Antimicrobial resistance in the environment – should we worry about it?

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Abstract:

In recent years, the emergence of antimicrobial resistance has drawn heightened global concern because of the severe ramifications on the treatment of microbial infections. In particular, the issue of antibiotic resistance arises due to the overuse and misuse of antibiotics in both developed and developing countries. Bacteria develop antibiotic resistance in the presence of residual levels of antibiotics and these antibiotic resistant bacteria in turn, are able to spread their resistance to other bacteria through mechanisms such as horizontal gene transfer. There is a worrying trend that pathogens are developing antibiotic resistance to a degree where last resort antibiotics are no longer effective. This, in turn, has severe implications on public health and healthcare costs.

In an effort to better understand the rising levels of antimicrobial resistance, surveillance studies have been undertaken across countries in a common effort to explore the occurrence of antimicrobial resistance in both clinical and natural environments. Implementing such initiatives through assessing the types of antibiotics used, antibiotic resistant bacteria present and associated antibiotic resistant genes in microbiomes enables better understanding of the impact of antibiotics in clinical, veterinary, agriculture and aquaculture settings. In particular, aquatic environments harbour diverse freshwater bacterial communities which may be subjected to anthropogenic pressures, while domestic wastewaters receive direct loads of antibiotics and pathogenic bacteria from human excretion. The nature of these environments allows them to function as hotspots for resistance through the selection of antibiotic resistant bacteria and circulation of antibiotic resistant genes via stimulation of horizontal gene transfer between members of the microbial community. Here, we examine levels of antibiotic resistant factors from a variety of environmental waters, including hospital and domestic sewage as well as freshwater and marine environments. We also examine potential novel methods of countering antimicrobial resistance such as application of anti-quorum sensing molecules.