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Short Communication

Impact of Henneguyosis Infestation on Hematological Parameters of Catfish (*Clarias garipienus*)

DALIA MOHAMED SABRI[1], MOHAMMED ABD EL-HAMEED EL-DANASOURY†, ISMAIL ABD EL-MUNEM EISSA‡ AND HAFIZ MOHAMED KHOURAIBA†
Biotechnology Research Center, Suez Canal University (New Campus), Ismailia, Egypt
†Department of Animal Production and Fish Resources, Faculty of Agriculture, Suez Canal University, Egypt
‡Department of Fish Diseases and Management, Faculty of Veterinary Medicine, Suez Canal University, Egypt
[1]Corresponding author's e-mail: dotsab@yahoo.com

ABSTRACT

The present investigation was carried out to study the impact of the parasitic infestation with *Henneguya branchialis* on the hematological parameters of catfish, *Clarias garipienus*. Therefore, 140 catfish specimens with average body weight of 257±8.8 g were subjected to hematological investigations. The hematological analysis showed significant reduction in red blood cells (RBCs) count, hemoglobin (Hb) value, packed cell volume (PCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC), while total white blood cells (WBCs) count, mean corpuscular volume (MCV) were significantly increased in the infested catfish. This study concluded that *H. branchialis* causes physiological dysfunctions on the infested fish by showing several alterations in hematological parameters that may often cause anaemia through reduction in RBCs count, hemoglobin value and packed cell volume.

Key Words: African catfish; Hematological analysis; Hemoglobin value; *Henneguya branchialis*; Packed cell volume; Red blood cells count

INTRODUCTION

For decades, fish have been extensively used as a cheap source of protein rich diet for human consumption in Egypt, The annual production of 724000 tons has been estimated with a shortfall of 214000 tons to fill the gab between supply and demand (General Authority of Fish Resources Development, 2002). A lot of serious efforts have been made to increase the fish production from the natural resources and by fish farming, as a step of realizing the maximum production of the cultured fish came the importance of producing healthy and disease free fish (Mahfouz, 1997).

As the lakes, rivers and sees became illegally the end point of the discharge of pollutants (Elnwishy *et al.*, 2007) the majority of fish diseases might be occurred as a result of parasitic infection or environmental pollution (Hussain *et al*., 2003). About 80% of fish diseases are parasitic especially for warm water fish (Eissa, 2002). Protozoan infections have been mentioned as the most critical parasitic infections on the external body surface (Stoskopf, 1993), leading to severe destruction of gills as well as to economic losses and mortalities in freshwater fish. Genus *Henneguya* from Myxosporidioses is considered as one of the most important pathogen groups causing infestation in both freshwater and marine fish (Lom & Dyková, 1992), Henneguyosis mainly infesting catfishes and the respiratory form causes congestion of the gills and accessory respiratory organs hence causes high economic losses, because of the presence of large visible cysts on the gills and the denderitic organs that make infested catfish un-marketable (Eissa, 2002).

It is well known that certain blood parameters serve as reliable indicators of fish health (Bond, 1979) as many parasites can live in a host, sometimes causing damage to it. Therefore, the changes associated with haematological parameters due to various parasites establish a database, which could be used in diseases diagnosis and in guiding the implementation of treatment or preventive measures. These measures are essential in fish farming and fish industry (Roberts, 1981) also. Therefore, this study was conducted to investigate the impact of henneguyosis infestation on the hematological parameters of the African catfish (*Clarias garipienus*), which is considered as the most widely distributed fish species in Africa (Skelton, 1993) and one of the most popular economic fish in Egypt (Brewer & Friedman, 1989).

MATERIALS AND METHODS

Experimental details. A sample of 140 live catfish (*Clarias garipienus* L.) having both infested and non-infested

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specimens were collected from different water ways and private fish farms in Ismailia governorate- Egypt, with average wet body weight of 257±8.8 g. The collected fish were transferred alive in polyethylene bags to the laboratory for further investigations. Fish specimens were kept in glass aquaria with chlorine free tap water and continuous aeration according to Innes (1966) and they were fed on commercial diet pellets containing 30% crude protein, twice a day as 3% of their body weight (Eurell *et al*., 1978). Fish were acclimated for 24 h and subjected to the parasitological and hematological investigations. Parasitological examination was carried out for the detection and identification of the *Henneguya branchialis* on the gills and the accessory respiratory organs of the samples.

Blood samples. Seventy blood samples from each infested and non-infested fish were obtained from caudal artery of anesthetized fish with 150 mg L^{-1} tricane methan sulphonat (MS 222) (Wagner *et al.*, 1997) and kept for further studies, which were done immediately after collection.

