Evaluation of some heavy metals pollution on *Oreochromis niloticus* in River Nile and Ismailia Canal

Mohamed. M. Moustafa[1] Abd El Aziz M.[1], Abd El Meguid A. Z.[1] and Hussien A. M. Osman [2]

[1] Department of Fish Disease and Management, Faculty of Veterinary Medicine, Cairo University,
[2] Department of hydrobiology National Research Center Giza, Egypt
dr.hussien_osman@yahoo.com

Abstract: Water and Nile Tilapia fish samples were collected from industrial localities in the River Nile at "Helwan, El muasaia, shubra El Khima" and from Ismailia canal at (Moustord, Ceriakos, Abu zaabal) The samples were examined for the presence of heavy metals "lead, mercury and cadmium" using atomic adsorption spectrophotometer. On comparing our Results with the recommended standard levels of these metals in water it revealed that the levels of these metals in River Nile and Ismailia canal were found at critical limits that constitute a great potential health hazards. Also the analysis of Nile Tilapia fish collected from the same areas & on comparing with the recommended levels Revealed that these metals were found at serious concentrations many times higher than the levels of such metals in water which indicated that Bioaccumulation of these metals occurred which represents a potential health hazard for humans consuming these fishes. The effluents which are directly thrown down to these water by many factories found along the course of River Nile Ismailia canal are considered the main source of these metals.

[Mohamed M. Moustafa Abd El Aziz M, Abd El Meguid A. Z and Hussien A. M. Osman. **Evaluation of some heavy metals pollution on *Oreochromis niloticus* in River Nile and Ismailia Canal.** Researcher. 2011;3(2):75-79]. (ISSN: 1553-9865). http://www.sciencepub.net/researcher

Key words: River Nile – Ismailia canal – Heavy metals – Pollution – Nile Tilapia

Introduction

Human activities release heavy metals into the atmosphere where they are also transported across national boundaries (**Costa *et al* 2004**). These results in air, soil and water pollution through the deposition of heavy metals in environment that are located far away from the actual emission sources (**Adams, 2002**).Pollution of the environment is one of the most important problems facing human in this century, it includes pollution of water, air and land pollution but the costs of water pollution even more difficult to be estimated than the costs of air or land pollution (**Direr *et al,* 2003**) .

Sources of water pollution are categorized into 4 groups domestic water pollution, industrial water pollution, agricultural water pollution and shipping water pollution (**Vesilind *et al* 1990**) .

There are different types of pollutants including oxygen debilitating materials, toxic metals, toxic gases, pesticides, fertilizers and toxic organic compounds (**Broeg *et al* 2002 and Chatlopodyay *et al* 2002**).

Heavy metals are treated with special care and great importance due to their highly toxic effect on fish, also as the fish known by their tendency to localize significant amounts of heavy metals in their tissues (**Skouras *et al* 2003, Oost *et al* 2003 and Marcovecchio, 2004**) so they constitute a potential health hazards to human consuming these fishes.

The aims of this study were screening for the presence of heavy metals (lead, mescury and cadmium) at industrial localities in Egypt along the River Nile at (Helwan, El Maasara, shubra El Khima) and in Ismailia canal at (Moustord, Ceriakos, Abu zaabal). Also, determination of the residues of these metals in Nile Tilapia fish collected from the same places .

Material and methods

1. Fish:

120 Nile Tilapia fish were collected from the River Nile at (Helwan, El Massara, Shubra El Khima) and from Ismailia canal at (Moustord & Abu zaabal). Specimens were taken from liver, kidney, muscnlature and spleen for determination of residues of lead, mercury and cadmium according to **Mourgan, (1995**) .

Statistical analysis of the detained data was done using slatview 5/2 soft were 1986.

2. Water:

Water samples from the River Nile & Ismailia canal from the previously mentioned places were collected and preserved according to **Tramontana *et al* (1987).** The analysis of these water samples for presence of lead, mercury and cadmium were performed using atomic adsorption spectro-photometer.

