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Characterization of metal tolerant bacteria from polluted river

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Toxic effect of heavy metal metals in polluted rivers has been a major concern as they pose threat to the flora and fauna. The chemical methods of heavy metal removal from industrial effluents which are added to rivers are expensive and inefficient. Bacteria may serve as cost effective bio-remediation tools for heavy metal removal. Thus the present study was envisaged to isolate and characterize heavy metal tolerant gram negative bacteria from polluted Yamuna water, Delhi, India. Bacterial colonies were isolated from water sample collected from different sites. Colonies with different morphologies were selected and metal tolerance concentration (MTC) was determined. The two isolates selected on the basis of MTC values were identified by morphological, biochemical and molecular (16S rRNA gene sequencing) methods. Besides, growth kinetics, co-metal tolerance and antibiotic resistance were also determined. The identified isolates were tolerant to cadmium (3000 µg/ml) and nickel (2000 µg/ml), respectively. Besides the isolates were co tolerant to Cd (3000 µg/ml) and Ni (2000 µg/ml) resistance to various antibiotics. Scanning electron microscopy clearly revealed change in morphological pattern in isolates on exposure to 2000 µg/ml Nickle and Cadmium (3000 µg/ml). The identified heavy metal tolerant bacteria could be useful for the bioremediation of contaminated wastewater and industrial effluents.

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Bio-conjugation of metal-organic frameworks with bacteriophage for bacterial detection

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Food-borne disease outbreaks caused by the antibiotic resistant bacteria lead to severe threats to human health and thus are of major concern worldwide. Recently, the metal organic frameworks (MOFs) have been proposed as useful materials in the development of small molecule sensors. The MOFs possess certain excellent characteristics for example tunable porosity, high thermal/chemical stability and optoelectronic properties which make them exciting materials for the development of sensitive bio-sensors. It is imperative to explore techniques for the bio-conjugation of the MOFs with biomolecules to construct the desired specific sensors. The present research is aimed on bio-conjugating the MOFs with bacteriophage which are highly specific and stable natural alternative of other bio-recognition molecules including antibodies, nucleic acids and enzyme. Bacteriophages can be easily produced from natural wastewaters or soil in a cost effective manner and they can differentiate between dead and viable cells. The bacteriophages are particularly advantageous over other bio-recognition molecules (antibodies, nucleic acids, enzymes) which pose certain limitations e.g., high cost of production, instability under varying physiological conditions, ethical issues concerned with antibody production from animals and inability to differentiate viable cells from dead ones. In the present work, an amine functionalized luminescent MOF (IRMOF-3) was synthesized using solvothermal process at room temperature. Bacteriophages specific to *Staphylococcus* bacterial sp. were conjugated to the MOF surface in an oriented manner using covalent chemistry. The conjugated MOFs were characterized using several techniques, viz., UV-vis spectroscopy, FTIR, photoluminescence spectrophotometer, XRD and SEM. The above conjugated MOFs can be explored further for the detection of bacteria by measuring change in luminescence intensity of MOF for development of convenient, rapid, specific and effective sensors of bacterial contamination in food products.

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