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ESTIMATION OF SOME HEAVY METALS IN AN OSTRICH FARM ENVIRONMENT AND THEIR RESIDUES IN MUSCLES, LIVER AND EGGS OF OSTRICH AT ISMAILIA PROVINCE

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A B S T R A C T

This work was carried out to clarify the correlation between the levels of some heavy metals (lead, cadmium and mercury) in ostrich farm environmental samples (water, feed, dropping & soil) and ostrich by-products (liver, muscles and eggs) to identify the source of such metals to ostrich. Water samples (n=210) were collected from an ostrich farm and in addition to slaughter house located at Elkassaseen, Ismailia Province [feed and water samples (75 of each), dropping & soil, eggs, muscles and liver samples (15 of each)] during summer season, 2011. Results showed significant higher concentrations of heavy metals in both feed and water samples collected from grower and breeder flocks in comparison to those collected from the rearing flocks. Also, there was a positive correlation between the levels of metals in soil and dropping samples and their levels in both feed and water. Moreover, dropping and soil appeared to be the main source of heavy metals contamination in the ostrich farm followed by feeds and drinking water. The highest level of metals was detected in liver samples, followed by muscles and lastly in eggs. Moreover, there was a positive correlation between the heavy metals levels in liver, muscles and eggs and their concentrations in the environment (water, feed, dropping and soil).

KEY WORDS: Atomic absorption spectrometery, Food products, Heavy metals, Soil, Water.

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1. INTRODUCTION

Environmental pollution is a major global problem posing serious risk to man and animals. The development of modern agricultural technology and the rapid industrialization are among the foremost factors for environmental pollution. The environmental pollutants are spread through different channel, many of which finally enter into food chains of livestock and man [19]. Various anthropogenic activities such as burning of fossil fuel, mining and metallurgy, industries and transport sectors redistribute toxic heavy metals into the environment, which persist for a considerably longer period and are trans-located to different components in environment. These toxicants are accumulated in the vital organs including liver and kidney or are excreted in milk or incorporated in eggs and cause health problems in humans as well as domestic and wild populations [21]. Among environmental pollutants, heavy metals like lead (Pb), cadmium (Cd) and mercury (Hg) which affect the biological functions are potentially dangerous because of bio-accumulation through the food chain. The major routes of heavy metal inputs to agricultural soils include atmospheric deposition, sewage sludge, animal manures, agrochemicals and inorganic fertilizers [30]. The main sources of heavy metal into poultry farms were contaminated air, water and feeds of plant and/or animal origin. Moreover the contaminated poultry feeds has been considered as the main source of metal residues in poultry meat and eggs and the excretion of such metals via eggs constitute an important excretory pathway for this compound in avian species [3]. The concentration of toxic elements in poultry tissues mainly depends on the type, dietary concentration, absorption, concentration of other tissues elements, homeostatic control mechanism of the body and the species of animal [36].

All soils and rocks, including coal and mineral fertilizers, contain some Cd. Cadmium has many uses, including batteries, pigments, metal coatings, and plastics. Moreover, Sewage sludge containing Cd and other heavy metals is frequently applied to agricultural land as a fertilizer material. Ingesting very high levels severely irritates the stomach, leading to vomiting and diarrhea, while long-term exposure to lower levels leads to a buildup in the kidneys and possible kidney disease, lung damage, and fragile bones [25].

Sources of lead include human activities, such as fossil fuel burning, mining and manufacturing, lead-based paint and water pipes in older homes, in addition to lead arsenate which used as insecticides. Lead and lead compounds can be found in all parts of our environment, this includes air, soil, and water. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system; weakness in fingers, wrists, or ankles; small increases in blood pressure; and anemia. While exposure to high lead levels can severely damage the brain and kidneys and ultimately cause death [25].

Metallic Hg is used to produce chlorine gas and caustic soda, and is also used in thermometers, dental fillings, switches, light bulbs, and batteries. Coal burning power plants are the largest human caused source of mercury emissions to the air. Mercury in soil and water is converted by microorganisms to methyl mercury, a bioaccumulating toxin. The nervous system is very sensitive to all forms of mercury. Exposure to high levels can permanently damage the brain, kidneys, and developing fetuses [25].

