

10th FISABIO Summer School: Introduction to Genomics for Microbiologists: from diagnostics applications to outbreak detection

Dates: June 22nd - June 26th 2020

Organizer: Prof. Fernando González-Candelas

The course is addressed to graduate students, professionals and practitioners of biology, biomedical research and the health sciences. Some background in microbiology, molecular biology, molecular evolution and phylogenetics will be advantageous, but it is not required. This course will introduce the methods and techniques used in the analysis of genome sequences obtained through high-throughput sequencing (HTS) technologies and their direct application in clinical and epidemiology problems. HTS are becoming the new gold standard in clinical microbiology laboratories for many different tests, including typing, identification of resistance and virulence factors, and surveillance of plasmids and other relevant genetic factors.

Molecular epidemiology is an emerging discipline in the interface between molecular biology, population and evolutionary genetics, and traditional epidemiology, interested in providing a perspective on population and epidemic processes from the perspective of the infectious organism. From the origin of new pathogens to the sources of outbreaks or more detailed surveillance, there is an increasing number of problems that can be tackled with molecular epidemiology approaches.

Practicing microbiologists and epidemiologists should become familiar with these new methodologies. This course provides an excellent opportunity for breaking the initial barriers, providing a head start for further advances. The course will consist of theoretical lectures, practical sessions with computers and seminars, with an emphasis on fundamental concepts and applications. Attendants are welcome to bring their own data.

Instructors

FGC-Fernando González-Candelas, PhD. FISABIO-Public Health Senior Scientist, Genomics and Health Area and Professor of Genetics, University of Valencia (fernando.gonzalez@uv.es).

MAB-María Alma Bracho Lapiedra PhD. FISABIO-Public Health Scientist, Genomics and Health Area (alma.bracho@uv.es).

FXL-F. Xavier López-Labrador, PhD. FISABIO-Public Health Senior Scientist, Genomics and Health Area (f.xavier.lopez@uv.es).

AC-Álvaro Chiner Oms, PhD. Institute of Biomedicine-CSIC. TB Genomics Area (achiner@ibv.csic.es).

BB-Beatriz Beamud Aranguren, MSc Bioinformatics. Univ. Valencia-FISABIO Public Health Graduate student. Genomics and Health Area (beatriz.beamud@uv.es).

NGG-Neris García González, MSc Bioinformatics. Univ. Valencia-FISABIO Public Health Graduate student. Genomics and Health Area (neris@uv.es).

Module program:

Monday June 22nd: Introduction and Methodologies

- 09:00 – 11:00 Welcome and introduction to molecular epidemiology FGC.

Break

- 11:30 - 13:30 Sequencing technologies for microbial genomics. FXL/BB.

- 13:00 - 13:30 Installation of Virtual Machines. MAB.

Lunch

- 15:00 - 18:00 **Practical session:** Introduction to Bioinformatics. AC/MAB.

Tuesday June 23rd: Theoretical Foundations

- 09:00 - 11:00 Phylogenetic inference from molecular data. MAB.

Break

- 11:30 - 13:30 Foundations of HTS analysis. NGG/BB.

Lunch

- 15:00 - 18:00 **Practical session:** HTS I: managing output files. Analyses with reads. NGG/BB.

Wednesday June 24th: Analysis of Genetic Diversity

- 09:00 - 11:00. Bacterial genome evolution. FGC/NGG.

Break

- 11:30 - 13:30 Molecular Epidemiology and Population Genetics of Viruses and Bacteria. FXL/FGC.

Lunch

- 15:00 - 18:00 **Practical session:** HTS II: assembling and mapping. AC/NGG.

Thursday June 25th: Advanced Topics in Molecular Epidemiology

- 09:00 - 11:00 Virus surveillance using HTS. FXL.

Break

- 11:30 - 13:30 Applications of HTS in Clinical Microbiology. FGC/NGG.

Lunch

- 15:00 - 18:00 **Practical session:** HTS III: variant calling, multiple sequence alignments. AC/NGG.

Friday June 26th: Seminars

- 09:00 - 12:00 **Practical session:** HTS IV: Phylogenetic trees from HTS data. MAB/NGG

Break

- 12:30 - 14:30 Molecular Epidemiology Seminars. FXL/FGC.

Lunch