

Risk Assessment of *Salmonella* spp. in *Labeo rohita* Marketed in Lahore, Pakistan

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Abstract

Aquatic food especially fish is significantly accomplishing the need of protein of the major part of the world. Fish is very prone to parasites including *Salmonella*. *Salmonella* is the second largest group of pathogens, causing food borne diseases. During the course of study, a total of 25 *Labeo rohita* samples were collected randomly from five markets of Lahore. These samples were transported to the Microbiology section of Fish Quality Control Labs, Manawan, Lahore, under hygienic conditions to preserve the original state. Fish was found healthy and normal when observed for appearance, texture, odor, and abnormality. The samples were tested for *Salmonella* spp. using biochemical procedures and the results were negative for *Salmonella* spp. in all fish samples. All the samples indicated the healthy condition for consumption of fish as food.

Keywords: *Labeo rohita*, *Salmonella* spp, Microbiology, Lahore.

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INTRODUCTION

Fish and marine food have gained a significant status all over the world with respect to food consumption (Bakr *et al.*, 2011). In Pakistan, during the last few decades export of fish and its products have been increased magnificently, playing a significant role to boost economy, creating employment and earning foreign currencies (Memon, 2015). The carps are valuable aquatic food and the major carps are commercially significant fish species of Pakistan. Rohu (*Labeo rohita*), Mrigal (*Cirrhinus mirrigala*) and Thaila (*Catla catla*) are prominent source of protein from Pakistani waters. All these species got preference due to their great profitable value (Sheikh *et al.*, 2017).

Salmonella is a genus of Enterobacteriaceae family, it is gram-negative bacillus (Su and Chiu, 2007). *Salmonella* is a microorganism, may have positive or negative effect on our lives, causing food borne diseases, stinky smells, deterioration of food and food products are major negative impact of microorganisms. *Salmonella enteric* subspecies are observed all over the world in animals and their environment (Su and Chiu, 2007). Species of *Salmonella* cause illnesses such as typhoid fever and other enteric diseases (Ryan and Ray, 2004). The bacterial intestinal flora of fish may reflect the condition of the water. The risk of *Salmonella* infection is lower in marine fish than in fresh

water fish (Youssef *et al.*, 1991). *Salmonella* can infect a range of animals, and are zoonotic (Jantsch, 2011). *Salmonella enteritidis* is the chief culprit of diseases in fishes. Other *Salmonella* species are also clinically important e.g., *S.typhimurium*, *S.agora*, *S.Montevideo* and *S.enteretia* (Bibi *et al.*, 2015). All over the world, it is known as the second largest group, causing food borne diseases (Wong and Chen, 2013).

In aquaculture, contamination of environment and fish due to pollutants and diseases are major food safety hazards. These hazards may be increased during catching or during the processing of fish after catch (Hastein *et al.*, 2006), *Salmonella* is the major threat during all the processing as compared to other bacteria. Water the natural habitat of fish is highly vulnerable to pollutants from domestic, agricultural and industrial effluents. That is why, all the aquatic life is prone to these environmental risks, because in these circumstances growth of bacteria like *Salmonella* flourish significantly (Rauf *et al.*, 2014). The disease causing bacteria such as *Salmonella* are facultative pathogens for both human and fish, these bacteria are high danger for the food safety concerned to the consumption, industry and regulatory authorities in the whole world (Novotny *et al.*, 2004). Quality check of food supply is depended on the rapid and accurate detection of bacterial pathogens (Germini *et al.*, 2009).

Little is known about the occurrence of *Salmonella* in locally consumed fish. Therefore, the purpose of this study was to detect the prevalence of *Salmonella* which is causative agent of many food-borne illnesses, from local markets serving consumers in Lahore.

MATERIALS AND METHODS

Twenty five samples of *Labeo rohita* fish were collected from five major markets of Lahore (five samples from each market). Lahore Main Fish Market, Hyperstar Super Store, Metro Super Store, Shahdara and Jallo Market. Samples were prepared and tested according to the *Bacteriological Analytical Manual*, Chapter 5 (Andrews et al., 2015) mentioned in the flow sheet below. The *Salmonella* in food allowed to culture in non-selective, pre-enrichment media during incubation. After that they are allowed to multiply by incubating in enrichment media to produce enough populations that are necessary for examination. The *Salmonella* are then selected by incubating in several selective media. The identification of *Salmonella* is established based on the colors developed during biochemical reactions in specific agar media.