The aim of the study is to determine the concentrations of some harmful elements (Pb, Cd, and Hg) in both environment (water, feed and dropping and soil) and food products (liver, muscles and eggs) of ostrich, in order to identify the sources of such metals to ostrich. It also aims to investigate the correlation between the levels of such metals in environment and their residues in food products.

2. MATERIALS AND METHODS

2.1. *Ostrich farm and slaughter house:*

2.1.1. *Ostrich farm:*

The present study was carried out in an ostrich farm located at Elkassaseen, Ismailia province. The farm contained 1500 birds and divided into four sectors (hatchery, reproduction, chick and grower pens). Rearing of ostrich was carried out in age groups as follow: 1-10 days old chicks; 10-60 days old, 2-6 months old; 6-12 months old and over 2 years. Ostrich chicks from day 1 to 10 days old were kept in rearing unit I (environmentally controlled with rubber mat floor). After that, they transferred to rearing unit II and III (run/pen) with concrete floor until they grow to 2 months and over 2 months to 6 months old respectively. Later on, they were transferred to the grower yard, where ostriches stayed up to 12 months old (when they were ready to be slaughtered) or until 24 months old (when they could replace discarded breeders). From the grower yard, ostriches were sent either to slaughter house or to reproduction sector. The grower and production yards were partially sheltered with sandy floor and are surrounded by wire mesh fence. The ostriches' drinking water comes from tap water (surface water, Ismailia canal). All ostrich feeds [starter feed (22%), grower feed (16%) and breeder feed (20-22%) protein] were obtained from feed processing company (FPCO) at the 10th of Ramadan city. The ratio of chopped green fodder to feed is maintained at 2:1 for both grower and breeder flocks. The ostrich farm is located 500 meters far from many cultivated lands with fruits and large animal farms (beef calves and dairy buffalos).

2.1.2. *Slaughter house*

The slaughter house is located in the same geographical region and it is less than 500 meters away from the ostrich farm. It is specialized in ratites processing and it has the ability to slaughter and process around 30 ostriches per week.

2.2. *Sampling*

Two hundred and ten samples were collected during summer season, 2011 after three visits. All samples were collected after one month interval from both ostrich farm and slaughter house.

2.2.1. *Water, feed, eggs, dropping and soil sampling*

One hundred and eighty samples including water and feed samples (75 of each), eggs, and dropping and soil (15 of each) were collected from the ostrich farm. Water samples were collected from tap, tanks and drinkers, while feed samples were collected from feed bags in storage room and feeders. Eggs, dropping and soil were collected from breeder flocks over 2 years old. All samples were placed in polyethylene bags and stored frozen at - 20^{o}C until analysis.

2.2.2. *Muscles and liver samples:*

Thirty muscles and liver samples (15 of each) were obtained from slaughter house during the same period. The weight of each sample was represented by 50-100 gm. Tissues were washed with deionized water and warped separately in acid washed polyethylene bags and stored frozen at -20 °C until analysis.

2.3. *Determination of heavy metals*

Water samples were prepared for the determination of heavy metals according to methods described by APHA [8]. While, muscles, liver, eggs, dropping and soil samples were prepared for the determination of Pb and Cd according to the method described by Finerty *et al.* [16] and Hg was performed according to Diaz *et al.* [11]. Heavy metals were determined by using Atomic Absorption Spectrophotometer (Perkin Elmer, 2380, USA). The obtained results of heavy metals were recorded as ppm (mg /kg) on wet weight of the examined (feed, dropping & soil, muscles, liver, and eggs) samples and as ppm (mg/L) for water samples.

2.4. *Statistical Analysis*

The results were analyzed by software program according to Selvin [34].

