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A Review of the Potential Issues of Pollution Caused by the Mineral Elements, Mercury, Lead and Arsenic, Its Possible Impacts on the Human Beings and the Suggested Solutions

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ABSTRACT

Objective: This paper mainly discusses and summarises the potential issues of pollution caused by the Mineral elements, Mercury, Lead and Arsenic, its possible impacts on the human beings and the suggested solutions. **Methods:** This paper is prepared by reviewing the latest academic literatures. **Result:** First, this article discusses two aspects including the effects of Mercury, Lead and Arsenic on the Chinese herbal medicine and the potential issues of causing the environmental pollution. And then further study its toxicity effects and the side impacts on the human bodies in order to realize the actual circumstances people are encountering nowadays. This paper will also the corresponding its treatment method of reviews. Hope this will provide a valuable reference. **Conclusion:** Theses issues caused by the Mineral elements are prominent nowadays, thus the ongoing researches on the impacts of pollution and the possible solutions are regarded as highly valued in order to conserve the natural environment and meanwhile safeguard the well beings of people and the future offspring.

Keywords: Mineral Elements; Arsenic; Lead; Mercury

1. Introduction

With the continuous development of the science, more and more serious pollutions stem from Mineral elements, including arsenic, lead, mercury, cadmium, nickel, copper and zinc, fierce, and sources etc. The sources of pollutions are very broad, factors including environment, food and drugs. This paper mainly discusses three Mineral elements, Mercury, Lead and Arsenic. The focuses are mainly on the basis of environment and drugs. We can also realize the extent of harm of the heavy metals on the human health and the feasible methods in resolving the health impacts.

2. Pollution of Mercury, Lead and Arsenic

Rapid economic development in countries and concern for both the environment and protection against pollutants is increasing. Identification of sources of contaminants and evaluation of current environmental status are essential to environmental pollution management. Mining and metallurgical activities these anthropogenic Mineral elements from the contaminated areas into the environment. Harmful Mineral elements included Mercury, Lead and Arsenic. Lead is used in many industries, including lead smelting and processing, the manufacturing of batteries, pigments, solder, plastics, cable sheathing, ammunition, ceramics, and battery recycling. It was the most common Mineral elements contaminant [1-3]. Arsenic contamination in the arises due to human activities like mining, combustion, and pesticide application. As indicated by the presence of pyrite, hydrous ferric oxide, organic matter, clay minerals, fracture surfaces, and high permeable (moldic) zones. Arsenic was present in all of the stratigraphic units at low concentrations, close to the global average for as in limestone of 2.6 mg/kg. The highest As concentration was 69 mg/kg [4,5]. Mercury was common Mineral elements in home contamination. If you broken thermostats or from the accidental or intentional spilling or sprinkling of elemental mercury. Because it can easily trapped in porous surfaces such as plaster or stucco interiors, carpeting or cracks between tile or wood floors. So it may persist in an indoor environment for several years. There are many publications in the scientific literature addressing this issue, including

several excellent reviews. This type of contamination is a public health issue worldwide. In particular the ongoing catastrophic problems in Bangladesh and West Bengal have been front-page stories in newspapers and scientific journals [6-9].

Toxic contaminant release; toxic substances can follow different environmental pathways and accumulate in environmental soil and elevated concentrations of toxic metals. Metals are persistent in soils for a longer time after their introduction, and most metals do not undergo microbial or chemical degradation. Such as deforestation and soil erosion, inevitably resulted in environmental degradation in the surrounding seas induced historical soil and groundwater pollution by Mineral elements. That is a worldwide problem (**Tables 1** and **2**).

3. Traditional Chinese Medicine and Proprietary Chinese Medicines in Mineral Elements of Arsenic, Mercury and Lead

In recent years, the total number of people using traditional Chinese herbal medicine is vast and steadily increasing in East Asian countries and Chinese society. The industrial output value of traditional Chinese herbal medicine has also continued to expand rapidly across the world since the year 2000 [43]. Thereafter, the united states studies show, that approximately 14.8 billion USD were spent in 2007 on non-mineral, non-vitamin natural products, most of which consisted of herbal medicines,

Table 1. Comparisons of the concentrations of trace metals in urban soils of different cities in China (mg·kg^{-1}).

