Introduction

People keep ornamental fish as pets worldwide since ages. Southeast Asian countries supply nearly 85% aquarium fish throughout the world (Haroon, 2015). An estimated global retail value of this trade is worth US$ 3 billion (Andras, 2012). The presence of pathogens on these pet fishes is a fact. The infected ornamental fishes and their transportation into other countries such as: Germany, Australia, Korea, Sri Lanka, Norway, Brazil and Pakistan have been documented (Iqbal and Haroon, 2014). Some fish pathogens have threat to clinical staff, veterinarians, fish producers, fish handler and pet owners (Lowry...
There are few reports about the zoonotic infection by parasitic, fungal and viral pathogens from aquatic organisms including fish (Khail et al., 2014). Zoonotic larval nematode Capillaria sp. has been reported from goldfish Carassius auratus in Pakistan (Haroon, 2015). Zoonotic trematode, Centrocestus sp. has been reported in imported ornamental fish Xiphophorus maculates in Denmark (Mehrdana et al., 2014). The cultivable fish, Iranian grass carp and common carp have also been reported to have gill infection by zoonotic parasite Centrocestus formosanus (Rezaie et al., 2017). These pathogens are communicable from human to fish during handling, treatment and consumption.

Bacteria can be stated as the main etiological agents of zoonotic infections. These infections appear as a result of contact and association with aquatic animals. The pathogenic bacteria infect human and disease develop in immune-compromised humans. Aeromonas hydrophila has been implicated in human diseases (Lowry and Smith, 2007). Another bacteria Vibrio vulnificus cause infection in human through fish too (Lehane and Rawlin, 2000). Zoonotically potential bacteria also include; Edwardsiella, Escherichia Salmonella and Klebsiella spp. (Nemetz and Shotts, 1993). Mycobacterium sp. affect fish handler and such infections termed as fish handler's disease" (Hummet al., 1986; Lacaille et al., 1990). Dvorska et al. (2004) have reviewed the fish as source of bacterial pathogens in human beings. Iqbal (2016a) has reviewed parasitic, fungal and bacterial diseases of cultivable carps and imported ornamental fishes in Pakistan. The aims of this study was to observe infection in the ornamental fishes and isolate pathogenic bacteria from selected fish species and observe probable risks of zoonotic infection in fish handlers in Laboratory.

Materials And Methods

Over last ten years a total of 1300 imported ornamental fish were obtained from local supplier in Lahore. The experimental fishes were belonging to 10 different species. These fishes were examined for fungal and bacterial infection according to Kabata (1985); Willoughby (1994); Roberts (2003). The skin, fins and gills and external surface were screened according to the procedures detailed by Iqbal (2016a); Iqbal and Imtiaz (2016).

The experimental fish species were; Carassius auratus (n=490) and its six varieties (shubunkin (n=93), comet (n=50), black moor (n=30), oranda (n=30), double tail (n=30) and fantail n=30), molly Pocilia sphenops (n=100); platy Xiphophorus maculates (n=115); swordtail Xiphophorus helleri (n=50); guppy Pogociliareticulata (n=45); tiger Oscar Astronotus ocellatus (n=75); koi carp Cyprinus carpio (n=22); giant gourami Osphronemus goramy (n=30); blue line shark Pangasianodon hypophthalmus (n=30); silver shark Balantiocheilos melanopterus (n=80).

The bacterial pathogens were isolated from three fish species (C. auratus goldfish and shubunkin; C. carpio koi carp) by standard Laboratory procedures and followed these steps: Preparation of Culture Media, Isolation of Bacterial Samples; Preparation of Serial Dilutions; Inoculation of Plates; Pure Culturing. Biochemical Characterization was done by Gram’s Staining; Catalase Activity Test; Oxidase Test; Oxidative Fermentative Reaction; Simmon’s Citrate Agar Test; Gelatin Hydrolysis.