Results and discussion

The analytical results in table (1) and Fig (1) demonstrate that the mean values of lead, mercury and cadmium in collected water samples from Ismailia canal at Moustord were zero, 0.054 & zero respectively,

at ceriakos were zero, 0.12 & zero respectively and at Abu zaabal were 0.114,0.12 & 0.017 mg/l respectively. The mean values of these metals in collected water sample from River nile at Helwan were 0.257, zero and zero respectively while at Maasara were 0.114, 0.12 & 0.017 respectively and at Shubra El Khima were 0.085,0.017 & 0.035 mg/l respectively .

The recommended standers for water quality criteria all over the world are as fellows :

National academy of science (1973) : stated that the safe conc. of lead in water ranging from 0.00059 – 0.0059 mg/l .

Czechoslovakian health laws (1975) stated that lead in water course, used as water supply shouldn't exceed 0.05 mg/l & the maximum permissible limits of lead in other surface water should not exceed 0.5 mg/l .

U.S.E.P.A. (1979) : stated that the maximum allowance levels of lead, mercury and cndmium in surface water were 0.05 mg/l, 0.002 mg/l & 0.01 mg/l respectively

On comparying our results with the recommended standards we can find that the levels of lead, mercy and cadmium in certain area at Ismailia canal & River Nile are higher than the recommended standards & so constitute potential health hazard (**Canli *et al* 1998; Zoghloul *et al* 2001 and Marcovecchio 2004**)

Our results agree with (**Abd El Kader *et al* 1993**) who also reported that lead in water samples from Ismailia canal at El Abassa exceeded the permissible limits.

These results indicate that these areas suffering from pollution which could be resulting from the factories that found along the water course . (**Zaghloul *et al* 2001; Guilio 2002 and Duquense and Riddl 2002**)

The analytical results in table (2) and Fig (2) revealed that the mean values of the residual content of lead in Nile Tilapia fish speunies collected from Ismailia canal at Abu zaabel were 2.88, 1.43, 1.17 & 1.98 ppm in liver, Muscnlature, Kidney & spleen respectively while at Mouatord were 1.97, 0.98, 1.28 & 1.14 ppm respectively in River Nile at Helwan were 1.82, 0.54, 1.14 & 1.46 respectively at Maasara 2.44, 0.71, 1.92 & 1.18 in liver , Muscles, Kidney & spleen respectively & at Shubra El Khima the values were 3.18, 1.04, 1.93 & 2.71 respectively these results similar to these recorded by **Al Yousuf *et al* (2000) R, Aajotte *et al* (2003) and Kraemer (2005**) .

The mean values of the residual content of mercury in Nile Tilapia fish samples collected from Ismailia canal at Abu zaabal were 3.13, 1.63, 1.97 & 2.18 in liver , Muscles, Kidney & spleen respectively while at Moustord were 2.98, 1.87, 2.22 & 1.77 respectively in River Nile at Helwan 0.51, 0.19, 0.37 & 0.68 respectively & at Maasara were 0.91, 0.42, 0.88 & 0.67 in liver , Muscles, Kidney & spleen respectively while at shubra El Khima were 0.54, 0.27, 0.67 & 0.58 respectively these results nearly agree with **Marcovecchio (2004) and Costa *et al* (2004**) .

The mean values of cadmium in Nile Tilapia fish samples collected from Ismailia canal at Abu zaabal were 1.87, 1.96, 1.87 & 0.42 ppm in liver , Muscles, Kidney & spleen respectively while at Moustord were 0.88, 1.16, 1.28 & 0.64 ppm respectively. In River Nile at Helwan the mean values were 0.88, 0.76, 1.02 & 0.61 ppm respectively at Maasara were 0.77, 0.91, 0.68 & 0.39 in liver , Muscles, Kidney & spleen respectively & at Shubra El Khima were 0.78, 1.02, 1.14 & 0.23 in liver , Muscles, Kidney & spleen respectively the results nearly agree with **Farkas *et al* (1998) and Ward and Neumann (1999**) .

The recommended standards and permissible limits of residual contents of lead, mercury & cadmium in fish reported as follows : NHMRC (National health medical research council) 1979 Stated that the recommended standards for lead and cadmium in tissues that the maximum cons shouldn't exceed 0.1 ppm for cadmium & 0.2 for lead reported that who stated that the permissible tolerable intake of cadmium was 0.057 – 0.071.

