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Structural biology: biocrystallography and an appetizer for cryo-EM

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Structural biology aims to determine the three-dimensional structures at atomic level of biological macromolecules, ranging from metabolites or potential drugs bound to their targets, enzymes, nucleic acids, membrane proteins, macromolecular complexes or even whole viruses.

The information provided by the precise location of the atoms in the structure is closely linked to their function in living cells and organisms, such as enzymatic mechanisms, regulatory systems or DNA transcription. This information is also crucial for drug development through the structure-based drug discovery strategy.

Over the years, a number of structural biology techniques have been developed. Biocrystallography represents the first and the most widely used structural biology technique. In this technique the atomic structure of a biological molecule is determined through an X-ray diffraction experiment on a crystalline sample. Nowadays, most biocrystallographic studies employ synchrotron X-ray sources. Another important technique in structural biology is the single particle cryo-Electron Microscopy (cryo-EM). Here, a transmission electron microscope is used to get images of a vitrified macromolecular solution, that then are used to obtain the high-resolution macromolecular structure.

In this lesson, we will see an overview of the structural biology field with a special focus on biocrystallography.