nucleic acid synthesis, replication, transcription: Inhibitors of type II topoisomerases, rifampicin, fidaxomicin
Efflux: structure-function of efflux systems and inhibitors
Influx-Efflux in *P. aeruginosa*
Cationic peptides

Origin, mutations, and transfer of resistance

Origins of resistance genes
Mutations, selection, biological cost, compensation
Mobile genetic elements

Antibiotic discovery

Antibiotic chemical space in Gram-positives and -negatives
Antibiotic chemical matter: Natural products, synthetics
New approaches in natural products discovery
Screens, hit generation, and hit to lead
Systems biology to guide antibiotic discovery and mode of action

Antibiotic development and approval

Preclinical PK/PD and optimizing leads
Preclinical toxicity assessment
Pathways to approval and commercialization
New pathways to antibiotic registration

Strategies for more focused applications of antibiotics

Targeting biofilm, virulence, site specific delivery
Antibiotics under development
Antibiotic combinations and adjuvants

Susceptibility determination and identification of resistance mechanisms

Antibiogram: phenotypic techniques and clinical categorisation
Rapid techniques and point-of-care diagnostics
Diagnostic stewardship: Optimizing the treatment of infections
Mass spectrometry

New anti-infective strategies

Antibodies and engineered antibodies, vaccines, bacteriophages
Microbiome and antibiotics

Bioinformatics

Genomic epidemiology
Real time sequencing of epidemic clones or resistance genes
Novel resistance mechanisms and the chimera of in silico antibiograms
Computer guided design of novel therapeutics
Finding resistance genes in bacterial genomes (ResFinder and CARD)
Finding biosynthetic gene clusters in bacterial genomes (antiSMASH)
Genome based analysis of resistant lineages or outbreak isolates (PathogenWatch, Microreact)
Phylogenetic analyses of bacterial genomes (iTOL)