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Estimate Lead and Cadmium contents of some archeological samples collected from ancient cities location (Cyrene and Abolonia) at Al -Gabal Al -Akhder Region, Libya

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Abstract

This study was carried out on archeological samples which collected from one of the most important ancient cities which located at eastern north side of Libya, these cities called (Cyrene and Abolonia Cyrene). Different samples were collected from the outside surface of the studied samples. The contents of lead (pb) and cadmium (Cd) were determined b using atomic absorption instrument. The results showed small variations for the studied metals between the studied samples. The concluded that the source of the detected metals are mainly due to the effects of air pollutions by the dust of machines and cars.

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Introduction

Cyrene

Cyrene was an ancient Greek city on the North African coast near present-day Shahhat, a town located in north-eastern Libya. The precise location of the ancient city was thirteen kilometers from the coast [1].

Greek colony

Cyrene owes its birth to a Greek Island named Thera in ancient times and which today is known as Santorini, located in the Southern Aegean Sea. As a result of the rise in population that took place in the Greek world during the 8th and 7th century BCE, the Tehran's became concerned about the effects of overpopulation and dispatched an expedition to the North African region. The traditional date for this event is 630 BCE. During the expedition, some citizens were relocated to an offshore island, not far from the North African coast. The natives that lived in Libya welcomed the newcomers and showed them an inland site more auspicious and the Greeks chose a spot

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marked by the presence of an abundant spring to found a new city [2].

The name of the city is rooted in one of the many myths about Apollo's love affairs with young women. In this case, Kyrene was the daughter of a Thesalian King named Hypseus and a water nymph. She was a young virgin huntress who lived in the woods of Mount Pelion and protected her father's herd from beasts of prey with the aid of a sword, a spear and two hunting dogs that were given to her as a gift by the goddess Artemis. Apollo saw her fighting a lion with only her hands and fell in love: he took Kyrene to North Africa and they got married. The springs where the Greeks chose to found the city were identified as the domain of the Kyrene (since her mother was a water nymph), hence the city's Greek name Kurene. The Latin version of the name that the Romans used is Cyrene [1,2].

The best known version of this myth comes from Pindar's *Pythian*. The famous Greek historian Herodotus describes the difficulties of the Theran's agriculture shortly before they dispatched the expedition to North Africa: for many months, there was no rain and almost all trees in the island died. On the other hand, Cyrenes's agriculture was very generous according to Herodotus description:

Heavy metals

The expansion of human industrial activity, including mining, smelting, and synthetic compound creation, has caused an exponential increase in the amounts of heavy metals released to the atmosphere, water, and soil [(3)] . This increase is a major threat for human health. Although the adaptive capabilities of our species at the multi-millennial scale are far from understood, it is clear that human communities have been in close contact with heavy metals ever since the origin of mining exploitation during the Chalcolithic, and evidence abounds in southwestern Iberia from c. 5000 years BP . That kind of pollution was triggered in western Europe around 4000 years BP or slightly before . However, the subject has not hitherto been considered through specifically orientated investigations from Neolithic backwards and this is the main goal here.

Therefore, assessing the concentration of heavy metals in archaeological and anthropological evidence is a pertinent matter of study. Caves are persistently restricted environment and heavy metal bio-mediated accumulations, such as those caused by natural organic sources [4,5], or by inorganic sources pertinent to the geological context of the cavern [6,7] may reach relatively high levels. Increases of these pollutants can be expected from long-term human activities, especially combustion, which has been reported in connection with ash biomass (heavy metal enrichment mainly dealing with pb and Cd) [8] and demonstrated to show variable toxicity.

In the past, the use of fire might have provided major adaptive advantages to humans [9] and may have promoted sociability [10]. However, whenever *Homo* species may have begun to use open fires in the restricted environments of caves, it is clear they became to some extent exposed to pollutants. Biomass cooking, using open fires or rudimentary stoves, is still a common practice in certain societies. Apart from unstudied, unpredictable, long-term effects, pollution from combustion can be associated with up to 1.9 million premature deaths every year, as well as chronic and acute respiratory illnesses, and it is the 4th major cause of morbidity globally [11]. Indeed, the decrease of open fire exposure has been regarded equivalent to smoking cessation [12]. The aim of this study is evaluate the contents of Lead and Cadmium in some samples collected from archeological cities (Cyrene and Abolonia old cities).

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Materials and Methods

Sampling

Different samples were collected from cyrene and abolonia regions, different sites were selected.

Used techniques

Six samples were selected from the two archaeological sites, including three samples of marbled column samples, in addition to three samples of acrolith, Table (1). Analyses of two trace elements (Pb and Cd) were carried out by atomic absorption (Thermo) at the central laboratory of the University of Omar El - Mukhtar.

Table 1: The locations of samples.

Sample No	Sample type and location
1	Marbled column (APOLONIA),
2	Marbled column, (Cyrene)
3	Marbled column, (Cyrene)
4	(Acrolith), APOLONIA
5	(Acrolith), APOLONIA,
6	(Acrolith), Cyrene

Glass wears

Before the starting in the experimental part of this all the glass wears which using in this study were washed several times with distilled water, then dried in oven, the glass wears including (Conical flasks, measuring flasks and funnels).

Samples preparation

The samples were prepared before the analysis by designed method. Aliquot 0.5 gram of each sample was designed with 5 ml of concentrate nitric acid until dryness, than about 20 ml of distilled water was added, the samples were heated then filtered, the volume then completed in measuring flask (100 ml), The Lead and Cadmium were determined by Atomic absorption at Omar El - Mukhtar University

Results and Discussion

The results

The contents of lead of the studied samples were given in Table (4) and represented in Figure (1). The results showed different values of lead, the concentrations were ranged between (1.32 - 2.70 µg/g), with average value of (2.1 ± 0.53).

