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Hypoglycemic Response of *Clariasgariepinus* to Therapeutic Administration of Chloramphenicol Anti-Biotic Treatment

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ABSTRACT

The Blood sugar response of *Clariasgariepinus* to the routinely used antibiotic chloramphenicol was investigated in order to gauge its safety in aquaculture and the wider implication on human health after fish consumption. Fishes were exposed to 250mg, 500mg and 750mg of chloramphenicol in 20liters of borehole water in plastic aquaria tanks for one week. Each tank contained 4 table size fish. The control tank had no medication in it. Blood samples were collected after 48 hours by means of cardiac puncture using physical restrain and put in fluoride oxalate bottles. Blood sugar was analyzed using a blood sugar tester machine. Result revealed that mean blood sugar levels of 3.3mmol/L, 3.2mmol/L and 3.6mmol/L were obtained for fish treated with 250mg, 500mg and 750mg of chloramphenicol respectively. There is no significant difference between treatment levels except the control group. The control tank had mean blood sugar level of 14.9mmol/L. Although no standard normal levels for fasting and random blood sugar levels exist for *Clariasgariepinus* fish, this result indicate a hypoglycemic dose related response of *Clariasgariepinu*s blood to the antibiotic. It can be concluded that the use of chloramphenicol and other drug relatives should be used with care in fish disease treatment in aquaculture as it can result in total loss of fish stocks and bio-magnification in humans causing grave health problems.

Keywords: Hypoglycemia, *Clariasgariepinus*, Anti-biotic, Treatment,chloramphenicol.

1. Introduction

Fish diseases contribute a significant percentage of fish loss in aquaculture systems. Fish diseases can result in inability of fish to eat, reduced fish growth, morphological distortions and outright mortality. Most poor fish yields have been directly traced to fish diseases. Most fishes diseases are of bacterial origins which are introduced into aquatic systems as a result of infested feeds, poor pond practice and rarely by the introduction of sick and unhealthy stock. Fortunately, fish diseases are treatable with antibiotics. Antibiotics are used in aquaculture to treat diseases caused by bacteria but more commonly antibiotics are used to prevent disease by treating the water or fish before disease occurs. Most fish farms use chloramphenicol, oxytetracycline and erythromycin for treating bacteria and parasitic diseases (Aftab and Abdul, 2006)

The administration of antibiotic medication is vital in aquaculture to treat disease and ensure survival and high profitability. Sadly, the administration of antibiotics to fish may result in a plethora of unexpected problems as a result of deliberate or unintended overdose. These problems are identifiable as death of entire fish stocks, severe hematological responses such as hypoglycemia and poor physiological responses. The use of blood glucose for measuring fish health and stability is one of the cheapest and easiest method of physiological monitoring. As antibiotic use are inevitable in aquaculture, it is necessary to monitor its implication on the safety and survival of fish stocks. This is the objective of this study.

2.0 MATERIALS AND METHODS

2.1Collection of Experimental Fish

20 Juveniles of *Clariasgariepinus* were procured from a private fish farm at OsiriYenagoa, Bayelsa state and transported under cool conditions to the Biological sciences laboratory of the Niger delta University, Amassoma between the hours of 7;30am to 10am. The fishes were of mixed sexes with mean length 38cm ± 2.5cm and mean weight and 318.2g ± 10.2g.

2.2Procurement of Experimental Medication

The antibiotics chloramphenicol was procured from a registered pharmacy in Yenagoa, Bayelsa State. This was done to ensure the efficacy of the medication.

2.3Acclimatization

Fishes were acclimatized for 48 hours in 5 different plastic basins containing 20 litres of tap water with 4 fish in each basin to enable them get used to the new environment. Water was changed daily to prevent buildup of metabolic wastes and was aerated manually to increase oxygen supply. The fish were examined for morphological abnormalities. Mortality during acclimatization did not exceed 3% of the fish population. Hence the fish were certified safe for use as experimental organisms.

Fishes were feed twice daily at 9.00 am and 5.00 pm using pelleted compounded diet for the period of 2 days. The feeds were dispensed evenly on the water surface of the aquaria basin to enable equal feeding opportunity. Feeding was stopped 24hrs prior to the application of the medication. This was done to ensure that the blood sugar result will not be affected by food mediated sugar sugar level spikes. Also, because feeding increases the rate of respiration and excretory products, which may influence the test solution.

2.4Experimental Tanks

4 plastic basin (A,B,C and D) were used for the experiment. Basin A was used as the control tank and B,C,and D contained treatments of different concentration of the medication (250mg, 500mg, 750mg) respectively.

2.5Experimental Design

This experiment is a 1x3x4 factorial experiment in a completely randomized design. 3 fishes each were randomly put into each tank which were covered with 4mm plastic wire net mesh to prevent the fishes from jumping out of the tank. Fish were exposed for a period 24 hours. The control tank was void of chlorophenicol. Tank B contained 250mg, tank C contained 500mg and tank D contained 750mg respectively.

2.6Test Solution

The antibiotic chloramphenicol was administered at different concentrations of 250mg, 500mg and 750mg in the various tanks which contains 20litres of water. Homogeneous mixing of the medication and water was achieved by using a glass rod to steer each container.