Soils pollution				
Chinese provinces and cities	Pb	Hg	As	Reference
Beijing	25.5 - 208	n.d	n.d	[10]
Changchun	19.7 - 378	0.026 - 1.43	6.1 - 67.7	[11,12]
(Jilin)	28.8	0.037	8.0	[13]
Changsha	7.80 - 413	0.050 - 1.29	2.49 - 79.8	[13]
(Hunan)	29.7	0.12	15.7	[13]
Chongqing	13.5 - 53.9	0.049 - 0.89	4.12 - 18.9	[14]
(Sichuan)	30.9	0.061	10.4	[14]
Fuzhou	22.8 - 1072	0.020 - 6.24	1.39 - 42.2	[15]
(Fujian)	41.3	0.093	6.30	[15]

The chart above indicates the distribution status of lead, mercury and arsenic in the soil of both provinces and cities of China. The results show that the distribution of lead element in the soil of provinces is higher than that of cities; conversely, the distribution of arsenic in the soil of cities is higher than that of provinces; the discrepancy is much less for the content of mercury in the soil of both provinces and cities.

Table 2. Concentration of several elements (mg·kg^{-1}) found in sediments collected in different estuaries of the world.

Pollution of Estuary			
Around the world in Estuary	Pb	As	Reference
1. Medway (UK)	67	14	[16]
2. Thames (UK)	63	15	[17]
3. Odiel-Tinto (Spain)	523	278	[18]
4. Nerbioi-Ibaizabal	21 - 445	0.6 - 220	[19]
5. Krka (Croatia)	11	n.d	[20]
6. St Lucie (Florida)	2.8 - 23	n.d	[21]
7. Vigo (Spain)	57	n.d	[22]
8. Mersey (UK)	65	n.d	[23]
9. Hudson (New York)	81	n.d	[24]
10. Pearl River (China)	16 - 93.3	n.d	[25]
11. Severn (UK)	50 - 68	n.d	[26]
12. Tagus (Portugal)	65 - 200	n.d	[27]
13. Ulla (Spain)	57 - 58	n.d	[28]
14. Marabasco (Mexico)	2 - 18	n.d	[29]
15. Pontevedra (Spain)	37 - 144	n.d	[30]
16. Ennore Creek (India)	32	n.d	[31]
17. Tamaki (New Zeeland)	51 - 122	n.d	[32]
18. Pearl River Estuary (China)	59.4	n.d	[33]
19. Shenzhen Bay (China)	46.0	n.d	[34]
20. Jiaozhou Bay (China)	30.9	n.d	[35]
21. Quanzhou Bay (China)	34.3 ± 16.9	n.d	[36]
22. Western Xiamen Bay (China)	50.0	n.d	[37]
23. New York Harbor (USA)	109 - 136	n.d	[38]
24. Bremen Harbor (Germany)	122	n.d	[39]
25. Izmir Harbor (Turkey)	97	n.d	
26. Boston Harbor (USA)	86	n.d	[40]
27. Marine Sediment Quality Primary standard criteria	60	n.d	[41]
28. Marine Sediment Quality Secondary standard criteria	130	n.d	[41]
29. Sediment guideline for effects range-low (ERL)	46.7	n.d	[42]
30. South China Sea (China)	23.6 ± 8.9	n.d	[42]

The above chart indicates the extent of air pollution triggered by lead and arsenic in different countries. The results show that the extent of air pollution triggered by the elements in the countries such as United States, China and India are different. There is less data obtained for the analysis of arsenic element. Based on all available information, the extent of pollution triggered by lead is higher than that of arsenic.

up from an estimated total of 6.6 billion USD spent ten years previously but several studies have shown that CHMs and other botanical supplements may be contaminated with minerals and metals 15, also in some cases at toxic levels. Much of what has been reported regarding potentially worrisome contamination in herbal medicines relates to patent or proprietary medicines [44-46].

We learned that Proprietary Chinese Medicines can produce Mineral elements poisoning and that physicians need to take patient histories carefully, being aware of the possible side effects of herbal medicines. In traditional Chinese medicine, mercury and arsenic is part of some preparations. In which "calomel" (mercury chloride) or "hydrargyri oxydum rubrum" (mercury oxide) and it contains 10% cinnabar HgS (mercury sulfide) of An-Gong-Niu-Huang Wan (AGNH） [47]. Also that arsenic including arsenolite, orpiment (mainly containing As_2S_3), realgar (mainly containing As_4S_4), arsenolite and arsenic trioxide (mainly containing As_2O_3) [48]. It has long been used in traditional medicine for treating various diseases but in some cases at toxic levels [49].

