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An Appraisal on Toxic Effects of Heavymetal Ions in Aquaculture

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Abstract

Heavy metals pose a severe threat into the aquaculture. Their mere abundance in aquatic system above the permissible level is categorized as toxic. Consequently, theIr excess concentration leads to undesirable impact in the flora and fauna. This short communication briefly overviews the toxicity levels induced by these heavy metal ions. Apart from this, the detection as well as recommendations is also highlighted here.

Short Communication

Heavy metals are ubiquitous in nature; they possess permeating capability to step inside the marine ecosystem [1-9]. If we look for their causes, mostly they are anthropogenic in nature. So far natural sources are concerned, Earths' crust, volcanic eruption can be considered. In terms of manmade sources, there are plenty [4-9]. We can cite discharges from sewage, waste from agricultures, industrial wastes from petrochemical and oil industries. When the heavy metals make their entry into the sediments, they become bioavailable; thereby initiating bioaccumulation in the aquatic organisms [1-4]. There are reports that the deep water species such as mullets and whiting which are basically carnivorous in nature show traces of heavy metals such as Co, Ni, Cd, Zn. etc. which are supposed to enter either through their gills and intestine or food web. In general, the entry of heavy metals inside fishes occurs either via gills or by digestive tract. Along with that, body surface can also be considered as another entry point for these heavy metals. The serious impacts of heavy metal ions are huge. Heavy metals impact rate of growth. As per reports, heavy metals result in harmful impacts in the growth of fish species. As for instance, lead can be cited. Irrespective of its origin, lead can lead to immature breeding of fishes if they are exposed to high dosage of lead. Similarly, calmodulin, being the assimilating result of cadmium with lead, creates anomalies in cellular functions. Apart from this, cadmium severely leads to degradation of catalytic activities. Reproductive system is also influenced by heavy metals. Exposure to higher concentration of heavy metals such as zinc, lead, cadmium, mercury can impair the reproductive system. Through passage to gonads of fishes, these heavy metals contaminate the eggs and sperm. This eventually affects fish fertility as well as mutation of embryo. As for example, sperms become less mobile as incurred by methyl mercury. Less quantity of larvae gets produced as considerable no. gets spoiled due to absorption of lead and copper. It has also been reported that embryos coming under the influence of mercury exhibit ventricle deficiencies as well as under developed heart etc. In essence, the breeding capability is totally jeopardized by these heavy metal ions. Similarly, the gills and respiratory system are also impacted by these heavy metals indifferent proportions. Higher dosage of Zinc causes hypoxia which is further accompanied by alteration in ventilator and heart anatomy of fishes. Apart from this, there are various neurotoxic effects of heavy metals directly on aqua farming [3,4]. In this context, we can refer to the Hg toxicity as one of the potential neuro-toxicants. Surprisingly, these findings remain unaltered in a span of ten years or more which reveals a grueling picture of heavy metal contamination in marine environment. The problem now arises as to what effective procedures could be adopted so that the impact of heavy metals can be reduced in aquaculture.

In general, these heavy metals show less chance of remobilization so that they can be converted into less toxic substances. However, this is totally impeded by their characteristic non biodegradability in nature. After their entry into the aquatic system, they either accumulate in sediments or get consumed by aggregation; thereby making their passage as bio-accumulative entities in flora and fauna [2-9].

In order to reduce this continually growing danger of toxic effects induced by heavy metals, we have to look into two aspects, namely, detection and prevention/removal. As per EPA and WHO, there are standard levels of concentrations of heavy metal ions in water body falling in the permissible level. Anything above it is treated as toxic. Hence, there is need of rapid diagnosis of trace determination of heavy metal ions in aquatic systems. In this direction, several researches are being executed [10-18]. Once the proper diagnosis is done, the next level is their proper removal. However, there goes a proverb-prevention is better than cure. Accordingly, it is necessary that we should resort to preventive steps which would help in reducing the heavy metal sludge in oceans. As we know that development will be crippled if we forego our industrial sector. Hence, there should be a check on disposal of industrial effluents in to marine systems. The entrusted nodal agencies should strictly monitor these processes so that the violators can be brought to book immediately with stringent punitive measures. If all these measures are taken in a systematic manner, the toxicity induced by heavy metal in aqua culture can be effectively tackled; thereby imbibing a total ecological balance.

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