

PREVALENCE, CHALLENGES AND CONTROL OF *Listeria monocytogenes* IN *Clarias gariepinus* IN IBADAN, OYO STATE NIGERIA

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ABSTRACT

This study examined the prevalence of *Listeria* species in fish (*Clarias gariepinus* and *Oreochromis niloticus*). The total number sixty (60) of fishes were randomly selected from commercial outlet in Ibadan and examined. Sex, Total Length, and Total Weight were determined in respect to occurrence of *Listeria* spp. Simple percentages were adopted to analyze the data. The results show that 12 out of 60 (20%) were positive for *Listeria* species. The three species identified were *L. monocytogenes*, *L. innocua*, and *L. grayii*. Male has highest rate of infection (18.91%), fishes with average length of 20-30cm had 41.17%, 351-400g has highest number of infection (28.57%). *C. gariepinus* shows the highest presence of *Listeria* spp with over 26.67% (*L. monocytogenes* = 16.67%; *L. innocua* = 6.67%; and *L. grayii* = 3.33%) while *O. niloticus* shows total of 13.33% presence of *Listeria* species (*L. monocytogenes* = 10.00%; *L. innocua* = 3.33%; and *L. grayii* = 0.00%). Isolation of *L. monocytogenes* in fish (*Clarias* and *Tilapia*) in Ibadan in this study indicates that there is high presence of *Listeria* species and this further suggested that there is high risk of contracting listeriosis in the study area. It was recommended that proper hygiene and cooking to at least 70°C is recommended since the bacteria can be killed at that temperature. Attention should be given to avoid cross-contamination and re-contamination from the chain, especially ready-to-eat fish such as fried fish, smoked fish and so on.

Keywords: *Listeria monocytogenes*, *Listeria innocua*, *Listeria grayii*, Prevalence, Infection, *Clarias gariepinus*.

1.0 INTRODUCTION

Fish is considered as one of the safest and highly nutritional sources of protein. The need for fish to be readily available in the market cannot be overemphasized, as the gap between its demand and supply is very huge. According to [1], fish account for more than 40% of the protein diet of two-thirds of the global population. Despite a noticeable decrease in capture production, aquaculture is assuming a profitable venture economically. Fish consumption per capita of 12.0kg is considered globally adequate for normal and healthy growth. It can be observed that this has not been met in developing countries like Nigeria. The quality of fish and its products must be standard and safe for consumption if fish must remain in the market. Fish can harbour some pathogens/diseases which can be transmitted to person(s) who have contact with, or eat the

infected fish. It has been recorded that Nigeria is the largest consumers of fish throughout the world (1.5million tonnes/year) [2]. Yet, Nigeria is deficient in fish requirement as the country imports over 900,000 metric tonnes of fish with domestic production lingering behind at 450,000 metric tonnes/year [3]. There are several pathogens associated with fish but the case of *Listeria monocytogenes* has drawn some attention. *Listeria* are considered ubiquitous organisms and causes serious illness in man and fish called Listeriosis [4]. The organism is found in the soil, vegetation, plants, mud, water, sludge, animals and birds. (*L. monocytogenes*) is a harmful bacterium that can be found in a variety of foods. In pregnant women, *L. monocytogenes*-caused illness can result in miscarriage, fetal death, or severe illness or death of a newborn infant. The economic and social impact of *L. monocytogenes* on animals and the

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Nigerian population are largely unknown. Each year, USA estimates about 1,500-2,500 cases of *L. monocytogenes* infection with 350-500 deaths. Moreso, old adults, pregnant women and immunodeficient people are more prone to infections [5].

Reports of *Listeria* infections in Africa are scanty and particularly in Nigeria, despite many pathognomonic signs and symptoms suggestive of listeriosis [6]. Significant human demographics, behaviour and land use changes have been witnessed in Nigeria within the last decade. These changes have influenced the lifestyle of the citizenry contributing to new disease emergence by changing transmission dynamics to bring animals (including fish) and people into closer and more frequent contact with pathogens. Such changes have led to increases in human agricultural and aquacultural activities in both residential areas and their environments [7]. The economic and social impact of *Listeria monocytogenes* on animals and the Nigerian population are largely unknown. This is because there is still a paucity of knowledge on the ecological distribution, molecular and serotypes of *L. monocytogenes* and other *Listeria* spp coupled with unreported cases. The animal wastes of commercial farms of this area are used directly as bio-organic fertilizer of some farm [8]. The study therefore was designed to determine the prevalence of *Listeria* spp in fish in Ibadan, Nigeria.

2.0 MATERIALS AND METHODS

This study was conducted in Ibadan, Oyo State. It lies within the forestry zone of Western Nigeria. Ibadan is located at Latitude 7° 25' North and Longitude 3° 5' East approximately 145 kilometres north of Lagos [9].