Flow Sheet for the Detection of *Salmonella*

Add	Food 25g+225ml Pre-enrichment broth
Mix	Blender jar/Stomacher
Pre-enrichment	Incubate at 35±0.5°C for 24 hours
Selective enrichment	10ml Tetrathionate broth
Incubate	35±2°C for 24 hours
Plate in	Hektoen Entric Agar (HEA) Xylose Lysine Desoxycholate Agar (XLD Agar)
Incubate	35 ±0.5°C for 24-48 hrs
Look for	Blue or blue green colonies with or without black centers on HEA Pink colonies. With or without black centers on XLD Agar.

RESULTS AND DISCUSSION

Fish samples were collected and analyzed from the prominent Fish markets of Lahore. The details of Fish samples and analytical results are presented in Table 1.

Isolation of *Salmonella* from fish is an indication of contamination of the river/lakes by pathogens or bacterial addition due to less efficient post-harvest methods including poor sanitary conditions and environment during storage and transfer.

In current study, *Salmonella* was not detected in any fish sample. Similar observations were obtained by Youssef et al., (1991) they found three stereotypes of *Salmonellae* from 101 examined samples for *S. wangata* (1.98%), *S. typhimurium* (0.99%), and *S. newport* (0.99%). Incidence of *Salmonella* in fresh fish samples is very low as compared to other bacteria, this observation is strengthened by many researchers as they found *Salmonella* in 5 (3.2%) of 156 samples (Maxine and Janelle, 1997) and overall incidence of *Salmonella* was 7.2% for import and 1.3% for domestic seafood in 11,312 import and 768 domestic seafood samples (Maxine et al., 2000). According to Food and Drug Administration (FDA), the *Salmonella* level in food should be nil or zero. Bakr et al. (2011) favor our findings, as they also didn't detect any marginal or hazardous level of *Salmonella* spp. in their samples.

In the current study, the *Salmonella* spp. was found nil, this investigation was same to the Sanjee and Karim, (2016), they also found no pathogenic microorganisms e.g. *Vibrio* and *Salmonella* in fish samples. DePaola et al. (2010) investigated very low frequency of *Salmonella* spp. (1.5%) in marine food, these findings are according to the current work. In another study, no *Salmonella* was detected in juice samples indicating good quality of food products available in markets of Lahore city for human consumption (Iqbal et al., 2016; Iqbal et al., 2016)

In contrast to the present study, Shahbarinath et al. (2007) found the high load of *Salmonella* in aquatic food, this high load may be the result of bad processing facilities and poor environment conditions. Many researchers found high range of *Salmonella* in different fish samples. Polo et al. (1998) found *Salmonella* in river samples (58.7%), followed by those from freshwater reservoirs (14.8%) and sea water (5.9%) and higher incidence of *Salmonella*. (28%) in different fish samples (Hatha and Lakshmanaperumalsamy, 1997). Kumar et al. (2009) detected the *Salmonella* spp. at high level in fish samples (28%), almost same findings were investigated by Popovic et al. (2010), they found unacceptable limits (40%) in fish samples that is conflicting from the present study in which no *Salmonella* spp. was detected.

CONCLUSION

This study was conducted on the major carp (*Labeo rohita*) being marketed in Lahore Fish markets. Fish from all the sites was fresh and frozen without any abnormality, bad odor and with soft texture. The fish was found free of *Salmonella*, thus, the fish available in the markets of Lahore is safe for consumption as food.

Table 1. Fish markets and parameters tested for detection of Salmonella

Sr.No.	Fish Market	No. of Fish	Appearance	Texture	Odor	Abnormality	Salmonella	
							HEA	XLD Agar
1	Lahore Main Fish Market	5	Fresh	Soft	No	None	-ve	-ve
2	Shahdara	5	Fresh	Soft	No	None	-ve	-ve
3	Jallo Morh	5	Fresh	Soft	No	None	-ve	-ve
4	Hyperstar Super Store	5	Fresh	Soft	No	None	-ve	-ve
5	Metro Super Store	5	Fresh	Soft	No	None	-ve	-ve

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CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

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