



Research Article

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# Evaluation of Some Toxic Elements in the Soil of Langerud: S Northern Iran

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**To Cite This Article:** Ebrahim A A, Zahra Alizadeh T, Milad S, Muhammad A, Zeliha S. Evaluation of Some Toxic Elements in the Soil of Langerud: S Northern Iran. *Am J Biomed Sci & Res.* 2022 - 17(1). *AJBSR.MS.ID.002315*. DOI: [10.34297/AJBSR.2022.17.002315](https://doi.org/10.34297/AJBSR.2022.17.002315)

**Received:** 📅 July 05, 2022; **Published:** 📅 September 19, 2022

## Abstract

As we are sure, all toxic elements are raising. The existence of various carcinogenic elements in the environmental places is known to be the main evidence of this adding. The general purpose of this paper was to assess the heavy metal contamination in Langerud soil, totally Lead (Pb), Cadmium (Cd) and Arsenic (As) which are found playing main role in cancer development. This research completely was done by the self-supporting. To receive a reasonable result for an analytical distribution, 200 mixed soil samples were investigated to find the amount of toxic elements contamination from the different portions of roadsides of Langerud in Guilan. The results showed that the amount of Pb in the mentioned areas was within the range of 4.7-111.9ppm and 3.9-118.7ppm. The Cd amount ranged between 0.1-1.22ppm and 0.4-0.69ppm. As (arsenic) was measured to be between 0.1-10.5ppm and 1.3-14.5. It is obvious that the amount of Pb contamination in soil is measured to be 400ppm by EPA, and we can express that all the regions in Langerud city are safe and suitable for farming. However, we guess high concentration of toxic elements that may be due to some reasons like leaded petrol.

As is another toxic element that is mentioned in cancers of skin, bladder, liver, lung, and prostate and some other diseases like heart and brain disorders. Due to its different disorder causing effects, the mainly permissible limit of as contamination is cited to be 10ppm. The results of soil assessment showed presence of high as amounts in many samples which were warning contamination in the center regions of investigated parts. Cd is famous to make a negative effect on the extension of breast cancer. Since the contaminating concentration for Cd was found to be 1ppm (EPA), the assessment determined a threat for a place among the regions which were investigated the following study shows the results of toxic elements assessment in Langerud city soil in Guilan province and indicates the regions with Pb, Cd and as contaminations in this region in Iran. This information will advise the farmers for selecting the suitable region for their goals. Increasingly, this would alert the related official organizations to take some notes for the contaminants removal and avoid the use of some items that cause the contamination issue. Finally, all these elements will support increasing the health conditions of the people who are settled.

**Keywords:** Cancers of Skin; Bladder; Liver; Lung; Prostate; Toxic; Pesticides; Rubbers; Petrochemical; Farmers

## Introduction

Toxic elements contamination of the nature has been a huge issue since the time of civilization and moving the people to city. The immense expansion of all types of metals, especially in developing countries like Iran, causes pollution of many resources such as soil, water, and air. In this way, these toxic metals are

absorbed by factors such as plants and cannot be removed quickly, and their accumulation occurs in the human body. Let's say that Pb is one of the important toxic elements that has been surprisingly used and accumulated since the beginning of human civilization. Among the applications of toxic Pb metal include refining, metal



casting industry, industries related to plastic and nylon or rubber, soldering and brazing industry, metal welding and cutting industry, battery production, industries related to ceramics and pottery, dyeing industries, all kinds of pesticides, rubbers, petrochemical and polymer related industries. Direct exposure to the toxic metal Pb can generally be due to ingestion or inhalation [1-6]. It should be remembered that the combustion of gasoline and the resulting Pb can account for most of the amounts and accumulations of Pb in the past decades.

