	٩	0.172	٠.706	٢٦٠٠
Sediments	١	٠.198	٠.٢٥٠	٢٩٩٥
	٢	٠.112	٠.٢٣١	٢٩٩٠
	٣	0.315	٠.٣٢٩	٢٨٩٠
	٤	٠.196	٠.٢٧٣	٢٨٩٠
	٥	٠.250	٠.٣٣٨	٢٩٣٠
	٦	0.263	٠.٢٨٠	٢٩٥٠
	٧	0.188	٠.٢٠٦	٢٩٥٥
	٨	٠.٢٨٩	٠.٢٨٦	٢٨٩٠
	٩	٠.١٦١	٠.٢٤٨	٢٩١٠

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BIO-ACCUMULATION OF COPPER AND LEAD IN DIFFERENT

ORGANS OF GOLD FISH *CARASSIUS AURATUS* AND THEIR EFFECT AMMONIAON BLOOD

Ayad H. Dawood
College of science
University of basrah

Majdy F. A.Al-Ali
college of veterinary medicine
university of basrah

Zainab A.M.Salih
college of science
university of basrah

SUMMARY

The study was conducted on gold fish *carassius auratus* to show : 1.effect of different concentraion of coppr (2and 3 mg/L) and lead (25and 35 mg/L) on accumulation of these metals in different organs (liver,gut,kidney and muscles) exposed for 96 hours.Lead has a great ability to accumulate in tissue more than copper.The highest

concentration of both metals was noted in liver and it was followed by gut, kidney and muscles.

2.effect of the above metals concentration on the levels of blood ammonia,for two time intervals (48 and 96 hours) were studies also.
There were proportional relationship between metals concentration the levels of ammonia in the blood .
Ammonia concentration were affected by the presence of copper more than lead.

Introduction

Heavy metals were naturally found, inminute concentration, in most aquatic ecosystems, unless the human activites had a nagative role in raising their concentrations (Mc Donald et al.,1989).

Fishes and other aquatic organisms may absorb these metals, or their soluble form, either directly through gills and intestine or indirectly via food chain, ultimately affecting individual survival and reproduction (Helfman *et al*., 1997) .

Cooper is one transitional metals,which are required in low concentrations in building many biological and contribute molecules(Clark, 1997).however, high concentration of cooper in the enveronment may cause several problem to the aquatic life(Helfman *et al*.,1997). on the other hand, lead is among the metalloids, which are not generally required for metabolic activities and are toxic to the cell at quite low concentrations (Clark,1997).

Several studies dealing with the effect of copper and lead on accumulation, and other physiological aspects were locally performed on some cyprinids, such as (Barbus belayew) (Khalaf *et al.*,1986),Cyprinion marcrostomus (Khaleel,1988),Garra rufa (Dawood,1988)and Cyprinus carpio (Abdullah & Ahmed,1998 and Al-Ali,1999).

The study of metals accumulation in fishes is of great imprtance as it provides an indication to detect the level of pollution in a given environment and also to assign harmful effects on public health.Therefore,the present study was designed to shed some light on

copper and lead accumulation in different organs of Carassius auratus and their effects on ammonia concentration in the blood.

MATERIALS AND METHODS

Gold fish Carassius auratus (13+2cm) were collected from local waters, Garmat Ali canal,during January and February, 1999 by using cast net.Fish were acclimated to laboratory condition for one week in well aerated water.The physical and chemical characteristics of water were recorded(Tempreature=17.9+0.8 ,pH=7.8+0.3 ,Salinity=1.1+0.1% ,Dissolved Oxygen=8.8+0.2 mg/L and Hardness=780+8.5mg CaCO3/L).Fish administered commercial diet containing 23% protein.

Stock solution(1g/L) of copper and lead were prepared by dissolve 3.9294 gm of CuSO4.5H2O and 1.8308 gm of CH3COO in one liter of D.W. respectively.Stock were used to prepare two concentration of copper (2&3mg/L) and lead (25&35 mg/L) with 2 replicates(Total No.=12 fish) for each concentration in addition to control group.Experimental fish were exposed to above concentration for 96 hours.Kidney, liver, gut and a piece of muscle were removed and dried in oven at 105 C for 24 hours.The dried tissues were ground by using pottery mortar. A mixture of perchloric acid (HCIO4) and nitric acid (HNO3) was used to extract the metals . Metals concentration were measured, on dry weight basis, by flame absorption spectrophotometer along with standard solutions (ROPME, 1983).

Blood samples which were represented in two time interval (48&96h.) and two different treatments for Cu & Pb beside control treatment were collected from caudal vein or artery-after cutting the caudal peduncal –by using heprinized capillary tubes.Blood ammonia was measured according to Ravindranaths(1981).

Data were analysed statistically according to analysis of variance by using Minitab program.The significance of differences means was tested by using revised least significant differeences (R.L.S.D.) (Al-Rawi &Khalafallah,1980).

RESULTS &DISCUSSION

Bio-accumulation of Cu and Pb in Different Organs

The study revealed that both metals (Cu &Pb) and their bio-accumulation in different organs were directly correlated. In general, lead has a great chance to accumulate in tissues (Mean=33.075 mg/g) as compared to copper (Mean=19.517 mg/g)(Table 1&2).Clark(1997) found that flounder Platichthys flesus feeding largely on polychaete in polluted area was able

to limit the assimilation of copper in gut and do not acquire an increased body burden of the metal, although there is some evidence of liver damage in flounders exposed to high levels of metals.