2.7Blood Collection Method/ Technique

Frank blood samples were collected by the method of cardiac puncture using physical restrain by holding the head and tail region,. The technique involves the use of a hypodermic syringe of 5ml and needle size of 0.8 × 40mm gauge. The needle was gradually inserted into the chest region of the fish and syringe pulled up a bit to allow the flow of blood into it by blood circulatory pressure.The collected blood samples were then transferred from the syringe into a newly labeled fluoride oxalate bottle. This process was done in each of the fish in the exposure tanks containing various levels of the antibiotic (chloramphenecol) and also the control.

2.8 Analysis of blood sugar

Blood sugar analysis was immediately done using an a Fine Test® blood testing machine. Test strips are inserted into the machine and blood samples dropped on the sensitive part of the strip. Blood sugar levels were then displayed as digital lights on the machine.

2.9Statistical Analysis

Data were analyzed for means and standard deviation. Analysis of variance was employed to compare means at the 95% probability level (P=0.05). Mean was separated if significantly different using the Duncan Multiple Range Test (DMRT). The statistical Package for Social Sciences (SPSS) was employed to aid the analysis.

3.0 Result

Table 1: Blood sugar levels of Clariasgariepinus with antibiotics administration

Blood sugar mmol/dl (Replicates)	**Treatment (Chloranphenicol)**			
	250mg	**500mg**	**750mg**	**0mg(control)**
1	3.2	3.5	3.5	14.5
2	3.3	3.2	3.6	14.9
3	3.0	3.6	3.3	14.8
Mean±S.E	3.17 ± 0.09^{b}	3.50 ± 0.17^{b}	3.47 ± 0.08^{b}	14.73 ± 0.12^{a}

Means with same letter superscripts are not significantly different (P=0.05)

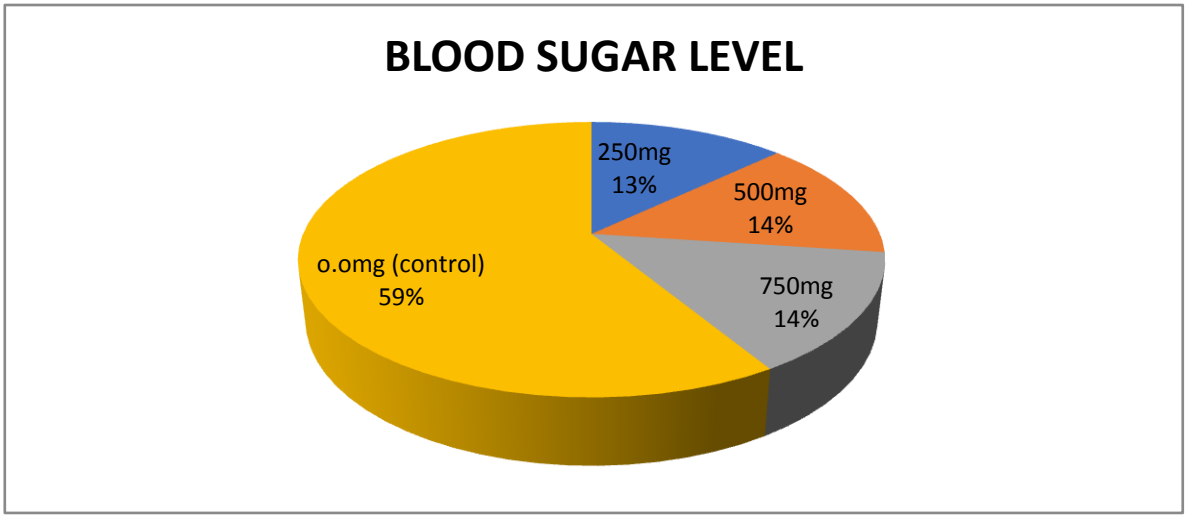

Figure 1: Blood sugar levels of Clariasgariepinus with antibiotics administration

3.2 Discussion

The result of the investigation show that the administration of the antibiotic results in the reduction of blood sugar levels. Similar reductions in blood glucose in humans have been associated with the use of certain other antibiotics. These antibiotics are clarithromycin, moxifloxacin, levofloxacin and tigecycline (Kennedy et al, 2020). However, hypoglycemic effects of chloramphenicol have not been observed in previous literature. Chloramphenicol may cause fatal aplastic anemia and together with nitrofurans are classified as carcinogenic chemicals (GEASAMP, 1999, Aftab and Abdul, 2006). Although the mechanism of how antibiotics may cause hypoglycemic presentation is not wholly understood, however there are some suggestions which propose certain mechanisms. Majorly, previous scholars suggest that the increase production of insulin by the inhibition of the K+ATP channels in the pancreas beta cell by these antibiotics may trigger this change (Saraya et al, 2004). On the contrary however, chloramphenicol works by inhibiting protein synthesis by restricting the action of peptidyl transferase thus preventing peptide bond formation. This is unconnected with the mechanism of sugar reduction in blood, thus demand further scrutiny. Also the reduction in blood sugar appear not to be perfectly dose related, as the highest dose administered did not produce the lowest blood sugar outcomes. This may be due to certain factors as the sex of the fish, the physiological state of the fish as well as some unnoticed exogenous factors.

Finally, the massive difference between the blood sugar levels of the control and that of the treatment groups may be due to the deliberate over dose of chloramphenicol used in this study. Standard application rates of 4mg of chloramphenicol per litre of water was exceeded in this study as the lowest dose of 250mg also exceeded the recommended application rate in aquaculture.

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