Potential Health Risks of Heavy Metals Due to Consumption of Vegetables

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Abstract

Vegetables are one of the vital components of daily food. Environmental contamination is rapidly flourishing worldwide. The soil contaminated with heavy metals like lead Chromium, Manganese, Iron, Nickel, Copper, Zinc, Cadmium and Mercury has serious impacts on environment since these metals are non-essential and toxic to plants and animals and have significant noxious effect on human health too. Heavy metals are very deleterious due their non-biodegradable nature, long biological half-lives and their potential accumulation in various body parts. Most heavy metals are immensely poisonous because of their water soluble nature. Paradoxically small volume of heavy metals has adverse health effects to humans as there is no good system for their excretion from the body. Globally, ingestion of heavy metals through the food chain by human populations has been vastly reported. Consumption of metal contaminated vegetables may lead to a immune system suppression, intra-uterine stunted growth, psycho-social personality disorders, increased incidence of upper gastrointestinal cancer and other disorders typically associated with malnutrition.

Keywords: contamination; environmental pollution; Heavy metals; metabolic effects; toxicity; vegetables

Introduction

Vegetables are important sources of nutrient elements for human health such as potassium, fiber, and vitamins. The possible introduction of these elements has contributed to the rising occurrence of heavy metals in the ecosystem through their direct ingestion from polluted soils, consumption of vegetables grown on the polluted soils or drinking waste water that has drained through such soils. Evidence from various studies suggests that daily consumption of vegetables can prevent the development of cardiovascular diseases and some cancers, especially gastrointestinal cancers [1]. However, the consumption of vegetables grown in heavy metal-contaminated soils can lead to harmful metabolic and physiological effects on human body [2]. High application of organic and inorganic fertilizers in the fields can lead to the accumulation of nitrates and heavy metals in crop plants and consequently, the consumption of these products can threaten human health [3-5].

Health Effects and Risks from Metals in Vegetables

It is well known that lead, arsenic and cadmium are very toxic heavy metals for human health [6, 7] and directly or indirectly enter human body. Soil and water contamination by heavy metals is one of the human society's problems that reduce yield and quality of agricultural products and threaten human health [8]. Lead is not a necessary element for human health, and its high intake has different harmful effects such as enzymatic and nervous problems, skeletal damages, and immune system damage. Exposure to arsenic causes various problems such as skin damages, peripheral neuropathy, and vascular diseases [9]. Chronic exposure to cadmium leads to lung cancer, prostate problems, kidney disease, and osteoporosis. Even the intake of necessary elements with significant biological effects can threaten human health. Overall, after penetration of metals into cells, they are affected by oxidation and reduction potential, which can disturb the intracellular reactions in living cells [10]. Heavy metals enter human body through various pathways such as inhalation, dust and air pollution and consumption of vegetables grown in the contaminated soils. Accordingly, assessment of the heavy metals health risk seems necessary, although reducing heavy metals concentration is a useful method for protection of human health [11].

Lead contamination adversely affects mental growth, causing neurological and cardiovascular diseases in humans, especially children [12]. Certain heavy metals, especially lead and cadmium, have carcinogenic effects and can also lead to bone fractures and malformation, cardiovascular complication kidney dysfunction, hypertension, and other serious diseases of the liver, lung, nervous system, and immune system [13].
Conclusion

Heavy metal contamination of agricultural soils as a result of urbanization and industrialization is of great concern because of potential health hazard due to dietary intake of contaminated vegetables. Vegetables are vital to the human diet and in particular provide the nutrients to maintain normal health. The prolonged application of fertilizers, pesticides has resulted in accumulation of heavy metals especially in vegetables. Exposure to heavy metals by consumption of contaminated vegetables and its toxicity is a serious concern. High levels of toxic metals deposited in body tissues and subsequently in the brain, may cause significant developmental and neurological damage, including depression, increased irritability, anxiety, insomnia, hallucination, memory loss, aggression and many other metabolic as well as physiological disorders.

References