



## Pathological lesions of acute sodium chloride toxicity in common carp: Case report

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### Abstract

Sodium chloride (NaCl) have a major impact on fish farming, as it used to disinfect fish and their eggs, in contrast using NaCl in high dose can cause life threatening toxicity with high mortalities in *Cyprinus carpio*. We aimed in current report to introduce for specialist in fish culturing and farmers a typical acute NaCl toxicity by presenting pathological lesions. The histopathological lesions composed from sever degenerative and necrotic changes in gill filaments with destruction in blood vessels and hyperplasia in secondary gill lamella. In conclusion, using NaCl in high uncalculated doses can cause significant pathological changes that lead to 100% mortalities in *Cyprinus carpio*.

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### Introduction

Common carp *Cyprinus carpio* considered the most common fish species that culture in all world, this due to its resistance to the diseases and easily acclimatize with changes in water temperature, since that common carp can be culture in northern and southern Iraq water, in addition, *Cyprinus carpio* life cycle can be integrated in Iraqi water (1). The total fish production in Iraq from fish industry in estimated by 56835 metric tons in 2016 which have a major impact of general Iraq budget (2). *Cyprinus carpio* sufferer from wide range of diseases that could be bacterial, viral, parasitic or fungal, in addition, changes above critical limit for chemical and physical properties of pond's water can induce diseases, one of the most important of these diseases occur upon failure to manage the fish ponds, and this failure occur may be related to concentration of dissolved oxygen and carbon dioxide, changes in water quality and high concentration of heavy metal in water (3). NaCl use in fish culture to disinfect

fish, their eggs, fingerling, ponds and premises in various degree of concentration, since *Cyprinus carpio* is fresh water fish and the median lethal concentration (LC<sub>50</sub>) in water of NaCl is estimated at 10.9 ppm in water for 24 hours that indicated broad range of toxicity of NaCl (4). This report aimed to give a description to pathological finding to cases related to NaCl toxicity induced by bad management in Iraqi common carp caged.

### Case history

During the last week of December 2018, a massive mortality has recorded in carp fish that raised in cages in Euphrates river started from Saqlawiyah (50 Km western to Baghdad DC) and ended by the river inlet at Karbala (southern to Baghdad DC). This massive mortality forced fish owners to use an uncommon therapeutic method to overcome these mortalities. One of this method summarized by using sodium chloride salt (NaCl). In Saqlawiyah city a group of fish cages owned by one person who advice by a

veterinary to use NaCl to disinfect the fish. The owner agrees with this opinion, and they thought that they use salt every day in human feeding, at this level the mortalities not more than 20%. For this case to be progressed dramatically owners stop feeding for at least 12 hours before application NaCl. Later workers pull up the fish net until the whole fish body appear outside the water, then adding NaCl salt to jumping fish in uncalculated dose until the fish scales appear white in color. After five minutes, the owner adds another amount of uncalculated dose of NaCl to previously stressed fish, workers 'wait for at least one minute, then re-immersed the fish in river's water. In three days, 100% mortality was recorded in these cages.

### Histopathological protocol

Samples of gills fixed in 10% neutral buffered formalin for at least 72 hours. Briefly, the samples grossed at first then fixed in formalin dehydrated in alcohol (ethyl), cleared in xylene and chloroform, infiltrated and embedded in paraffin, sectioned at 4  $\mu$ m, stained with Harris hematoxylin and eosin (HE) (5,6).

### Results

#### Pathological examination

The clinical signs appear on fish represented by stop feeding, loss escape reflex, increase in gasping at water surface as a sign for asphyxia, fish accumulated in far location of cages against water current, lethargy, abnormal swimming behaviors. Finally, fish loss all reflexes and float on water surface before death. The mortality rate at first day up to 20%, 50% in second day, and 100% in third day.

Grossly, marked necrotic pale and congested areas in gills this lesion termed as mosaic lesions, with time all gill arch and filaments were pale to white in color, with erosion and destruction in fins lead to loss of normal swimming behaviors. The fish appear cooked white to pale in color with ulceration on body parts, this ulceration penetrate the whole abdominal wall lead to secondary bacterial infection. The internal organs showed sever necrotic reaction (Figure 1).

Microscopically the gill filaments showed hyperplasia at the ends of filaments with increase in infiltration of inflammatory cells specially macrophages, heterophils and lymphocytes with presence of fungal hyphae in the blood vessels of gills (Figures 2).

### Discussion

*Cyprinus carpio* L. fish consider a fresh water fish, since its loss its ability for osmoregulation of high concentration of salinity over 30%, in addition carp fish can persist a concentration up to 7% of salts in water for five hours before a clinical sign of stress to be recorded (7). NaCl salts used in fish industry in many cases mostly as disinfectant against parasites and fungal pathogens in dose represented by 250

grams to each 1000 L of water, this dose helps in disinfect the fish before they introduced in pond or cages, in addition, a dose of 5 grams to each 100 L of water used to disinfect fish eggs from fungal infection (8). One of the most misapplying related to NaCl is occur when the owner add salt directly to fish outside water surface, this will cause lysis of mucous covering layer that preserve fish and act as protective shield against pathogens present normally in water (9). On other hand, the high concentration of NaCl cause direct damage to gills and blood supply lead to vacuolar degeneration and cogaulative necrosis of secondary gill lamellae, result in dysfunction in gills that represented by asphyxia and gasping at water surface (10).

