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Research Article

Histopathology, Coprology and Bacteriological Survey of Tilapia Fish in Jos Plateau State, Nigeria

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Abstract

Background: Tilapia fish is commonly consumed in Jos metropolis of Plateau State Nigeria. Consequently, consumers are potentially exposed to harmful chemicals or they can be infected by pathogenic organisms such as bacteria or parasites of zoonotic importance, if such fish are farmed in a contaminated environments.

Aim: The study was carried out to assess the histopathology, coprology and bacteriology of apparently healthy tilapia.

Results: Our parasitological findings revealed 29 (58%) of the 50 intestinal samples examined had at least one intestinal parasite, two parasites were seen in 4 (8%) and no parasites were observed in 17 (34%) of the samples. Some of the parasites found include *Eimeria vanasi*, eggs of *Dipylidium caninum*, eggs of *Taenia spp*, *Ascaris lumbricoides*, eggs of *Schistosoma spp* and so on. Microbiological analyses of the 50 gill samples indicated the presence of *Aeromonas spp* in 35 (75%) of the examined samples, followed by *Bacillus spp* 13 (26%) and Proteus 2 (4%). The following bacterial pathogens were found in the intestinal samples: *Aeromonas spp* 15 (30%), *Escherichia coli* 33 (66%) and 2 (4%) were Proteus spp.

Conclusion: The heavy load of parasites (*Taenia* and *Ascaris spp*) and bacteria (*Escherichia coli*) found in this study established the presence of pathogens of zoonotic relevance and serious veterinary and public health concerns in tilapia fish without gross and histopathological lesions. It is imperative that fish farmers adhere to biosecurity/biosafety measures by improving management and sanitary conditions in fish farms. Additionally, fish consumers should roast or properly cook the fish in order to inactivate or eliminate harmful pathogens before consumption. Public awareness should be supported so as to emphasize the importance of these microorganisms to the health of the fish, man and his environment.

Keywords: Tilapia Fish; Histology; Coprology; Bacteriology

Introduction

Fish are an important source of proteins, minerals, vitamins and most importantly omega-3 fatty acid, needed for the development of the body. Fish also play an important role in the human ecosystem, providing important components in the food chain and provisions for food security [1].

The name tilapia actually refers to several species of mostly freshwater fish that belong to the cichlid family. Originally, wild tilapia are found in Africa, but due to their hardiness, reproductive vigour, the ability to adapt to a wide environmental conditions coupled with its ability to feed on cheap and available plant-based foods, they have been successfully introduce into other parts of

world giving them a cosmopolitan status. In addition it has been observed that they are economical to farm [2,3]. Good management practices in tilapia farming largely determines loses or gains in the venture [4]. Aside their importance as a rich source of protein to people, tilapia fish farming has provided job opportunities to many unemployed persons and has improved the socio-economic status of many people [5]. Despite the many advantages of this aquacultural practices, tilapia fish are threatened by obnoxious human practices that results in the accumulation of harmful chemicals and disease propagation with attendant deleterious effects to the fish [1].

Histopathological techniques have been employed in the study of human and animal pathologies that has advanced beyond physical observation. Histopathology has just recently gained notoriety as a valuable tool in the study of fish and the detection of some biomarkers in diseased fish. Additionally, histopathological, coprological and bacteriological methods are employed in the evaluation of environmental contaminations through the examination of vital organs of fish such as the gills, livers, intestine, kidneys responsible for excretion, respiration and biotransformation of xenobiotics [6-8]. Chronic exposure of fish to environmental pollutants even in low concentrations can induce structural and biochemical changes in the cells, tissues and organs, which ultimately influences the quality of the fish consumed [9,10]. Fish are susceptible to bacterial and parasitic diseases in poorly managed body of waters as a result of oxidative stress and weak immunologic defenses [11]. Another area of concern is the use of antibiotics as growth promoters in fish farming. Misuse or abuse of antibiotics could result in the deposition of drug residues in the muscles and other parts of fish further exposing the consumers to the challenge of antibiotic resistance [12].

Materials and Methods

Study area

The study was carried out in Jos, which is located at latitude and longitude coordinates: 9.896527, 8.858331 with the GPS coordinates of 9° 53' 47.4972'' N and 8° 51' 29.9916'' E respectively [13]. Jos is the capital city of Plateau State in the north-central geopolitical region of Nigeria. It has a clement weather suitable for both livestock and fish farming [13].

Materials

These are list of some basic tools and reagents needed to conduct the examination. Scissor, Forceps, Tray Tissue paper, Camera, Hand gloves, Universal tissue bottles, petri dish, wire loop, fume cabinet, microtome, fridge, weighing balance, microscope, beaker, spatula, autoclave, incubator,distilled water, hematoxylin and eosin stain, 10% neutral buttered formalin,70% alcohol, normal saline, peptone water, MacConkey agar, blood agar, paraffin wax [14,15].

