

Assessment of Morphology and Nuclear Abnormalities in Freshwater Fish Specimens

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Abstract: The objective of the present study was to detect the morphological anomalies and nuclear abnormalities especially induction of micronuclei (MN) and abnormal nuclei (NA) in the peripheral erythrocytes of deformed fish (*Oreochromis niloticus* Linn.) collected from the Barasat market, West Bengal. The specimens were collected as per visual observation among normal and abnormal morphological features followed by MN and NA test after visualizing under brightfield binocular microscope. External morphologies of deformed fish specimens were observed bulging at lateral side and bending at trunk and tail region. Regarding mutational risk, micronuclei, notch nuclei, blebbed nuclei and nuclear kariolysis were identified in the peripheral erythrocytes of studied fish specimens. In conclusion, the abnormal external morphology induced the mutagenic effect in the studied fish specimens. Although the causative factors are unknown. Further study is suggested to analyse the mutagenic compounds such as metals and organic compounds in future.

Keywords: Abnormal morphology, Aquatic pollution, Fish market, Mutation risk, nuclear anomalies, *Oreochromis niloticus*

1. Introduction

Fish is an important diet for human beings, as well as for other animals. In pisciculture, it is targeting maximum fish production to optimize the profitability. ^[1]

In this context, introduction of exotic fish can be introduced to maintain the productivity. ^[2] While indiscriminate and non-judicious introduction of exotic fish in our country has brought a wide array of problems including extirpation of indigenous fish species ultimately leading to biodiversity loss. ^[3, 4]

The abnormalities in the external morphology depend upon several factors viz. nutritional, environmental and genetic factors individually or in combinations. ^[4 - 17]

Moreover, the morphological abnormalities may lead to abnormal nucleation especially induction of micronucleus (MN) and different types of nuclear abnormalities (NA) in the peripheral erythrocytes of different fish species. ^[18 - 21]

In the present study, we evaluated abnormal of morphology related to nuclear abnormalities in the peripheral erythrocytes of fish specimens (*Oreochromis niloticus* Linn.).

2. Materials and Methods

As per our earlier study, the study sites were mentioned. ^[22] The fish specimens (*Oreochromis niloticus* Linn.) were collected as deformed from the study area. The morphological features were observed as per visual observation and earlier studies. ^[17, 23, 24] The genotoxicity test especially MN and NA test in the peripheral erythrocytes of fish species (*Oreochromis niloticus*) were performed as per earlier protocol. ^[18, 19, 24, 25] The genotoxicity screening especially MN and NA scoring were performed according to the methods of Palhares and Grisola ^[26] and Talapatra and Banerjee ^[24] with some modifications.

3. Results

Fig 1 represents the morphological anomalies in *Oreochromis niloticus*. Among four specimens, former was observed normal external morphology while other four specimens were observed bulging at lateral sides and bending trunk and tail region, which was found as major abnormalities.



Figure 1: Morphological anomalies in *Oreochromis niloticus* (1st = Normal and 2nd - 5th = Deformed body)

Four different types of nuclear abnormalities such as MN or micronucleus, which is a small nucleus, the size ranges between 1/4th to 1/16th size from main nucleus. BLN or blebbed nucleus in which the shape is ameiboid. NN or notch nucleus, which looks like horseshoe or kidney shaped and NC or nuclear caryolysis in which a big hole is observed within the nucleus (Fig 2).

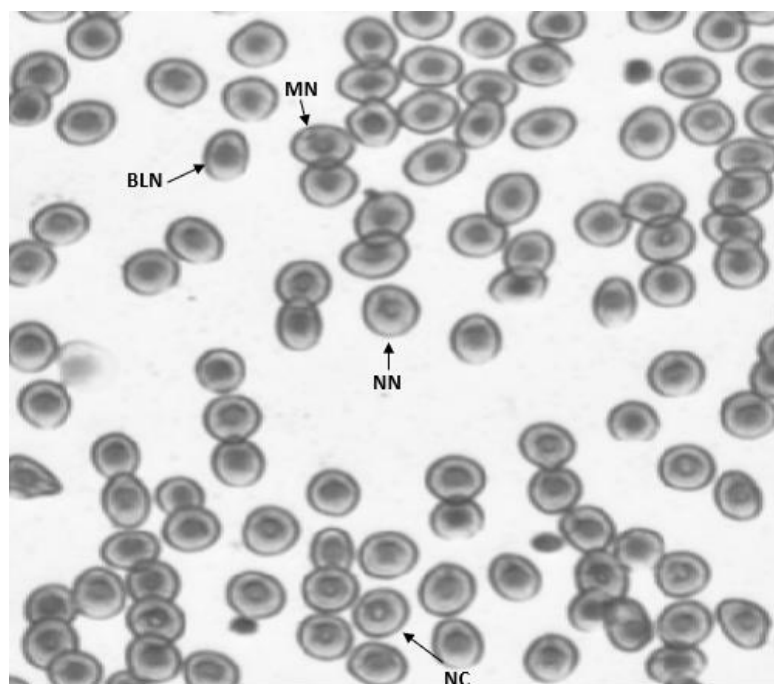


Figure 2: Photomicrograph of abnormal nucleation in *Oreochromis niloticus*
((MN = Micronucleus; BLN = Blebbed nuclei; NN = Notch nuclei; NC = Nuclear caryolysis)

Table 1 describes MN and NAs frequencies in deformed fish specimens, the MN frequency (1.39 ± 0.08) while the NA frequencies such as BLN (2.59 ± 0.08), NC (0.78 ± 0.07) and NN (1.13 ± 0.04) were observed.

Table 1: Percentage frequencies of MN and NAs in the peripheral erythrocytes of deformed fish *Oreochromis niloticus* ($M \pm SD$; $n = 4$)

MN	NAs		
	BLN	NC	NN
1.39 ± 0.08	2.59 ± 0.08	0.78 ± 0.07	1.13 ± 0.04

MN = Micronucleus; NA = Nuclear abnormalities; BLN = Blebbed nuclei, NN = Notch nuclei; NC = Nuclear cariolysis

4. Discussion

The present study was an observational and analytical methods in which there were maximum morphological deformities observed in the studied fish specimens when compared to control specimen. The morphological anomalies in these specimens of market fish were supported by earlier studies. [11 - 17] Still, the causative factors are unknown.

These morphological anomalies triggered the mutational risk in the peripheral erythrocytes of studied fish specimens. In earlier studies, there are several causative factors such as water pollution, etc. led to induce nuclear abnormalities. [18 - 21]

Therefore, the risk of mutation in these deformed fish specimens may be vulnerable in near future.

5. Conclusion

This investigation is suitable indicator to detect mutational risk among studied fish specimens collected from market. It is suggested to analyse the mutagenic compounds such as metals and organic compounds in near future. Otherwise, an important diet like fish will vanish in near future.

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Conflict of interest

There is no conflict of interest in the present study.

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