Isolation and characterization of chromium tolerant *Staphylococcus aureus* from industrial wastewater and their potential use to bioremediate environmental chromium.

Objectives: Chromium with its great economic importance in industrial use is major metal pollutant of the environment. Chromium are used in different industries for various applications such as textile, dyeing and pigmentation, wood preservation, manufacturing pulp and paper, chrome plating, steel and tanning. The release of untreated chromium in industrial effluents causes serious threat to environment and human health, therefore, the current study designed to isolate chromium tolerant *Staphylococcus aureus* for removal of chromium prior to their final discharge into the environment due to its cost effective and beneficial advantage over physical and chemical methods.

Methods: Wastewater samples were collected from discharge point of different industries. Heavy metal analysis by atomic absorption spectrophotometer and microbiological analysis such as total viable count, total coliform, fecal coliform and *Escherichia coli* were conducted. *Staphylococcus aureus* was identified through gram's staining, biomeriux vitek 2 microbial identification system and 16S rRNA gene amplification by polymerase chain reaction. Optimum growth conditions with respect to temperature, pH, salt concentrations and effect of chromium on the growth of bacteria, resistance to other heavy metal ions, minimum inhibitory concentration and chromium uptake ability of *Staphylococcus aureus* strain K1 was determined by spectrophotometer. Antibiotic sensitivity pattern was also determined by disc diffusion method. Furthermore, chromium uptake ability was confirmed by Fourier transform infrared spectroscopy (FTIR) and scanning electron microscope equipped with Oxford Energy Dipersive X-ray (EDX) micro analysis system.

Results: The results presented that optimum temperature was 35^{o}C, pH was 8.0 and salt concentration was 0.5% for growth of *Staphylococcus aureus* K1. The maximum uptake ability of chromium by bacteria was 20mM than other heavy metal ions. The antibiotic sensitivity pattern revealed that Staphylococcus aureus was vancomycin and methicillin sensitive. Non hemolytic activity on blood agar and negative coagulase reaction showed that it was non-pathogenic. Furthermore, the growth of bacteria decreases in the presence of chromium and maximum chromium uptake by bacteria observed at optimum growth conditions. Fourier transform infrared spectroscopy (FTIR), scanning electron microscope (SEM) and Energy dispersive X-ray (EDX) analysis confirmed the presence of chromium uptake by *Staphylococcus aureus* K1.

Conclusion: The study revealed that *Staphylococcus aureus* K1 have the potential to bio-remediate chromium toxicity from wastewater. Gradually, this biological treatment becomes more important due to its advantage over physical and chemical methods to protect environment and human health.