رقم البحث (24)

SOME STUDIES ON HEAVY METAL POLLUTION AND THEIR EFFECT ON FISH (CLARIAS GARIEPINUS) AT BAHER EL-BAKER AREA IN SHARKIA GOVERNORATE

By

Hassan M.Moussa*,Al-Nabarawy,E.A.And EMAM,E.E.*****

Pathology , Food Hygiene and Biochemistry*** Departments*

Animal Health Research Institute(Zagazig branch)

ABSTRACT

Pollution of water has increased due to the industrial effluents, municipal waste and agricultural drainage. To evaluate the pathological, biochemical effect of heavy metal as well as concentration of heavy metals residues in the muscles of fish(Clarias gariepinus) reared in Bahar El Baker sea and mouas sea) and concentration of heavy metals in water of Bahar El Baker sea in which Bahar El Baker drainer sea is consider the main place for agriculture drain, sewage discharge,waste water and industrial effluents in Sharkia Governorate but the water in mouas sea from Nile River in Sharkia Governorate.A total of 100 random samples of fish(Clarias gariepinus) with different sizes were collected (50 from Baher El-Baker drain as well as 50 from mouas sea) and 10 water samples were collected (5 from Bahar El Baker as well as 5 from mouas sea, Sharkia Governorate) for the determination of some heavy metals (lead, mercury,cadmium, copper and zinc) in water and fish muscles by using Atomic Absorption spectrophotom-eter.Blood samples from 5 fish was taken from caudal vein of fish in centrifuge tube for obtain clear serum for biochemical analysis

. The obtained results in our study revealed that heavy metals induced change in concentrations of liver enzymes and kidney function in our gained results were evident to show significant increased in AST, ALP, urea and creatinine levels and significant decrease in total protein, albumin and globulin levels

The mean values of heavy metals (lead, mercury, cadmium copper and zinc) residues in the examined fish muscle ,gill, liver and kidney samples were significantly increased in fish reared in Bahar El Baker sea when compared with same organs from fish reared in mouas sea Also,14 %,4 %, 28 % and 6 %of in Bahar El Baker sea fish samples exceeded the MXL for lead, mercury, cadmium and zinc respectively. The copper levels were within the permissible limits in examined fish samples set by **FAO,WHO(1992).** experimental lead pollution in fish was done and tacke samples.

The gross picture included congestion of the all internal organs and dark of the skin. Histopathological examination showed degenerative changes and necrosis in liver and kidney, Gills revealed desquamation and necrosis of epithelial cells lamellae, Heart showed hyalinization and edema in cardiac muscle fiber, spleen showed hyperplasia of lymphoid tissue and melanomacrophages proliferation, skin showed desquamation and necrosis of superficial cells. Ovary revealed hyalinization and necrosis in ovarian follicles and brain showed neuronal degeneration and encephalomalacia.

It could be concluded that, water in Bahar El Baker sea and fish reared in Bahar El Baker contain high concentrations of heavy metals and induce adverse effect in biochemical Parameters and induce sever pathological change in internal organ of fish.

INTRODUCTION

The production of fish from natural water resources or from fish farms as a source of protein of high biological nutritive value is the goal of many countries allover the world **(Marzouk,et.al.2001).**Fresh water fish have been used as a food in most countries over the world **Campton,(1981).** The muscle is often the main part of fish used for human consumption due to its contribution of high quality animals protein, calcium, phosphorus and its generous supply vitamins. **(Ackman (1990).**

Environmental pollution is deleterious to the biological life. Pollution due to chemical substances such as pesticides, heavy metals, organic compounds, toxic gases and fumes widely spread and threatens the biological balance **Saleh and Hussein (2003).**Heavy metals are recognized to be among the most dangerous contaminants of environment and they are now of great concern all over the world. Industrial and agricultural processes have resulted in an increased concentration of heavy metals in air, water and soil subsequently, these metals

are taken by plants and animals and take their way into the food chain. Man are exposed to uptake of heavy metals from air, food and water **(Sohair,et.al.1992).**Heavy metals are recognized as cumulative toxic substances due to its low elimination rates from the body. More- over, the heavy metals could not be metabolized, thus they persist in the body and exert their toxic effects which result in serious health hazards to human, depending on their level of contamination Lucky and **Antonious, et. al.(1989).**There is a very narrow range at which the heavy metal is considered essential or toxic **Highom and Tomkins(1993).**Among these metals, Lead, cadmium and mercury have a great concern due to a variety of their uses that increases their level in environment. They cause several clinical problems due to their competition with the essential elements for binding sites and their interference with the sulphahydryl groups and structural protein **Ally, et.al(2003).**Zinc and copper are essential metals and import-ant in the maintenance of normal physiological function of the body, but in large concentrations ,it may cause toxic effects that tend to be more complicated than that of the non essential metals **Sorensem, (1991)..**Moreover, Histopathological changes have been reported in gills, liver and kidney in response to different irritants including heavy metals **(Mazhar,1986).**

The present study was carried out to investigate the toxic(pathological)effect of accumulated heavy metals on the different organs and tissues, biochemical effect as well as its residues in muscles of fish (Clarias gariepinus) reared in Bahar El Baker sea and mouas sea) and levels of this elements in water of Bahar El Baker sea and mouas sea in Sharkia Province

MATERIAL AND METHODS

1)Fish (Clarias gariepinus)

The present study was carried out on the cat fish (Clarias gariepinus) with weight 300-320 gm were collected from (50 from Baher El-Baker drain in Sharkia governorate as well as 50 from mouas sea at Zagazig city)The samples were collected during the summer season from May to Octobar 2008.