Method

Fish were purchased within Jos metropolis from tilapia hawkers. Samples such as gills, brain were collected and sent for histopathology examination, intestines for parasitology analysis, gills/intestine for microbiology analysis, at National Veterinary Research Institute (NVRI) Vom. Histology results are presented as photomicrographs. Samples for parasitology and microbiology were analyzed using standard laboratory procedures [12,16].

Histopathological analysis

Fifty (50) sample of tilapia were collected and dissected through a central abdominal incision. The brain, intestine and gills samples were collected separately and immediately fixed in 10% formal saline in labeled sample plastic bottles. The tissues were dehydrated in graded concentrations of xylene, embedded in molten paraffin wax, and sectioned at 5 micron. Tissue sections were fixed on glass slides and stained with hematoxylin and eosin for light microscopy at x 100 and x 400. Photomicrographs of some of the tissues were taken using a microscope fitted with a camera unit [6,10].

Tissue processing procedure

Preservation using fixative (10% buffered formalin). Dehydration: removal of water using ascending grades of alcohol (70%, 80%, 90%, and 100%). Clearing: removal of alcohol from the tissue using agents such as xylene, benzene, and toluene. Impregnation: process of placing the tissue in molten paraffin wax to displace the clearing agent and fill in available spaces in the tissue. Embedding: process of burying the tissue inside molten paraffin wax in a mould. It is allowed to solidify in a cooling surface and blocked out. This gives the tissue an external support for proper sectioning. Sectioning: the embedded tissue is "sectioned "using a Microtome machine and placed on a slide [6,10].

Tissue staining procedure

The slides were dewaxed with xylene (2-3 changes). The slides were hydrated by passing through descending grades of alcohol from absolute to 70% alcohol and then to water. The slides were

stained with Hematoxylin for 5 minutes and then rinsed with water. The slides were differentiated in 1% acid alcohol briefly and then rinsed with water. The slides were blued with Scott's tap water substitute for 2-3 minutes. The slides were counterstained with eosin for 1 minute and then rinsed with water. The slides were dehydrated in ascending grades of alcohol (70). The slides were mounted with DPX and cover slip and allowed to dry ready for microscopy examination [6,10].

Result

Figure 1: Tilapia fish.

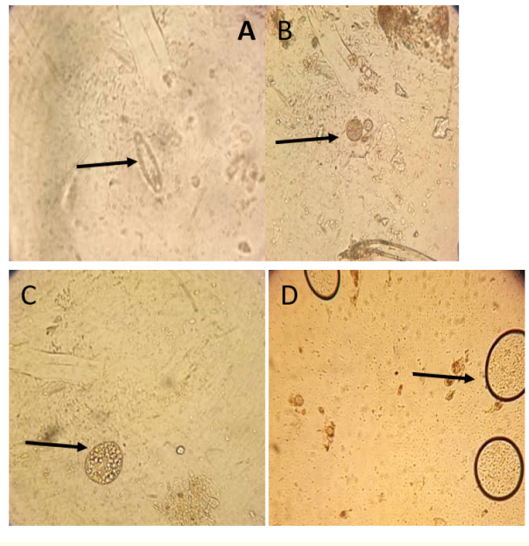

Figure 3: Microorganisms from intestinal samples; A-Larva of *Diphyllobothrium latum*; B- Egg of *Taenia* species; C-Egg of *Dipylidium caninum*; D- Cysts of *Eimeria vanasi*.

Histology photomicrograph of randomly selected normal tissues from 50 samples of tilapia brain and gills viewed under x400.

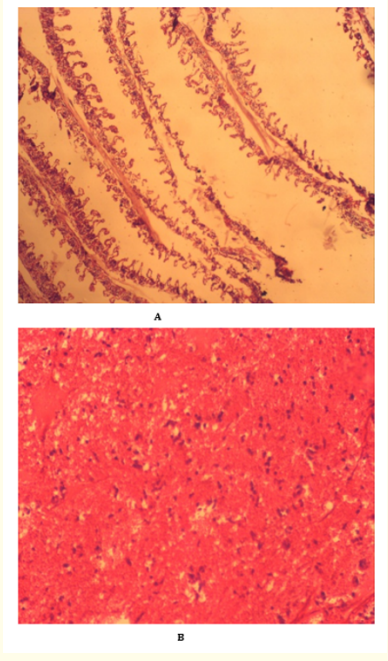

Figure 2: Photomicrographs of Normal gill (A) and brain (B) tissues, H&E Stains x 400.

