Module 2 / *FISABIO Summer School in Biomedical Research and Public Health: Microbial Genomics & Metagenomics Workshop*

Dates: *June 24th – June 28th 2024*

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 sessions in bioinformatics and biostatistics. 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. Rheka Seshadri from the JGI's Microbial Genomics & Metagenomics Scientific Program, 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 (giuseppe.dauria@fisabio.es).

M. Pilar Francino, PhD. Scientist, FISABIO-PUBLIC HEALTH Genomics and Health Area and CIBERESP (pilar.francino@fisabio.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 (paezespino@gmail.com).

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 (mariana.reyes@fisabio.es).

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

Module program:

Monday June 24th:

- 09:00 - 10:00 Welcome and Overview of the Workshop by Dr. M. Pilar Francino, Dr. Rekha Seshadri and Dr. Natalia Ivanova.

- 10:00 - 11:00 Features and Diversity of Microbial Genomes by Dr. M. Pilar Francino.

Break

- 11:15 - 12:15 Microbial communities, the human microbiome and its relationship to health by Dr. M. Pilar Francino.

- 12:15 - 13:15 Introduction to the Analysis of Bacterial Communities by Dr. M. Pilar Francino.

Lunch

- 15:00 - 15:30 Introduction to the Integrated Microbial Genomics system by Dr Natalia Ivanova.

- 15:30 - 18:00 Unix commands and moving around the system by David Pérez-Villarroya.

Tuesday June 25th:

- 09:00 - 10:00 Informatic Processing and Quality Control of Sequencing Reads by Mariana Reyes.

- 10:00 - 11:00 Microbial Diversity Analyses with 16S rRNA (I) by Mariana Reyes.

Break

- 11:15 - 13:15 Microbial Diversity Analyses with 16S rRNA (II) by Mariana Reyes.

Lunch

- 15:00 - 18:00 Sequence Assembly and Read Mapping by Dr. Giuseppe D'Auria.

Wednesday June 26th:

- 09:00 - 11:00 Functional Annotation and Comparative Genomics in IMG by Dr. Rekha Seshadri
  - Introduction
  - Isolate Comparative Genomics Case Study: Live Demo

Break

- 11:15 - 13:15
  - Hands-on Exercise (student work)
  - Review/Discuss solutions by Dr. Rekha Seshadri and Dr. M. Pilar Francino

Lunch

- 15:00 - 18:00 CRISPR analyses and Uncovering the Earth's virome by David Páez-Espino.

Thursday June 27th:

- 09:00 - 11:00 IMG/M Metagenome Analysis: Live Demonstration by Dr. Natalia Ivanova
    - Introduction
    - Metagenome Comparisons Case Study: Live Demo

Break

- 11:15 - 13:15 - Hands-on Exercise (student work)
    - Review/Discuss solutions by Dr. Natalia Ivanova and Dr. M. Pilar Francino

Lunch

- 15:00 - 18:00 Preparation of student analysis projects: students form groups, choose their genome or metagenome analysis project and start carrying it out, supervised by Dr. Rekha Seshadri and Dr. M. Pilar Francino

Friday June 28th:

- 09:00 - 11:00 Preparation of student analysis projects: students complete their genome or metagenome analysis project and prepare a presentation, supervised by Dr. Rekha Seshadri and Dr. M. Pilar Francino

Break

- 11:15 - 12:45 Presentations of genome or metagenome analysis projects by student groups, supervised by Dr. Rekha Seshadri and Dr. M. Pilar Francino

- 12:45 - 13:15 IMG Tutorial Summary, Discussion and Questions, supervised by Dr. M. Pilar Francino