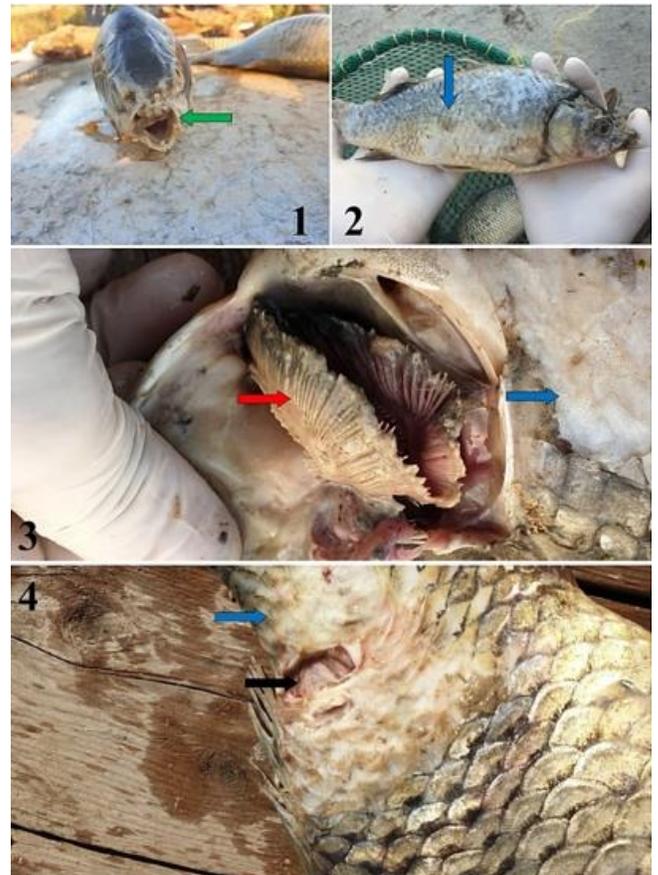


Figure 1: Gross lesions induced by NaCl in *Cyprinus carpio* showed necrotic lesions in mouth (arrow), skin without scales (arrow), necrosis and increase in mucous secretion in gills and ulceration (arrow).

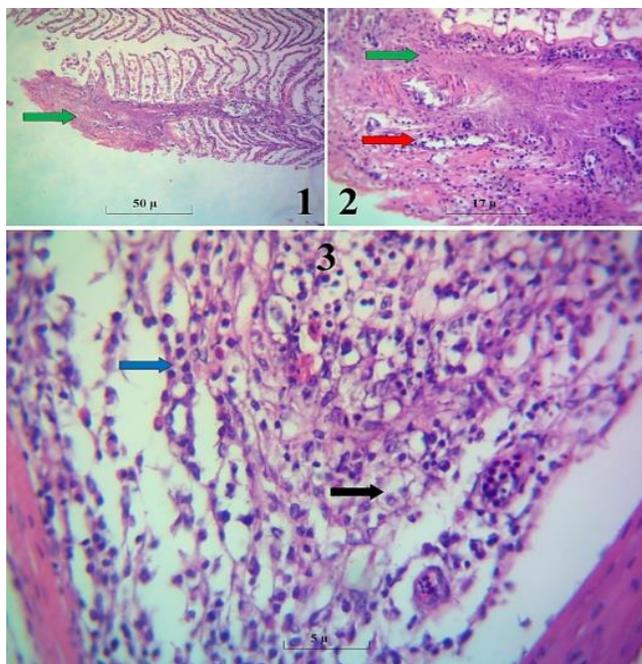


Figure 2: Histopathological lesions induced by NaCl in *Cyprinus carpio* showed hyperplasia in the gill filaments (arrow), infiltration of mononuclear inflammatory cells (arrow), vacuolar degeneration in epithelial cells lining gill filaments (arrow), and coagulative necrosis in other cells (arrow). HE. (1) 40x, (2) 100x, (3) 400x.

### Conclusion

Using of NaCl in high doses can cause significant changes in blood profile, blood cell counting, minerals, enzymes, and antioxidant with pathological changes that lead to 100% mortalities in *Cyprinus carpio*, in addition the concertation of 100 grams of NaCl in 1000 L of water for 5 minutes will be sufficient to disinfected fish from many pathogens including fungal infection.

### Conflict of interest

The authors declare that their no conflict of interest regarding this case report.

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### الآفات المرضية للتسمم الحاد بكلوريد الصوديوم في اسماك الكارب الاعتيادي: تقرير حالة

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### الخلاصة

إن لكلوريد الصوديوم تأثير كبير على تربية الأسماك إذ يمكن استخدامه في تطهير الأسماك وبيوضها، وعلى النقيض فإن استخدامه بجرع عالية يسبب تسمم يهدد الحياة ويحدث هلاكات مرتفعة في اسماك الكارب الشائع. إن الهدف من التقرير الحالي هو وصف لحالة مثالية للتسمم الحاد بكلوريد الصوديوم لمختصي ومربي الأسماك من خلال وصف الآفات المرضية. أظهرت نتائج الدراسة الحالية أن الآفات النسجية قد شملت تغيرات تنكسية وفتورية في الخيوط الغلصمية وتحطم في الأوعية الدموية وفرط تنسج في نهايات الخيوط الغلصمية وارتشاحا للخلايا التهابية أحادية النواة. نستنتج من هذه الدراسة أن استخدام كلوريد الصوديوم بجرع عالية وغير محسوبة يسبب تغيرات مرضية والتي تسبب مجتمعة هلاكات بنسبة 100% في اسماك الكارب الشائع