International Journal of Latest Trends in Engineering and Technology
Special Issue - International Conference on Nanotechnology: The Fruition of Science-2017, *pp.121-127*
e-ISSN:2278-621X, p-ISSN: 2319-3778

SIMULATION STUDIES AND EFFECT OF AMOXICILLIN IN THE RENAL FUNCTIONING OF RATTUSALBUS

Jenila. G. J[1], Ginil Mon S[2], Jaya Vinse Ruban Y[3]

Abstract-Antibiotics revolutionized medicine in the 20th century, and have led to the new eradication of diseases such as tuberculosis in the developing world. Their effectiveness and easy access led to over use, especially in livestock raising, prompting bacteria to develop resistance. This work is focused on the study of renal function in rat and to study the variation of sodium, potassium and calcium, urea, creahnine, and uric acid level in the experimental animal after the injection of Amoxicillin 300 mg. Level of blood sodium varied from 4.8 mm ol/L in the 1st day and increase in 7.6 mm ol/L. Level of blood potassium shows a tremendous increase in the 5th day that is 7.8mmol/L. The level of blood urea varied from 20.3 mgs/dl to 12.6 mgs/dl m the 15th day. The result obtained from the content and experimental animal shows a significant change. The body weight seems to be reduced. The biochemical analysis result shows that Amoxicillin injection (300mg) has some effect on the renal function of the experimental animal. The antibiotic molecule was simulated with various viruses to study the interaction effect
Keywords: Amoxicillin (300mg), Potassium significant, Stock raising, biochemical analysis, simulation

INTRODUCTION

Antibiotics, also called antibacterials, are a type of antimicrobial drug used in the treatment and prevention of bacterial infections. They may either kill or inhibit the growth of bacteria. A limited number of antibiotics also possess antiprotozoal activity. Antibiotics were not effective against viruses. Their appropriate use allows the emergence of resistant organisms. In 1928 Alexander Fleming identified penicillin, the first chemical compound with antibiotic properties. Fleming was working on a culture of disease, causing bacteria when he noticed the spores of a little green mold (PenicillumChrysogenum) in one of his culture plates. He observed that the presence of the mold killed or prevented the growth of the bacteria.

The era of antibacterial treatment began with the discovery of arsphenamine, first synthesized by Alfred Bertheim and Paul Ehrlich in 1907, and used to treat syphilis. The first systemically active antibacterial drug, prontosil was discovered in 1933 by Gerhard Domagk, for which he was awarded the 1939 Nobel Prize. All classes of antibiotics is use today were first discovered prior to the mid 1980s.

However, a far more common use is to increase feed efficiency, resulting in better profits. (Coghlan, 1996 and Bonner, 1997) with the widespread use of antibiotics has come a variety of concerns. Primarily, fear that microbial resistance will render antibiotics useless against common illnesses. A commonly used antibiotic on the market is tetracycline. In a variety of forms, tetracycline is used for both human and animal purposes. The agricultural impact of antibiotics on microbes in the environment is just beginning to be examined, but at least in the case of Tetracycline, appears to increase the microbial resistance to the drug.

The large use of antibiotics in livestock has become a highly debated topic. (Coghlan 1996 and Bonner 1997). In general, antibiotics are administered at higher concentrations for therapeutic and prophylactic use and lower concentrations for non-therapeutic use (Wegener 2003). A recent study conducted at state university of New York focused on the removal of antibiotics in waste water. This reduction, observed in a single batch reactor, may be applicable to large scale waste water treatment as research is continued (Sungpyo, 2005).

Even though pharmacological industries have produced a number of new antibodies in the last three decades, resistance to these drugs by microorganisms has increased. In general, bacteria have the genetic ability to transmit and acquire resistance to drugs, which are utilized as therapeutic agents. (Cohen. ML, 1992).

The beginning of mass production of antibiotics over half a country ago represented a major breakthrough un the medical treatment of infectious disease. Physicians and the scientific community were so enthusiastic about their initial success in fighting pathogens that in 1970, the US surgeon Genera stated that the war against pestilence had been won (Anker and Schoaf, 2000).

