Detection of Carbapenemase-producing *bla*$_{KPC}$ gene in sewage from the Greater Nanaimo Pollution Control Center

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Carbapenems are a class of β-lactam antibiotics that function by inhibiting bacterial cell wall synthesis. These drugs are clinically used as a last line of defense against multi-drug resistant *Klebsiella pneumonia* and *Escherichia coli*. The presence of the genes for New Delhi β-metallolactamase (*bla*$_{NDM}$) and *Klebsiella pneumonia* carbapenemase (*bla*$_{KPC}$) can be used to evaluate the prevalence of carbapenem-resistance among bacterial isolates, and the presence of such isolates in the environment. This study determined whether or not the *bla*$_{NDM}$ and *bla*$_{KPC}$ could be detected in raw sewage collected from the Greater Nanaimo Pollution Control Center using PCR (polymerase chain reaction). Influent raw sewage, effluent treated sewage, and precipitated biosolids, were collected on October 27th 2015 and February 11th 2016. Environmental DNA was extracted using the PowerLyzer®PowerSoil® DNA extraction kit. Sewage and biosolid samples were also incubated in tryptic soy broth supplemented with 18 μg ml^{-1} meropenem, and DNA from the resulting bacteria was extracted as above, or with GeneReleaser®. *Klebsiella pneumoniae* (*bla*$_{KPC}$) (ATCC: BAA 1705) and an *Escherichia coli* (*bla*$_{NDM}$) (ATCC: BAA 2452), were used as positive controls for the target genes. Direct extraction of DNA from environmental samples failed to detect either of the target antibiotic resistance genes. However, broth enriched samples indicated the presence of the *bla*$_{KPC}$ gene in the influent, raw sewage. This result suggests that carbapenem-resistant bacteria containing the *bla*$_{KPC}$ gene are present in Greater Nanaimo sewage, prior to treatment, but is removed after treatment.