3. RESULTS AND DISCUSSION

The results recorded in Table 1 showed that the highest concentrations of lead, cadmium and mercury (0.039±0.007 mg/L, 0.097±0.010 mg/Land 0.011±0.002mg/L, respectively) were detected in water collected from ostrich flock over 2 years old, then the mean concentrations of Pb, Cd and Hg were gradually decreased in younger flocks to reach the lowest values (0.011±0.002 mg/L, 0.038±0.012 mg/L and 0.002±0.001mg/L, respectively) in water collected from the rearing flock at 1-10 days old. The obtained results were in accordance with those reported by Abd El-Kader [3] who reported that the levels of Pb and Cd in drinking water of laying farm were 0.06 mg/L and 0.03 mg/L, respectively, while Hg was not detected. EL-Dahashan [13] detected both Pb and Cd in water of Elzomor canal at 0.042 mg/L and 0.16 mg/L concentrations respectively. Metawea [27] detected lead, cadmium and mercury in surface water of Minufiya Governorate at levels of 0.051 mg/L, 0.02 mg/L and 0.050 mg/L, respectively, while Aya [9] found that the levels of both lead and cadmium in drinking water of poultry farms were ranged between 0.025-0.057 mg/L and 0.050- 0.104 mg ⁄L, respectively. On the other hand, lower levels of heavy metals were detected by other researches [18], who found that the mean values of lead, cadmium and mercury in drinking water from ostrich farm located at Ismailia Governorate were 0.022 mg/L, 0.002 mg/L and 0.005 mg/L, respectively. Moreover, Abd El-Aziz [1] reported that the levels of lead and mercury in water from Gharbia Governorate were 0.211 mg/L and 1.07 mg/L, respectively, where Khalaf -Allah [20] reported that the levels of both Pb and Hg in water samples collected from Nile River were 0.317 mg/L, 1.08 mg/L, respectively. Ali [7] detected lead and cadmium at levels of 0.27 mg/L and 0.0.14 mg/L, respectively in fresh tap water while, their levels were 1.87 mg/L and 0.55 mg/L, respectively in polluted water with sewage at Assuit Governorate. On the other hand, Maysa *et al.* [26] detected high level of lead (0.7 mg/L) in tap water of some Egyptian Governments while, the level of cadmium was 0.09 mg/L. Additionally, Madiha [24] recorded high levels of mercury, lead and cadmium (0.26 mg/L, 0.15 mg/L and 0.09 mg/L, respectively) in water samples collected from Nile River at Gharbia Governorate. Our results were compared to the limits of heavy metals stated by WHO [37] and indicated that the highest percentages exceeded the permissible limit of Pb, Cd and Hg (6.7%, 73% and 46.7%, respectively) in water samples collected from the breeder flocks over 2 years old, while the low percentages were detected in water samples collected from the ostrich flock at 1- 10 days old. On the other hand, the concentrations of lead were within the permissible limit (0.05 mg/L) in all water samples collected from flocks at day 1 and up to 6 months old.

Table 1 Concentrations of lead, cadmium, mercury in water samples collected from ostrich flocks at different age (n =15)

Ostrich age group	*Lead (P.L. 0.05 mg/L)*			*Cadmium (P.L. 0.005 mg/L)*			*Mercury (P.L. 0.001 mg/L)*		
	Mean ± SE (range)	No exceeded P.L	%	Mean ± SE (range)	No exceeded/ p. L	%	Mean ± SE (range)	No exceeded P.L.	%
1-10 days	0.011±0.002[a] (0.001-0.020)	0	0.0	0.038±0.012[a] (0.002-0.090)	5	33.3	0.002±0.001[a] (0.001-0.003)	1	6.7
10-60 days	0.015±0.004[a] (0.002-0.037)	0	0.0	0.053±0.013[a] (0.003-0.104)	7	46.7	0.003±0.001[a] (0.001-0.005)	2	13.3
2-6 months	0.018±0.004[a] (0.008-0.040)	0	0.0	0.56 ±0.012[a] (0.004-0.111)	8	53.3	0.004±0.001[a] (0.002-0.005)	3	20.0
6-12 months	0.032±0.006[b] (0.010-0.060)	1	3.3	0.088±0.010[b] (0.030-0.130)	10	66.7	0.007±0.001[b] (0.006-0.009)	5	33.3
Over 2 years	0.039±0.007[b] (0.017-0.080)	2	6.7	0.097±0.010[b] (0.050-0.153)	11	73.3	0.011±0.002[b] (0.008-0.020)	7	46.7

P.L. is according to WHO [37]. Values with different letters in the same column are significantly different at $P<0.05$.