As a result of past research, the Environmental Protection Agency (EPA) banned the use of leaded gasoline throughout the United States in 1996, which is now being implemented in many countries. This is while in Iran and many developing countries, leaded gasoline is used, and it has and will have many consequences for the people of these societies. It should be said that the lead used in paints causes the contamination of toxic elements in the soil of different regions and can enter the body structure of humans through inhalation and oral intake and cause side effects [7,8]. There is no doubt about the toxicity of this element, and unfortunately, during the absorption of Pb and of course its transfer to many parts of the body, it can be in the blood, absorbing tissues such as liver, kidney, lung, brain, spleen, muscle, and heart, and of course some other tissues like the bones and teeth which remain cumulatively stable. The harms and problems of the toxic element Pb are certainly more and bigger in children than in adults. Especially in children, it can lead to some events such as reduced intelligence, impaired behavioral development, and hearing impairment [9-13].

In addition, it should be noted that in the process of the development of the nervous system of the fetus and young children, if these accumulations occur in high amounts, it will cause convulsions, coma or, unfortunately, death. It can be predicted that consists of 1.5-5x10<sup>-4</sup>% of the earth's crust. These statistics include sedimentary and igneous rocks, some coal and peat, and large amounts of sediments [14,15]. It is almost clear to everyone that the toxic element is biologically classified as a toxic element and is among the potential threats to the health and stability of human health, and sometimes in case of excessive accumulation in the human body for various reasons, it can cause some cancers such as lung and ovary [16-18]. It seems interesting that this element, under the title of wood material preservatives, is used in various alloys for industrial use, glass-related industries, additive parts in various foods and extracts, several types of famous herbicides in wheat and rice fields., various pesticides, hematological additives and chemicals have many applications in the veterinary industry and animal sciences. [19,20]. The environmental cycle through various methods, such as the melting of ores containing Pb, copper and nickel materials, and the combustion process of fossil fuels, and the excessive and incorrect use of arsenic-containing pesticides [21].

In addition, it should be mentioned that exposure to as contamination in the soils of the surrounding areas, which enters the structure and food cycle of the human body through the methods we have already mentioned [22-24]. As mentioned in the articles, Cadmium (Cd), Lead (Pb) and Arsenic (As) are known as the most important sources of pollution through metals all over the world. By the way, it should be mentioned that Cd is a natural metal with the origin of soil, stones, and water, which can have accumulations. The candidate is the second known toxic element on the list of priority pollutants of the Environmental Protection Agency (EPA) and this issue has been reported through various articles. [25,26] and the International Agency for Research on Cancer (IARC) [27] has been reported as one of the most famous cancer-causing factors Many studies have reported the relationship between exposure to Cd and the development of breast, lung, prostate, and testicular cancers, which is a source of much thought [28-30]. It should be said that Cd is used for many industrial purposes such as galvanizing pipes, which can be mentioned as the pollution of some sources such as water due to corrosion of pipes or improper disposal of waste.

The root of these problems is the erosion of some natural sediments, exiting through metal refineries, entering water through waste batteries and paints, among the most important routes of cadmium entering the food cycle and human body. It should be noted that Cd is widely used in fungicides and insecticides, and they easily contaminate the soil and plants. Humans are exposed to Cd through mouth and contact with contaminated soils or fish grown in soils contaminated with Cd, but the main causes of exposure to Cd include smoking, smelting, welding, or shipbuilding. It should be said that the use of tobacco and cigarette smoke will raise the average daily intake of Cd to about two times [31-33]. We should pay a lot of attention to the fact that organic farming with the aim of producing crops and vegetables without toxic elements and free from the accumulation of toxic metals has a lot of importance, and contaminated and non-contaminated soils should be separated. The aim of this study is to determine the safe areas for organic farming and of course the areas that need to remove pollutants. Soon, this information will reduce the absorption of toxic metals by plants and thus reduce their accumulation in the human food chain. In the end, it should be mentioned that this issue can be related to the management of these materials and of course their reduction in some communities and specific areas.

