The Effect of Norbactin on the Lipid Profile of the Cardiovascular System of Albino Rats

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ABSTRACT

Antibiotics have been reported to produce varied degree of toxicity to different organs and systems. Thus, the present study investigated the effect of Norbactin on the lipid profile of the cardiovascular system of Albino rats. The research was performed on 20 adult male Albino rats, randomly placed in 5 groups (A,B,C,D,E) of 4 rats in each. Group A,B,C,D were administrated 5.72,11.43,17.15 and 22.86(mg/kg) respectively of Norbactin solution. Group E was the control. The administration was by oral intubation and lasted for 7 consecutive days. Physical activities, feed and water intake was found to decrease in the test groups while the control did not show significant (p>0.05) changes. Concentration of total cholesterol, triglyceride and low density lipoprotein in the groups administered the drug was significantly (p>0.05) higher than the control. The level of high density lipoprotein recorded in group A,B,C and D was significantly (p<0.05) lower than in the control. This effect were found to be dose dependent. The findings of this study suggest that Norbactin may be toxic to the cardiovascular system. It may not be suitable for a patient with cardiovascular disorders.

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1. INTRODUCTION

In pharmacology, a drug is a chemical substance, typically of known structure, which, when administered to a living organism, produces a biological effect. An antibiotic is an example of an antimicrobial substance or drug that is active against bacteria and is the most significant type of antibacterial agent for fighting bacterial infections [1]. Antibiotics are substances derived from microorganisms that inhibits or destroy the growth of other microorganisms. They are used to treat infections caused by organisms that are sensitive to them, usually bacteria or fungi Salkind *et al.*(2011). In 1928, penicillin, the first antibiotics was discovered by Alexander Fleming, Professor of Bacteriology at St. Mary's Hospital in London (ACS). They alter the normal microbial content of the body (example, in the lungs, bladder and intestine) by destroying one or more groups of harmless or beneficial organisms, which may result in infection (such as thrush in women) due to over growth of resistance organisms. These side effects are mostly allergic reaction [2].

Antibiotics should not be used to treat minor infections which will clear up unaided. Antibiotics are commonly classified based on their mechanisms of action, chemical structure or spectrum of activity. Norbactin is an antibiotic that affects the cardiovascular system and it is a 400 MG tablet that is a combination medicine that is used to cure bacterial infections. It is primarily used to treat diarrhea and dysentery. It is a combination of two antibiotics Norfloxacin and Tinidazole. Norbactin affect the cardiovascular system by causing a condition that affects the heart rhythm (QT prolongation). QT prolongation can rarely cause serious (rarely fatal) fast/irregular heartbeat and other symptoms (such as severe dizziness, fainting) that need medical attention right away [3].

Due to Antibiotics pharmacological or toxicological properties, it may involve adverse effects such as nausea, fever, allergic reactions, diarrhea, rashes, stomach upset. Examples are Penicillin and Ciprofloxacin. Antibiotics has certain effects on both animals and humans. Cardiovascular system, also known as called the circulatory system or the vascular system, is a system that allows blood to circulate and transport nutrients such as amino acids, oxygen, carbon dioxide, hormones, and blood cells to and from the cells in the body to provide nourishment and help in fighting diseases, stabilize temperature and pH, and maintain homeostasis [4]. The essential components of the human cardiovascular system are the heart, blood and blood vessel. It is made up of the pulmonary circulation; a "loop" through the lungs where blood is oxygenated and the systemic circulation; a "loop" through the rest of the body to provide oxygenated blood. The systemic circulation can also be seen to function in two parts: a macro circulation and a micro circulation. When the cardiovascular system is infected by a particular disease, the condition is called cardiovascular disease [5].