3.1. Orpiment, Realgar and Arsenic Stone Toxicity of Mineral Elements

Arsenical preparations have been used by many physiccians in the treatment of malignant diseases, such as leukemia, Hodgkin's disease, pernicious anemia and non-malignant diseases, such as psoriasis, pemphigus, eczema, and asthma for centuries [50]. Recent studies prove that realgar is used to counteract toxicity, kill parasites, and cure malaria [51]. Also that orpiment nanoparticles can inhibit the telomerase activity of K562 cells, which may be an important mechanism in the anticancer effect of orpiment nanoparticles [52,53]. In fact, it is a known human carcinogen producing a series of organic cancers and has many other profound toxic effects following short-term or long-term exposure [54]. In which, arsenolite and arsenic trioxide are highly toxic compared to orpiment and realgar. Short-term toxicity of As_2O_3 is the major concern in the use of this agent against malignancies, and at least three sudden deaths have been reported [55]. To ensure the safe use of mineral arsenicals, identifying them accurately is necessary (**Table 3**).

3.2. An-Gong-Niu-Huang Wan (AGNH) Toxicity of Mineral Elements (Mercury)

An-Gong-Niu-Huang Wan (AGNH) is a patent traditional Chinese medicine for brain disorders. The medicine containing cinnabar is insoluble, has very low bioavailability and thus is poorly absorbed from the gastrointestinal tract. In study display, long-term administration (>30 days) of cinnabar at doses above 100 mg/kg also produced mercury poisoning [56]. In addition, heating cinnabar results in release of mercury vapor, which in turn can produce toxicity similar to inhalation of these vapors [57]. The cinnabar which contains 96% mercuric sulfide (HgS), Mercury binds to other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercurous (Hg_1þ) or mercuric (Hg_2þ) salts, such as mercury sulfide (HgS, purified from cinnabar), mercurous chloride (Hg_2Cl_2, also called calomel) and mercuric chloride ($HgCl_2$) [58]. In which ethyl mercury (C_2H_5Hgþ) is the major component of thimerosal. Mercuric oxide was once used as a disinfectant and antiseptic agent [59]. Other preparations containing mercury are still used as antibacterials [60] but dimethyl mercury [$(CH_3)2Hg$] is the most toxic mercurial [61]. The abuse of cinnabar leading to intoxication of Hg in infants has been reported so these uses have largely been replaced by safer therapies [62,63] (**Table 4**).

3.3. Mineral Elements of Hongdan (Pb_3O_4) and Lead

Hongdan is the official term for red lead (Pb_3O_4) according to the pharmacopeia of traditional Chinese medicine. In addition to its use in traditional medicine, Hongdan is widely used in paint and in the battery industry as a raw or additive material. Also, used for superstitious purposes (by low income families in China) as a cultural

Table 3. Effect of metallic element to human health (Hg), (As) and (Pb) [65,66].

Diseases	Toxic metals potentially involved in etiology	Reference
Allergy	Hg	[67,68]
Autism	Hg	[69]
Parkinson's disease	Hg, Pb, As	[70,71]
Poisoning and anemia	Pb	[72]
Diabetes	As	[71]

The above chart indicates that the lead, mercury and arsenic poisoning could cause certain diseases among which Parkinson's disease is the common disease which could be caused by all three of the elements.

Table 4. Hg (10 mg/kg) for 10 weeks on liver, kidney, cerebral and cerebellar injury of male and female [72].

	Cerebral	Cerebellar	Liver	Kidney
	Cortex	Cortex		
Male	15 μg/g	21 μg/g	112 μg/g	180 μg/g
Female	9 μg/g	18 μg/g	80 μg/g	140 μg/g

The above chart indicates that mercury could cause damages of Cerebral cortex, cerebellar cortex, liver and kidney for both males and females. Overall, the damages to males are more serious than that to females.

powder to ward off bad luck by daubing. Use to traditional medicine, Though most qualified physicians are aware of its potential toxicity, most traditional medicine practitioners are not certificated to practice. In April 2009, the national Food and Drug Administration responded to the report and launched a campaign nationwide. Until now, China as a suggestion to prohibit the use of Hongdan as a remedy [64].

