ISOLATION AND CHARACTERIZATION OF *Escherichia coli* FROM DRINKING WATER OF KATHMANDU WITH RESPECT TO ANTIBIOTIC SUSCEPTIBILITY AND HEAVY METALS RESISTANCE PATTERN

A DISSERTATION
SUBMITTED TO THE CENTRAL DEPARTMENT OF MICROBIOLOGY
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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE OF
MASTER OF SCIENCE IN MICROBIOLOGY
(ENVIRONMENT AND PUBLIC HEALTH)

BY
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2009

RECOMMENDATION

This is to certify that **Ms. Geeta Pandey** has completed this dissertation work entitled **"ISOLATION AND CHARACTERIZATION OF *Escherichia coli* FROM DRINKING WATER OF KATHMANDU WITH RESPECT TO ANTIBIOTIC SUSCEPTIBILITY AND HEAVY METALS RESISTANCE PATTERN"** as a partial fulfillment of M.Sc. Degree in Microbiology under my supervision. To my knowledge this thesis work has not been submitted for any other degree.

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CERTIFICATE OF APPROVAL

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ABSTRACT

Water deficit and deteriorating of water quality in Kathmandu is of great concern. The pollution of drinking water is responsible for a large number of mortalities and morbidities due to water–borne diseases. A study was carried out to evaluate the quality of drinking water of Kathmandu valley, was conducted from August 2008 to March 2009 in the laboratory of Central Department of Microbiology, Kirtipur. A total of 102 tap water samples were randomly collected from different areas of Kathmandu. These samples were analysed for physicochemical and microbiological parameters to assess the drinking water quality. *E. coli* isolated from these water samples were subjected to antibiotic susceptibility testing and heavy metals resistance pattern.

The seasonal variation in temperature was observed with the highest and the lowest temperature being 25.7^0C and 11.8^0C respectively. No variation was seen in the pH values of the water samples with all the values lying within the WHO recommended limit (6.5-8.5).

Out of 102 water samples 86.2% and 19.6% of the samples were found to contain total coliform and thermotolerant coliform respectively beyond the guideline value as recommended by the WHO (0 CFU/100 ml). A total of 20 *E. coli* isolates were obtained. Antibiotic susceptibility testing revealed resistance of *E. coli* isolates mainly towards Cephalexin (65%) followed by Amoxycillin (45%) and Tetracycline (15%). All the isolates were 100% sensitive to Co-trimoxazole, Amikacin, Chloramphenicol, Ceftriaxone, Ciprofloxacin, Nalidixic Acid and Gentamicin. The study of heavy metals resistance pattern revealed that 66.6% of *E. coli* isolates that exhibited resistance to more than one antibiotics had high MIC values for a set of heavy metals. All isolates exhibited high resistance to Zinc with average MIC 679.2 µg/ml and low resistance to Mercury with average MIC 58.3µg/ml.

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APHA	-	American Public Health Association
ATCC	-	American Type Culture Collection
ATPase	-	Adenosine Tri- Phosphatase
ATSDR	-	Agency for Toxic Substances and Disease Registry
BOD	-	Biochemical Oxygen Demand
CBS	-	Central Bureas of Statistics
$CdCl_2$	-	Cadmium Chloride
CEDA	-	Centre for Economic Development and Administration
CFU	-	Colony forming unit
Conc	-	Concentrated
$CuSO_4$	-	Copper Sulphate
DISVI	-	Italian International Co-operation
DNA	-	Deoxyribonucleic acid
DoHS	-	Development of Health Services
ENPHO	-	Environment and Public Health Organization
$HgCl_2$	-	Mercurous Chloride
HMG	-	His Majesty's Government
H_2S	-	Hydrogen Sulphide
ICIMOD	-	International Centre for Integrated Mountain Development
IOCC	-	International Office of Cocca, Chocolate and Sugar Confectionery
JICA	-	Japanese International Co-operation Agency
MHA	-	Mueller Hinton Agar
MIC	-	Minimum Inhibitory Concentration
MF	-	Membrane Filter
$Pb(NO_{3)}$	-	Lead Nitrate
Spp	-	Species
TSI	-	Triple Sugar Iron Agar
UNEP	-	United Nations Environmental Programme
UNICEF	-	United Nations International Children Emergency Fund
USEPA	-	United States Environmental Protection Agency
WHO	-	World Health Organization

w/v	-	Weight by volume
$ZnCl_2$	-	Zinc Chloride
µg		Microgram