The variations among heavy metals values in water samples in different papers may be attributed to the source of water, seasonal variation, and level of pollution with agriculture drainage, sewage discharge and industrial effluents. In the current study, the contamination of water with such metals may be from external sources due to exposure of water course (Ismailia canal) to different agriculture and industrial activities, also from internal sources due to contamination of water in tanks and drinkers with feed particles, dropping and soil as the ostrich farm located near by many cultivated lands and other animal farms (agriculture activities).

The obtained results in table 2 clarified that, the highest concentrations of Pb, Cd and Hg (0.325±0.08 mg/kg, 0.143±0.010 mg/kg and 0.071±0.007 mg/kg, respectively) were detected in the feed collected from breeder flocks over 2 years old, then the values of all metals were gradually decreased in the feed samples collected from younger flocks to reach 0.103 ±0.009 mg/kg, 0.086±0.019 mg/kg and 0.034± 0.010 mg/kg, respectively in the feed samples collected from the rearing flock at 1-10 days old. The obtained results are nearly in accordance with those reported by other researchers. Abdullah *et al.* [5] detected both lead and cadmium in poultry feed in Saudi Arabia with a range of 0.10-3.21 mg/kg and, 0.004-0.249 respectively. On the other hand, higher levels of heavy metals were detected in poultry feed by Abd El-Kader [3] who recorded higher concentrations of Pb, Cd and Hg (10.73 mg/kg, 2.63 mg/kg and 9.26 mg /kg, respectively) in poultry feed samples collected from laying hen farms located at Dakahlia Governorate. Li and Chen [22] also recorded the concentration of cadmium in poultry feed from northeast China and it was 8.13 mg/kg. Additionally**,** Madeha [23] detected Pb, Cd and Hg in soybean meal samples used in animal feeding in Saudi Arabia at levels of 1.9 mg/kg, 0.75 mg/kg and 0.08 mg/kg respectively. Fengsong *et al.* [15] detected cadmium in poultry feed at a concentration of 1.6 mg/kg. On the other hand, lower levels of heavy metals were detected by Shahidul *et al.* [35] who detected some heavy metals in poultry feed at 0.0232-0.1852 ppm for cadmium while the concentration was 0.0116-0.0579 ppm for mercury.

Statistical analysis of data in tables 1 and 2 showed that there were significant differences ($p<0.05$) among the mean concentrations of lead, cadmium and mercury in all examined water and feed samples collected from grower and breeder flocks (over 6 months- over 2 years) and those collected from rearing flocks (under 6 months). Moreover, there were no significant differences in mean values of metals in both water and feed samples collected from the rearing flock from day 1 old to 6 months old. Additionally, no significant differences were observed in the mean values of all metals in both water and feed samples collected from both grower and breeder flocks. High levels of heavy metals in both water and feed of grower and breeder flocks may be attributed to the exposure of both feeders and drinkers to higher level of pollution from the surrounding environment such as contaminated sand from floor, dropping, and dry feed particles (hay). Moreover, both grower and breeder flock yards are not far away from many agriculture lands and large animal farms. On the other hand, low level of contamination in water and feed samples collected from rearing flocks may be attributed to the drinkers and feeder which were less liable to contamination as the rearing flocks were kept in environmentally controlled pens with rubber mate floor, in addition to the cleaning of both feeders and drinkers all times. In the current study, the high levels of such metals in ostrich feed may attributed to contaminated feed ingredients (grown in contaminated soil) and/or during manufacturing (as ostrich feed was manufactured at 10th of Ramadan city). Also it may be contaminated from farm environment due to different agriculture activities around the farm.

