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Bioaccumulation of Heavy Metals within Mangrove Ecosystems

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Introduction

Urban development can have a serious environmental impact on different aspects including biodiversity and health. Mangroves are one of the most highly dynamic ecosystems which could sensitively reflect variations within the environment. One of the most significant ecological roles for mangroves is maintaining balance and stability within marine habitats by numerous means including erosion mitigation of coastal landforms [1,2]. One of the fifty nine different types of mangrove species present within the world; *Avicennia marina* is a cosmopolitan species which can grow within several coastal habitats like Indonesia, Arab Gulf and Eastern Africa [3-5].

Mangroves as Bio-indicators of heavy metals

The recent urban recreational and industrial developments of coastal mangrove areas within numerous parts of the world have posed a threat on such important ecosystems. Bioaccumulation of anthropogenic chemicals and non-essential nutrients through the food chain has recently become a matter of concern for several researchers [6]. Heavy metals like lead, cadmium, chromium and zinc are highly toxic pollutants which could be significantly associated with bioaccumulation within a myriad of ecological systems because they cannot be biologically degraded and instead get concentrated within sediments [7]. Globally, there has been a unanimous agreement that the reported levels of heavy metals within mangrove sediments are increasing every year as a result of pollution and activities caused by developmental growth and urbanization [7,8]. Although there are variations in the levels of heavy metal tolerance exhibited by different types of mangroves, the grey mangrove *Avicennia marina* has a relatively higher tolerance level when compared with other mangrove species [4,7]. This quality qualifies grey mangrove to be a good bio-indicator and enables researchers to obtain quantitative information about the environmental/ecological quality of its habitat through monitoring and experimental testing. It is speculated that *Avicennia marina* could be more tolerant to heavy metal by developing several adaption mechanisms including avoiding the uptake of metals actively and exclusion of ions [4]. Numerous studies have utilized mangrove species and their sediments as reliable bio-indicators for heavy metal pollution and contamination[4,9]. Interestingly, the bio-concentration of various metals in this plant differs according to the type of tissue. For instance mangrove leaves tend to accumulate lower levels of metals as compared with mangrove roots and sediments [9]. It has been reported that very low heavy metal concentrations accumulated in leaf tissues because most absorbed heavy metals accumulated in stem and root tissue. Nevertheless, root tissue is the most commonly used bio-indicator for heavy metal pollution with high reliability and accuracy as compared to leaves [9].

The most commonly investigated heavy metal contamination pertains to the pollution of mangrove habitats with lead, zinc, mercury, magnesium, nickel, chromium, cadmium, and manganese [8]. A research study has revealed high lead levels in the grey mangrove sediments of the United Arab Emirates most likely as a result of massive expansion of developmental construction projects. The vast developmental growth with emphasis on recreational reshaping of coastal beaches has subjected mangroves to discarded contaminants which could have led to the sedimentation of heavy metals within plant tissue [3]. Research investigations of the status of heavy metal pollution in grey mangrove habitat biota within the Red Sea coastal areas of Saudi Arabia have also documented a very high concentration particularly for copper and chromium [10]. Similarly in India and Hong Kong, the intense development and industrialization have posed an ecological threat to the nearby mangroveforests whichhave revealed elevated levels of heavy metals that exceed sediment quality guidelines particularly with lead [1,9,11]. It has been predicted that the levels of lead within mangrove sediments in the Gulf region and others could be increasing in the coming few years due to impacts of oil spills and the higher rate of fuel consumption [3,7,8].

Conclusion

To summarize, indicator species are important because they can be utilized to reflect the level of pollutants including heavy metals within biological systems. Mangroves and their sediments have an important ecological value because they can act as natural sinks for heavy metals owing to the high capacity of this organism to sequester such metals from tidal waters and rivers and other sources [12]. Ambitious urban structure framework plans within mangrove habitat biotas should always consider the establishment of a comprehensive environmental risk assessment and mitigation plan due to the highly likely chances of pollution caused by anthropogenic chemicals [1,2].

References

1. Sarika PR, Chandramohanakumar N (2008) Geochemistry of heavy metals in the surficial sediments of mangroves of the south west coast of India. Chemistry and Ecology 24: 437-447.

2. Chen GZ, Peng YS, Zhao B , Zhou YW (2010) Influence of mangrove reforestation on heavy metal accumulation and speciation in intertidal sediments. Mar Pollut Bull 60: 1319-1324.

3. Shriadah MMA (1999) Heavy metals in mangrove sediments of the United Arab Emirates shoreline. Water, Air, and Soil Pollution 116: 523-534.

4. Burchett MD, MacFarlane GR, Pulkownik A (2003) Accumulation and distribution of heavy metals in the grey mangrove Avicennia marina (Forsk.) Vierh.: biological indication potential. Environmental Pollution 123: 139-151.

5. Rajkumar M, Saravanakumar A, Serebiah JS, Sun J, Thivakaran GA (2009) Forest structure of arid zone mangroves in relation to their physical and chemical environment in the western Gulf of Kachchh, Gujarat, Northwest coast of India. J Coast Conserv 13: 217-234.

6. Alberic P, Baillif P, Baltzer F, Cossa D, Lallier Verges E (2006) Heavy metals

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distribution in mangrove sediments along the mobile coastline of French Guiana. Mar Chem 98: 1-17.

7. Agoramoorthy G, Chen FA, Hsu MJ (2008) Threat of heavy metal pollution in halophytic and mangrove plants of Tamil Nadu, India. Environ Pollut 155: 320-326.

8. Basamba TA, Kakudidi E, Mutumba G, Oryem Origa H, Sekabira K (2010) Assessment of heavy metal pollution in the urban stream sediments and its tributaries. Int J Environ Sci and Tech 7: 435-446.

9. Defew LH, Guzman HM, Mair JM. (2005) An assessment of metal contamination in mangrove sediments and leaves from Punta Mala Bay, Pacific Panama. Mar Pollut Bull 50: 547-552.

10. Usman AR, Alkredaa RS, Al-Wabel MI (2013) Heavy Metal Contamination in Sediments and Mangroves from the Coasta of Red Sea: Avicennia marina as potential metal bioaccumulator. Ecotoxicol Environ Saf 97: 263-270.

11. Lewis M, Pryor R, Wilking L (2011) Fate and Effects of Anthropogenic Chemicals in Mangrove Ecosystems: A review. Environ Pollut 159: 2328-2346.

12. Tam NFY, Wong YS (1999) Mangrove soils in removing pollutants from municipal wastewater of different salinities. J Environ Qual 28: 556-564.