**How To Explore a Topic of Interest at a Molecular Level**

**Learning Objectives**:

1. To broadly understand/learn more about the topic of interest
2. To identify name(s) (and where possible sequence) of key players relevant to the topic of interest

**WHERE can you find relevant scientific information about the topic of interest?**

* 1. Books, Literature, Online
     + Textbook chapters – provide the topic’s context to rest of biology
     + Review articles - provide comprehensive view about some or all aspects of the topic.
     + Scientific articles – provide details about a specific aspect of the topic; may be referenced by textbooks/review articles
     + Wikipedia – provides an idea about the topic and links to relevant primary literature
     + Online search and Literature research tools - such as Google Scholar, Web of Science provide links to relevant literature
  2. Databases and Resources
     + NCBI (<http://www.ncbi.nlm.nih.gov/>) - includes collections of databases and resources, most of which provide free access to data (e.g. PubMed, PubMed Central, NCBI Books, GenBank, OMIM, Mesh)
     + UniProt (<http://www.uniprot.org/>) - includes sequence, information of proteins along with functions, disease associations and other information. Can download sequence information from here
     + RCSB PDB ([www.rcsb.org](http://www.rcsb.org)) - includes access to 3D structures of bio-macromolecules (e.g. proteins and Nucleic Acids).



**Steps**:

1. WHAT is the topic of interest?

Find background information 🡪 Get an overview of the topic and learn about key players, their interactions and important functions. Also gather information about conditions of interactions (e.g. When, Where)

If you are you exploring …

* 1. The function of a specific molecule (e.g. hemoglobin’s function in transporting oxygen)
     + Learn about the function, its role in relevant biological processes (in health and disease), key regulators (other proteins or molecules that interact with and facilitate or block the function)
  2. A biological process (e.g. protein synthesis, DNA replication, cell signaling, photosynthesis)
     + Learn about the overall process, location in the cell/body, steps involved in the process, key players and their roles
  3. A disease process 🡪 Learn about the main cause and/or effect of the disease. For example, if you are exploring …
     + Infectious diseases such as HIV/AIDS, malaria or tuberculosis 🡪 find out about the pathogen that causes it, how it infects the host and its life cycle. Learn about key proteins or other components of the pathogen that have been studied
     + Metabolic disease such as diabetes or cancer 🡪 find out about affected metabolic pathway(s) and/or signaling cascades. How is/are the pathways different in healthy vs diseased states?
     + Genetic disorders such as phenylketonuria 🡪 learn about the genetic basis of the disease, which proteins and/or genetic elements are affected?

1. WHO are the key players?

Identify components that interact with, participate in, facilitate or regulate the topic of interest.

* + - Pick up protein name(s), sequence, classifications etc. to be used for further research
    - If the key players are multi-domain proteins, learn about the domains relevant to the topic of interest

1. HOW do these molecules relate to the topic of interest?

Using literature and database resources, figure out the functions or roles of each molecule, and its relevant domains identified above and how that relates to the topic of interest. Classify player by role, location, properties and nature of interactions.

At the end of this exploration you should have (a) an overview/understanding of the topic; and (b) names and sequences of key molecules/domains relevant to the function, biological or disease process of interest.

Use this information to query for relevant molecules in the PDB and learn more about their structure-function relationship.