2.1 Sample Collection

Thirty (30) *C. gariepinus* and thirty (30) Tilapia (*Oreochromis niloticus*) were purchased live from local fish sellers at various fish markets within Ibadan metropolis between September and December, 2013. The fish samples were transported in bowl (plastic) containing clean water from a well (Department of Aquaculture and Fisheries, University of Ibadan) to the Pathology and Parasitology laboratory of Veterinary Hospital, Mokola Ibadan, where they were examined for *Listeria* spp. The fishes were separated based on their sexes using genital

observation. Total lengths and total weights of the fish were recorded. The samples were stored at 4°C for not more than 24 h before analysis.

2.2 Isolation and Identification of *Listeria* species

Samples were analyzed for *Listeria* spp. using the enrichment, selection and isolation protocols recommended by the US Food and Drug Administration (Lovett, 1988). For each sample, 5g of intestine and 5g of gills were removed aseptically and placed separately in 20ml of *Listeria* enrichment broth (LEB, Merck Germany) containing potassium thiocyanate 937.5g/L. The compound was homogenized and incubated at 35°C. On days 1, 2, and 3 the cultures were plated onto *Listeria* selective agar (Oxford formulation, Himedia, India) and incubated at 37°C for 2 days (48h). The plates were observed for *Listeria* colonies (greenish-yellow colonies) and at three colonies were subjected to sub-culture (Brain heart infusion Agar (BHIA, Hispanlab) and incubated at 37°C for 48h. The colonies were characterized by Gram staining, motility, catalase and oxidase test and acid production from xylose.

3.0 RESULTS AND DISCUSSION

From the study, it was observed that 12 out of 60 (20%) were positive for *Listeria* species (3). Table 3.1 shows highest number of infected species based on sex was high in male (18.91%) but the percentage of infection was high in female (21.74). Table 3.2 shows the occurrence of *Listeria* species based on Total length, where fishes with 20-30cm has highest infection (41.17%) while fishes with 30-40cm has lowest (9.09%). Table 3.3 shows the prevalence based on body weight. It was observed that fishes with 351-400 have highest number of infection with 28.57%. The results further confirmed that *Listeria* species deposited mostly in intestine and gills rather than body surface and it shares similar observation with the work of Siavash, *et al.*, (2011). *C. gariepinus* shows the highest presence of *Listeria* species with over 26.67% (*L. monocytogenes* = 16.67%; *L. innocua* = 6.67%; and *L. grayii* = 3.33%) while *O. niloticus* shows total of 13.33% presence of *Listeria* species (*L. monocytogenes* = 10.00%; *L. innocua* = 3.33%; and *L. grayii* = 0.00%). This result in agreement with the work of Siavash, *et al.*, (2011) who recorded 18%. The dominant two species (*L. monocytogenes* and *L. innocua*) shared the same or similar ecological niche so the similarity in their occurrence is in order.

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Table 3.1: Occurrence of *Listeria* species in fish samples (positive) based on sex

Species	Number of samples	Number infected	Intensity of infection
Male	37	7(18.91%)	0.19
Female	23	5(21.74%)	0.20
Total	60	12(20.00%)	0.20

Source: Field Survey, (2013)

Table 3.2: Occurrence of *Listeria* species in fish samples (positive) based on total length

Total Length (cm)	Number of samples	Number infected	Intensity of infection
10-20	21	3(14.29%)	0.14
21-30	17	7(41.17%)	0.41
30-40	22	2(9.09%)	0.09
Total	60	12(20.00%)	0.20

Source: Field Survey, (2013)

Table 3.3: Occurrence of *Listeria* species in fish samples (positive) based on weight

Body weight (g)	Number of samples	No. Infected	Intensity of infection
100-150	0	0(0%)	0.00
151-200	9	1(11.11%)	0.11
250-300	13	3(23.07%)	0.23
301-350	0	0(0%)	0.00
351-400	28	8(28.57%)	0.24
Total	60	12(20%)	0.20

Source: Field Survey, (2013)

Table 3.4: Occurrence of *Listeria* species in fish samples (positive) based on species

Species	Percentage (%)			
	Number samples	of <i>L. monocytogenes</i>	<i>L. innocua</i>	<i>L. grayi</i>
<i>C. gariepinus</i>	30	5(16.67%)	2(6.67)	1(3.33%)
<i>O. niloticus</i>	30	3(10.00%)	1(3.33%)	-
Total	60	8(13.33%)	3(5.00%)	1(1.67%)

Source: Field Survey, (2013)

CONCLUSION

Isolation of *L. monocytogenes* in fish (clarias and tilapia) in Ibadan in this study indicates that there is high presence of *Listeria* species and this further suggested that there is high risk of contacting listeriosis in the study area. Although the case of listeriosis is not formally reported but the study suggested that it may be responsible for many deaths and lost of pregnancy among others side effect in Ibadan. It was recommended that proper

hygiene and cooking with at least 70°C will be save since the bacterium will be killed at the said temperature and attention should be given to avoid cross-contamination and re-contamination from the chain especially ready to eat fish such as fried fish, smoke fish and so.

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