## Materials and Methods

Planning had been started with collecting samples at pre-defined locations of agricultural activities, particularity related to herbs and crops under evaluation. The samples of soil were collected by using hand augers, to retrieve soil at a depth of 20-40cm. This is in fact the depth at which the root hairs of the plants under investigation lies, which can extract contaminating elements from the soil within that they occur. Since the downward motion of

water during rainy seasons can lead to the leaching of the elements in the soil which travel deeper, the sample collection was carried out twice; one during the dry season and the other during the rainy season. Atomic absorption spectrophotometry (wet digestion) was applied for the analysis, and content of the minerals per sample was expressed as  $\mu\text{g/g}$ . The levels of minerals were compared to their limit specification for soil samples [34-37].

## Results

To assess as well in this research, Lead (Pb), Arsenic (As) and Cadmium (Cd), as the major sources of soil contamination were explored in Langerud soils which is the one of important city of Guilan province in north of Iran. Being absorbed by plants and entering human body via the food chain, the goal of the research was to understand their extension in soils and recommend rules as well as to distinguish safe regions for organic agriculture. Increasingly, the purpose was to demonstrate the presence of carcinogenic metals in particular regions that can be related to risen cancer incidence in some related research. The tolerable limits of the mentioned heavy metals in the soils (approved by EPA) are given below in (Table 1). The average concentrations of Pb, As and Cd in Northern Regions of Langerud were found as given in Table 2, following the collection of soil samples at different areas (Table 2).

**Table 1:** Tolerable limits of Pb, As and Cd (EPA).

| Heavy Metal | Max Limit (ppm) |
|-------------|-----------------|
| Lead        | 400             |
| Arsenic     | 10              |
| Cadmium     | 1               |

**Table 2:** Average concentrations of Pb, As and Cd in Northern Regions of Langerud.

| Area | Pb (ppm) | As (ppm) | Cd (ppm) |
|------|----------|----------|----------|
| R1   | 21.5     | 8.3      | 0,34     |
| R2   | 41.3     | 6.9      | 0,69     |
| R3   | 27.41    | 10.06    | 0,47     |
| R4   | 29.01    | 5.14     | 0,34     |
| R5   | 14.06    | 7.16     | 0,2      |
| R6   | 9.06     | 6.07     | 0.01     |
| R7   | 11.11    | 11.16    | 0.01     |

## Discussion

It should be said that after collecting soil samples and analyzing their specific data in a laboratory scale, the obtained results were studied according to EPA (Environmental Pollution Organization) standards for more detailed evaluation and investigation. At the beginning of the research, the general situation and overall evaluation of the Pb element was carried out and the maximum

concentration of Pb was shown in the range of R2 and R4, and it should be said that other areas are considered free of any threat from the lead element. It was tried to evaluate and measure the values of the west and east of the city of Langerud in relation to the Pb element. Of course, these results fully prove that the high and maximum use of transportation in various ways, including private or public vehicles, causes the lead of refineries and gasoline is transported to different areas, which was also shown in the upcoming research [38,39].

It should be said that the general situation of the toxic element as was evaluated in different areas of Langerud city. It clearly states that the toxic element arsenic is indeed a potential and accumulative threat in all 7 assessed areas. It is recommended that more extensive research with more details be done in these areas, and of course, there is a need to develop a plan to neutralize this very important threat. Finally, the general situation and distribution of Cd in the study area were investigated in a different way [40-42]. The results obtained in this research are very close to the results and previous studies. Based on the findings, the highest amount of concentration is evaluated in the R2 area, and it is possible that it will become a threat and cause problems in the following years. It should also be noted that other areas in question are free from this threat.

## Conclusion

Totally, the average concentration of some toxic elements in city areas soils of Langerud province (Iran northern) was evaluated and assessed by attention. The results have demonstrated that the amounts of assessed toxic elements are high in some areas and threaten the standards of bio ecosystems. Due to the quickly rising population of Langerud city, the pollution rate along this road is expected to add in the future. Some protective measures such as the use of public transportation instead of some personal vehicles, conversion of liquid fossil fuel to gaseous fuel or other clean energies, having more green landscapes as well as storing the natural sources and assessing the pollution centers to control and better managements are suggested to combat this problem.

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