Prevalence of Heavy metal and multiple antibiotic resistance in bacterial species isolated from Hasdeo river water.

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Background

The heavy metal pollution of river exert development of antibiotic resistance to bacterial species and pose serious threat to health of human and animal. Detection of antibiotic substances in water resources has considerably increased in the recent years and the development of multiple antibiotic resistant microorganisms in the environment represent a challenge to maintaining public health in the future. The most significant aspects of studying the antibiotic sensitivity in water sample were to identify the source of microbial pollution in the water resources.

Objectives:

In the present work our objective was to isolate and estimate the percent density of the heavy metals resistance bacterial species, measurement of amount of different heavy metals (Cu, Cd, Fe, As, Pb) present in the Hasdeo river in Korba region and also studying heavy metal driven co-selection of antibiotic resistance in the bacterial species.

Materials and Methods:

Description of sampling sites: Water samples for the study were collected from different location in Korba region sites river water.

Analysis of heavy Metal Concentration: **Content of heavy metas were analyzed as described by standard protocol from APHA**

Isolation of Bacterial species from Hasdeo river water: 1. Serial dilution and 2. Isolation of heavy metal resistant bacteria.

Cultural characteristic of bacteria: Biochemical and Molecular characterization of the isolates:

Antibiotics Sensitivity and MAR Index analysis: Antibiotics sensitivity were performed in Vitek 2C (Biomerieux, France).

Results and Discussion

Based on biochemical and 16S rRNA sequence analysis bacterial isolates having metal resistance (Cd, Cu, Pb, Ni, Fe) capacity were identified as Bacillus subtilis, Pseudomonas Stutzeri,.

Metal resistance capacities of the bacteria's are mainly associated with antibiotic resistance

Pseudomonas sp., Bacillus sp. were most sensitive against doripenem, imipenam, meropenam (MIC<=0.25). All the species show were showing least sensitivity to trimethoprim/Sulfamethoxazole (MIC=20).

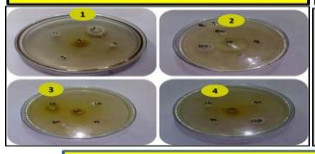
MAR index of all the isolates were recorded below 0.2 except water sample collected from Sarvamangla where it was recorded 0.208, MAR index more than 0.2 indicated source of contamination would be place where antibiotics used often

Results and Discussion

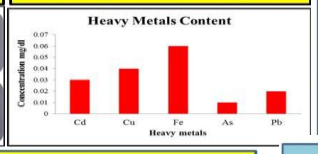
Bacillus subtilis

Pseudomonas aerugenosa

Antibiotic Resistance



Heavy Metal analysis



Metal Resistance

	Cd	Cu	As	Pb	Fe
Bacillus subtilis	+	+	+	+	+
Pseudomonas aerugenosa	+	+	+	+	+

Conclusion

Increased industrialization and urbanization leads to rise in level of Heavy metal contamination and level of microbial pollutant in river water Hasdeo.

Pollution of water resources exert a selective pressure on these plasmid-harboring bacteria, resulted in to resistance towards heavy metals that can be very well employed as a biological agent of bioremediation to remove the toxic waste.

Profound use of antibiotics and their discharge in river in form of domestics waste from different sources add to the ability to promote co-selection process, indirectly selecting for antibiotic resistance

References

Rajshree Singh and Shweta Sao (2015), Evaluation of Water Quality by Physicochemical Parameters, Heavy Metal and Use of Metal Resistant Property of Bacteria for Bioremediation of Heavy Metals. World Journal of Environmental Pollution 5 (2): 23-28