



# Microorganisms and heavy metals associated with atmospheric deposition in a congested urban environment of a developing country: Sri Lanka



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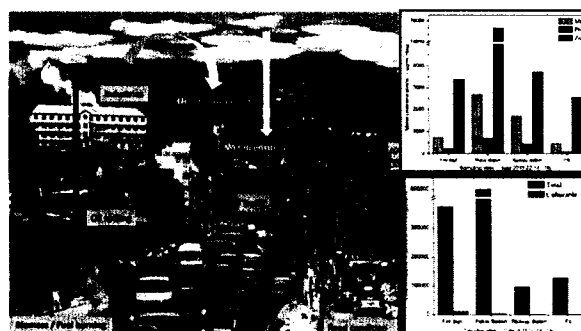
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## HIGHLIGHTS

- Nine bacterial species were identified, six Gram-negative and three Gram-positive.
- Al and Fe, geogenic in origin and may be re-deposited by vehicular traffic.
- High Cr, Mn, Ni, Cu, Cd and Pb are traffic influenced, galvanized roofs release Zn.
- Bacteria and heavy metals in deposition create human and ecosystem health risks.

## GRAPHICAL ABSTRACT



## ARTICLE INFO

### Article history:

Received 7 October 2016

Received in revised form 17 January 2017

Accepted 18 January 2017

Available online 7 February 2017

Editor: J Jay Gan

### Keywords:

Bacteria  
Opportunistic pathogens  
Atmospheric pollution  
Heavy metals  
Wet and dry deposition  
Sri Lanka

## ABSTRACT

The presence of bacteria and heavy metals in atmospheric deposition were investigated in Kandy, Sri Lanka, which is a typical city in the developing world with significant traffic congestion. Atmospheric deposition samples were analyzed for Al, Cr, Mn, Fe, Ni, Cu, Zn, Cd and Pb which are heavy metals common to urban environments. Al and Fe were found in high concentrations due to the presence of natural sources, but may also be re-suspended by vehicular traffic. Relatively high concentrations of toxic metals such as Cr and Pb in dissolved form were also found. High Zn loads can be attributed to vehicular emissions and the wide use of Zn coated roofing materials. The metal loads in wet deposition showed higher concentrations compared to dry deposition. The metal concentrations among the different sampling sites significantly differ from each other depending on the traffic conditions. Industrial activities are not significant in Kandy City. Consequently, the traffic exerts high influence on heavy metal loadings. As part of the bacterial investigations, nine species of culturable bacteria, namely: *Sphingomonas* sp., *Pseudomonas aeruginosa*, *Pseudomonas monteilii*, *Klebsiella pneumonia*, *Ochrobactrum intermedium*, *Leclercia adecarboxylata*, *Exiguobacterium* sp., *Bacillus pumilus* and *Kocuria kristinae*, which are opportunistic pathogens, were identified. This is the first time *Pseudomonas monteilii* and *Ochrobactrum intermedium* has been reported from a country in Asia. The culturable fraction constituted ~0.01 to 10%. Pigmented bacteria and endospore forming bacteria were copious in the atmospheric depositions due to their

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