# Use of *cop* operon of *Staphylococcus epidermidis* TWSL_17 in biosensor construction

P.M. Wijayaweera*, C.D. Wijayarathna, & D.M.C.C. Dissanayake

*Department of Chemistry, University of Colombo, Sri Lanka*

***Corresponding author:** prasanmalintha@gmail.com*

## Abstract

Heavy metals are defined as metallic elements, which have a relatively higher density than water. Copper is an abundant metal element in the environment which is required by all living organisms. However, high concentration of copper can be toxic to both prokaryotes and eukaryotes. Bioremediation is widely used in heavy metal remediation where resistant mechanisms of microbes are mainly used. *Staphylococcus epidermidis* TWSL_17 was found to be resistant to heavy metals such as Cu, Zn, Pb and Cd. This study was aimed at using proteins involved in metal resistance to develop a bacterial biosensor to detect metal contaminations in wastewater. The *cop* operon involved in copper homeostasis, consists of promoter P*cop*, regulator *csoR*, $P_{IB}$-ATPase *copA*, and copper chaperone *copZ* in *Staphylococcus* sp. A whole-cell biosensor was designed using the *cop* operon of TWSL_17 and a reporter, GFP. P*cop* and *csoR* were PCR amplified using gDNA of TWSL_17. The resulted PCR amplicon of 397 bp was then digested using *NheI* and *XbaI* and ligated with the expression vector, pQBI-T7-GFP. Subsequently transformed into *E. coli* BL21 (DE3) cells and screened using colony PCR. Metal sensitivity of the recombinant was evaluated using $Cu^{2+}$, $Zn^{2+}$, and $Ni^{2+}$. A significant difference of bacterial growth in the presence of $Zn^{2+}$ was observed while a significant difference of bacterial growth was not observed in the presence of $Cu^{2+}$ and $Ni^{2+}$. However, constructed whole-cell biosensor did not fluoresce in the presence of any heavy metals.

**Keywords:** *Bioremediation, Biosensor, Copper, GFP, Metal*