EURO-CHOLANGIO NET COST ACTION
MULTI-OMICS TRAINING SCHOOL

Date: 2-3 June 2022

Location: Krakow, Poland

Outline:

To give a general understanding of easy-to-use tools and public data sets for basic analysis in your own study.

Training objectives:

Main objective: to get a general overview of multi-OMICs data and to analyze them.

The topics that will be covered during the Training School are:

- Genomics
- Metagenomics
- Transcriptomics
- Proteomics

The specific learning objectives are:

1 - Get to know the available repositories of various OMIC datasets

2 - Conduct genomic analysis of CCA tumors (identify and classify recurrent mutations, associations with prognosis, essentiality and druggability of genes)

3 - Gain insights on differential gene expression analysis

4 - Learn how to do create a heatmap and how to perform clustering of samples and/or features

5 - Perform gene ontology (GO) and gene set enrichment analysis (GSEA)

6 - Get in touch with the important tools to know your gene/protein of interest

08h00 – 08h45: Arrival and registration

08h45 – 09h00: Welcome

Vincenzo Cardinale, Jesus M. Banales, Rui E. Castro, Jesper B. Andersen, Marcin Krawczyk, Piotr Kuśtrowski, Jerzy Kotlinowski, Jolanta Jura and Melissa Kerr

09h00 – 12h00: Genomics

09h00 – 09h15: Applications of genomics in cholangiocarcinoma research

Prof. Jesper B. Andersen (Copenhagen, Denmark)

09h15 – 10h30: Examples and practical exercises I

i) Check expression of your gene(s) in Tumor *vs* surrounding liver

ii) Investigate genomic alterations (mutations, copy number variations, methylation) of your gene of interest and associate genomic alterations with patients' survival
iii) Stratify patients based on your gene(s) of interest and generate KMplots

10h30 – 10h45: Coffee break

10h45 – 12h00 - Examples and practical exercises II

iv) Investigate the relative importance of your gene of interest for tumor cell survival
v) Assess the druggability of your gene of interest and investigate the sensitivity of CCA cells to targeted therapies against druggable genes of interest.

12h00 – 13h00: Lunch

13h00 – 15h30: Metagenomics

13h00 – 13h15: Metagenomics and hepatobiliary tumors

Prof. Marcin Krawczyk (Homburg, Germany)

13h15 – 15h30: Examples and practical exercises

i) Taxonomic & Functional Profiling of a Human Sample
ii) Cohort Study: compute alpha-diversity, beta-diversity, and detect differential abundances between two classes on a prepared abundance table

15h30 – 16h00: Coffee break

16h00 – 19h00: Transcriptomics

16h00 – 16h15: Applications of transcriptomics in cholangiocarcinoma research

Prof. Rui E. Castro (Lisbon, Portugal)

16h15 – 17h30: Examples and practical exercises I

i) Sequencing basis, Data upload, Quality control, sequence trimming and mapping
ii) Use **GEO2R** to perform differential expression analysis in deposited microarray datasets (we let galaxy time to map sequences)

iii) Quantify gene expression and prepare formats for differential expression analysis

17h30 – 17h45: Coffee break

17h45 – 19h00 - Examples and practical exercises II

iv) Perform differential expression analysis and visualize differentially expressed genes and sample grouping with PCA
v) Perform gene set enrichment analyses (GSEA) overrepresentation analysis
vi) Discover expression of your gene in single-cell RNAseq dataset(s).

DAY 2

09h00 – 12h00: Proteomics

09h00 – 09h15: Applications of proteomics in cholangiocarcinoma research

Prof. Jesus M. Banales (San Sebastian, Spain)

09h15 – 10h30: Examples and practical exercises I

i) Set up the proteomic processing of raw data downloaded from PRIDE
ii) Protein interaction and post-translational modifications (PTM)

10h30 – 10h45: Coffee break

10h45 – 12h00 - Examples and practical exercises II

iii) Get to know the characteristics of your protein of interest
iv) Study the involvement of your protein/gene of interests in distinct type of cancers and know in which human organs (multi-organ RNA-seq) and which cell types (sc-RNAseq of healthy tissue) is your gene being expressed

12h00: Farewell and lunch