SCIENTIFIC REPORTS

OPEN

Comparative mangrove metagenome reveals global prevalence of heavy metals and antibiotic resistome across different ecosystems

Received: 19 December 2017
Accepted: 13 July 2018
Published online: 25 July 2018

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The mangrove ecosystem harbors a complex microbial community that plays crucial role in biogeochemical cycles. In this study, we analyzed mangrove sediments from India using *de novo* whole metagenome next generation sequencing (NGS) and compared their taxonomic and functional community structures to mangrove metagenomics samples from Brazil and Saudi Arabia. The most abundant phyla in the mangroves of all three countries was Proteobacteria, followed by Firmicutes and Bacteroidetes. A total of 1,942 genes were found to be common across all the mangrove sediments from each of the three countries. The mangrove resistome consistently showed high resistance to fluoroquinolone and acriflavine. A comparative study of the mangrove resistome with other ecosystems shows a higher frequency of heavy metal resistance in mangrove and terrestrial samples. Ocean samples had a higher abundance of drug resistance genes with fluoroquinolone and methicillin resistance genes being as high as 28.178% ± 3.619 and 10.776% ± 1.823. Genes involved in cobalt-zinc-cadmium resistance were higher in the mangrove (23.495% ± 4.701) and terrestrial (27.479% ± 4.605) ecosystems. Our comparative analysis of samples collected from a variety of habitats shows that genes involved in resistance to both heavy metals and antibiotics are ubiquitous, irrespective of the ecosystem examined.

Mangroves are estuarine ecosystems composed of saline tolerant plants and are found in 60–70% of the coastal areas, exclusively in tropical and subtropical regions[1]. They are exposed to fresh and oceanic water, experiencing a wide variation of salinity throughout the tidal cycles[2]. Mangroves are important as they are a rich reservoir of microbial diversity and act as a buffer zone between land and sea. Furthermore, mangroves are also a source of novel enzymes and small biomolecules such as LipA-like lipase[3], aspergilumamide-A peptide[4], pyrrolizidine alkaloid penibruguieramine-A[5], GH44 family endoglucanase[6], pullularins E, F peptides[7] and salt-tolerant endo-β-1, 4-glucanase Cel5A[8]. They also serve as a potential phytostabilizer to absorb heavy metal pollutants in industrial areas[9]. In addition, recent studies have shown that mangroves can enhance fish abundance[10] and provide an

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