

5th Interdisciplinary Course on Antibiotics and Resistance (ICARe)

Director:

P. Courvalin, Institut Pasteur, France

Scientific Advisors:

G. Wright, McMaster University, Canada

M. Gilmore, Harvard Medical School, USA

Scientific Committee:

G. Challis, University of Warwick, UK

T. Dougherty, Harvard Medical School, USA

E. Duffy, CARB-X, USA

D. Hughes, Uppsala University, Sweden

S. Lahiri, Boehringer Ingelheim, USA

F. Lebreton, Walter Reed, USA

S. Lory, Harvard Medical School, USA

A. Myers, Harvard University, USA

S. Projan, Beat the Reaper, USA

J. Rex, F2G, UK

H.-G. Sahl, University of Bonn, Germany

M.-W. Tan, Genentech/Roche, USA

U. Theuretzbacher, CAIA, Austria

Organizing Committee :

C. Grillot-Courvalin, Institut Pasteur, France

B. Pansier, Fondation Mérieux, France

Core faculty

J. Ambler, Wockhardt Pharmaceuticals, USA

D. Andes, University of Wisconsin, USA

H. Boucher, Tufts Medical Center, USA

S. Brisse, Institut Pasteur, France

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G. Challis, University of Warwick, UK

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J.-F. Collet, Université de Louvain, Belgique

P. Courvalin, Institut Pasteur, France

G. Cox, University of Guelph, Canada

L. Debarbieux, Institut Pasteur, France

J.-D. Docquier, University of Siena, Italy

T. Dougherty, Harvard Medical School, USA

E. Duffy, CARB-X, USA

M. Fisher, St Georges University, UK

M. Gilmore, Harvard Medical School, USA

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S. Harbarth, Hopitaux de Genève, Switzerland

D. Hughes, Uppsala University, Sweden

F. Lebreton, Army Institute of Research, USA

S. Lory, Harvard Medical School, USA

B. Luisi, University of Cambridge, UK

A. Mankin, University of Illinois, USA

H. Moser, Novartis, USA

A. Myers, Harvard University, USA

E. Pamer, University of Chicago, USA

R. Patel, Mayo Clinic, USA

M. Pinho, Universidade Nova de Lisboa, Portugal

S. Projan, Beat the Reaper LLC, USA

M. Pucci, Spero Therapeutics, USA

J. Rex, F2G, UK

H.-G. Sahl, University of Bonn, Germany

M.-W. Tan, Genentech/Roche, USA

U. Theuretzbacher, CAIA, Austria

M. Vazquez-Laslop, University of Illinois, USA

G. Wright, McMaster University, Canada

Program

Saturday, October 16

14:00 **General orientation of the course:** P. Courvalin, M. Gilmore, and G. Wright

14:15 Les Pensières: B. Pansier

Antibiotic resistance and discovery

14:30 Antibiotic resistance is a global problem (S. Harbarth, CH)

15:30 Syndemics of antibiotic resistance and Covid (H. Boucher, US)

16:30 *Break*

17:00 Antibiotic R&D: History and strategies (T. Dougherty, US)

18:00 The socio-economic challenges of antibiotic discovery (E. Duffy, US)

19:00 Presentation of the participants

19:30 *Dinner*

Sunday, October 17

Modes of action of and mechanisms of resistance to existing classes

Cell wall

8:30 Cell wall structure, synthesis, and targets (H.-G. Sahl, DE)

10:00 *Break*

10:30 Outer membrane barrier (J.-F. Collet, BE)

11:30 Inner membrane barrier (J.-F. Collet)

Evaluation

12:30 *Lunch*

14:30 Penicillin-binding proteins (M. Pinho, PT)

15:15 β -lactams and β -lactamases (J.D. Docquier, IT)

16:00 β -lactamase inhibitors (J.D. Docquier)

16:45 *Break*

17:15 Glyco-lipopeptides (P. Courvalin, FR)

18:00 Panel discussion

Evaluation

18:30 Presentation of the participants

19:30 *Dinner*

Monday, October 18

Modes of action and mechanisms of resistance to existing classes (continued)

Ribosomes

8:30 Ribosome structure and function (A. Mankin, US)

10:00 *Break*

10:30 Antibiotics active against the large subunit (N. Vazquez-Laslop, US)

11:15 Antibiotics active against the small subunit (A. Mankin)