Table 2: The contents of Lead in the studied archeological samples.

Location (sample)	Concentration (µg/g)
Marbled column (APOLONIA),	1.32
Marbled column, (Cyrene)	1.76
Marbled column, (Cyrene)	1.90
(Acrolith), APOLONIA	2.32
(Acrolith), APOLONIA,	2.60
(Acrolith), Cyrene	2.70
Average	**2.1**
±SD	**0.53**

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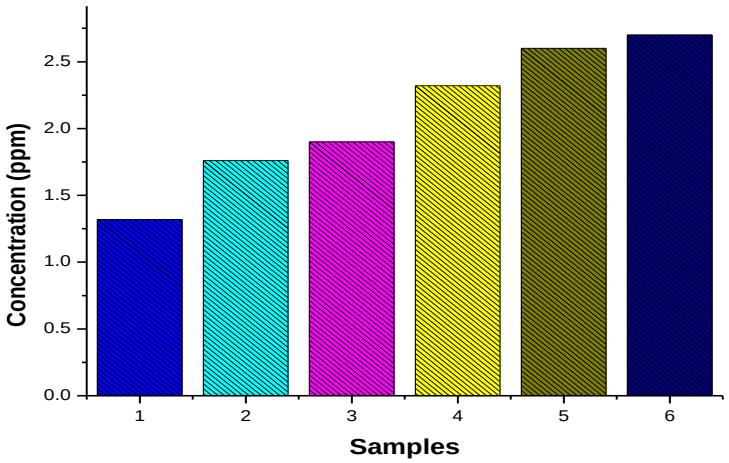

Figure 1: The distribution of Lead in the studied samples.

On the side the contents of cobalt were shown in Table (3) and represented in Figure (2). The values were ranged between (0.0.030 - 0.24 µg/g), average (0.13 ± 0.08).

Table 3: The contents of Cadmium in the studied archeological samples.

Location (sample)	Concentration (µg/g)
Marbled column, (APOLONIA),	0.10
Marbled column, (Cyrene)	0.23
Marbled column, (Cyrene)	0.24
(Acrolith), APOLONIA	0.16
(Acrolith), APOLONIA,	0.030
(Acrolith), Cyrene	0.069
Average	**0.13**
SD	**0.08**

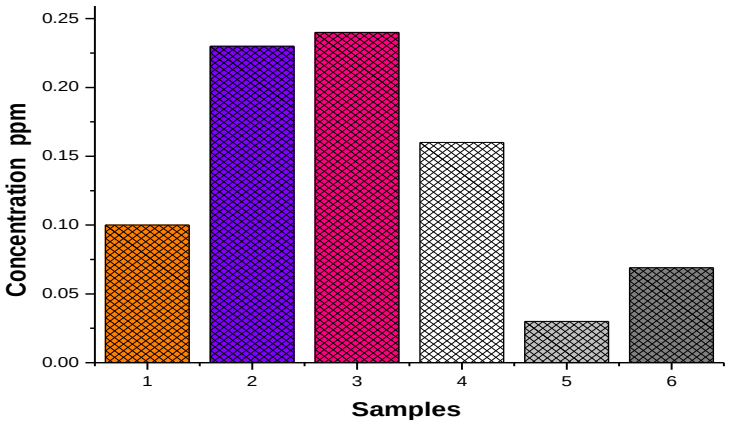

Figure 2: The distribution of Cobalt in the studied samples.

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Discussion

Heavy metals are presently considered to be those elements with an atomic weight greater than that of Fe (>55,85 g/mol). Heavy metal pollution means that the concentration of the element is higher than the established threshold, or natural geochemical background in a given area [13]. The expansion of human industrial activity, including mining, smelting, and synthetic compound creation, has caused an exponential increase in the amounts of heavy metals released to the atmosphere, water, and soil . This increase is a major threat for human health**.** Although the adaptive capabilities of our species at the multi-millennial scale are far from understood, it is clear that human communities have been in close contact with heavy metals ever since the origin of mining exportation during the Chalcolithic, and evidence abounds in southwestern Iberia from c. 5000 years BP . That kind of pollution was triggered in western Europe around 4000 years BP or slightly before . However, the subject has not hitherto been considered through specifically orientated investigations from Neolithic backwards [14] and this is the main goal here. Therefore, assessing the concentration of heavy metals in Marbled and Acrolith shelters with archaeological and anthropological evidence is a pertinent matter of study. Archeological are persistently restricted environment and heavy metal bio-mediated accumulations, such as those caused by natural organic sources (bird and bat guano) [12], or by inorganic sources pertinent to the geological context of the archeological, may reach relatively high levels. Increases of these pollutants can be expected from long-term human activities, especially combustion, which has been reported in connection with ash biomass (heavy metal enrichment mainly dealing with pb & Cd) [8] and demonstrated to show variable toxicity.

Conclusion

The present study which carried out on some samples collected from archeological cites in Libya including (Cyrene and Apolonia) showed presence of the selected two heavy metals (Lead and Cadmium), the study results not showed wide variations in lead values, while for the cadmium values relative variations were recorded, the study indicated that the source of the studied metal are mainly due to the human activity, especially the fuel consumption of cars.

Recommendation

According to the results which recorded in this study, amounts of some heavy metals were obtained, therefore, may be by using other advance technique the rare element may be detection, so this study recommends to use XRF or SEM or ICP instruments to study the investigated locations.

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