2)Water analysis

Water samples were collected in duplicate from Baher El-Baker drain, as well as water sample from sea water (mouas sea at Zagazig city).The techniques of sampling and analysis

were carried out **A.p.H.A.(1985).**The water samples were filtered thro- ugh a 0.45u membrane filter. The required volume (100ml) of filtrate was collected and preserved by 0.3 ml of 1:1 HNO3.Metals in filtered water samples were identified and quantified by using perking Elmer 2380 Atomic Absorption spectrophotometer **A.P.H. A.(1985).**The analytical detection limit for instrumentation used were cadmium, 0.003 ugil, copper 0.02 ugil lead, 0.05 ugil, mercury 0.001 ugil and zinc 0.01 ugil and data were recorded as mgil.

3)Fish analysis:

Samples of fish (Clarias–gariepinus) with weight 300-320 gm were collected from Baher El-Baker drain in Sharkia governorate as well as from mouas sea at Zagazig city), The fish specimens were individually placed in clean polyethylene bags and immedia-tely taken to the laboratory where they wee kept frozen until preparing for digestion and analysis.

Digestion of samples.

The frozen fish were defrosted then digested according to the recommended method **Al-Ghais(1995)** in which 2 grams of muscle from each fish sample were digested with 10 ml of analytical grade nitric/ perchloric acid mixture (4:1) in a clean acid washed was digestion flask. Initial digestion was performed at room temperature for 3-4h.,followed by careful heating in water bath at 40-45˚c for one hour to prevent frothing. The tempe-rature way then raised to 70-80˚c with gentle shaking until the digestion was completed within 3h .The resulting digestion were allowed to cool to room temperature and diluted up to 20 times with deionized water, then filtered through what man paper No.1. Blank and standard solutions were also prepared and analyzed for quality control purpose.

Heavy metal analysis:

Residual heavy metals (lead, mercury,cadmium, copper and zinc) were evaluated in gills, liver, kidney, of fish according to the American Public Health Association (**APHA, 1985)** then measured using the atomic absorption spectrophotometry (Perkin Elmer, 2280)

Blood samples

blood was collected from the caudal vein of fish in centrifuge tube and centrifuged at 3000 r.p.m. for 15 min to separate clear serum, for determination of total protein calorimetrically according to **Doumas,et.al.(1981)** albumin **Drupt (1974)** globulin was calculated as difference between total protein and albumin, transaminases (AST-ALT) **Reitman and Frankel(1957),** urea**(Patton and Crouch,1977) ,**creatinine **(Henry,1974)**

Experimental desgin

Fish : Forty healthy fish of both sexes and 150 ± 5 gm body weight were obtained alive from El-Abbassa Research center and Transport immediately to the laboratory .This fish must be free from lead and other heavy metals in their tissue after examination. They were kept in a.glass aquaria (100 X 30 X 50 cm) that provided daily with a tap water and continuously with filered air .The water temperature. was adjusted at 18 - 22˚c along the period of experiment using thermostatic heater. The fish were feed in a balanced ration daily using the formula suggested by **Ahmed and Matty(1989).**Fish kept under observation for 2 weeks.The acut leathal concentration dose of fish (LC50 -72 hr)was 150 mg/liter lead acetate were recorded according to **Aly,et.al.(2003).**Fish were divided two groups,(20 of each.)The first group received tape water and kept as control.The second group was expose to 1/10 of LC50 /72hr2(1.5 mg/liter)of lead acetate for two weeks.Fish in both groups were sacrificed. and speciment from gill, liver, kidneys, heart, ovaries were collected histopathological examination at the end experment.

Histopathological examination:

Clinical and postmortem examination were performed by using the method described by **(Plumb and Bowserو1983).**Tissue. specimens from Liver, Kidney,. Spleen, Heart, Brain, Gill, Ovary and Skin from natural and experimental pollution of cat fish were fixed in 10% neutral buffered formalin paraffin section of 5 Microns were prepared and stained with hematoxylin and Eosin (HXE) according to **Bancroft ,et. al.(1991) and Robertes (1989)** and. examined microscopically.

