2D Protein Monolayer Unravels Amyloidosis

Source: PIB

Why in News?

Recently, researchers have achieved a significant breakthrough in disease study through the creation of a **two-dimensional (2D) protein monolayer** using **lysozyme molecules.**

What are Lysozyme and Amyloidosis ?

- **Lysozyme** is a **naturally occurring enzyme** found in various bodily secretions like tears, saliva, mucus. It plays a crucial role in the body's defense system against bacteria.
    - This **enzyme works by breaking down the cell walls of certain bacteria,** essentially disrupting their structure and leading to their destruction.
    - It is also the principal component of **airway fluid,** serving as a model protein in investigating diseases like **Amyloidosis,** which trigger **multi-organ dysfunction.**
- **Amyloidosis** refers to a group of **rare conditions characterized by the accumulation of abnormal protein clumps** called amyloids in various organs and tissues throughout the body.
    - These amyloid proteins, typically made up of **misfolded proteins,** can disrupt normal organ function such as the **heart, kidneys, liver, spleen** and cause damage over time.

What are the Major Highlights of the Research?

- Scientists assembled **lysozyme molecules into a 2D monolayer** at the interface of **a pure water subphase.**
    - These meticulously arranged layers of lysozyme, positioned at different interfaces, provide an **exceptional model for delving into the complexities of Amyloidosis.**
    - Employing the **sophisticated Langmuir-Blodgett (LB) technique** was crucial in forming this specialized two-dimensional protein layer.
        - The Langmuir-Blodgett technique is a process used to create monolayers of molecules, including proteins, at air-water and air-solid interfaces.
- The changes observed in the structure and shape of lysozyme molecules under different pH conditions **remarkably mirror the abnormalities seen in Amyloidosis.**
- This groundbreaking research not only paves the way for a more profound comprehension of Amyloidosis but also **establishes a versatile platform for probing disease mechanisms.**
- Furthermore, it presents **exciting possibilities for exploring nanotechnology applications within the realm of protein science.**