9th FISABIO Summer School: Molecular Epidemiology, from Outbreaks to the Global Spread of Pathogens

Dates: *June 17th- June 21st 2019*

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 provide an introduction to the concepts and laboratory and bioinformatic methods applied to specific problems in the short, medium and long-term evolution of infectious microorganisms. We will pay special attention to new methods and techniques derived from high-throughput sequencing (HTS) technologies and their direct application in clinical and epidemiology problems.

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).

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

AC-Álvaro Chiner Oms, MSc Bioinformatics. Univ. Valencia-FISABIO Public Health Graduate student. Genomics and Health Area (alvaro.chiner@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 17th: Introduction and Methodologies

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

Break

- 11:30 - 13:30 Laboratory methods in molecular epidemiology. FXL/MAB.

Lunch

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

Tuesday June 18th: Theoretical Foundations

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

Break

- 11:30 - 13:30 HTS introduction and methods. NGG/BB.

Lunch

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

Wednesday June 19th: Analysis of Genetic Diversity

- 09:00 - 11:00 Molecular Epidemiology and Population Genetics of Viruses and Bacteria. FXL/FGC.

Break

- 11:30 - 13:30 Phylodynamics and phylogenomics. FGC.

Lunch

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

Thursday June 20th: Advanced Topics in Molecular Epidemiology

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

Break

- 11:30 - 13:30 Applications of HTS: case studies in Molecular Epidemiology. FGC/NGG.

Lunch

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

Friday June 21st: Seminars

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

Break

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

Lunch