Multiplex PCR detection of carbapenemase-producing genes *bla*$_{KPC-2}$, *bla*$_{NDM-1}$, and *bla*$_{OXA-48}$ in sewage from the Greater Nanaimo Pollution Control Center

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The widespread use of antibiotics has put an immense selective pressure on bacteria and resulted in their widespread resistance to these life-saving medications. Moreover, resistance to multiple antibiotics, including antibiotics of last resort, such as carbapenems, is especially troubling. This problem is compounded by horizontal gene transfer mechanisms, which contribute to the rapid rate of dissemination of antibiotic resistance genes among bacterial species. Thus, regional monitoring of wastewater for the presence of antibiotic resistance-producing genes is the first step in mitigating the release of these genes into the environment. The objectives of this study were to determine whether the carbapenemase-producing genes *bla*$_{KPC-2}$, *bla*$_{NDM-1}$, and *bla*$_{OXA-48}$ could be detected, via multiplex PCR, in influent and effluent sewage samples from the Greater Nanaimo Pollution Control Center (GNPCC); and whether temporal or environmental fluctuations in the presence of these genes could be observed over the course of one year. The protocol that was used allowed for the detection of all three of the proposed *bla* genes. *bla*$_{KPC-2}$ was consistently detected throughout the entire duration of this study, albeit only in meropenem-enriched cultures of sewage. Similarly, *bla*$_{NDM-1}$ was only detected in meropenem-enriched cultures; however, only in September, November and December. *bla*$_{OXA-48}$ was detected only once, in un-enriched effluent sewage in May. The precise bacterial species possessing these detected genes remains unknown.