4. Lead, Mercury and Arsenic Poisoning and Its Treatment Method

Lead (Pb), mercury (Hg) and arsenic (As) are metals ranked among the top ten most toxic substances, summarized as follows [73].

4.1. The Toxicity of Lead

We defined high lead content to be >1.5 mcg/serving. The early European Pharmacopoeia has issued a draft monograph herbal drugs, proposing the limits for Mineral elements in herbal drugs: 5 $mg \cdot kg^{-1}$ for lead, furthermore, the European Commission has established the lead limits in food supplements of America [74,75].

After that, in America, California criteria for acceptable lead levels of <1.5 mcg/serving of natural calcium supplement.

Lead is mainly divided into two kinds of structure: Inorganic and organic. Inorganic and organic forms of lead are absorbed through the lungs and gastrointestinal tract; in occupational settings, exposure through inhalation is more common, whereas in the general population, it is largely through ingestion. And organic lead compounds may also be absorbed through the skin [76]. Excretion is primarily via the kidneys, and the half-life of lead in the blood is about 30 days. If high lead is taken up in the blood and deposited in soft tissues (brain, liver, kidney, bone marrow) and bone up to 94% of the body burden of lead is in bone, where it has a half-life of years to decades [77]. A clinical report showed, ordinary people may include abdominal pain, anorexia, nausea and constipation, headache, joint and muscle pain, difficulties with concentration and memory, sleep disturbances, anemia with basophilic stippling, peripheral neuropathy and nephropathy [78]. Among adults, the potential implications of low-level lead exposure are most relevant to women of child-bearing age, as lead is especially harmful to developing nervous systems of fetuses and children and passes through the placenta and breast milk [79-81]. As lead accumulates in bones and is mobilized into circulation during periods of increased bone turnover (particularly in women during periods of pregnancy, lactation, and menopause). Calcium deficiency increases lead absorption and lead retention, and is a risk factor for increased maternal lead transfer. In which, Methyl mercury crosses the placenta and reaches the fetus, and is concentrated in the fetal brain at least 5 to 7 times that of maternal blood [82-86]. Prenatal methyl mercury exposure at high levels can induce widespread damage to the fetal brain. Given birth to infants with severe developmental disabilities, raising initial concerns for mercury as a developmental toxicant. The child's brain and nervous system equally susceptible to its effect of lead [87].

4.2. The Toxicity of Mercury

Mercury is known to produce toxicity of Mineral elements. The European Pharmacopoeia has issued a draft monograph Herbal drugs, proposing the following limits for heavy metals in herbal drugs: 0.1 $mg \cdot kg^{-1}$ for mercury. Furthermore, the European Commission has established the mercury limits in food supplements [88]. Mercury is mainly divided into two kinds of structure: Inorganic and organic. It is distributed primarily to the central nervous system and the kidneys. Elimination is through the urine and feces. The half-life of elemental and inorganic mercury in the blood is 40 - 60 days, and the half-life of organic mercury in the blood is about 70 days. Signs and symptoms of mercury toxicity vary with the form of mercury and route of exposure [89]. In which, inhalation of high concentrations of elemental mercury vapor also damages the lungs, skin, eyes, and gingival. Chronic exposure to elemental mercury vapor primarily affects the central nervous system. Major symptoms include a fine tremor, psychological changes (e.g., increased excitability), and gingivitis. Other symptoms can include insomnia, loss of appetite, irritability, depression, headache, short-term memory loss, and muscle wasting [90]. Symptoms of acute exposure include cough, dyspnea, chest pain, nausea, vomiting, diarrhea, fever, and a metallic taste in the mouth. If the exposure is great enough, these symptoms can progress to interstitial pneumonitis, renal injury, increased blood pressure and heart rate, and pulmonary edema [91]. In which, the woman developed a variety of symptoms, including pain and tingling in one hand, abdominal pain and bloating, diarrhea and constipation, increased bruising, varicose veins and fatigue. In the fetus, organic mercury disrupts the cytoarchitecture of the developing brain and has been associated with neuropsychological changes after birth [92].

