



## DETECTION OF *SALMONELLA* SPECIES IN VISCERA OF CARP FISH

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### Abstract

Fish are one of the major sources of food for humans worldwide. This study involved isolation of genus *Salmonella* from fish bowels. *Salmonella* considered the main pathogen that could affect fish. To determine the proportion of genus *Salmonella* in carp fish (*Cyprinus carpio*) internal organs. The analysis was performed on fresh fish purchased from vendors in Baghdad city (Iraq) and the source of the docks owned between the period May to June 2015, in which, 50 bowel samples were tested. Results revealed that *Salmonella* was isolated at 40% through culturing on Salmonella-Shigella agar (SS agar), gram stain and a set of biochemical tests. To sum up, *Salmonella* is a serious food poisoning pathogen than can threaten public consumers in Iraq.

**Key words :** *Salmonella*, fish viscera, meat pathogen, fresh fish.

### Introduction

*Salmonella* considered as a pathogenic source for either fish or man. It is possible that *Salmonella* isolated from apparently healthy fish without apparent clinical symptoms of disease (Novotny *et al.*, 2004). The source of infection of fish consumers may be either fish food or acquired infection through contact with other infected fish during handling. However, water or other components of fish within live environment also had been recorded (Acha and Szyfres, 2003).

Different causes are attributed to *Salmonella* transmission, such as injury or wounds due to cleaning of aquarium base with merely bare hands (Alinovi *et al.*, 1993), possible handling of fish tank water (Kern *et al.*, 1989), young children might be infected when they were in close contact with a fish tank (Bleiker *et al.*, 1996; Speight and Williams, 1997), humans might got infected via fish processing in the industrial machines or while preparatory processing of dishes (Notermans and Hoornstra, 2000), the oral route of infection could be attributed to eating infected fish or other factors related

to water environment. Environmental exposure factors include everything living in the surrounding environment of fish tanks, the stress and immunosuppression that related to infections by HIV/AIDS (Von Reyn *et al.*, 1996).

Fish and most often shellfish appeared to be active viable carriers of genus *Salmonella*, with no clinical illness and apparent disorder (Novotny *et al.*, 2004). However, transmission of this bacteria in the records showed that fish may serve as a vector for *Salmonella* spp. (Metz, 1980; Minette, 1986; Chattopadhyay, 2000). Most zoonotic *Enterica* species is exclusively belonged to genus *Salmonella*, non-typhoid *Salmonella* contamination hazard in all raw foods (Molbak *et al.*, 2006).

*Salmonella* outbreaks associated with different types of seafood such as shrimp, fish, oysters and clams, for the period between 1998 and 2004. According to CDC, genus *Salmonella* was the main causative agent of foodborne sickness amongst outbreaks related to seafood. In the last decade, the FDA had related the availability of *Salmonella* pathogens in a numerous fish and shellfish as well as their products (Iwamoto *et al.*, 2010).

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This research involved the isolation of *Salmonella* in fish sample collected from Iraqi markets, no similar study was reported such analysis to the time of writing this research. The results focused on distribution of infected fish in Iraqi markets.

## Materials and Methods

### Collection and Processing of Samples

Fifty (50) carp fish (*Cyprinus carpio*) viscera samples were collected from Iraqi markets during the period May and June 2015 in different geographical areas in Baghdad. Viscera of fish were collected and transferred in sterile sealed bags with aeration during shipping, which were stored at 4°C. Specimens were examined in the enriched inoculum which was cultured by streaking on Salmonella-Shigella agar (SS agar) then incubated for 24-48 hours. Black colorless colonies with black centers (or some of them without) were recognized, which were attributed to H<sub>2</sub>S production. Gram stain was done for each sample and a set of biochemical tests were performed. The biochemical tests contained bacterial motility, cytochrome oxidase, catalase, and Triple Sugar Iron (TSI) as well as microscopic observation

## Results and Discussion

The analysis was achieved on fifty fish viscera specimens. A total of 20 out of 50 (40%) of them were infected with genus *Salmonella*. This ratio of infected fish may be related to contamination by the water used to keep them alive. Research reported that genus *Salmonella* is a dangerous microbe which could invade fish and consequently humans through the route of contaminated freshwater where normally fish is living. This is possible the main way of transmission of *Salmonella* from fish to humans. However, our opinion agrees in this regard with the study of (Alcaide *et al.*, 2005).