The obtained results in table 3 indicated that, the mean concentrations of Pb, Cd, and Hg in dropping and soil samples collected from the breeder flocks were 0.525±0.05 mg/kg, 0.445±0.03 mg/kg and 0.212±0.03 mg/kg, respectively.

Higher levels were detected by Abd El-Kader [3] who found that the mean concentrations of Pb, Cd and Hg in dropping of laying hen were 6.6 mg/kg, 2.13 mg/kg and 5.73 mg/kg, respectively. Nicholson *et al.* [30] detected both Pb and

Cd in laying hen manure at a level of 8.7 mg/kg and1.06 mg/kg respectively, while Fengsong *et al.* [15] found that the concentrations of lead and Cd in chicken manure were 4.44 mg/kg and 4.05 mg/kg, respectively.

Statistical analysis of data in table 3 clarified that there were high significant differences ($p< 0.01$) in mean values of Pb, Cd, and Hg in water samples and those of dropping and soil as well as between feed and dropping. Moreover there were significant difference ($p< 0.05$) among the mean values of metals in feed and water samples. The obtained results indicated that there was a positive correlation between the levels of metals in dropping and soil and their levels in both feed and water. Dropping and soil are found to be the main source of heavy metals in ostrich farm followed by feed and lastly by drinking water. The high levels of metals in dropping and soil may be attributed to the excessive application of low-quality fertilizers, pesticides, sewage sludge and other bio wastes which increase the concentrations of heavy metals in many agricultural soils above the safe levels of food production [14].

Table 2 Concentrations of lead, cadmium, mercury in feed samples collected from ostrich flocks at different age (mg/L) (n =15).

Ostrich age group	*Lead** Mean± S.E. (range)	*Cadmium*** Mean± S.E. (range)	*Mercury*** Mean± S.E. (range)
1 -10 days	0.103±0.009^{a} (0.09-0.120)	0.086±0.019^{a} (0.054-0.118)	0.034±0.007^{a} (0.021-0.045)
10 -60 days	0.219±0.095^{ab} (0.096-0.403)	0.102±0.016^{ac} (0.061-0.137)	0.039±0.008^{a} (0.022-0.051)
2 -6 months	0.248±0.102 ^{ab} (0.098- 0.440)	0.111±0.014^{ad} (0.080-0.140)	0.047±0.008^{ac} (0.031-0.063)
6 -12 months	0.307±0.101^{ab} (0.124-0.468)	0.132±0.012^{bcd} (0.100-0.159)	0.057±0.007^{bc} (0.042-0.069)
Over 2 years	0.325±0.08^{b} (0.20-0.521)	0.143±0.010^{b} (0.116-0.173)	0.071±0.007^{b} (0.052-0.09)

* P.L. is 1mg/kg according to Nicholson [30]. ** P.L. is 0.5 mg/kg for Cd and 0.1 mg/kg for Hg according to NRC [29]. The different letters in the same column are significantly different at P< 0.05.

Table 3 Concentrations of lead, cadmium, mercury in feed, water and dropping& soil samples collected from breeder flocks (mg/L) (n =15)

Samples	Lead			Cadmium			Mercury		
	Min.	Max	Mean± SE	Min.	Max	Mean± SE	Min.	Max	Mean± SE
Water	0.017	0.080	0.039±0.07^{a}	0.05	0.153	0.097±0.01^{a}	0.008	0.02	0.011±0.02^{a}
Feed	0.20	0.521	0.325±0.08^{b}	0.116	0.173	.0.143±0.01^{b}	0.052	0.09	0.071±0.007^{b}
Dropping& Soil	0.318	0.770	0.525±0.05^{c}	0.341	0.551	0.445±0.03^{c}	0.125	0.290	0.212±0.03^{c}

Values with different letters in the same column are significantly different at P<0.05.