Statistical analysis:

The statistical analysis of data was conducted by **(Petric and Watson, 1999).**

RESULTS

The obtained results in our study revealed that heavy metals induced change in concentrations of liver enzymes and kidney function in our gained results were evident to show significant increased in AST, ALP, urea and creatinine levels and significant decrease in total protein, albumin and globulin levels

The mean values of heavy metals (lead, mercury, cadmium copper and zinc) residues in the examined fish muscle ,gill, liver and kidney samples were significantly increased in fish reared in Bahar El Baker sea when comared with same organs from fish reared in mouas sea Also,14 %,4 %, 28 % and 6 %of in Bahar El Baker sea fish samples exceeded the MXL for lead, mercury, cadmium and zinc respectively. The copper levels were within the permissible limits in examined fish samples set by **FAO/WHO (1992).** experimental lead pollution in fish was done and tacke samples

Histopathological studies. The postmortem lesions were congestion in all internal organs and dark of the skin .Microscopically the liver revealed congestion and diffuse vacuolar of melanomacrophages and necrosis in some hepatocytes were seen in one week till the end of experimental. Fig. (I). The kidney showed tubular nephrosis by 3rd days of exposure, thickening and hyalinization of renal blood vessels, necrosis of some renal tubules and proliferation in melanomacrophages were evident one week of exposur till the end of experiment. Fig (2). The Gill exhibited desquamation and necrosis of the epithelial cell lining of the lamellae with lymphocytic cell infiltration. These results were recorded one week of exposure till the end of experiment. Fig.(3).The heart revealed hyaline degeneration with edema in the cardiac muscle fibers and leukocytic cells infiltration were evident one week of exposure till the end of experiment Fog.(4).The spleen sgowed focal lymphoid hyperplasia and proliferation of melanomacrophages along the period of experiment. Fig.(5). The skin revealed destruction of the superficial epithelial cells with edema and proliferation of melanomacrophages in the dermis by one week of exposure till the end of experiment Fig.(6).The ovary showed atretic follicles, edema, hyyalinization and necrosed of the follicles at 2 weeks of exposure. Fig.(7).The brain showed neuronal degeneration,perineural edema and encephalomalacia at 2 weeks of exposure. Fig.(8).The above mentioned pathological alteration were similar in natural and experimental pollution.

Table(1): Heavy metal concentration in the examined water sample (ppm).

Heavy metal Type	Zinc	Cadmium	Copper	Mercury	Lead
Mouas Sea water (control)	0.0492	0.0138	0.0345	0.0032	0.1092
Baher El-Baker water (tested)	0.3192	0.019	0.152	0.791	0.912
M.X. allowable level	5.000	0.005	1.000	0.001	0.05

Table (2) : Some blood components in fish (N=5)

	Protein profile (gm/dl)			Liver enzymes (IU/L)		Kidney function (gm/dl)	
	T.protein	**Albumin**	**Globulin**	**ALT**	**AST**	**Urea**	**Creatinine**
Mouas Sea fish (control)	4.34± 0.73	2.56± 0.62	2.37± 0.89	98.31± 1.34	25.18± 1.18	20.17± 1.32	1.69± 0.14
Baher El-Baker fish(tested)	2.98± 0.21**	1.68± 0.10*	1.30± 0.13*	109.7± 2.05**	37.08± 0.97**	26.18± 0.89**	1.70± 0.12**

***Significant at P < 0.05 ** Significant at P < 0.01**

Table 3: Heavy metal concentrations (ppm) in fish muscles, gills ,liver and kidney (n = 50).

Heavy metal Type	Mouas Sea water (control)				Baher El-Baker water (tested)			
	muscle	**Gills**	**Liver**	**Kidney**	**muscle**	**Gills**	**Liver**	**Kidney**
Lead	0.451± 0.021	0.89± 0.09	0.91± 0.08	0.69± 0.05	1.199± 0.16**	1.83± 0.38*	1.98± 0.19*	3.19± 0.51**
Mercury	0.132± 0.033	0.151± 0.18	0.62±0 .10	0.71± 0.20	0.933± 0.22**	1.09± 0.24**	1.45± 0.21**	1.32± 0.17**
Copper	0.38± 0.020	0.47± 0.07	1.04±0 .21	1.12± 0.27	1.09± 0.20**	2.02± 0.32 **	3.91± 0.89**	4.38± 0.93**
Cadmium	0.090± 0.031	0.008± 0.002	0.12±0 .01	0.14± 0.01	0.98± 0.22**	0.22± 0.03***	0.61± 0.13**	0.97± 0.18**
Zinc	1.19± 0.48	1.72± 0.96	2.41±0 .69	2.24± 0.87	4.465± 0.97*	6..38± 1.43*	7.22± 0.56*	8.46± 1.92 *

***Significant at P < 0.05 ** Significant at P < 0.01 *** Significant at P < 0.001**

Table(4) : Frequency distribution of heavy metals in Baher El-Baker fish compared with maximal permissible limits(a)

Heavy metals / Permissible limits		Within the permissible limits		Over the permissible limits	
		No	%	No	%
Lead	0.1	43	86	7	14
Mercury	0.5	48	96	2	4
Copper	1.2	50	100	0.0	0.0
Cadmium	0.1	36	72	14	28
Zinc	5	47	94	3	6

(a)Permissible limits according to E.O.S.q.c.(1993).