Budiati *et al.*, (2011) isolated *Salmonella* from whole-body of catfish (80%), gills (40%), intestine (20%) and finally water (6.67%). Depending up on both morphological and cultural characteristics by using a different media. The colonies appeared pale, small, smooth, rounded with black center on SS agar (Novotny *et al.*, 2004). The use of SS agar was very effective in this research and isolation on XLD agar (figure 1), colonies appeared red with a black center and these results were in line with (Ruiz *et al.*, 1996).

The technique used for isolation of genus *Salmonella* from a specimen requires utilization of enrichment culture media which supply two features: inhibitory effect to the majority of saprophytes growth and a selective capacity

to *Salmonella* growth on culture media that make its



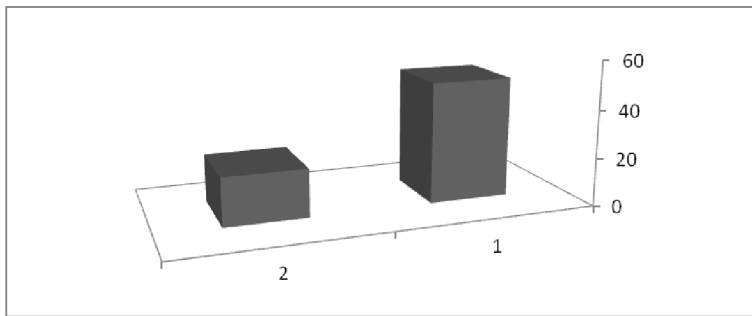
**Fig. 1:** A/ *Salmonella* cultured on SS agar, B/*Salmonella* colony subcultured in TSI.

colonies easily recognized (Budiati *et al.*, 2011).

The correlation between Iraqi fish infection and *Salmonella* could be attributed to different causes. These causes could include handling, environmental changes, fecal-oral transmission route, feeding sources. However, our results agree with the report of Department of Health at Washington State (2011) which estimated that transmission of *Salmonellae* was fecal-oral and vehicle-borne (poultry, fish, and egg salad) (Molbak *et al.*, 2006).

Our results represent higher recorded values than other studies (Fig. 2). This could be related to following health conditions and criteria from sellers and producers. Danba *et al.*, 2014) isolated *Salmonella* (9.30 %) from fish with no clinical disease which informed that fish could survive with *Salmonella* infection without any impact of its general health. However, Fish and their products were recognized as transporters of foodborne bacterial diseases in human beings (Novotny *et al.*, 2004; Hastein *et al.*, 2006; Efuntoyee *et al.*, 2012). *Salmonella* might possibly be admitted to fish production processing by human workers in the fish industry via handling as noted by (Emikpe *et al.*, 2011).

However, *Salmonella* can infect carp fish during packaging for preparation before selling (Blevins, 1991). Also *Salmonella* was detected in the liver of carp fish due to contaminated water which is concomitant with the findings of our study (Daskalova *et al.*, 2014). Retails of fish in the Kingdom of Saudi Arabia were detected positive for *Salmonella* infection which could pose an impact on Saudi consumers and this is in line with the current study (Elhadi, 2014). Another study revealed that



**Fig. 2:** *Salmonella* infection from total collected sample. 1= Represents the total collected sample (50 sample), 2= Represents *Salmonella* infection (20 sample, 40%).

*Salmonella enteritidis* had shown the ability to penetrate and persist into the tissues of live common carps which can boost our interpretations (Hudecová *et al.*, 2010).

In conclusion, health precautions should be applied for fish and fish products consumers to avoid *Salmonella* infection as well as study other types of infection related to fish that could affect public health. We recommend that the investigation should be performed on all geographical areas of fish farms and fish production. The ignorance of solution leads to serious complication that affects human to find a suitable solution for the problems. Fish producers and sellers must know the *Salmonella* effect on human and method of avoiding infection and method of applying hygienic protocols to reduces infections.

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