

- Heavy metal contamination constitutes a serious health risk
- Exposure to heavy metals through contaminated food is widespread in Bangladesh
- Adequate food standards need to be set and enforced for consumer protection
 - To better protect consumers, food standards need to be enforced and the Food Safety Act implemented effectively

Heavy metal contamination – a threat to food safety

The presence of heavy metals in constituents of the daily diet such as cereals, fish, meat, fruits and vegetables and spices expose households in Bangladesh to serious health hazards. Contamination rates of arsenic, lead and mercury are alarming, while levels of cadmium and aluminum are of concern. Dietary risks could be reduced through regular assessments as well as improved monitoring and inspection mechanisms. The setting of risk-based food safety standards should therefore be a priority for Bangladesh. This should be taken into consideration within the rules and regulations of the Bangladesh Food Safety Act, 2013 for its effective implementation.

Growing concern

Many households in Bangladesh are exposed to foods containing heavy metals including cadmium, arsenic, lead, mercury, antimony and aluminium. These enter the food chain through pathways such as irrigation water, polluted soils and agricultural chemicals among others. High levels of arsenic and lead, for example, have been detected in rice and vegetables. Indeed, a recent study conducted by the Bangladesh Agricultural University showed the presence of at least one or more heavy metals in five out of 16 food groups, namely cereals, fish, meat, fruits and vegetables and spices.

As indicated in Table 1, the intake of food contaminated with heavy metals spans both low and higher income groups. An alarming 94 percent of poor households and 78% of non-poor households were found to be exposed to cadmium in excess of PTWI. Moreover, just their mean intake

Elements in diet	PTWI* (µg/kg BW)	Mean dietary risk exposure (µg/d)	
		Poor households	Non-poor households
Arsenic	none	40	90
Lead	none	254	272
Cadmium	0.025 (monthly)	106	40
Mercury	1.6 - 4.0	1.4	3.1
Aluminium	1.0	3.8	12.5
Antimony	2.3	0.2	0.8

Table 1: Dietary risk exposure of heavy metals across income groups

* provisional tolerable weekly intake

per day vastly exceeded the monthly provisional intake recommended by WHO. Similarly, the mean daily intake of arsenic of the sampled populations is very high, mostly derived from rice and fish. Average daily lead intake in poor and non-poor households' ranges from 40-90 µg. FAO-WHO now recommend an as-low-as-possible intake for both arsenic and lead. Aluminium intake exceeded PTWI in twice as many non-poor households as poor households. The risk of excessive mercury ingestion through food, in contrast, was low. Overall, non-poor households have a higher intake of heavy metals most likely due to greater access. This clearly indicates that key food commodities, irrespective of the consumer's purchasing power, are heavily contaminated with heavy metals and pose a grave public health risk.

Various sources of contamination

Heavy metals can enter the food chain through many routes. One of the main sources of contamination is groundwater irrigation, which plays a key role in

Bangladesh's crop production, especially during the dry (Boro) season. Due to ineffective water purification, groundwater is frequently contaminated with arsenic. Heavy rainfall during the monsoon season and regular floods further exacerbate the problem. In the case of Boro rice, irrigation with potentially contaminated groundwater affects around 3.5 million hectares of land. The use of pesticides and chemicals containing heavy metals is another source of contamination. Pollution of surface water by industrial effluents and run off from contaminated soils is common in Bangladesh.

Food also gets contaminated during processing and preparation for consumption. For example, lead contamination of spices can arise from lead paint and lead containing equipment such as piping and during food handling and food packaging. Adulteration is a serious problem in Bangladesh with chemicals such as lead chromate being added to turmeric to enhance its colour. The addition of illegal chemicals for ripening and preservation is another source of contamination. Traditional cooking techniques might also have a role. For instance, the concentration of heavy metals in rice is influenced by the way it is prepared: i.e. lower for the draining and higher for the absorption method. Finally, consumer preferences are also important, as puffed rice displays a higher concentration of manganese and aluminium when compared to ordinary rice.

Preventing exposure to heavy metal contamination

Contaminated foods expose all households in Bangladesh to high dietary risks. The level of exposure depends on where and how foods are grown, processed, marketed and consumed. Therefore, food safety can only be strengthened by regular monitoring and inspection along the entire food chain and incorporating preventive practices from production through to consumption. Improving the country's food safety and nutritional standards and ensuring their effective implementation through a regulatory framework will be instrumental to safeguard public health and national productivity. Against this background it is promising to note that in response to public health concerns, the Parliament of Bangladesh passed the Bangladesh Food Safety Act, 2013 and is

constituting a regulatory body, the Bangladesh Food Safety Authority.

The way forward

Any attempt to reduce heavy metal contamination and improve food safety will have to address multiple issues. Specifically, environmental interventions are needed to decrease industrial pollution, promote proper treatment and safe disposal of effluent. The use of deep tube well water for irrigation which is less prone to contamination should be encouraged. The use of permitted agro-chemicals at the recommended dose and schedule needs to be propagated. Awareness campaigns and nutrition education programmes are needed to sensitize people at various stages of the food chain to the risks of heavy metal contamination, their toxicity and effects on human health. An understanding of preventive measures that can be implemented at various stages of production, processing and consumption of foods should be provided. Apart from reducing exposure to heavy metal contamination, such efforts could also promote the consumption of fruits and vegetables, thus contributing to a more balanced diet.

At the institutional level, the Bangladesh Standards and Testing Institute will be instrumental in ensuring food safety and nutritional standards of foods. The formulation of country specific food standards, the adoption of international and in particular Codex Alimentarius standards, should be fostered. Concerned Ministries and agencies also have to frame appropriate regulations and controls to treat industrial effluents and disposal to minimize heavy metal contamination. The Food Safety Act of 2013 and its rules and regulations, currently being framed, can become a catalyst in this process, but new legislation will have to be accompanied by effective monitoring, inspection and enforcement ●

Key sources: ● Islam, M.R., Jahiruddin, M., Islam, M.R., Alim, M.A., Akhtaruzzaman, M. 2013. Report on the 'Consumption of unsafe foods: heavy metal, mineral and trace element contamination'. Bangladesh Agricultural University, www.nfpcsp.org (research grant reports) ● Bangladesh Food Safety Act 2013, Government of the People's Republic of Bangladesh ● FAO Food Safety Programme, Ministry of Health and Family Welfare, Government of the People's Republic of Bangladesh.