# ASSING OF SOME HEAVY METALS CONTENT IN MILK AND CHEESES SURROUNDING DIFFERENT ALEXANDRIA DISTRICTS

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#### ABSTRACT

Plasma Optical Emission Spectrometry (ICP-OES) method was applied for screening copper, lead, cadmium and zinc in some dairy products samples.

A total of 36 samples of liquid cow s milk, Domitti and Ras cheeses were purchased from supermarkets from 4 districts in Alexandria City. Chemical contamination of heavy metals Pb (Plumbum/Lead), Cu (copper) and Cd (Cadmium) is a contamination of milk and dairy products can affect quality and food safety for human consumption. For this reason, distribution of heavy metals surrounding Alexandria districts was investigated.

*The most important parameters affect on heavy metals contamination in dairy manufacture are The Processing conditions and the equipment.* **Keywords:** Food safety of milk and dairy products, Pb, Cd, pb, and zn residues

#### **INTRODUCTION**

Fresh milk is one of the natural foods produced by the mammary glands of mammals and is widely used to meet nutritional needs, milk. contents play an important role for human health, especially the growth and development of children (Krismaningrum *et al.*, 2020).

Metals in the composition of machinery and equipment used during milk storage and processing may reach into the product during milking (Brown *et al.*, 2001). Disadvantages of cheeses are solved by adjusting certain technological parameters and heavy metals contamination during manufacture. However, as previous studies and long-term practice show, technological methods for achieving the desired non hazard cheese, including control heavy metals levels (Banks *el al.*, 2004). Information on the presence of heavy metals in dairy products is necessary for, standard formation, and for taking corrective action. Heavy metals (HMs) are metallic elements which have a high atomic weight and a density at least5 times than water. HMs are 4 of the top 6 toxic hazards substances present in toxic waste sites (Ratnawulan and Fauzi, 2018). Generally, heavy metal contamination is infected from environmental sources such as soil and water or feed consumed by

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animals. Toxic heavy metals are not metabolized and accumulated in the soft tissues (Pb, and Cd). On the other hand, beneficial certain heavy metals are nutritionally essential for a healthy life, in small quantities called as trace elements (Cu, and Zn). Milk and dairy products must be free from heavy metal contamination. In this regard the detection of heavy metals on milk and dairy products based on (Pb, Cu and Cd) (Qin *et al.*, 2009). Maximum Residual Limits (MRLs) of heavy metals in milk and dairy products are regulated ,Pb standards for milk and dairy products are below 1.00 ppm and Cd maximum limit is below 0.01 ppm. contamination (Simsek *et al.*, 2000).

Therefore, this study is needed to evaluate the content of heavy metals milk samples from different Alexandria locations to confirm the health risks if the milk is consumed.

#### MATERIALS AND METHODS

#### MATERIALS

#### Samples collection

A total of 36 samples of liquid cow" s milk, Domitti and Ras cheeses were purchased from supermarkets from 4 districts in Alex. City.

## 2-METHODS

Wet digestion of samples According to Goudarzi et al., (2013).

## **Estimation of Hms concentration**

Cu, pb and Zn were determined using Atomic absorption spectrophotometer (Thermo fisher scientific Registration NO. 441506, 2005 as shown in Figure 1.



Figure (1) Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES) Is used in Cadmium Specimens

#### Statically analysis

MSTAT-C (1996) Russet, D. Freed MSTAT Director, crop and Soil Science Department ,Michigan State University, U.S.A.

#### **RESULTS AND DISCUSSION**

#### First : Beneficial trace elements ( copper and Zinc ) Copper (Cu)

The present data in Table (1, and figure 1), shown the mean of <u>the</u> Concentrations mg\L (ppm) of Copper in fluid milk, Domitti, and Ras cheese samples around four of Alexandria districts . The results showed highly difference significant between the ppm . Cu concentrations in Amraya and East region. The significantly of the studied traits indicated the presence of high concentrations Rregion as cheese samples in Amraya comparing with milk and Domitti cheese in all other studied regions . These results are in agreement with finding of (Sviridenko and Shukhalova, 2022).

Copper detected in fresh milk samples from Table (1) was (0.484 ppm.),this value is lower than the maximum limit for copper content in fresh milk allowed by WHO, which is 1.3 ppm.

Table (1) Concentration $mgL$ (	(ppm)of Copper	in fluid milk, Do	mitti, and Ras
cheese samples.			

Products	Amraya	West	Middle	East	Mean
Milk	1.04	0.45	0.227	0.217	0.484
Domitti cheese	1.24	0.467	0.403	0.387	0.624
Ras cheese	1.267	1.027	0.777	0.48	0.887
Mean	0.182	0.65	0.47	0.361	0.416
L.S.D(0.05)A			0.266		
L.S.D(0.05)B			0.03		
L.S.D(O.O5)AXB			0.053		

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Figure (2) Concentration mg\L (ppm) of Copper (Cu)in fluid milk ,Domitti, and Ras cheeses Samples

Figure (2) displays data on zinc contents in fresh milk, Domitti and Ras cheeses samples, levels are not the same, as the copper concentration(Figure 2). This indicator is significantly higher in the Concentration mg\L (ppm ) of zinc. However, Figure (3) shows the change in the Zinc concentrations of cheeses are higher than the raw milk samples in all different studied districts .Obtained results were lower than (20.83 ppm) compared to the results documented by Budaraga and Salihat, (2022) which is 53.08 ppm in fresh milk samples.