Fig(1): Liver of fish 2 weeks post exposure showing diffuse vacuolar degeneration and periportal aggregation of melanomacrophages as well as necrosis of hepatocytes. H&E X 300

Fig(2): Kidney of fish 2 weeks post exposure showing necrosis in some renal tubules, hyalinization in the wall of renal blood vessels with proliferation of melanomacrophages . H&E X 300.

Fig(3): Gill of fish 1 week post exposure showing desquamation and necrosis of the epithelial cell lining of the Gill lamella with lymphocytic cells infiltration H&E X300

Fig(4): Cardiac muscle of fish 1 week post exposure showing hyaline degeneration with edema and leukocytes cells infiltration. H&E X 300.

Fig(5): Spleen of fish 2weeks post exposure showing focal lymphoid hyperplasia and proliferation of melanomacrophages. H&E X 300

Fig(6): Skin of fish 1 week post exposure showing destruction of the superficial epithelial cells with edema and proliferation of melanomacrophages in the dermis.H&E X 300

Fig(7): Ovary of fish 2 weeks post exposure showing atretic follicles, edema, necrosed and hyalinization of the follicles. H&E X 300.

Fig(8): Brain of fish 2 weeks post exposure showing neuronal degeneration perineural edema and encephalomalacia. H&E X 300.

DISCUSSION

The increased concentration of lead in surface water during the post few years is correlated to high industrial wastes. In examined water of Bahr El-Baker drain, the value of lead was 0.912 ppm (Table,1).Similar findings were detected by **Mahdy, et.al.(1993).** For mercury it as 0.7gl ppm which agrees with **Mahdy,et.al.(1993)** while **khalef Allah (1998)** recorded higher levels in Nile River near Helwan as 1.082 ppm. The recorded levels of mercury were higher than the permissible limits recommended by **WHO (1984).**Copper value was 0.152 ppm which is in agreement with **Mahdy,et.al. (1993).** Cadmium was 0.019 ppm similar to that determined by **Dawood,et.al.(1999).**Cadmium pollution of the environment is increased due to its use in the manufacture of plastic, nickel cadmium batteries, photocells, rubber tires and other items **(Booth and Mc Donald,1982).**The mean value of zinc was 0.3192 ppm which is below the maximum permissible limits according to **WHO(1984).** Meanwhile, it is higher than those recorded by **Dawood et al.(1999).** These results when compared with that obtained from control sea water, showed significant increase in most elements.

Concentrations of liver enzymes and kidney function in the fish live in water contain high level of heavy metals in our gained results were evident to show signif-icant increased in AST and ALP activity levels,urea and Creatinine**(Forstner and Wittmann, 1983)** attributed the increase in liver enzymes to toxic effects of lead on the liver tissue. cadmium accumulates mainly in the liver and kidneys and **(Goyer, 1989)** mentioned that the chronic cadmium toxicosis included kidney damage with increase in urea and Creatinine (Donaldson,1980). These results coincided with those obtained by **Saygy,et. al. (1991)** recorded that cadmium induced damage in the liver as fibrosis in portal area. Our results came in agreement with **Novelli, et.al. (1998)** in rats supplemented with cadmium.Also mercury causes severe kidney damage with increase in urea and Creatinine **(Manahan, 1989)..**

In the present total protein, albumin and globulin levels were significantly decreased in the serum of fish live in water contain high level of heavy metals. These results agree with that of **Sallam,et.al.(2000**) who reported that, Chronic exposure to copper causes liver cirrhosis that led to degenerative changes in the liver which may led to reduction in protein profile.This hypoproteinemia, hypoglobulinemia and hypoglobul-inemia observed in the serum of cow suffering from cystic ovary with endometritis may be due to lead toxicity in

which induce liver dysfunction and have toxic effects on sulfh-ydrylcarboxy and imidazole contaning protein, membrane protein and globulin **(Khan, et.al.1993).Coles(1986)** mentioned that the liver is a primary organ which is responsible for biosynthesis of albumen. Hypoproteinemia and hypoalbuminemia due to chronic toxicity by heavy metals are also reported **(Gossel and Bricker,1990).**

Lead concentration in tables (3) were 1.199,1.83,1.98 and 3.19 ppm in muscles gills, liver and kidney respectively in the fish (Clarins gariepinus)collected from Bahar El Baker sea when compared with fish collected from mouas sea.Similar results were recorded by **El-Dosky (2005);**Moreover, higher lead concentration, than our findings were recorded by **Eromasels,et.al.(1995).**Lead has a large affinity for the thios and phosphate containing ligands, inhibiting the biosynthesis of heme and thereby affects the membrane permeability of the Kidneys, Liver an Brain cells which reduces the function or completely breakdown these tissues (**Forstner and Wittmann (1983**). Therefore, the CNS, kidney, Liver and hematopojetic system are important targets of lead toxicosis.