4.3. The Toxicity of Arsenic

Arsenic is a poison since ancient times. It is a geogenic water menace affecting millions of people all over the world and is regarded as the largest mass poisoning in history. Moreover, it has been used as a Chinese herbal medicine and proprietary Chinese medicines for many centuries [93]. In force since 1 July 2009, shows national

and regional limits for arsenic and toxic metals in various types of herbal products proposed by the WHO [94]. Therefore, removal and recovery of arsenic from contaminated water and effective and safe use of mineral arsenicals has attracted more and more attention. Arsenic occurs in the environment in several chemical forms, showing different toxicological characteristics. Organic forms of arsenic are rarely significant in ground water, however, the inorganic forms: arsenite (AsO_3^{3-}) and arsenate (AsO_3^{3-}) are often found in this kind of water. Permanent arsenic intake leads to chronic intoxication. Dosages much lower than this have been associated with a variety of adverse health effects including mild symptoms such as throat irritation, nausea, and more serious signs of intoxication such as anaemia, liver injury, skin injury, renal failure, encephalopathy and a gastrointestinal bleeding [95]. Prenatal exposure to arsenic is associated with later life health effects in adults [96-98]. Toxic metal exposures in utero and during childhood may result in significant health effects including, low birth weight, reduced fetal growth and reproductive and cognitive deficits in adolescents [99-101]. Results in the appearance of diverse types of cancer, such as hyperkeratosis, lung, and skin cancer.Increased mortality and increased risk [102,103]. Once the report display, the Vietnamese pills have caused a classic case of fatal arsenic poisoning in Vietnam [104].

5. Determination of Lead, Mercury and Arsenic

5.1. Determination of Lead

The lead pollution comes mainly from environmental factors. Asia and America same affected by pollution [105]. In China, the powder was analyzed in a chemistry laboratory in Guangzhou Center for Disease Control. There use to flame atomic absorption spectrometry (FAAS, Zeeman-5000, Hitachi Limited, Japan) and use to situ XRF for structure determination of lead. In addition, China specializing in lead poisoning treatment. The BLLs were measured again by graphite furnace atomic absorption spectrometry with Zeeman back-ground correction (GFAAS; Thermo Elemental, Solaar MQZ) in the hospital [106]. The lead structure included: $Pb(NO_3)_2$; $Pb(C_2H_5)_4$; $PbCO_3$; $PbSiO_3$; $PbCrO_4$; PbO_2; PbO (litharge); PbO (massicot) *et al.* [107]. Based on the sample analysis using inductively coupled plasma mass spectrometry (ICP-MS) [108].

In USA of El Paso and TX have been used synchrotron-based XAFS (X-ray absorption fine structure) to identify and quantify the major Pb species present in airborne PM collected so. It can bulk technique that provides structural information at the molecular level about a given element in a sample and hence used to environmental testing. If you visited the family to investigate the source of lead exposure used to a portable X-ray fluorescence analyzer (XRF, Innov-α 4000, Innov-X System Company, Woburn, MA) was used to screen the indoor environment, household products, drinking water and food [109]. Hence, in lead poisoning treatment use of (GFAAS); in the pharmaceutical analysis and the environmental pollution can be used on X-ray fluorescence spectrometry [110].

5.2. Determination of Mercury

Several techniques are currently available in the determination of mercury and these include cold vapor atomic absorption/fluorescence spectrometry (CV-AAS/AFS), gas and liquid chromatography (GC/LC) and inductively coupled plasma with either atomic emission spectrometry (ICP-AES) or mass spectrometry (ICP-MS), etc. [111, 112]. Laboratory studies revealed, urine specimens were analyzed for inorganic mercury using an automated flow injection mercury system (FIMS) that uses cold vapor atomic absorption spectrometry and Urine specimens were analyzed for total mercury using inductively coupled plasma mass spectrometry (ICP-MS) [113-115]. CVG technique has some merits such as high sensitivity, wide linear dynamic range, low noise level, fast analysis speed, ease of operation, and low cost [116]. However, the drawbacks are also serious and remarkable. This sample pre-treatment step is time-consuming. moreover potential losses of the volatile mercury species in the sample may also occur and quite often also the major source of contamination, Furthermore, still some difficulties exist in the analysis of mercury in some TCM drugs because of its extremely low concentrations following the interferences caused by the complex sample matrices and the wide change in matrix composition from sample to sample [117]. Comparing with other technique, the thermolysis atomic absorption method provides an attractive alternative in mercury analysis, because of its direct solid sampling without pre-treatment, which eliminates tedious sample digestion or derivatization steps commonly used in conventional methods. The method is rapid, typically requiring only 4 min to complete a total mercury analysis. Moreover, the method provides high sensitivity, low detection limit and outstanding background correction capability utilizing Zeeman-effect. In this study, our objective is to develop and apply this technique to investigate the content of mercury and the preliminary species in several TCM drug products for quality assessment and regulatory purposes [118,119].

