

2016

CHALLENGES AHEAD

WATER QUALITY AND HUMAN HEALTH

International Symposium
PROCEEDINGS



All begins with water

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Invited Speech

CURRENT ISSUES IN WATER SECTOR RESEARCH

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Water is the most familiar and abundant liquid on earth and it is an essential nutrient, a vital component of every cell, tissue and organ in the body. On earth, 97% of water is found in seas and oceans, and 3% in freshwater. The Sri Lankan river system comprising 103 rivers flowing from the central highlands makes up a total collective length of about 4560 km covering a total area of 59,245 km². Groundwater extraction in the country has estimated at about 7,800 million m³ per year, and 72% of the rural population and 22% of the urban population is dependent on groundwater for their daily requirement. It is a known fact that variety of quality concerns in water includes contamination by nitrate, phosphate, heavy metals, pathogenic microbes, antibiotics, chloro and fluoro chemicals and cyanotoxins. Recent research in the Centre for Water Quality and Algae Research has revealed that heavy metals related to toxic chemicals are derived from the industrial sector and agricultural lands. Further, it has been shown that insufficient sanitary conditions and poor management of waste disposal would elevate the occurrence of human pathogenic bacteria, antibiotic, fluoro and chloro chemicals in surface and ground water, sediment and fish. The results are alarming bioaccumulation potential of hazardous xenobiotics via food chain, drinking water along with pathogens. Thus, providing safe drinking water is a challenge and consequently, research on environmental and health issues related to water quality, and development of novel technologies for water purification should be priority areas to develop the country. Results of such studies were shared with the Central Environmental Authority, Ministry of Environment, Ministry of Health and United Nations Development Programme to prepare a strategic plan for the river basin in the country. Accumulation of nitrate in ground water due to heavy usage of fertilizers has become another burning health problem with "blue baby syndrome" in some part of the country and hence, a green approach using microbes are being studied to develop removal methods for nitrate by bioremediation through enzyme technology. Further, Chronic Kidney Disease of unknown etiology (CKDu) has become a major health issue over the past two decades in Sri Lanka and no exact source of course or causative agent has been identified. Among the prevailing hypothesis on CKDu, the USJP a research team of the University of Sri Jayewardenepura (USJP) has investigated the effect of cyanotoxins and heavy metals on CKDu along with contamination status of microcystin in both ground and surface drinking water sources. As a result of collaborative research conducted by Japan International Cooperation Agency (JICA), National Water Supply and Drainage Board and USJP, microcystin-LR and cylindrospermopsin were included to the SLS drinking water quality standards in 2014. It is believed that this is high time to move environmental friendly green methods and technologies to find solution for water pollution. In this context, application of bioremediation and phytoremediation technology in order to find solution for oil pollution, textile dye pollution, cyanotoxin and pesticide contamination, water odor and taste problem prevailing in different part of the country are being under investigation. Recent work at the Robert Gordon University and the Macaulay Institute, UK have discovered far greater toxin and other xenobiotics degrading bacteria as world first record on microcystin degrading actinobacteria and recent studies in Sri Lanka the bacterium *Rahnella aquatilis* was recorded as world first report of microcystin-degrading bacteria which belong to class gamma-proteobacteria. Pivotal to this work the robust bacteria was incorporated as biofilm into lab-scale sand filters as a novel finding to treat microcystin contaminated water for water treatment solution.