The concentrations of the mercury residues in muscles, gills, liver and kidney of the fish (Clarins gariepinus)collected from Bahar El Baker sea in our study were 0.933,1.09 ,1.45 and1.32ppm as shown in tables (3).Nearly similar finding of mercury residues were reported by **Galhoom et al. (2000)** who mentioned that mercury residues is very high in internal organs of Mugil fish (Mugil) cephalcus reared in Bahr El-Bakar drain. Mercury is a particular cumulative poison and act as inhibitr for numerous enzymes. While, it is less than those stated by **Mahdy,et.al. (1993)** and higher than those obtained by **Khalaf–Allah(1998).** More-over, it causes sever Kidney damage in both man and animals **(Manahan, 1989**).

The mean value of copper in cat fish muscle ,gill, liver and kidney in our study were 1.09,2.02, 3.91 and 4.38 ppm respectively as showed in Table(3).Similar results were obtained by **El–Dsoky (2005)**,While lower results was recorded by **Oehlensch laeger (1990**).Mean while higher level was detected by **Norris and Lake (1984).** Copper is an essential element for several enzymes. The gastrointestinal absorption of Copper is normally regulated by body store and most of the Copper is stored in the liver and bone marrow where it is bound to metallothioneine **Sarkar,et. al. (1983).**

The achieved results in Table 3 declared that the mean values of cadmium in cat fish muscle,gill,liver and kidneys was 0.98, 0.22, 0.61 and 0.97 ppm respectively .Nearly similar results were recorded by **El-Dosky (2005),** While lower levels were reported by **Galhoom**

(2002),Cadmium accumulates mainly in the liver and kidneys. The chronic cadmium toxicosis included kidney damage with proteinuria, impaired regulation of calcium and phosphates,manifesting bone demineralization, osteomalacia and patholog-ical fractures. Moreover cadmium is a possible cause of hypertens-ion, inosomia and testicular atrophy. **(Friberg and Elinder,1985)**

The results obtained in table 3 revealed that the concentration of zinc in cat fish muscle, gill, liver and kidney was 4.465,6..38,7.22 and 8.46 ppm. Same results were recorded by **El-Dosky (2005),**On the other aspect, lower zinc levels than those obtained in the current study were reported by **Galhoom (2000)**Zinc is an essential constituent or cofactor for more then zoo mettalloenzyme and hormone receptor, protein, neuropepti-des and polynucleotides. zinc does not accumulate with continued exposure but the body content is modulated by homeostatic mechanisms **Lee. (1998).**

Histopathological observation in the liver and kidney of fish were degenerative change proliferation of melanomacrophages and necrosis. These results were observed by several authors **Bashman,et.al(2001)** associated with cadmium,copper,mercury and zinc exposure in carp., **Ally,et.al.(2003)** associated with lead toxicity in fish, **Lilia (2003)** associated with cadmium and lead toxicity in oreochromis niloticus and **Hanan and Fadel (2005)**associated with heavy metal pollution in Tilapia .

The Gill in this study showed desquamation nd necrosis of the epithelial cells of Lamellae. these results were observed by **metelev,et.al.(1994)** associated with heavy metal toxicity in fish,**Ashman,et.al.(2001)** associated with cadmium,copper, mercury and zinc exposure in carp beside **Hanan and Fadel (2005)** associated it heavy metal pollution in Tilapia.

The heart in this work showed hyaline degeneration with edema in cardiac muscle fibers. these results were observed by**Gaafer(2006)** associated with pesticide toxicity in fish.The spleen in this study revealed lymphoid hyperplasia and melanomacroph-ages proliferation. these results were observed by **Ally,et.al.(2003)** associated with lead and pesticide toxicity in fish respectivilly. The skin showed destruction of the epithelial cells and proliferation of melanomacrophages in the dermis These were observed by **Gaafer (2006)** associated by pesticide toxicity in fish.

The ovary showed atretic follicles, hyalinization and necrosis of the follicles . these results were observed by **Hnan and Fadel (2005)** associated with heavy metal pollution and pesticide toxicity in Tilapia and fish respectively. The above mentioned pathological

alteration in many organs may be attributed to cumulative and necrotizing effect of heavy metal residues in Tissue fish.

Generally, it could be concluded that these pollutions could be probably attributed to the industrial effluents, the previous using of leaded gasoline, phosphate fertilizers, sewage sludge and some herbicides.

The using of fish from uncontaminated water controlling the industrial and agriculture effluents into lakes and surface water are the preventive measures to produce a hygienic fish for human consumers.

REFERENCES

Ackman,R.(1990): Sea food lipids and fatty acids. Food Review International,6:61-64.