F D A. "Food Drug Administration" (1970):

Set that the level of 0.5 ppm as a maximum acceptable of mercury in fish & shell fish on comparing our results with the recommended .

The standards what we can found that the levels of lead, mercury and cadmium in tissues of Nile Tilapia fish collected from Ismailia canal (Abu zaabal & Mouatord) and from the River Nile (Helwan, El Maasara, Shubra El Khima) indicated that the mean values of these metals are higher than the recommended standards and so they constitute a great potential health hazards for human consuming these fishes (**Stein *et al* 1992; Gibbs and Miskiewicz1995; Farkas *et al* 1998; Al Yousuf *et al* 2000 and Kraenner 2005**) .

The conc. of these metals in fish tissues were many tines more than the conc. in water which indicated that bioaccumulation in fish tissues exceed .

The effluents which are directly thrown down to these water by many factories found along the course of River Nile & Ismailia canal are considered the main source of these metals and so we advise that these effluents should be drained away of the water streams to avoid its bioaccumulation in fish tissues and aquatic organisms .

Table (1): The mean values of lead, mercury and cadmium (mg/L) in water samples collected from industrial localities in River nile & Ismailia canal

Locality	Mean value (mg/L)		
	Lead	Mercury	Cadmium
Ismailia canal			
a) Moustord	Nil	0.054±0.003	Nil
b) Cenados	Nil	0.12±0.008	Nil
c) Abu zabal	0.114±0.004	0.12±0.020	0.017±0.004
River Nile			
a) Helwan	0.25±0.001	Nil	Nil
b) Maasra	0.114±0.003	0.12±0.024	0.017±0.001
c) Shubra El Khima	0.085±0.014	0.017±0.003	0.035±0.002

Table (2): Residues of lead, merary and cadmium (ppm) in Nile Tilapia fish collerted from Ismailia canal at (Moustord, Abuzaabal) & from the River nile (Helwan, Maasara, Shubra El Khima)

Element	Locality	The mean of residues in tissues			
		Liver	Muscnlature	Kidney	Spleen
Lead	Moustord	1.97±0.18	0.98±0.14	1.28±0.25	1.14±0.22
	Abu zaabal	2.55±0.26	1.43±0.17	1.17±0.22	1.98±0.24
	Helwan	1.82±0.33	0.54±0.14	1.14±0.17	1.46±0.41
	Maasara	2.44±0.25	0.71±0.19	1.92±0.28	1.18±0.54
	Shubra El Khima	3.18±0.27	1.04±0.34	1.98±0.31	2.71±0.42
Mercury	Moustord	2.98±0.35	1.87±0.27	2.22±0.46	1.77±0.34
	Abu zaabal	3.13±0.23	1.68±0.18	1.97±0.23	2.18±0.26
	Helwan	0.51±0.11	0.19±0.06	0.37±0.12	0.68±0.18
	Maasara	0.91±0.17	0.42±0.12	0.88±0.26	0.67±0.22
	Shubra El Khima				
Cadmium	Moustord	0.88±0.27	1.16±0.24	1.28±0.33	0.64±0.14
	Abu zaabal	1.87±0.33	1.96±0.18	1.87±0.21	0.42±0.06
	Helwan	0.88±0.17	0.76±0.09	1.02±0.24	0.61±0.15
	Maasara	0.77±0.22	0.91±0.24	0.68±0.19	0.39±0.09
	Shubra El Khima	0.78±0.12	1.02±0.17	1.14±0.23	0.23±0.06