The obtained results in table 4 indicated that the highest mean concentrations of Pb, Cd, and Hg (0.118±0.012 mg/kg, 0.174±0.023 mg/kg and 0.09±0.009 mg/kg, respectively) were detected in liver, while the lower levels of Pb, Cd, and Hg were detected in muscles (0.078±0.014 mg/kg, 0.112±0.011 mg/k and 0.05±0.012 mg/kg, respectively). The lowest concentration of Pb, Cd, and Hg (0.052±0.013 mg/kg, 0.078±0.014 mg/kg and 0.022±0.006 mg/kg) were detected in eggs. Nearly similar levels of heavy metals in muscles and liver of different species and in hen eggs were recorded by Jehan and Amany [18] who detected Pb, Cd, and Hg at a range of 0.08- 0.21 mg/k, 0.01-0.04 mg/kg and 0.007-0.034 mg/kg, respectively in ostrich muscles. Hanaa *et al.* [17] stated that the levels of Pb and Cd in ostrich muscles were at a range 0.065- 0.235 and 0.019-0.05 mg/kg, respectively, while in ostrich liver were at a range of 0.118-0.345 and 0.04-0.07 mg/kg, respectively. Safaa [32] found that the levels of Pb and Cd in thigh muscles of ostrich were 0.075-0.192 and 0.0-0.04 mg /kg respectively, while Azza and Hanaa [10] recoded that the level of Pb was 0.057±0.02 mg/kg in organic hen eggs but cadmium was not detected. Samia *et al.* [33] reported that the levels of Pb and cadmium in hen eggs were 0.178 mg/kg and 0.019 mg/kg, respectively. On the other hand, higher levels of metals were detected by others [2, 4] and, lower levels of metals were detected by Monika et al. [28] who found that the concentrations of Pb, Cd, and mercury were 0.020±0.030 mg/kg, 0.004±0.004 mg/kg and 0.002±0.002 mg/kg, respectively in ostrich muscles. The results indicated that, the highest levels of metals were detected in liver, followed by muscles and lastly eggs. These findings are in agreement with those recorded by Li and Chen [22] who mentioned that cadmium and lead are non-essential nutrients that are of direct concern to human and livestock health and may accumulate in the body, particularly in the kidney, liver, and to a lesser extent in the muscle.

Comparing our results with the limit of Pb stated by EOSQC [12], the percentages exceeded the limit in liver, muscles and eggs samples were 20%, 13.3% and 6.7% respectively, while for cadmium, the percentages were 26.7%, 20% and 6.7% respectively. On the other hand, all the results of liver, muscles and eggs samples were within the limit of Hg stated by EOSQC [12]. Statistical analysis of data in Table 4 clarified that there were significant differences ($p<0.05$) among the mean values of Pb, Cd, and Hg between liver and muscles as well as between liver and eggs. Moreover there were significant differences ($p<0.05$) among the mean values of metals between muscles and eggs.

Table 4 Concentrations of some heavy metals in liver, muscles and eggs samples collected from breeder flocks over 2 years old (mg/L) (n =15)

Samples	Lead*			Cadmium*			Mercury**		
	Mean± S.E. (range)	No ex. P.L	%	Mean± S.E. (range)	No ex P.L	%	Mean± S.E. (range)	No ex. P.L	%
Liver	$0.118±0.012^a$ (0.08-0.16)	3	20	$0.174±0.023^a$ (0.10-0.23)	4	26.7	$0.09±0.009^a$ (0.05-0.13)	0	0.0
Muscles	$0.078±0.014^b$ (0.05-0.13)	2	13.3	$0.112±0.011^b$ (0.08-0.15)	3	20.0	$0.05±0.012^b$ (0.03-0.10)	0	0.0
Eggs	$0.052±0.013^c$ (0.02-0.11)	1	6.7	$0.078±0.014^c$ (0.04-0.12)	1	6.7	$0.022±0.006^c$ (0.01-0.06)	0	0.0

* P.L. (0.1 mg/kg) according to EOSQC [12]. ** P.L. (0.05 mg/kg) according to EOSQC [12]. Values with different letters in the same column are significantly different at P<0.05.

