Eurolife Summer School 2017

10th-14th July 2017

Antimicrobial drug resistance – Research and Innovation

University of Barcelona
Barcelona Institute of Global Health (ISGlobal)
Spanish Network for Research in Infectious Diseases (REIPI)

Organizers:

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Course coordinator: Dr. Clara Ballesté Delpierre

Background:

Antimicrobial resistance is a major global threat. The number of bacterial isolates showing resistance, and particularly, multi-drug and extended-drug resistance (MDR and XDR) has increased in the last decades. Consequently, there is a decrease in the availability of antimicrobial agents active against these resistant bacteria, which has important health concerns. International organizations such as the World Health Organization and the European Centre for Diseases Control have recognized infections caused by MDR bacteria as a priority for global health action. The economist O'Neill has recently published an exhaustive review ("Tackling drug-resistant infections globally") reporting over 700,000 people deaths per year worldwide attributable to MDR bacterial infections, with predicted figures for 2050 of 10 million deaths unless new policies and actions are implemented. Undoubtedly, we are facing a global health problem with major economic implications, as infections last longer and become more expensive to treat, with longer in-hospital stays required in many cases. Therefore, important efforts need to be destined to search for new strategies to combat this problem that involves both clinical and social areas.

The current situation is the result of abuse of antibacterial agents and poor prescription practice in both the clinical settings to treat human infections and the indiscriminate use of prophylaxis and treatment of infections in animals from food

industry. The MDR and XDR bacteria arrive to humans through direct contact but also through the food chain. Moreover, antibiotics accumulate in food and are subsequently passed on to humans through ingestion. In developing countries, in addition to these factors, the over-the-counter availability of antimicrobial agents, the lack of diagnostic laboratories, and in some cases the poor quality drugs (less active against bacteria) due to limited control procedures in the manufacturing process, also favour the emergence of resistant bacteria. Although there are local reasons to explain the spread of MDR and XDR bacteria in certain settings, antimicrobial resistance is a global phenomenon as these bacteria disseminate all over the world through human migration and the international trade of food. To disentangle this complexity, a major role for new predictive algorithms and big data analysis is expected in the coming years.

Overall objective:

We propose to organise an international summer school focused on the current challenges of antimicrobial resistance with a major emphasis on the **molecular bases of antimicrobial resistance**, **antimicrobial stewardship**, **rapid diagnostic tools**, **research for the development of new tools** (new antibiotics, vaccines, etc.), **innovation** and **policies** and **strategic interventions** to tackle antimicrobial resistance.

This summer school is addressed mainly to PhD students interested in the different aspects in the field of antimicrobial resistance; however, it will also be of interest to other medical specialities such as medical microbiology, infectious diseases and epidemiology. All students will have the opportunity to present a brief summary of her/his doctoral thesis followed by a 5 minutes discussion with the professors and students involved.

Specific Learning Objectives:

At the end of this course the students should be able to have a good understanding of

- The major problems associated with AMR;
- The current and future tools to detect antimicrobial resistance both in clinical and research settings;
- The different specific and integrative measures available to control the emergence and

dissemination of MDR/XDR bacteria;

- The tools available for recognising, analysing and solving research questions concerning the detection of antimicrobial resistance and the design of potential new antibacterial drugs,
- The new strategies to discover and develop new antibacterial drugs; and
- How to potentiate the relationship between academia and industry in order to increase the collaboration.

Programme outline*:

Day 1 *The problem:* Multidrug-resistant (MDR) and Extended-drug resistant (XDR) bacteria (July 10th)

8:00-8:15	Registration
8:15-8:30	Opening session
8:30-9:30	MDR/XDR bacteria and global health implications (Jordi Vila, UB, ISGlobal, Spain)
9:30-10:30	Epidemiology of MDR/XDR bacteria (Patricia Ruiz, Hospital Ramón y Cajal, Madrid, Spain)
10:30-11:00	COFFEE BREAK
11:00-12:00	Molecular basis of antimicrobial resistance (Luis Martínez-Martínez, Hospital Reina Sofia, Córdoba, Spain)
12:00-13:00	The economic burden of MDR/XDR bacteria (TBD)
13:00-14:30	LUNCH
14:30-17:30	Basics on bioinformatics (practical session) (David Vilanova, Actigenics, Toulouse, France)
17:30-19:30	Oral presentations by the students (n=8 students)
19:30-22:00	Networking