Ahmed,T.and Matty,A.(1989): The effect of feeding antibiotic on growth and body composition of carp (cyprinus carpio). Aquacultwe , 77, 211.

Al-Ghais,S.(1995) Heavy metal concentration in the tissue of sparus sarbn forskal, 1775 from the united Arab Emarates. Bull. Environ. Contam. Toxic 55 : 581.

Ally,S.;Mona,S.;Zaki,R. and Hala M.El.Genaidy(2003) Pathological, Biochemical, Hematological and hormonal changes in fish (clarias Gariepinus) exposed to lead pollution pEgp. Vet .Med . Assoa 63 no. I 331 - 342.

Anthonious,H.;Tsoukali,P.and Sasant.F.(1989) Consumable tissues in relation to age of animals and area of their breeding. Bull. Environ. Contam.Toxi,4:915– 919.

A.P.H.A. (1985): Standard methods for examination of waters and waste water.16th Ed. Washington, D.C.2005.

Bancroft,J.;Stevens,A. and turner,D.(1991) Theory and practice of histological techniques, thierd edition churchill livivngstone,Med. Division of longman Group.

Bashman,R;Soltant,M.and Sasnt.F(2001) Asurvey on copper, cadmium and zinc Histopathological lesions in common carp(Cyprinus carpio)Vet.Bull.,71(11)136.

Booth,N. and McDonald,L(1982) Veterinary pharmacology and therapeutics. 5lh Ed. Pllor The lawn state Univ. press., Ames.

Brown,V.(1980) Acute toxicity in theory and practice with special reference to the toxicology of pesticides. Wiley in tersciencepublica tion. John Wiley and sons. chichester.

Campton,G.(1981) In Campton's Encyclobedia Vol.5:601.publisher university of Chicago USA.

Coles,E.(1986) Veterinary Clinical Pathology,4thEd.,W.B.Saunders Comp.West Washington square Philadelphia

Dawood,R.;Aida,M.;Amin,M.and Abd El-Khalek.(1999): Residual analysis of some heavy metals in water and oveochromis Niloticus fish from polluted areas vet. Med. J., Giza. Vol. 47, No. 3:351 – 365.

Donaldson,W.(1980)"Trace element toxicity"In:Hodgson E. and Guthrie,F.(3rdEd) Introduction to Biochemical Toxicology,Elseiver,New York,P. 330.

Doumas,B.;Carter,R.;Peers,T.andSchaffer,R.(1981) Method for determination of total protein in serum.Clin.Chem.27.1642

Drupt,F.(1974): Colorimetric method for determination of albumin.Phar.Bio.(9)77- 79

Egyptian organization for standardization and quality control(E.O.S.q.c.)(1993): Maximum residue limits for heavy metals in food. Ministry of Industry.No.2360/ 1993. pp.5 cario–Egypt.

El-Dsoky,K(2005) Some Heavy metal residues in Tilapia Nilotica and Mugil cephalcus Fish Zag.vet.J.33(3):65 – 62.

Eromasels,C.; Eromasels,C.;Muktar,S.and Birdlings,S.(1995): Metals in fish from the upper Bemue River and Lakes Grriyo and Niawa in northeytern Nigeria.Bull.Environ Contam Toxic. 54 : 8.

FAO/WHO,(1992) joint Expert Committee on food Additives, WHO Technical Report seriesNo.505(1972);No.555(1974c);No.683(1982);No751(1987)andNo.776(1989)Evaluation of certain food additives and contaminants, Geneva.

Forstner,N. and wittmann,G.(1983): Metal pollution in aquatic environment. Springer – verlag. Berlin.

Friberg, L. and Elinder,C.(1985) Cadmium and compounds In Encyclopedia of occupational Health and safety.3rd ed. Geneva, Switzerland. Internet.Labar.Org. 356.

Gaafer,S.A(2006)experimental pathological studies of some locally used pesticids as afresh water pollutants on the Nile fish(clarias Lazera) ph.D.of vet. med. Sce. Zag. Univ.

Galhoom,K.;Lilia, G.Rizk and El-Azzaway,M.(2000): Some biochemical and haematological parameter in Mugil fish (Mugil) cephalcus reared in Bahr El-Bakar drain. Egypt. J. Agric. Res., 78(1).

Gossel,T.and Bricker,J.(1990): Principles of Clinical Toxicology.2nd ed. Raven Press Ltd. New York. Goyer,R.(1989):Mechanism of lead and cadmium nephrotoxicity.Toxic. Lett. 46: 153 -162.

Goyer,R.(1989) Mechanism of lead and cadmium nephrotoxicity.Tox.Lett.6:153-162

Hanan,S. Gaber and Fadel,N.(2005) some studies on heavy metals pollution of abozabal lake and their effect on three tilapia species.Egypt. comp. path&clinic.path.18(I2)11- 23.

Harris,H.(1898):A new method of ripening hematoxylin. Cited by Romeis, B.1948. Mikroscopische Technique. R. oldenberg, Munchen.