Parasite	Frequency	Percentage
Eimeria vanasi	20	40.0
Eggs of Dipylidium	2	4.0
Eggs of Ascaris lumbricoides	4	8.0
Eimeria vanasi/Egg of Schinostoma	1	2.0
Eimeria vanasi/Dipylidium	1	2.0
Larva of Diphllobothrum lactum	2	4.0
Egg of *Taenia species*	1	2.0
Eimeria vanasi/Ascaris lumbricoides	1	2.0
Eimeria vanasi/ Egg of *Taenia species*	1	2.0
No parasite seen	17	34.0
Total	50	100.0

Table 1: Coprology result showing parasites from intestine samples.

	Parasite
Chi-Square	93.600[a]
Df	9
Asymp. Sig	.000

Table 1.1: Test Statistics.

Chi square test at P value less than 0.05 shows that the difference in number of the parasites observed is statistically significant.

Microorganism	Frequency	Percent
Aeromonas spp.	35	70.0
Bacillus spp.	13	26.0
Proteus spp.	2	4.0
Total	50	100.0

Table 2: Microorganisms from gill samples.

Thirty-five (35) samples (70%) were infected with *Aeromonas spp*, 13 samples (26%) were infected with *Bacillus* and 2 samples (4%) were infected with *Proteus*.

	Microorganisms
Chi-Square	33.880[a]
Df	2
Asymp. Sig.	.000

Table 2.1: Statistics of microorganisms from gill samples.

Chi square test at P value less than 0.05 shows that the difference in number of the bacteria observed the gill samples is statistically significant.

Microorganisms	Frequency	Percent
Aeromonas spp	15	30.0
E. Coli	33	66.0
Proteus spp	2	4.0
Total	50	100.0

Table 3: Microorganisms (Intestine samples).

Fifteen (15) samples (30%) were infected with *Aeromonas spp*, 30 samples (66%) were infected with *E.coli* and 2 samples (4%) were infected with *Proteus.*

	Microorganisms
Chi-Square	29.080[a]
Df	2
Asymp. Sig	.000

Table 3.1: Statistics of microorganism (Intestine sample).

Discussion

This study was aimed at histopathology which showed normal gill and brain tissues (Figure 1), coprology in which out of the 50 samples 29 (58%) were infected with one intestinal parasite, 4 samples (8%) were infected with two intestinal parasites and 17 samples (34%) were free from any intestinal parasite (Figure 2 and Table 1) and bacteriology survey of apparently healthy tilapia which indicated the presence of *Aeromonas species* in 35 gills of apparently healthy tilapia. Results from Praveen., *et al*. [17] corroborated with our findings where the presence of Aeromonas spp. was alluded to poor sanitation and malnutrition. Similarly, Omeje and Chukwu [18] and Agbede [19] attributed the presence of Aeromonas hydrophilia in samples from sites in Kainji Lake to aeromonad septicaemia. Agbede [19] reported the presence of some fish intestinal parasites including ones found in this study (*Eimeria species, Dipylidium species, Ascaris species, Taenia species).* Other parasites found in this study include: Egg of *Schinostoma* and larva of Diphllobothrum lactum which were not reported by previous researchers. This could be to the fact that the Filapia fish analyzed in Jos were from hawkers who might have gotten them from different sources (Figure 3, Tables 1 and 1.1).In Nigeria, few studies [20-23] had incriminated Gram-negative bacteria of the genera *Aeromonas*, *Escherichia*, *Klebsiella*, *Proteus* and *Pseudomonas*: Gram-positive bacteria of the genera *Staphylococcus* and *Streptococcus* contributing to infections recorded in fish farms; this is also similar to the findings in this study (Tables 2, 2.1, 3 and 3.1).

Escherichia coli has the highest occurrence in the intestinal content with 35 and the study by Holly and Abigail [15] shows that *E. coli* is common and diverse group of bacteria found in food, environment and in the intestine of both people and certain warm-blooded animals which explains why they are most populated in this study and this indicates or shows the state of poor management and sanitation of farmers as well as consumers. Serious measures should be put in place to reduce the load of these organisms to ensure the safety of man and his environment. *E. coli* is detrimental to human and animal's health, and most strains of *E. coli* are actually harmless and some strands are essential to good health, corresponding with the histology findings of gills and brain samples were seen to be normal, free from lesions [15]. Chi square test at P-value less than 0.05 shows that the difference in number of the parasites and bacteria observed are statistically significant for both the intestine and gills samples analyzed.

Conclusion

Certain microorganisms affect apparently healthy tilapia even as tilapia appear healthy as observed in the histopathological findings with absolutely no lesions to pose threat to consumers or farmers. We recommend that preventive and biosafety measures should not be overlooked in ensuring that fish are consumed in their healthiest states by improving sanitation and general aquaculture good management practices.

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