Table (2) Concentration mg\L (ppm ) of zinc in fluid milk Domitti, and Ras cheese samples

Products	Amraya	West	Middle	East	Mean
Milk	47.9	26	5.367	4.067	20.83
Domitti cheese	23.83	۲2.83	19.87	4.44	17.74
Ras cheese	63.76	6194	61	59.46	61.55
Mean	45.16	36.93	28.74	22.66	33.37
L.S.D(0.05)A			<b>٠</b> .381		
L.S.D(0.05)B			0.44		
L.S.D(0.05)AXB			0.763		



Figure (3) Concentration mg\L (ppm) of Zinc(Zn)in fluid milk ,Domitti, and Ras cheeses Samples

#### Second : Toxic heavy metals (Lead and Cadmium )

## Lead (Pb)

The present data in Table (3) show the means concentrations per mg  $\L$  of lead in milk and cheeses( domitti, and Ras) and means of Alexandrian regions ranged from (0.917 to 2.267) and from (0.833 to 3.020) ppm, respectively. The results concluded that the lowest mean of lead is (0.833) ppm which is recorded with east district. The lead content in fresh milk samples was (0.917), on the other hand the content from Lubuk Minturun (LM)was detected by Budaraga and Salihat (2022) was 13.58±1.01 ppm,

Table (3) Concentration mg\L (ppm) of Lead in fluid milk Domitti, and Ras cheese samples.

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Products	Amraya	West	Middle	East	Mean
Milk	1.5	1.01	0.673	0.483	0.917
Domitti cheese	2.267	2.15	1.6	0.95	1.742
Ras cheese	5.317	1.48	1.2	1.067	2.267
Mean	3.02	1.54	1.15	0.833	1.64
L.S.D(0.05)A			0.138		
L.S.D(0.05)B			0.159		
L.S.D(0.05)AXB			0.276		

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Figure (4). Concentration mg\L (ppm) of Lead(Pb)in fluid milk ,Domitti, and Ras cheeses Samples

#### Cadmium (Cd)

Cadmium contamination (ppm) of fresh milk and cheeses samples were determined by two different techniques can be observed in Tables (4 and 5). This proves that the tested fresh milk samples are not contaminated by cadmium. In addition, the livestock equipment used also does not contain cadmium which can contaminate the milk used in Domitti and Ras cheese producing. The maximum limit for cadmium contamination in milk set by WHO is 0.005 ppm. From Figures (4 and 5) it can be concluded that cd concentration in fresh milk is (0.011 ppm) which can cause human poisoning. Acute cadmium poisoning symptoms are dry throat , chest tightness, and, breath faultier, , and can even cause pneumonia, (Widaningrum *et al.*, 2007).

Excretory Organ Damage and changes in cellular function can be caused by continuous accumulation of cadmium in organs. Prolonged long-term exposure can cause cancer (Gumpu *et al.*, 2015).

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Products	Milk	Domitti cheese	Ras cheese	Mean	L.S.D (0.05)A	L.S.D (0.05)B
Amraya		• .• ٤	• • ٦٨	۰ <u>.</u> • ٤٧		
West		• • • • • •	• • • • • •	• • • ٤ ١		
Middle	• • 7 2	• • * *	•.•02	• . • ٣ 0	• • • • • •	• .• 12
East						

 Table (4). Concentration mg\L (ppm) of Cadmium in fluid milk Domitti, and Ras

 cheese samples measured by Atomic absorption spectrophotometer



Table (5) Concentration mg\L (ppm)of Cadmium in fluid milk Domitti, and Ras cheese samples estimated by ( ICPOSE)

Products	Amraya	West	Middle	East	Mean
Milk	Nd	Nd	0.0228	0.252	0.0687
Domitti cheese	0.221	0.145	0.0266	0.257	0.1624
Ras cheese	0.433	0.00567	0.0533	0.0581	0.13752
Mean	0.218	0.0502	0.34233	o.18903	
L.S.D(0.05)A			0.00650		
L.S.D(0.5)B			0.0076		
L.S.D(0.05)AXB			0.013		

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Figure (6). Concentration mg\L (ppm)of Cadmium in fluid milk Domitti, and Ras cheese samples estimated by ( ICPOSE)

#### Conclusion

Among all the heavy metals analyzed, cadmium, lead, copper, and zinc contained in fresh milk and cheeses samples were below the maximum limit set by WHO. Meanwhile, the content contained in the fresh milk samples from the locations Amara and West was quite high when compared to the average content in fresh milk in general.

Amara region is considered the most slightly significant increased ppm concentrations with all detected dairy products (1-1.3 ppm Cu, 47.5-64.1 ppm Zn, and 1.6 - 5.75 ppm Pb). That is because existing industrial areas pollutions. Whereas east Alex region samples were the lowest ppm concentrations with all the products and in the all tested heavy metals except cad. (0.2 -0.5 ppm, 0.3- 59.9 ppm, and 0.4-1.1 ppm) cu, zn, and pb, respectively. But cadmium was the highest with Domitti cheese sample. That is due to the milk farms and factories in the industrial area in west Alexandria. Processing procedures in Ras cheese have been shown the high influence on the higher concentration of the cu, zn, pb (0.5 - 1.3, 59.9-64.1, and 1.1 - 5.75) respectively. On contrary, The prevalence of cadmium in middle region was 0.0228 ppm in raw milk, 0.0266 ppm in Domitti cheese and 0.0533ppm.

The investigations revealed that the more safe concentrations of the most determinate heavy metals are always in east and middle Alex. that is because these

regions are not industrial points and low contamination zones. Finally, From the results of the experiment and from the health point of view we recommended the following: The levels of heavy metals (cu, zn, pb, and Cd ) in dairy products must be concerned .

Contamination above the maximum contaminant level (MCL) is dangerous for human consumption Therefore, fresh milk and milk products from these four locations is. cause of heavy metal contamination in fresh milk which is the raw material of all dairy products.

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