The cause of cardiovascular diseases is due to the Plaque accumulation thickens and stiffens artery walls, which can inhibit blood flow through the arteries to the organs and tissues. Certain causes can lead to Cardiovascular diseases such as smoking, high cholesterol, diabetes, family history of CVD, high blood pressure, high density lipoprotein, low density lipoprotein [6]. A common example of the cardiovascular disease is Atherosclerosis. Lipid profile is a panel of blood test that serves as an initial screening tool for abnormalities in lipids, such as total cholesterol, triglycerides, low density lipoprotein and high density lipoprotein. Whereas the low density lipoprotein is referred to as "Bad Cholesterol" and the high density lipoprotein is referred to as the "Good Cholesterol" because the low density lipoprotein accumulates the fats in the arteries and this can lead to stroke while the high density lipoprotein mops out the bad cholesterol to the liver for metabolism. The objective of the study was to evaluate the effect of Norbactin (an antibiotic) on the cardiovascular system in Albino rats, using lipid profile as an indicator.

2. MATERIALS AND METHODS

2.1 Collection of Drug Sample

A pack of Norbactin was purchased from Cifox pharmacy at Thinkers Corner, Emene, Enugu state.

2.2 Preparation of Drug Solution

10 tablets of antibiotic were dissolved in 100 ml of distilled water to give 0.04 g/ml.

2.3 Collection and Acclimatization of Animals

Healthy 20 adult male albino rats weighing 70-130 g were used for this study. Before starting the experiment, the animals were acclimatized to the laboratory conditions for 1 week at ambient temperature (24±25ºC) and relative humidity (40-60%). The animals were fed with standard laboratory diet and water and were fasted overnight before the study but had a free approach to water.

The purpose of starving the rats over night was because it is a must when doing lipid profile because the diet may affect the lipid profile. The rat was dissected using vein puncture method from the left leg. Lipid profile was measured.

2.4 Experimental Design

Evaluation of Lipid profile of albino rats administered Norbactin (an antibiotic) was done on five groups of rats by randomly selecting four rats for each group. The last group served as control while the others were induced with lipid profile. The groups are as follows:

Group A = 5.72 mg/kg
Group B = 11.43 mg/kg
Group C = 17.15 mg/kg
Group D = 22.86 mg/kg
Group E = Control

Determination of the dose to be administered to each animal in the group was done according to the body weight before administration. All animals in the groups were repeatedly exposed by oral gavage to the respective dose of their treatment for one week after which they were sacrificed.

2.5 Recording of Body Weight

Body weight was measured before and after the drug administration every day during the treatment in all groups.

2.6 Blood Samples Collection

The Blood samples for measuring lipids profile collected on the last day from the animals by vein puncture method from the left leg via a 5 ml syringe and dispensed into the appropriately labeled blood collection tubes and serum were separated by centrifuge at 3000 rpm [7].

2.7 Estimation of Lipid Profile

Lipid profile (Total cholesterol, Triglyceride, LDL and HDL) was estimated by using Star 21 bio auto-analyzer (E114947) at 505 nm by standard kits (Span Diagnostics Ltd. India) [8].

2.8 Statistical Analysis

The results were reported as mean ±SEM; n=4 animals in each group; * P<0.05: Statistically significant from control; ** P<0.05: Statistically significant from control; # P<0.05: The results gotten were subjected to statistical analysis using ANOVA (analysis of variance) to test for the significance and the effectiveness of drug solution to the experimental animals.

3. RESULTS

3.1 Total Cholesterol, Triglycerides, Low Density Lipoprotein and High Density Lipoprotein

The Lipid Profile of the animals is represented in Table 2. The lipid profile of the treated groups did not differ significantly (p>0.05), from that of the control. There was a significant increase (p<0.05) in the lipid profile of the test groups compared to the control.

4. DISCUSSION

The actual biochemical mechanism responsible for the observed decrease in physical activities, water intake and feed is not clear. However, it may be due to some chemical constituents of the administered drug (Norbactin). The work by James et al., (2001), observed that some of the antibiotics influenced various body processes such as appetite and overall body metabolism of the animals. The influence may be as a result of the stimulation/ inhibition of the cell metabolic enzymes.