The obtained data in table 5 indicated that there was a positive correlation between accumulation of heavy metals in tissues (liver, muscles, and eggs) and their concentrations in environment (water, feed, dropping and soil) and the highest correlation was reported for mercury in feed and its residues in liver (0.93), followed by lead in water and liver (0.85), while the lowest correlation was reported for Hg in soil and eggs (0.11). Similar findings were reported by Jehan and Amany [18].

The preventive measures intended to minimize the residues of heavy metals in both environment and food products include:

1- Avoid the contamination of water sources and ostrich feed with industrial and agriculture wastes.

2- Avoid the excessive application of low-quality fertilizers, pesticides, sewage sludge and other bio wastes in agricultural soils.

3- Accomplish a strict application of high biosecurity program in both ostrich farm and slaughter house to avoid heavy metals contamination from the surrounding environment (industry and agriculture).

4- Periodical examination of water, feed and soil to confirm it contain save levels of metals.

Table 5 Correlation coefficient (r) between levels of heavy metals in feed, water, dropping & soil and their residues in meat, liver and eggs of ostrich

Parameter	Heavy metal	Liver	Muscles	Eggs
Water	Lead	0.85	0.57	0.48
	Cadmium	0.71	0.65	0.57
	Mercury	0.45	0.65	0.39
Feed	Lead	0.076	0.57	0.45
	Cadmium	0.62	0.56	0.50
	Mercury	0.93	0.24	0.55
Dropping & soil	Lead	0.75	0.32	0.56
	Cadmium	0.43	0.53	0.47
	Mercury	0.39	0.24	0.11

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BENHA UNIVERSITY
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مجلة بنها للعلوم الطبية البيطرية

تقدير بعض المعادن الثقيلة فى بيئة مزرعة للنعام ومتبقياتها فى لحوم و كبد وبيض النعام بمحافظة الاسماعلية

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الملخص العربي

أجريت هذه الدراسة لتقدير بعض المعادن الثقيلة وهى الرصاص والكادميوم والزئبق فى بيئة مزرعة للنعام ومتبقياتها فى بعض المنتجات الغذائية للنعام بمنطقة القصاصين بمحافظة الاسماعلية وذلك للتعرف على اكثر المصادر احتواءا على المعادن الثقيلة بالاضافة الى دراسة الارتباط بين مستويات هذة المعادن فى البئية و متبقياتها فى المنتجات الغذائية مثل لحوم وكبد وبيض النعام . تم تجميع عدد 210 عينة من مزرعة ومجزر للنعام وهى عبارة عن عينات علف ومياه (75 عينة كل منها) زرق النعام مخلوط بالتربة, بيض, كبد و لحوم (15 عينة كل منهم) تم تقيم النتائج طبقا للحدود المسموح بها محليا و عالميا/ أو النتائج السابقة لباحثين اخرين كما تم اجراء تحاليل احصائية لكل البيانات. وقد اظهرت النتائج وجود مستويات عالية معنوية للمعادن الثقيلة فى كل من عينات المياه والعلف التى تم جميعها من قطعان النعام النامية والامهات مقارنه بالعينات التى تم تجميعها من القطعان التربية. لوحظ وجود ارتباط بين مستوى المعادن جميها الموجودة فى الزرق والتربة والتى تم تعينها فى كل من المياه والعلف وان اكثر المصادر احتواءا على المعادن كانت الزرق المخلوط بالتربة يليها عينات العلف واخيرا عينات المياه. بالاضافة الى ذلك فقد اوضحت النتائج ان عينات الكبد احتوت على اعلى نسبة من المعادن يليها اللحوم واخيرا البيض. كما تم شرح الآثار الضارة لكل من الرصاص والكادميوم والزئبق على صحة الإنسان بالإضافة مناقشه الإجراءات الواجب اتخاذها لتقليل تلوث البيئة والمنتجات الغذائية بمثل هذه المعادن.

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