Harnessing Cyanobacterial Anti-Quorum Sensing Agents: A Novel Approach to Combat bacterial Infections

Divya Singh

Laboratory of Algal Biotechnology, Centre Algatech, Institute of Microbiology,

Czech Academy of Sciences, Trebon

The rapid rise of antimicrobial resistance (AMR) poses a severe global threat, contributing to an estimated 5 million deaths annually. Misuse of antibiotics has accelerated AMR, creating an urgent need for innovative approaches to combat drug-resistant pathogens. Traditional antibiotics focus on killing or inhibiting pathogens, but non-traditional approaches, like anti-virulence strategies, show promising result by targeting pathogenic traits without affecting bacterial growth. This reduces evolutionary pressure and potentially minimizes resistance development. This research explores three main key anti-virulence strategies like quorum sensing inhibition (QSI), efflux pump inhibition (EPI), and anti-adhesion. The main aspect of this research involves screening and selecting cyanobacterial strains with potent anti-virulence activity**.** As, cyanobacteria are known for their bioactive compound production, are underexplored in the context of AMR. This study involves the isolation of various cyanobacterial strains and in vitro testing for evaluation of their ability to interfere with virulence pathways in clinically relevant pathogens. Selected strains with strong anti-virulence effects will undergo further characterization to identify the specific bioactive compounds. Quorum sensing (QS) is a bacterial communication system regulating pathogenic behaviours. Efflux pumps helps in lowering drug efficacy by expelling antibiotics out from bacterial cells whereas adhesion help in initiating the infection. Hence targeting these could restore antibiotic effectiveness. Through the targeted screening of cyanobacteria, this research project aims to discover compounds that could address AMR and virulence effectively.

Keywords: Antimicrobial resistance (AMR), Multi-drug resistance (MDR), Anti-virulence strategies, Quorum sensing inhibition (QSI), Efflux pump inhibition (EPI), Cyanobacterial bioactive compounds