Henry,R(1974) Colorimetric determination of creatinine.Clin.Chem. Prinicipales

Highom,A.and Tomkins,R.(1993)determination of trace quantities of selenium and arsenic in canned tune fish by using electroanalytical techniques. Food chem,48:8–13

Khalaf–Allah.(1998)Monitoring of heavy metal pollution River Nile around Helwan. Egypt. J. Egypt. Vet Med. Assoc. 58, (4): 571 – 589.

Khan,M.;Szarek,J.;Krasnodebska,D.and Koncicki,A.(1993): Effect of concurrent administration of lead and selenium on some haemotological and biochemical parameters of broiler chickens. Acta Vet. Hungarica, Olsztyn,Poland ,41(1-2):123.

Lec,R(1998) Zinc.In:harbsion R.(ed):Hamilton and Hardyss industrial toxicology-5th ed.5-11.

Lilia,Mohamed(200): Residues of some heavy metals in fresh water fish. M.V.Sc degree of Zoology. Dep. of Zoology Faculty of Science, Zag. Univ.

Lucky,T.and Venugopol,B.(1977) Metal toxicity in animals.Plenum press,New York , USA

Mahdy,A.;Tark,I.;Magda Amines, A. and Aref M.A.(1993): Heavy metal pollution fish ponds. zag.Vet.J.21(2):116 – 125.

Manahan,S.(1989): Toxicological chemistry. guide to toxic substances in chemistry Brooks / cole publishing Co.C.A.

Marzouk,M.; Ezz-El din,N.;Hashem, M.El. and Adawy,R.(2001) Studies on digenetic trematodes of some fresh water fishes in Dakahlia Provenance. The 2nd International Sci Conf.Vet.Med. Mansoura Univ 387-401.

Meteleve,V.; kanev, A. and Dzsoka Hova,N.(1994): water toxicology, 2nd edition. CABI publishing canada.

Mohamed,A.A(1993): Some trace elements in tissues of some fresh water fish .Ph.D. Thesis (Meat hygiene). Fact. Vet. Med Assiut university.

Norris,R. and Lake,P.(1984): Trace metal concentrations in fish from the south Esk River, Northen Tasmania, Australia. Bull. Environ. Contam. Toxic. 33:348.

Novelli,E.;Rodrigues,N.and Ribas,B.(1998) Assessment of cadmium toxicity on hepatic and renal tissue of rats. Environ. Res.79(2): 102-105,

Oehlenschlaeger,J.(1990): Heavy metal contents in various parts of red fish (Sepastes marinus) fillet,schwermetal lgehalte in verschidenen teilen von robtbar-schfilet (Sepastes marinus) in form. Fischwirt. 37 : 32 - 36.

Petri A. and Watson P. (1999): Statistics for veterinary and Animal science. Lst Ed., pp. 90 – 99. The Blackwell science Ltd, united kingdom.

Patton,C.and Crouch,S.(1977) Colorimetric determination of urea in blood.Anal.Ch. Chem.49:464-469

Plumb,J. and Bowser,P.(1983): Microbial Fish Disease Laboratory Manual. Alabama Agriculture Experimental station Auburn University.

Reitman ,S. and Frankel,S.(1957): Calorimetric determination of SGot and SGpt activity. Am. J. Clin. Path. (28) 56 – 59.

Robertes R. (1989): Fish pathology 1st Ed Baillier tindail, London.

Saleh F.S. and Hussein M.A.(2003) Pathological Studies On The Effects Of Some Water Pollutants On Nile Tilapia (Oreochromis Niloticus), Collected From Different Natural Egyptian Water Sources Zag. Vet. J. 31(2)225-239

Sallam,K.;Shehata,A.and Eldaly,E.(2000): Lead, cadmium and copper residues in some crustaceans.Zag.Vet.J.(2),363-370.

Saygy,S;Deniz,G.and Vural,N(1991) Chronic effects of cadmium on kidney liver, testis and fertility of male rats.Biol.Trace Elem.Res.31:209-214.

Sarkar,B.;Laussac,J.and Lau,S(1983) Transports forms of copper in human serum. Sarkar, B(ed)biological aspects of metal and metal elated diseases.New York:Raven press,23–40

Sohair R. Aly,I.and Mahmoud,A.(1992): Hazardous effect of some industrial pollutant on Tilapia nilotica. (Oreochromis niloticus) Assiut, Vet. Med. J.(27) 54-46

Sorensem,E.(1991) Metal poisoning in fish oxford and I.B.H.publ. co. Bombay.

Who (1984): Guide lines for drinking water quality: Geneva No.lll.