Hematological examination. Total RBCs count and WBCs count were determined by using an improved Neubair hemocytometer (Hesser, 1960) and the packed cell volume (PCV) was determined by using microhematocrit capillary tube (Wintrobe, 1967). Hemoglobin content in blood was determined by using Diamond diagnostic haemoglobin kit (Wintrobe, 1965). The other blood indices such as mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were also calculated by using standard formula according to Dacie and Lewis (1975).

Statistical analysis. Data were analyzed by using multivariate ANOVA analysis at ($P<0.05$) using the SPSS (13.0) statistical program.

RESULTS AND DISCUSSION

The hematological analysis revealed a highly significant reduction in Red Blood Cells (RBCs) count from 2.88±0.06 ($\times 10^6$ μL^{-1}) in the non-infested catfish (*C. garipienus*) to 1.82±0.09 ($\times 10^6$ μL^{-1}) in the infested ones with *Henneguya branchialis*. Also a significant decrease was recorded in hemoglobin (Hb) from 11.09±0.28 g dL^{-1} in the non-infested catfish in comparison with 6.01±0.42 g dL^{-1} in the infested fish (Table I), Moreover, Packed Cell Volume (PCV) was significantly reduced as 27.92±0.63% in the infested catfish while it was 33.9±0.42% in the non-infested fish with Hennguyosis.

The reduction in RBCs count, Hb value and packed cell volume in the infested catfish occurred as a result of the parasitic infestation that often leads to anemia (Martins *et al.*, 2004). Furthermore, the parasites simply act as a stressor; and during primary stages of stress the PCV changes due to the release of catecholamine, which can mobilize red blood cells from spleen (Wells & Weber, 1990) or induce red blood cell swelling as a result of fluid shift into the intracellular compartment (Chiocchia & Motais, 1989). Similar results were recorded by Hassen (2002) and Ismail (2003) in (*C. garipienus*) naturally infested with *Trypanosome mukasia*. On the contrary, Wendelaar (1997) and Lebelo *et al.* (2001) reported significant increase in Hb value and packed cell volume and non-significant increase in RBCs count ($\times 10^6$ μL^{-1}) in striped bass infested with Henneguyosis. Mlay *et al.* (2007) reported an increase in Hb value in the light infection with worm burden in freshwater fish including *C. garipienus,* while elevation in Hb value was appeared in the heavily infected fish.

Table I. Some haematological parameters of naturally infested catfish with *H. branchialis*

Blood parameter	Non-infested catfish	Infested catfish
RBCs ($\times 10^6$ μL^{-1})	2.88±0.06	1.82±0.09*
WBCs ($\times 10^3$ μL^{-1})	17.75±0.24	22.62±0.35*
Hb (g dL^{-1})	11.09±0.28	6.01±0.42*
PCV (%)	33.9±0.42	27.92±0.63*
MCV (Ft)	129.17±3.56	158.07±5.29*
MCH (pg)	42.13±1.44	34.10±2.13*
MCHC (%)	33.93±1.01	21.92±1.49*

*significant at $P< 0.05$

Total WBCs count was significantly increased from 17.75±0.24 ($\times 10^3$ μL^{-1}) in non-infested catfish to 22.62±0.35 ($\times 10^3$ μL^{-1}) in the infested catfish with Henneguyosis (Table I). That increase in WBCs count occurred as a pathological response since these WBCs play a great role during infestation by stimulating the haemopoietic tissues and the immune system by producing antibodies and chemical substances working as defense against infection (Wedmeyer & Wood, 1974; Lebelo *et al.*, 2001; Hassen, 2002). This could also attributed to the increase in the number of lymphocytes in the parasitized fish (Murad & Mustafa, 1988; Hassen, 2002), Similar results were reported by Lebelo *et al.* (2001), while working on striped bass infested with Henneguya. Murad and Mustafa (1988) also reported increase in WBCs count in catfish infested with metacercaria.

The MCV was significantly increased from 129.17±3.56 to 158.07±5.29 fimtoliter (fL) in the Henneguyosis non-infested and infested catfish respectively (Table I). Meanwhile, MCH was significantly reduced from 42.13±1.44 (pg) to 34.10±2.13 (pg) in non-infested and infested catfish, respectively (Table I). A highly significant was found in MCHC representing 33.93±1.01% and 21.92±1.49% in non-infested and infested catfish (*C. garipienus*) with Henneguyosis, respectively (Table I). The increase in MCV and the reduction in MCH and MCHC in the infested catfish with Henneguyosis were similar to the results reported by Hassen (2002) and Lebelo *et al.* (2001).

CONCLUSION

Henneguyosis as a parasites stressor on catfish caused several alterations in hematological parameters such as reduction in RBCs count, Hb value and packed cell volume

that may often cause anaemia. Also as a defense mechanism against the parasitic infestation, WBCs count was elevated in the infested fish.

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