

## Lab sheet 5

### Protein databases

#### -Objectives:

- To be familiar with different protein databases.
- Retrieve protein sequence, related information about the protein and Display 3D structure of a protein.

#### Use NCBI database to answer the following questions:

1. Retrieve the Homo sapiens 5-aminolevulinate synthase 2 (**ALAS2**) protein sequence from the NCBI **protein RefSeq database**.
2. What is the accession number, the function and how many amino acids does the protein have?
3. What is the name of the **region** located in 5..100 aa?
4. What are the locations of (pyridoxal 5'-phosphate binding site)?

#### Use Uniprot database to answer the following questions:

5. Display **Uniprot** page of ALAS2. What are the alternative names of this protein? What is the gene symbol that encodes it ?
6. Display **the secondary and tertiary structure**, then open the **3D** structure of ALAS2 in SWISS MODEL Repository (SMR) website.
7. What are the different **biological processes** of ALAS2?
8. Knowing the fact that ALAS2 is an enzyme, display the **sites involved in its catalytical** activity.
9. Display the **biological pathways** ALAS2 involved in, using Reactome website.
10. What is the **subcellular localization** of ALAS2?
11. Display if there are any **mutations or polymorphisms** found in the protein sequence, using Domain Mapping Of Disease Mutations (DMDM) .
12. Are there any **post-translational modification** that affect ALAS2 function? Name the type of modification and display all **PTM sites** of ALAS2 from PhosphoSitePlus website.

13. What are the tissues known to express ALAS2 From Genevisible website. Show the **expressional level** of ALAS2 in the Top 10 tissues and cancers.
14. Display the expression of ALAS2 at **tissue and cell** level in The Human Protein Atlas (HPA)
15. Display all **protein-protein interactions** of ALAS2 in BioGRID website
16. Show the **Interaction network** of ALAS2 with other proteins (this does not necessarily mean they are physically binding each other) by STRING website.
17. How many **isoforms** does ALAS2 have?

**To cover more info about Uniprot, Telomeric repeat-binding factor 2 (TRF2) will be studied as an example:**

18. View some pictures showing the localization of TRF2 in the colon tissue using immunohisto-chemistry IHC, and check the antibodies validations.
19. Since TRF2 is involved in a formation of complex where it physically binds to other proteins. Show the **other proteins involved with TRF2 in the formation of Shelterin complex** in Complex Portal
20. Display **domains and motifs** of TRF2. What is the length of the TRFH dimerization region? Show the arrangement of domains in Pfam website

**Exercise:**

- ✓ Display Uniprot page of the human **serine/threonine-protein kinase ATR isoform 1** protein. Show if there are any **mutations or polymorphisms** found in the protein sequence.
- ✓ Display all **post-translational modification sites** of protein. Determine the highest occurrence one.
- ✓ How many **isoforms** does this protein have?