The body weight of the animals treated with drug sample significantly decreased (p>0.05) while the control increased during the days of administration (Table 1). The actual mechanism to support this loss of weight can be a suggestion for further studies. The observed loss of appetite may account for the weight loss and apart from this, direct effect of constituents of Norbactin in the animals which may cause metabolic changes upon their ingestion which may certainly have contributed to the observed changes.

Table 1. Change in body weight

Doa	Group A	Group B	Group C	Group D	Group E
1	130.75±8.30	130.50±7.37	100.50±7.37	77.50±5.00	78.75± 2.50
2	130.50±8.23	125.75±4.92	97.50±9.57	73.50±5.80	87.50±5.00
3	123.75±4.22	122.50±5.00	97.50±9.57	68.75±3.95	95.25±5.77
4	120.50±8.23	107.50±9.57	87.50±9.57	66.25±5.56	97.50 ±5.00
5	119.75±0.50	104.50±10.00	79.50±1.00	64.75±2.87	102.50±6.46
6	107.50±9.57	103.50±9.98	77.50±5.00	57.50±4.86	110.75±8.17
7	105.75±9.50	97.50±9.45	70.75±7.37	53.75±3.95	112.50±5.00

The average body weight of the groups is shown in table 1
Values = Mean ± Standard Deviation
DOA - Day of Administration

Table 2. Changes in total cholesterol, triglycerides, low density lipoprotein and high density lipoprotein for lipid profile after seven days of drug administration

Animal Group	Total Cholestrol (Mg/Dl)	Triglycerides (Mg/Dl)	Low Density Lipoprotein (Mg/Dl)	High Density Lipoprotein (Mg/Dl)
A	235.95±8.37[a]	123.36±5.23[a]	161.26±5.54[a]	26.30±2.61[a]
B	252.41±9.80[b]	148.42±10.31[b]	196.37±11.90[b]	18.99±1.36[b]
C	276.71±4.90[c]	182.61±6.52[c]	241.54±6.80[c]	15.08±0.74[b]
D	299.10±7.45[d]	211.93±6.34[d]	276.78±3.47[d]	13.63±0.32[b]
E	201.62±7.33[e]	94.42±5.07[e]	129.96±7.68[e]	40.16±3.94[c]

All values are mean ± standard deviation, n = 4
Values within the same column having different superscript varied significantly ($P<0.05$).
The total cholesterol, triglyceride and low density lipoprotein concentration in the group administered the drug were significantly($p<0.05$) higher than in the control group. On the other hand, high density lipoprotein concentration in the test group were significantly($p>0.05$) lower than in the control. This effect was found to be linearly dose dependent

The lipid profile of the animals treated with drug samples significantly increased ($P<0.05$) compared with the control group (Table 2).

However, the result showed that the increase in the dose of the Norbactin would lead to an increase in the level of total cholesterol, triglyceride and low density lipoprotein (LDL) and a decreased in the level of high density lipoprotein (HDL) when compared to the control group. According to research, high level of total cholesterol and LDL usually deposit in the walls of the arteries, giving rise to cardiovascular disease. These deposits are known as plaque (or atheroma) and the process is called atherosclerosis. After some time, the plaque causes the arteries to narrow and eventually become blocked. This causes a lack of oxygen to the part of the organ supplied by the artery and will result in tissue damage [9].

5. CONCLUSION

The present study has clearly revealed that Norbactin has an adverse effect on cardiovascular system. However, the result showed that the effect is dose-dependent which implies that the higher the dose, the more the adverse effect on the cardiovascular system. From this present investigation, it can be concluded that Norbactin at high doses has a potential to cause cardiovascular diseases. However, more investigations are required to establish the actual mechanism involved in the effect of Norbactin in the cardiovascular system.

ETHICAL APPROVAL

Animal Ethic committee approval has been taken to carry out this study.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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