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Public Health and Economic Implication of the Microbial Flora of Cultivable Freshwater Fishes

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Abstract: The microbial flora of fishes raised in different earthen ponds at African Regional Aquaculture centre, Aluu, Rivers State, Nigeria, were examined. The skin, gills and gastro-intestinal tract of *Clarias gariepinus*, *Oreochromis niloticus*, Hybrid (cross of *Heterobranchus bidorsalis* and *Clarias gariepinus)* were examined. Fourteen species of bacteria, 8 types of fungi and 6 types of parasites were identified. *Escherichia coli, Aeromonas hydrophila*, *Acinetobacter* sp., *Pseudomonas fluorescens* were the most frequently isolated microorganisms. Gram-positive microorganisms: *Bacillus* sp. *Corynebacterium* sp. *Staphylococcus* sp., were also consistently isolated. *Micrococcus luteus* and *Clostridium perfringes* occurred variably. *Gyrodactylus* sp., *Dactylogyrus* and *Trichodina* were consistently isolated. The public health and economic significance of the findings were discussed.

Key words: Public health, economic implication, microbial flora, cultivable freshwater fishes, microorganisms

INTRODUCTION

Water is a natural habitat for a wide variety of microorganisms including bacteria, protozoa, algae and fungi. Hence, fishes and other aquatic animals may accumulate these organisms from their environment. Fishes from polluted waters may also carry bacteria, derived from human and animal sources. Shewan (1977) indicated that the microbial flora of fish is a function of the environment in which they are caught. While these microorganisms may not be pathogenic to fish, the role of cultured fish in the possible transfer of pathogens between livestock and humans is important, particularly in less developed countries (FAO, 2003).

Pathogens can affect human health through both active and passive contact. Livestock and fish are involved in both passive and active transfer of a range of parasites and diseases to humans, broadening the need for risk assessment (FAO, 2003). Linkages have been made between fish or livestock production and health in terms of communicable diseases, non-communicable disease, malnutrition and injury (Birley and Lock, 1998). Threats to public health from both livestock and aquaculture are diverse (FAO, 2003) as well as the negative impact on marketability, trade and consumer confidence (Subasinghe *et al*., 2001).

Over the past 3 decades aquaculture has expanded, intensified and diversified, based heavily on movements of live aquatic animals and animal products (Subasinghe *et al*., 2001). The rapid expansion of aquaculture continually surpasses the rate of education, research and adaptation of expertise in health management. Advances in live aquatic animal trade, facilitated by improved transportation efficiency, are now recognized as having played a pivotal role in the introduction and spread of pathogens into many aquaculture systems (Berthe, 2000; Humphrey, 2001; Subasinghe and Arthur, 2001).

The significance of pathogens as well their normal distribution in wild or hatchery stock is often completely unknown. These gaps in knowledge can cause severe delays in culture development (Subasinghe *et al*., 2001). This study was carried out in order to establish and identify the various microoranisms isolated from fish and pose a potential threat to aquaculture production and man.

MATERIALS AND METHODS

Raw materials: Fish samples were collected from different earthen ponds of African Regional Aquaculture centre and transferred to the laboratory. Species of fish examined include, *Clarias gariepinus*, *Oreochromis niloticus*,

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Hybrid (cross of *Heterobranchus bidorsalis* and *Clarias gariepinus*). They were killed by severing the spinal cord with sterile scalpel (Post, 1983). Prior to killing the fish, smears were obtained from the skin and the gills.

Preparation of smears: Smears from the skin were obtained from the lateral sides of the body and from the caudal fin with the aid of sterile spatula. To obtain smears from the gills, the operculum was clipped away thereby exposing the gills underneath. To obtain samples from the viscera, the entire fish was disinfected with alcohol for asepsis before opening the body cavity.

Microbiological analysis of samples: Inoculum was obtained from the smear and inoculated with sterile inoculating loop on Nutrient Agar (Oxoid), MacConkey Agar (Oxoid) and Sabouraud Dextrose Agar (Oxoid). The Nutrient Agar and MacConkey Agar plates were incubated at 37°C for 24 h while the Sabouraud Dextrose agar plates were incubated at 27°C for 4 days. Representative discrete colonies were examined culturally, Gram-stained and subjected to morphological and biochemical characterizations and identified (Harrigan and McCance, 1976).