5.3. Determination of Arsenic

Determination of arsenic in many methods including:

X-ray diffraction analysis [120]; Hydride generation (HG), liquid chromatography (LC), gas chromatography (GC) and capillary electrophoresis (CE) are commonly being utilized for the separation of as species. However, the advantage of HG method is that it can easily be connected to various detection systems like ICP-MS, AAS, ETAAS, ICPAES, AFS, and ICP-MS [121-123]. The most commonly analyzed species are As(III), As(V), MMAA, DMAA, arsenocholine (AsC), arsenobetaine (AsB) or TMAs+ (tetramethylarsonium ion-Me_4As+), TMAO (trimethylarsine oxide—Me_3AsO), arsenosugars, phenylarsonic acid (PAS) and metaloproteins [124].

The commonly used to Hydride generation of HG-AAS method, because of Hydride generation is a well-known technique for the determination of As at trace levels, which consists of the reaction of As compounds with sodium tetrahydroborate in acidic medium to produce various arsines (AsH3) [125]. As for example, As(III) and As(V) give AsH3, MMAA gives monomethylarsine (MMA-CH3AsH2) and DMAA produces dimethylarsine (DMA-(CH3)2AsH). Also, the AAS combined with HG is widely used for As speciation included, As(III) and As(V) [126,127]. It has been specific advantages included, selectivity, sensitivity, efficiency, rapidity and detection limit (DL), in addition, often combined with high performance liquid chromatography. The use of HPLC-HG-AAS enabled the elimination of interfereence and the highly sensitive determination of As(V) [128].

After that, the macroscopic and microscopic features are given in detail. In study display, that modern microscopic technique is a simple, fast, effective, low cost, and the results are in agreement with ICP-MS analysis. The authentication results for arsenolite and arsenic trioxide same are confirmed by ICP-MS analysis. But there are a lot of problems included inductively coupled plasma atomic emission spectrometry (ICPAES) [129], inductively coupled plasma mass spectrometry (ICP-MS) [130-134], graphite furnace atomic absorption spectrometry (GFAAS) [135], hydride generation atomic absorption spectrometry (HGAAS) [136], and hydride generation atomic fluorescence spectrometry (HG-AFS) [137]. These methodologies are often laboratory-based and time-consuming and may lead to large capital cost for multi-sample analysis and its major drawback is that these methods are unable to distinguish between As(III) and As(V) in the analyzed samples.

Recent studies, a novel hyphenated technique, a microfluidic chip-based capillary electrophoresis (μchip-CE) hydride generation (HG) system was interfaced with a microwave induced plasma optical emission spectrometry (MIP-OES) to provide two inorganic arsenic species separation capabilities. The detection limits for As(III) and As(V) are 3.9 and 5.4 $ng \cdot mL^{-1}$, at the moment the microchip system requires manual filling with background buffer and sample. Further improvements of the features of μCE-HG-MIP-OES may lie in the use of aminiaturized MIP at atmospheric pressure and miniaturized and portable spectrometer because toxic of hevy metal As(V) is much higher than that of As(III) [138,139]. There are few proposed methods to the direct determination of As(V), without pretreatment of samples. Today, a colorimetric method using the molybdenum blue complex has been developed for the sensitive de- termination of As(V) [140].

6. Conclusion

Based on the research conducted in this article, it is apparent that the pollutions of heavy metal stem from a variety of cause. It could devastate the health of wildlife and human beings, especially to the pregnant females and the fetus. The impact on the mental growth could prolong from the new born to the childhood and result in an irreparable jeopardy. As a matter of fact, many might have acknowledged that heavy metal pollutions are inevitable by-products during the exploration and development of society, therefore, in-depth study of the methods in resolving the heavy metal pollution is an important subject. In the future, in addition to enhance heavy metal to detection, also should consider the mineral traditional Chinese medicine on dosage and use method and the related problems, ensure the safety of medication.

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