Day 2 *The tools* (July 11th)

8:30-9:30	Detection of mechanisms of resistance (routine and research applications) (Jordi Vila, UB, ISGlobal, Spain)
9:30-10:30	Rapid diagnostic tools (Kate Templeton, University of Edinburgh, Scotland) *TBC*
10:30-11:00	COFFEE BREAK
11:00-12:00	Proteomics in the field of clinical microbiology and antimicrobial resistance (Climent Casals, UB, ISGlobal, Spain)
12:00-13:00	Next generation sequencing in routine microbiology and big data in MDR/XDR bacteria (Arnab Pain, KAUST, Saudi Arabia)
13:00-14:30	LUNCH
14:30-15:30	Biosensors as potential rapid diagnostic tools (Till Bachmann, University of Edinburgh, Scotland)
15:30-18:30	Oral presentations by the students (n=12 students)

Day 3 ***Solutions and implementation*** **(July 12th)**

8:30-9:30	Antimicrobial Stewardship: clinical initiatives (José Miguel Cisneros, Hospital Virgen del Rocío, Seville, Spain)
9:30-10:30	Veterinary-related factors Influencing the local and global spread of MDR/XDR bacteria (Ignacio Badiola Sáiz, IRTA-CReSA, Barcelona, Spain)
10:30-11:00	COFFEE BREAK
11:00-12:00	Measures to control hospital emergence and dissemination of MDR/XDR bacteria (Jesús Rodriguez-Baño, University of Seville, Spain)
12:00-13:00	Antimicrobial stewardship in developing countries (Heiman Wertheim, Radboud Universiteit, Nijmegen, The Netherlands)
13:00-14:30	LUNCH
14:30-16:30	How to define and control a nosocomial outbreak. Practical case (Antoni Trilla, University of Barcelona, Spain)
16:30-17:30	Oral presentations by the students (n=4 students)

- *Social activity* -

Day 4 ***The future*** **(July 13th)**

8:30-9:30	Strategies for the design and development of new antibiotics from natural origin (Peter Nibbering, Leiden University Medical Center, Netherlands)
9:30-10:30	Antimicrobial peptides (Francesc Rabanal, Faculty of Chemistry, UB, Barcelona, Spain)
10:30-11:00	COFFEE BREAK
11:00-12:00	Bacteriophages-CRISPR (Luisa de Sordi, Institut Pasteur, Paris, France)
12:00-13:00	Microbiota: FMT (Alex Soriano, Hospital Clinic, UB, Barcelona, Spain)
13:00-14:30	LUNCH
14:30-15:30	Recognition of bacterial virulence markers available for therapeutic interventions (Ed Kuipjer, Leids Universitair Medisch Centrum, Leiden, Netherlands)
15:30-16:30	Biotechnology approaches to potentiate the drug effect (Eduard Torrent, Institute of Bioengineering of Catalonia, Barcelona, Spain)
16:30-18:30	Oral presentations by the students (n=8 students)

Day 5 ***Academy-Industry partnerships to tackle MDR/XDR bacteria*** **(July 14th)**

8:30-9:30	Industrial efforts to tackle MDR/XDR bacteria (Domingo Gargallo, ABAC Therapeutics, Barcelona, Spain)
9:30-10:30	Main aspects on patenting issues (Mónica López, Centre de patents, UB, Spain)
10:30-11:00	COFFEE BREAK
11:00-13:00	Introduction to entrepreneurship and creative thinking (Jaume Argerich and Claudio Cruz, School of Economics, UB, Spain)
13:00-14:30	LUNCH
14:30-16:30	Oral presentations by the students (n=8 students)
16:30-17:00	Closing session and certificates to students

**This Programme is subject to changes (last update: 02/05/17)*