

Biotransformation of Beta-lactam Antibiotics pollutants into nontoxic form

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Abstract:

Most common and frequently used class of antibiotics are beta-lactams. Although antibiotics are most crucial organic compounds, but their low degradability and fast accumulation in the environment is now causing trouble as micropollutants. World Health Organisation has now declared antibiotics resistances as global health concern as well as silent pandemic. Rapid increase in resistance has developed superbugs which survive even to the last resort antibiotics. One of the ways to combat the antibiotics resistance is to degrade or biotransform them into less toxic form in the environment. Therefore, to combat this situation, microbial derived beta-lactamases are capable of degrading all beta-lactam antibiotics. In this study, beta-lactamase producing bacteria were isolated from sludge of pharmaceutical waste water treatment plant. The beta-lactamase producing bacteria were screened using iodometric and double disc diffusion assay respectively. Further, selected bacterial isolates were tested for degradation of three classes of beta-lactam antibiotics using in vitro assays. Degradation was confirmed by TLC, UV-Vis spectroscopy and iodometric assay. Degraded product completely loses its antimicrobial activity. The long-term goal of the study is to characterise bio-transformed products by LCMS and GCMS and determine how effectively beta-lactamase degrades antibiotics in a mixed antibiotic environment.

Keywords: Antimicrobial resistance; beta-lactamase; beta-lactam antibiotics; biotransformation