Table (1) reveals that the highest value of copper bio-accumulation(54.6mg/g) was recorded in liver during the second treatment with significant differences(P <0.01),followed by gut (33.75mg/g),kidney (32.4mg/g) an d muscles (9.3 mg/g).Whereas,copper accumulation in muscles and kidney was not detected in control treatment. However it was (2.5mg/g)in liver and (1.8mg/g) in gut.

Table (2) shows a significant differences(P<0.01) in lead accumulation; it was (78.5mg/g)in gut and (75.9mg/g)in liver for the second treatment,followed by kidney 959.8mg/g) and muscles (23.2mg/g),while the differences were insignificant in control treatment.

Liver`s ability to accumulate metals is attributable to its role in detoxifying and metabolizing these poisonous substances, through production of metallothioneins (Chaffai *et al.*, 1995&1997).Metallothioneins are low molecular weight proteins that form a complex with metals,so they cannot be involved in chemical processes which are the source of their toxicity (Clark,1997).Therefore,information about the levels and activities of these types of enzymes can provide information about environment in which fishes live(Helfman *et al.*, 1997) .However,fishes in area with contaminated sediments may show a high incidence of liver tumors, irregular nuclei and necrotic cells, and this abnormalities may subsequently affect other physiological function due to the importance of liver in energy storage and metabolism,contaminate detoxificantion and egg yolk production in females (Helfman *et al.*, 1997).

The increment of metals accumulation in gut can be interpreted either by their ability to pass through gut membrane by diffusion, or through competing on sites of active transport for calcium and sodium (Handy,1996).

The efficiency of freshwater teleosts kidney in producing a fairly large volume of diluted urine-as a result of constant influx of water-and also it`s ability in reabsorbing sodium and chloride during blood filtration can leads to increase of metals accumulation in its tissues due to the binding of these metals with metallothioneins(Fargg *et al.*, 1995, &Helfman *et al.*, 1997).

On the other hand, the low concentration of accumulated metals in muscle for all treatments may be attributed to their inactive metabolized ability in respect with detoxification as compared to liver and kidney. This result agrees with (Clark, 1997) who pointed out that the predator marlin (Makaira indica),which is at top of a food chain and caught from contaminated area, was containing low concentrations of copper in

muscles (0.4 ppm,wet weight) as compared to liver (4.6 ppm, wet weight).

In general, our results agree with several studies which deal with different fish species that were exposed to different concentration of copper and lead (Khaleel, 1988;Dawood, 1988; Villegas-Navaro & Villerreal-Trevino, 1989; Abdullah &Ahmed, 1998; and Al-Ali, 1999).

Effect of Cu & Pb on Blood Ammonia Concentration

In general, blood ammonia levels increased in blood of fish exposed to different concentrations of copper and lead in compraison with control group (Table, 3). This increment had a proportionaly correlated with prolonged time of exposure. However,the highest concentration of blood ammonia were measured in fish exposed for both copper concentrations in the second exposure time (96 h.),while those exposed to lead have the highest concentrations at second treatment after 96 hours with significant differences ($P<0.05$).

The prime source of ammonia is the deamination of amino acid and breakdown of the nucleotides; and some of ammonia is converted to urea, these reactions have taken place in liver (Love, 1980). Ammonia is a highly toxic compound for animals, and fish is able to get rid of it by removing the main quantity of ammonia rapidly and continuosly through the gills, while minor quantity is excreated by kidney (Schmidt-Nielsen, 1997).There are two ways for ammonia elimination, either by diffuse out passively or through exchange system, sodium molecule enters the gills in exchange with ammonia molecule (Love, 1980). Finally, the sensitivity of gills to various environmental stressers, such as metals, may related to excess mucus production and thickening at the gills epithelium. This may interfere and affect their function through inhibiting the mechanism of ammonia removal and this may lead to increase its concentration and toxicity in the blood (Hinton & Lauren , 1990).

Table (3) shows that the concentration of blood ammonia was affected by the presence of copper more than that of lead, and this was noted clearly through variation in general mean (0.41 and o.38 mg% for copper and lead respectively) during second time of exposure, after excluding the effect of treatment. Clark(1997) indicated that despite the existence of anumber of detoxifying and storage systems for copper,it is the most toxic metal after mercury and sliver, to awide spectrum of aquatic life. It seems that lethal concentration of lead on *C. aurtus* were strongly connected with water quality which were varied from 6.6mg/L in acidic soft water to 110mg/L in alkaline hard water (Katz,1975).

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اياد حنتوش داود *مجدي فيصل العلي* *زينب علي محمد صالح*

كلية العلوم كلية الطب البيطري كلية العلوم

الخلاصة

اظهرت الدراسة المنجزة على الاسماك الدهبية *Carassius aurtus* :

١-تاثير التراكيز المختلفة من النحاس (٢و٣ ملغم/لتر) والرصاص (٢٥ و٣٥ ملغم/لتر) على تراكم هده العناصر في الاعضاء المختلفة (الكبد والقناة الهضمية والكلية والعضلات) المعرضة لمدة ٩٦ ساعة . ان للرصاص قدرة كبيرة على التراكم في الانسجة اكثر من النحاس . وقد اظهر الكبد اعلى تراكم حيوي لكلا العنصرين تلته القناة الهضمية والكلية والعضلات .

٢-تاثير تراكيز العناصر اعلاه على مستوى امونيا الدم ولفترتين زمنيتين (٤٨و٩٦) ساعة . وتبين ان هناك علاقة طردية بين تراكيز تلك العناصر ومستويات الامونيا في الدم .ان تركيز الامونيا تتاثر بوجود النحاس اكثر من الرصاص.