الملخص العربى

بعض الدراسات على التلوث بالمعادن الثقيلة وتأثيرها على سمك القرموط الافريقى فى منطقة بحر البقر بمحافظة الشرقية

د.حسن موسى محمد ، د.عصام على النبراوى و د. السيد السيد إمام حسن
(أقسام الباثولوجى*،صحة الأغذية**،الكيمياء***)
معهد بحوث صحة الحيوان بالزقازيق - مركز البحوث الزراعية - الدقى - جيزة – مصر

أجري هذا البحث على سمك القرموط الافريقى التي يتم تربيتها في منطقتي بحر البقر وبحر مويس بمدينة الزقازيق بمحافظة الشرقية وذلك لتقدير بقايا المعادن الثقيلة في عضلات الأسماك وكذلك معرفة تركيز تلك المعادن في مياة المنطقتين وتأثير تلك المعادن الثقيلة على بعض الوظائف البيوكيميائية حيث يعتبر مصرف بحر البقر هو المكان الرئيسي الذي يتم فية صرف مياة الأرضي الزراعية والصرف الصحي ومياة الصرف لبعض المصانع بمحافظة الشرقية.لذلك تم تجميع ١٠٠عينةسمكة من اسماك القرموط الافريقى يتراوح حجمها من ٣٠٠ الى ٣٢٠ جرام (٥٠ سمكة من الأسماك المرباة ببحر البقر ، ٥٠ سمكة من الأسماك المرباة ببحر مويس)كذلك يتم تجميع ٥ عينة مياة من بحر مويس بمدينة الزقازيق و٥ عينة مياة من بحر البقر) وتم تحليل عضلات الأسماك وعينات المياة باستخدام مقياس الامتصاص الذرى الطيفي للوقوف على مستويات الرصاص الكادميوم الزئبق و النحاس والزنك.وتم اخذ عينات دم وعينات من الأعضاء الداخلية للأسماك من المنطقتين لمعرفة تأثير تلك المعادن على بعض الوظائف الهستوباثولوجية البيوكيميائية وخطورة بقايا المعادن الثقيلة في عضلات الأسماك على الصحة العامة.

أوضحت النتائج أن بقايا المعادن الثقيلة في اسماك بحر البقر كانت مرتفعة عنها فى مياة بحر مويس وكانت متبقيات المعادن الثقيلة بعضلات اسماك بحر البقر كانت كالاتى: ٠,١٩٩ ، ٠,٣٣٣ ، ٠,٩٠٩ ، ٠,١٤٨ ، ٤,٤٦٥ جزء في المليون من الرصاص ، الزئبق ، النحاس ، الكادميوم والزنك على التوالي بينما كانت نسبة تلك المعادن في مياة بحر مويس ٠,٤٥١ ، ٠,١٣٢ ، ٠,١١٧ ، ٠,١٩٤,٤٦٥ جزء فى المليون على التوالي .وكانت النسبة المئوية ١٤% ، ٤% ، ٢٨% ، ٦% زيادة عن المعدلات المسموح بها فى الرصاص ، الزئبق ، الكادميوم والزنك على التوالي أما النحاس فكان فى حدود المسموح به وذلك فى الأسماك المرباة فى بحر البقر فقط.

وتشير ا لنتائج أن المعادن الثقيلة أدت إلى حدوث نقص معنوي فى البروتين الكلى ،الزلال ، الجلوبيولين وبينما كان هناك زيادة معنوية في نشاط إنزيمات الترانس امينيزسس(الأسبرتيت امينوترانسفريزAST- الألانين أمينوترانسفريز ALT) وكذلك اليوريا والكرياتينين في مصل دم اسماك بحر البقر بالمقارنة بالمجموعة الضابطة(اسماك منطقة الزقازيق)

وبالعرض النسيجي للأسماك المرباة فى بحر البقر وجد بالكبد والكلى تنكس فجوى وتنكرز بالخلايا الكبدية والخلايا المبطنة للأنابيب الكلوية مع تجمع وانتشار للخلايا الملتهمة للميلانين على التوالي والخياشيم وجد بها تكسير وسقوط بعض خلايا الصفائح الخيشومية. أما القلب فوجد استحالات بالعضلات ، الطحال وجد زيادة في الخلايا الليمفاوية مع انتشار للخلايا الملتهمة للميلانين أما الجلد فوجد به تقرحات وسقوط لخلايا البشرة وبالمبيض سجل به تحطم وتنكرز بالبويضات مع تحطيم الأنسجة المسئولة عن تماسك البويضات أما المخ فوجد به تنكس ونخر بالخلايا العصبية .

يتبين لنا من تلك الدراسة أن المعادن الثقيلة موجودة فى مياة منطقة بحر البقر أعلى من الحد المسموح به مما أدى إلى وجود تأثير سمي ويؤدى إلى تغيرات كبيرة فى الصورة الباثولوجية للأعضاء الداخلية لأسماك بحر البقر وبعض الوظائف البيوكيميائية.وكانت نسبة متبقيات تلك المعادن الثقيلة فى عضلات اسماك القرموط النيلى فى منطقة بحر البقر أعلى من الحد المسموح بة، وأنه يجب دراسة ضرورة المحافظة على النسبة القانونية لوجود الملوثات من