

Module 3 / FISABIO Summer School in Biomedical Research and Public Health: Microbial Genomics & Metagenomics Workshop

Dates: June 28th – July 2nd 2021

Organizer: M. Pilar Francino

The workshop is addressed to students and professionals of biology, biomedical research, the health sciences and related fields who are interested in learning and sharing concepts, tools and research results in genomics, metagenomics and the human microbiome. The workshop will train participants in state-of-the-art analytical methods in this area, by means of theoretical lectures and seminars as well as practical hands-on exercises, all held via online live sessions in constant interaction with the instructors. Several sessions will be devoted to training in the use of the Integrated Microbial Genomes system (IMG), a database and analysis platform developed at the U.S. DOE Joint Genome Institute (Berkeley, California) for comprehensive studies of genomes and metagenomes. The IMG system will be presented by Dr. Natalia Ivanova and Dr. Rekha Seshadri from the JGI's Microbiome Data Science Group, the group responsible for IMG development.

Instructors:

Giuseppe D'Auria, PhD. Scientist, FISABIO-PUBLIC HEALTH Genomics and Health Area and CIBERESP. Coordinator of FISABIO Sequencing and Bioinformatics Service (dauria_giu@gva.es).

M. Pilar Francino, PhD. Scientist, FISABIO-PUBLIC HEALTH Genomics and Health Area and CIBERESP (francino_pil@gva.es).

M. José Gosalbes, PhD. Scientist, FISABIO-PUBLIC HEALTH Genomics and Health Area and CIBERESP (gosalbes_mjo@gva.es).

Natalia Ivanova, PhD. Scientist, JGI, Microbial Genomics & Metagenomics Scientific Program (nnivanova@lbl.gov).

David Páez, PhD. Associate Director of Discovery Informatics at Mammoth Biosciences (davidp@mammoth.bio).

David Perez-Villarroya, MS. in Bioinformatics (pevida@alumni.uv.es).

Mariana Reyes, MS. in Genetics and Molecular and Cellular Biology, FISABIO- PUBLIC HEALTH, Bioinformatician at Sequencing and Bioinformatics Service (reyes_ber@gva.es).

Rekha Seshadri, PhD. Scientist, JGI, Microbial Genomics & Metagenomics Scientific Program (rseshadri@lbl.gov).

Module program:

Monday June 28th:

- 14:00 - 14:30 Welcome and Overview of the Workshop by Dr. M. Pilar Francino.
- 14:30 - 15:30 Features and Diversity of Microbial Genomes by Dr. M. Pilar Francino.
- 15:30 - 16:45 Introduction to the Analysis of Bacterial Communities by Dr. María José Gosalbes.

Break

- 17:00 - 18:00 Uncovering Earth's virome by Dr. David Páez-Espino.
- 18:00 - 20:00 Unix commands and moving around the system by David Pérez-Villarroya.

Tuesday June 29th:

- 14:00 - 15:00 Informatic Processing and Quality Control of Sequencing Reads by Mariana Reyes.
- 15:00 - 16:45 Sequence Assembly by Dr. Giuseppe D'Auria.

Break

- 17:00 - 17:30 IMG UI Intro: Live Demonstration by Dr. Natalia Ivanova
- 17:30 - 18:00 Functional Annotation in IMG by Dr. Rekha Seshadri
- 18:00 - 18:30 Isolate Comparative Genomics Case Study: Live Demo by Dr. Rekha Seshadri

CLASSWORK or HOMEWORK

- 18:30 - 19:30 Hands-on Exercise (student work)
- 19:30 - 20:00 Review/Discuss solutions

Wednesday June 30th:

- 14:00 - 16:45 Microbial Diversity Analyses with 16S rRNA by Dr. Giuseppe D'Auria.

Break

- 17:00 - 18:00 IMG/M Metagenome Analysis: Live Demonstration by Dr. Natalia Ivanova
- 18:00 - 18:30 Metagenome Comparisons Case Study: Live Demo by Dr. Natalia Ivanova

CLASSWORK or HOMEWORK

- 18:30 - 19:30 Hands-on Exercise (student work)
- 19:30 - 20:00 Review/Discuss solutions

Thursday July 1st:

- 14:00 - 15:00 Microbial communities, the human microbiome and its relationship to health by Dr. M. Pilar Francino.
- 15:00 - 16:45 CRISPR analyses in IMG by Dr. David Páez-Espino

Break

- 17:00 - 17:30 Preparation of student analysis projects - students form groups and carry out genome or metagenome analysis project
- 17:30 - 20:00 Instructors circulate in Breakout rooms or ON CALL to answer questions or help troubleshoot

Friday July 2nd:

- 14:00 - 15:30 Introduction to Metatranscriptomics by Dr. María José Gosalbes.
- 15:30 - 16:45 Metagenome Analysis Research Talk by Dr. M. Pilar Francino.

Break

- 17:00 - 10:00 Presentations of projects by student groups
- 19:00 - 20:00 IMG Tutorial Summary, Discussion and Questions