The fungal isolates were identified based on their vegetative and reproductive structures. For the identification of parasites, cutaneous or gill material obtained by scraping was placed into a drop of water previously put onto a slide, the whole was carefully mixed by means of a pair of needles and then covered with a cover slip. In this state, it was examined under the microscope using a low power objective.

RESULTS

The types of bacterial isolated from the fish samples are presented in Table 1. Fourteen bacterial species, dominated by Gram-negative organisms were isolated (Table 1). The fungi isolated from the fish samples are also shown in Table 1. Four fungi: *Aspergillus niger*, *Aspergillus* sp., *Penicillium* sp. and *Rhizopus stolonifer* were isolated.The parasites isolated from the fish samples are presented in Table 2. Six parasites: *Dactylogyrus* sp. *Gyrodactylus* sp. *Hirudinea* sp., *Ichthyophthirius multifilis, Myxobolus* sp. and *Trichodina domerguei* were isolated. *Trichodina domerguei* and *Ichthyophthirius multifilis,* were consistently isolated from the skin and gills. *Dactylogyrus* sp. and *Myxobolus* sp. were isolated from the gills, while *Gyrodactylus* sp. and *Hirudinea* sp. were isolated from the skin (Table 2).

Table 1: Microorganisms isolated from fish samples from African Regional Aquaculture Centre, Aluu

Bacterial flora	
Acinetobacter	sp.
Aeromonas	*Hydrophila*
Pseudomonas	*Fluorescens*
Proteus	*Vulgaris*
Arthrobacter	spp.
Flavobacterium	*Brevi*
Bacillus	spp.
Corynebacterium	spp.
Staphylococcus	spp.
Micrococcus	*Luteus*
Clostridium	*Perfringes*
Escherichia	*Coli*
Streptococcus	*Faecalis*
Mycoflora*Aspergillus*	*Niger*
Aspergillus	spp.
Penicillium	spp.
Rhizopus	*stolonifer*

Table 2: Parasites isolated from fish samples from African Regional Aquaculture Centre, Aluu

Parasites	Skin	Gills
Dactylogyrus sp.	-	+
Gyrodactylus sp.	+	-
Hirudinea sp.	+	-
Ichyophthirius multifilis	+	+
Myxobolus sp.	-	+
Trichodina domerguei	+	+

+ = Isolated regularly, - = Not isolated

DISCUSSION

Most of the microorganisms isolated are found in water and soils in nature. Warren observed that many bacteria and parasites that are capable of causing serious diseases of fish are normal inhabitants of the aquatic environment. The presence of microorganisms is of signif-icance when considering the potential abilities of some species of these general to cause fish and human infections (FAO, 2003).The presence of *Escherichia coli* is indicative of the possible presence of enteric pathogens since it is associated with faecal contamination. *Pseudomonas fluorescence, Pseudomonas* sp. are aetiological agents of *Pseudomonad* septicaemia in fish ; *Clostridium perfringes* causes nervous inbalance in fish and when transmitted to man cause abdominal cramps, diarrhea and gastroenteritis (Post, 1983).

Large numbers of *Dactylogyrus* or other gill flukes cause loss of gill function and behavioural characteristics indicating partial suffocation (Post, 1983). The prevalence and importance of parasitic infections vary markedly depending on local risks and conditions. Several parasites found in fish can infect humans as non-traditional hosts (Babu, 2000). They enter humans by ingestion of raw or undercooked infected fish. There is little risk to people

who consume fish except in areas where fishes are eaten raw or partially cooked. Whatever the local eating habits, those who handle or prepare fish are at risk (Ward, 1989; Olayemi, 1990). The fish farmer loses money through rejection of the produce; the consumers suffers ill health through consumption of food containing zoonotic agents (Babu, 2000).

Public health issues can be considered as those of direct importance to both producers of fish and include broader issues of food production, processing and delivery systems (FAO, 2003). The development of genetically modified organisms, either as feeds of livestock and fish, or the animals themselves has been raised as both a moral and public health issue (FAO, 2003). Good health management and personal hygiene practices would ensure the production of good quality fish, optimize yield and reduce the incidence of food borne illness. However, fish should not be consumed without thorough cooking.

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