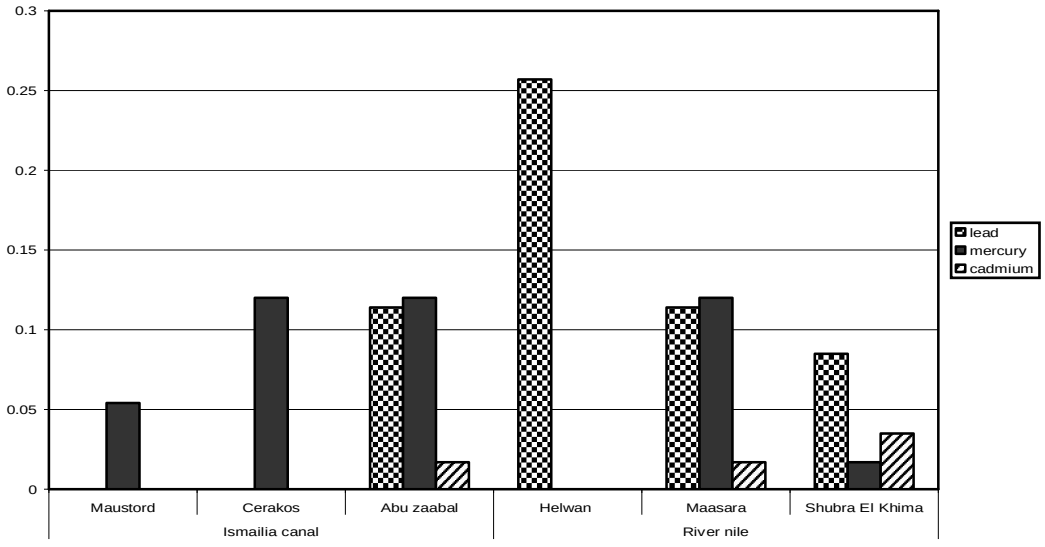

Fig (1): The mean values of lead, mercury and cadmiusn (mg/L) in water samples collected from industrial localities in River Nile & Ismailia Canal :

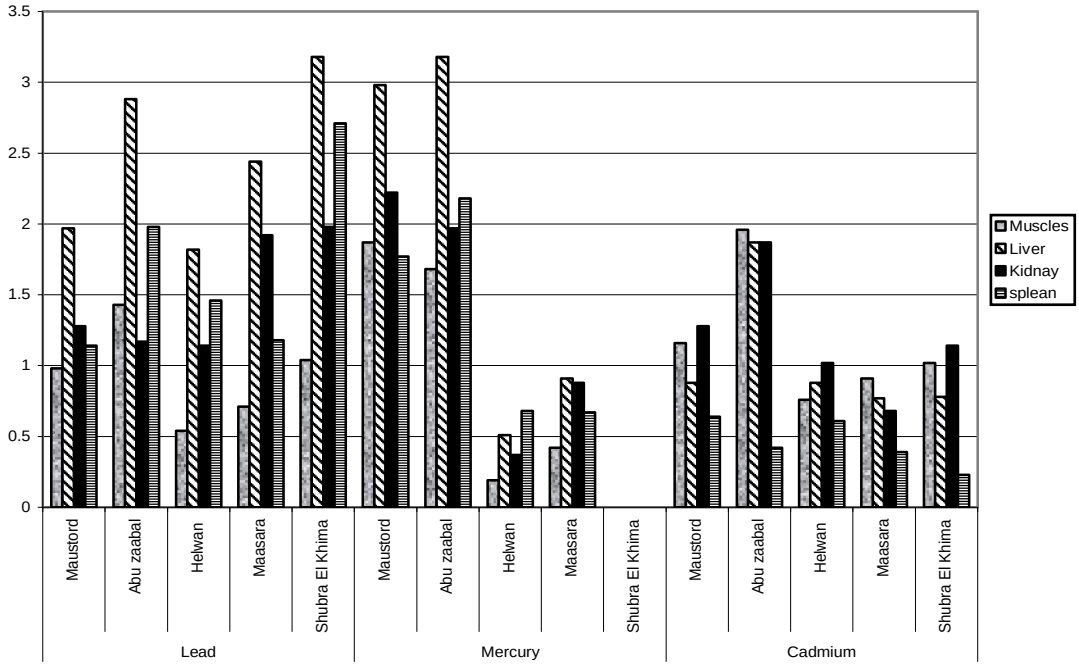

Fig (2): Residues of Lead, Merary and Cadmium (ppm) in Nile Tilapia fish collerted from Ismailia Canal at (Moustord, Abuzaabal) & from the River Nile (Helwan, Maasara, Shubra El Khima) :

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12/18/2010