A study on the association and localization of ESBL and heavy metal genes along with mobile genetic elements among bacteria from natural aquatic environment

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Antibiotic resistance, widely recognized as a global issue is a phenomenon originating from the retort of bacteria to the prevalent use of antibiotics and their occurrence in the environment that has increased the morbidity and mortality of bacterial infections. The spread of ESBL genes through horizontal transfer of genes is associated with mobile genetic elements like transposons, insertion sequences, integrons which help there easy dissemination in the environment. Apart from antibiotics resistance, heavy metals pose a significant health risk. Metal resistance gene in association with antibiotic resistance determinants and mobile elements is helping bacteria to acquire elevated level of resistance. In the present study we identified different antibiotics resistance genes viz. CTX-M, TEM, SHV, AmpC, various genetic elements like IS*ecp1*, Tn3, Tn21, Int I and its gene cassette (Sul, qnrS) among bacterial isolates from pristine lakes of Jammu & Kashmir; India . Co-occurrence of antibiotics and different heavy metal resistance gene (mer, sil and ars) was also determined. Among 201 bacterial isolates obtained from 13 different sampling sites 38 were found to be ESBLs producers. 30 ESBLs producing isolates were found positive for CTX-M gene, followed by TEM (11), AmpC (15), qnrS (15), IS*ecp1*(15), Tn3(10), Tn21(8), Int I(20), Sul (13). Co-occurrence of antibiotics and heavy metal resistance determinants mer, sil and ars was found among 18, 12 and 8 isolates respectively. Molecular analysis transconjugants showed the successful transfer of different antibiotics, mobile elements and heavy metal resistance gene in recipient E. coli J53 AZ^R strain. Furthermore plasmid based replicon typing was also performed. The study highlights the importance of understanding molecular biology of different mobile genetic elements in order to control the spread of antibiotic resistance. Study also put a strong need of further research to decipher the possible role of heavy metal resistance gene in over expression of antibiotic resistance.

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