



### **Lipids and proteins together shape functioning of mitochondrial membrane proteins**

Hyderabad, 28<sup>th</sup> Feb, 2025: There are many similarities in how living cells of different kinds function, irrespective of the fact if they are microbial cells or from plants or animals. Often, these similarities are attributed to the similarities in the proteins of their cells. The common knowledge is that similar proteins function similarly. But a recent [study](#) led by Dr Swasti Raychaudhuri at CSIR-Centre for Cellular and Molecular Biology (CCMB) and published in Nature Communications challenges this notion.

Dr Raychaudhuri's lab studies protein complexes called Respiratory Complexes. These are made of many proteins and are expressed in the inner membranes of mitochondria of cells of all aerobic organisms (those respiring with oxygen). They help in a key chemical reaction during respiration and are absolutely necessary for the survival of organisms. In the latest study, they show that these protein complexes have similar overall structures and functions. But, the compositions of their parts that are embedded in the mitochondrial membranes differ across organisms.

The insides of the cell membranes are rich in lipids. This made the researchers to also look at the differences in the membrane lipids in various life forms. They chose to study cardiolipin, which is a key lipid found in the mitochondrial inner membranes. The plants and animals have slight differences in the chemical composition of cardiolipin. These translate into differences in their overall structures as well. The different cardiolipins enable different kinds of cells to survive in different conditions. "We found that plant Respiratory Complex function only with plant cardiolipin and vice versa for the animal Respiratory Complex," said Pooja Gupta, the first author of the study.

"This is the first study to show that lipids have shaped the evolution of fundamental protein complexes. It draws our attention to the fact that evolution of life has optimized for functions, not single set of molecules – be it proteins or lipids," remarked Dr Raychaudhuri. The study also opens up newer possibilities of studying roles of lipids in diseases caused by malfunctioning Respiratory Complexes.