Results

A total of sixteen species of parasites were observed from various organs (skin, fins, gills) of these fish. These were categorized as: seven protozoans (Chilodonella sp, Ichthyobodo sp; Ichthyobodo sp. Epistylis sp. Tetrabymea sp. Lmultifiliis, P.pillulare); three monogeneans species (Dactylorhiza extensus, D. vaillatior, Gyrodactylus turnbulli); one digenean (Cryptocotyle sp.), two nematode (Capillaria sp., Camallanus sp.); two crustaceans (A. foliaceus, L. cyprinacea) one mollusca (Glochidium) species. Seven pathogenic fungal genera were also isolated from fins, skin, eyes, gills, of these fishes. These fungi were: Fusarium, Aspergillus, Alternaria, Penicillium, Mucor, Blastomyces, Rhizopus. The detail of parasites and fungi isolated is given elsewhere (Iqbal, 2016a, 2016b, 2017).

Ten bacterial genera were isolated from various organs from three species of fish; C. auratus goldfish and shubunkin a variety of goldfish (Figure 1) and koi carp C. carpio (Figure 1). These bacterial genera were: Aeromonas, Pseudomonas, Bacillus, Enterococcus, Streptococcus, Acinetobacter, Moraxella, Lactobacillus, Staphylococcus and Carnobacterium (Figure 2, 3 and 4; Table 1) (Ansar, 2013; Huma, 2013).

Figure 1: A shubunkin fish with damaged tips of dorsal, caudal and pectoral fin.
Table 1: Bacterial genera isolated from three ornamental fish species.

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(From Iqbal, 2016a)

Discussion

The parasites and fungal genera isolated from these fish are described separately by Iqbal (2016a). However, none of these parasites species and fungal genera can be stated to have potential risk of zoonotic infection in the fish handler (in this case the students and staff). Although, food borne zoonotic metacercaria of some trematode; Opisthorchis, Clonorchis and Heterophyid have been reported in major and Chinese carps in Pakistan (Marcus et al., 2012). Since, the raw fish consumption is not practiced in the country so the risk of zoonotic infection is almost none in Pakistan. Haroon (2015) recovered zoonotic larval Capillaria sp. from imported goldfish but no report of any public health issue. However, there may be potential risk of zoonotic infection as causing agent like C. formosanus has been reported in culturable carps reported by Rezaie et al. (2017).

Figure 2: Lactobacillus sp. isolated from kidney of shubunkin.

Figure 3: Staphylococcus sp. isolated from heart of shubunkin.

Figure 4: Aeromonas sp. isolated from gills of shubunkin.

Bacteria are the major zoonotic infections causing agents. In the present study ten bacterial species were isolated from three ornamental fish. Three out of ten bacterial isolates (Aeromonas sp. Staphylococcus sp. Streptococcus sp.) may cause zoonotic infections. Aeromonas hydrophila, A. caviae, A. sobria, A. Schubericaeuse human diseases and are associated with finfish. Streptococcus iniae is another serious zoonotic pathogen and attack human by ingestion of toxin produced by the bacteria during unhygienic food handling and cooking (Lowry and Smith, 2007).

According to Haenen et al. (2013) topically acquired pathogens from fish and shell fish is through lesions and open wounds. The pathogenic bacteria are V. vulnificus, V. damsel, Streptococcus iniae, Mycobacterium marium, E. tarda, A. hydrophila. Most fish-associated infections are self-limiting. However, serious cases are linked to factors such as: weak and poor immunity in the patient, virulent pathogen strains, high inoculums, deep skin penetration. In case of V. vulnificus patients may develop mild to serious infection which may become lethal as stated by Austin (2010).
Interestingly there was not a single case of topically acquired infection, among students and laboratory staff who worked on series of fish disease and health management projects in ten years. The reason for non-zoonotic infections in students is the strict use of safety measures; such as use of disposable gloves, thorough hand washing, using sterilized equipment, keeping work place clean and disinfecting it regularly. The possibility of isolation of fewer pathogenic agents in this study cannot be ruled out. There has not been any report of zoonotic infections in ornamental fish handlers in pet shops in the city of Lahore (Iqbal personal communication, 2017).

The prevention from topically acquired infections through fish needs more improvement in medical diagnostic. It is important to develop zoonosis data sheet to all the concerned like, veterinarians, doctors, hospitals, veterinary services. Further research is needed into issues of drug resistance and disinfection procedures.

Conclusion

The topically acquired zoonotic infections from fish seem very less, but individual cases can be serious. Although, zoonotic infection have not been observed in this study. Yet it must be kept in mind that zoonotic organisms are usually present and safety measures should be adopted to limit the spread of these infections.

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References