Evaluation

12:00 *Lunch*

14:00 Aminoglycoside resistance (G. Cox, CA)

14:45 Inhibitors of metabolism (E. Brown, CA)

15:30 *Break*

Nucleic acid synthesis, replication, transcription

16:00 Inhibitors of type II topoisomerases (M. Fisher, UK)

16:45 Rifampicin, fidaxomicin (G. Wright, CA)

17:30 CARB-X goals and progress (S. Chiang, US)

18:00 Panel discussion

Evaluation

18:30 Posters

19:30 *Dinner*

Tuesday, October 19

Modes of action of and mechanisms of resistance to existing classes (end)

Efflux

8:30 Structure-function of efflux systems and inhibitors (B. Luisi, UK)

9:30 Influx-efflux in *Pseudomonas aeruginosa* (S. Lory, US)

10:15 *Break*

10:45 Cationic peptides (M. Pucci, US)

11:30 Bioinformatics : General concepts (F. Lebreton, US)

Evaluation

12:15 *Lunch*

Origin, mutations, and transfer of resistance

14:15 Origins of resistance genes (G. Wright)

15:00 Mutations, selection, biological cost, compensation (D. Hughes, SE)

16:00 *Break*

16:30 Mobile genetic elements (P. Courvalin)

17:15 Overview of antibiotic resistance and persistence mechanisms (D. Hughes)

18:15 Panel discussion

Evaluation

18:45 Posters

19:30 *Dinner*

Wednesday, October 20

Antibiotic discovery

Antibiotic chemical space

8:30 Gram-positives, -negatives (H. Moser, US)

10:00 *Break*

Antibiotic chemical matter: Natural products

10:30 Natural products (G. Challis, UK)

11:30 Synthetics (A. Myers, US)

12:30 Panel discussion

Evaluation

13:00 *Cheese and wine tasting*

Afternoon off

19:30 *Dinner*

Thursday, October 21

Antibiotic discovery (end)

9:00 Systems biology to guide antibiotic discovery and MOA (E. Brown)

10:00 Screens and hit generation (M.-W. Tan, US)

10:45 *Break*

Antibiotic development and approval

11:15 Hit it to lead (T. Dougherty)

Evaluation

12:00 *Group picture, Lunch*

14:00 Preclinical PK/PD and optimizing leads (D. Andes, US)

14:45 Preclinical toxicity assessment (TBD)

15:30 *Break*

16:00 Pathways to approval and commercialization (J. Ambler, US)

16:45 New pathways to antibiotic registration (J. Rex, US)

17:45 Panel discussion

Evaluation

18:15 Posters

19:30 *Dinner*

Friday, October 22

Strategies for more focused applications of antibiotics

8:30 Targeting biofilm (L. Burrows, CA)

9:15 Targeting virulence (S. Lory)

10:00 *Break*

10:30 Antibiotic combinations and adjuvants (G. Wright)

11:15 Site specific delivery (M. Gilmore, US)

12:00 Panel discussion

Evaluation

12:30 *Lunch*

14:00 Bioinformatics: applications (S. Brisse, FR)

15:00 Bioinformatics (hands-on, optional) (F. Lebreton, S. Brisse)

Evaluation

18:30 Posters

19:30 *Dinner*

Saturday, October 23

Susceptibility determination and identification of resistance mechanisms

8:30 Antibiogram: phenotypic techniques and clinical categorization (R. Canton, ES)

9:15 Rapid techniques and point-of-care diagnostics (A. van Belkum, FR)

10:00 *Break*

10:30 Mass spectrometry (J.P. Charrier, FR)

New anti-infective strategies

11:15 Antibodies and engineered antibodies (M.-W. Tan)

Evaluation

12:00 *Lunch*

14:00 Vaccines (J. Grad, US)

14:45 Bacteriophages (L. Debarbieux, FR)

15:30 *Break*

16:00 Microbiome and antibiotics (E. Pamer, US)

17:00 Panel discussion

Evaluation

Global evaluation of the course

18:30 *Cocktail*

19:30 *Dinner*

8:30 Antibiotics under development (U. Theuretzbacher, AT)

9:30 Diagnostic stewardship: Optimizing the treatment of infections (R. Patel, US)

10:30 *Break*

11:00 How to return to the future (S. Projan, US)

Evaluation

12:00 *Lunch*