

**DIFFERENTIAL EXPRESSION OF MXYR GENE CLUSTER OF
Mycobacterium tuberculosis IN THE PRESENCE OF CARBOHYDRATES**

S. Mauran¹, S. Gamage², N.P. Senanayaka², J. Perera², N.T. Perera³ and I.C. Perera^{1*}

¹Department of Zoology and Environment Sciences, Faculty of Science, University of Colombo,
Colombo, Sri Lanka

²Department of Microbiology, Faculty of Medicine, University of Colombo, Colombo, Sri Lanka

³Department of Chemistry, Faculty of Applied Sciences, University of Sri Jayawardenapura,
Nugegoda, Sri Lanka

*icperera@sci.cmb.ac.lk

MxyR, a multiple antibiotic resistance regulator (MarR) family transcriptional regulator in *Mycobacterium tuberculosis*, is reported as a Mycobacterial Xylan Regulator. Gene *mxyR* is divergently oriented from a hydrolase (Rv3094c), oxidoreductase (Rv3093c) and an ABC transporter (Rv3092c) and convergently oriented with xylanase (Rv3096). Our previous studies revealed that MxyR is a carbohydrate responsive transcriptional regulator where specific carbohydrates act as natural ligands. Carbohydrate bound MxyR has the potential to change the expression levels of the respective gene cluster. Here, the different expression levels of the gene cluster in the presence of different carbohydrates have been investigated. Corncob (CC) xylan, glucose, galactose and arabinose were incorporated into the mid-log phase of *M. tuberculosis* culture to determine the influence of carbohydrates in expression levels of gene cluster Beechwood (BW) xylan. After incubating for one hour, the total RNA of the cultures was extracted separately and subjected to cDNA synthesis and quantitative RT-PCR. The data were analysed using the comparative C_T ($2^{-\Delta\Delta C_T}$) method. The expression levels of each gene fluctuated in the presence of different carbohydrates. Carbohydrates including BW xylan, CC xylan and arabinose up-regulated the expression of the whole gene cluster, while galactose down-regulated the expression. Further, higher up-regulation of the xylanase gene was observed in the presence of BW xylan (25 times) and CC xylan (57 times). Significant up-regulation of oxidoreductase was observed in the presence of arabinose (17 times) and BW xylan (12 times). In conclusion, xylan shows a significant fold change in the expression level of the gene cluster. Unravelling the regulation of mycobacterial metabolic pathways is a major challenge and current work aids in understanding the carbohydrate-mediated gene expression.

Financial assistance from the National Science Foundation (Grant No. NSF/SCH/2018/12) is acknowledged.

Keywords: Carbohydrates, MxyR, *Mycobacterium tuberculosis*