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Studying bacterial cell walls could hold clues to better human health

Hyderabad, 23 Jul, 2025: Bacteria are enclosed by protective cell walls which are made up of a unique polymer called peptidoglycan, which is absent in all the other life forms including humans. This makes the peptidoglycan a target of many of the clinically used antibiotics. A team of scientists led by Dr Manjula Reddy at CSIR-Centre for Cellular and Molecular Biology (CCMB), Hyderabad has discovered a novel proofreading step that ensures the strength and integrity of the bacterial cell wall.

The cell wall is a polymer of sugars and short chains of amino acids – the building blocks that make up proteins. One specific amino acid, L-alanine is normally found in the first position of these amino acid chains. The new study shows that while building the cell wall, bacteria can mistakenly add structurally similar amino acids such as L-serine or glycine instead of L-alanine, weakening the cell wall and making bacteria more vulnerable to antibiotics. Dr Reddy's team found that the bacteria have an enzyme, PgeF (Peptidoglycan Editing Factor) which corrects this mistake. "Using a powerful combination of genetics and high-resolution mass-spectrometry, we could see that PgeF specifically detects and removes the wrong amino acids to maintain the composition of the cell wall," said Dr Shambhavi Garde, the first author of the study.

This study also opens up new research questions. "By studying such vulnerabilities in cell wall synthesis, new ways of blocking bacterial growth can be designed. What makes the discovery more intriguing is that a homolog of this enzyme is also present in vertebrates, and defects in the human enzyme, known as LACC1, are closely associated with several autoinflammatory disorders - health conditions where the body's immune system is hyper-activated," said Dr Reddy.

The function of LACC1 is not clearly understood till now, and this study opens up a possibility of LACC1's involvement in the immune response to bacteria, leading to potential therapeutic strategies in the future.