[1] *Assistant Professor, Department of P.G. Zoology, Nesamony Memorial Christian College, Marthandam.*
[2] *Assistant Professor, Department of Chemistry & Research, Nesamony Memorial Christian College, Marthandam.*
[3] *Assistant Professor, Department of Chemistry & Research, St. Xaviers College, Tirunelveli.*

This investigation is done to study the renal function test in rat (Rattusalbus), to analyse the variation in sodium, potassium, and calcium level in it, to analyse the variation in urea, creatinine, and uric acid level. The effect of amoxicillin is simulated on the HIV and Influenza to study their interaction.

MATERIALS AND METHODS

The white rat were housed in cages with food and water. One rat was kept as a control for this experiment, and blood samples were collected as per the standard procedure and analyzed in the laboratory. Sodium, Potassium, Calcium were standardized in the laboratory. Amoxicillin is used to stop or treat certain bacterial infection such as infections of the ears nose, throat, urinary tract and skin. It is a penicillin like antibiotic and works by stopping the growth of bacteria. Amoxicilin 300mg injection prescription was purchased from standard market. Renal Function Tests for Sodium and Potassium are determined using Mono Test, Calcium usingArsenazo III Mono Test, Urea using Berthelot method, Creatinine by Kinetic Colorimetric method and Uric acid by Enzymatic colorimetric method.Serum was separated by centrifugation of blood at 1600g for 10 min and stored at -20°c, until analysis. The blood samples were collected from the vein of rats and was analyzed by the standard procedure in the laboratory. The interaction of the amoxicillin molecule with HIV and influenza virus molecules where studied using HEX software.

RESULTS & DISCUSSION

Table:1 displays the results of all the tests carried out. The control sample has the least value of the desired substance in most of the cases. The concentration is much higher in the 1st day of study and then it reduces day by day. Higher concentration of these substances will have adverse effect on the biological system. In the case of uric acid, the control value is higher than the rest. The amoxicillin has some effect on decreasing the uric acid content.

Antibiotics are a vital weapon in combating serious bacterial infections. Side effects range from mild to very serious depending on the antibiotics used, the microbial organisms targeted and the individual patient. There are three main problems with using antibiotics. One is direct medical side effects such as toxic effects eg. amino glycoside antibiotics are toxic to kidney cells or allergies which can be life-threatening. The second is that antibiotic could kill the normal flora by leaving the patient more vulnerable to pathogens and also resulted in antibiotic resistance.

Amoxicillin is used to stop or treat certain bacterial infections. However prudent medical practice dictates careful monitoring of prothrobin time in all patients treated with amoxicillin and warfain concomitantly. The kidney is a common target of toxicity of therapeutic and environmental xenobiobics, because of its high blood flow, tubular transport processes and complex metabolic activities. Beta-lactams are the largest and most rapidly growing of antimicrobials. Because of its excretion by the kidney it might result in nephrotoxicity, which is of major concern in the treatment of the increasingly resistant infections (Tune, 1997).

Beta-lactams are toxic to the kidney when given singly or in doses just above the therapeutic range and even more toxic when used in combinations with other nephrotoxic medications (servaisetal., 2005). The development and persistence of multidrug resistant bacteria pose increasing challenges to public health. The use of antibiotics in human medicine has influenced antibiotic-resistant bacteria; the use of antibiotics in animal agriculture has contributed to this critical problem as cell (Cohen and Tauxe 1986; Gorbach 2001; Institute of Medicine 1998; National Research Council 1999; Van den Boogard and Stobberingh 1999).

Industrialized countries have the highest antibiotic use and so could be the first to see the development of environmental communities of resistance. However, with global travel, drug resistance can be expected to spread steadily to all parts of the world. Developing countries may in turn suffer the worst consequences because of the poor state of their health sevices and their inability to pay for alternatives to cheap antibiotics (UNEP/DEWA Earth watch 1996-2005). The complexities of the modern food chain make it challenging to perform controlled studies that provide unequivocal evidence for a direct link between antibiotic use in animals and the emergence of antibiotic resistance in food-borne bacteria associated with human disease.

Regulation of the internal environment of body cells is maintained mainly by the kidney through glomerular filtration, selective reabsorption and secretion by tubules as well as exchange of hydrogen icons and reduction of ammonia for conservation of base. Threshold substances as urea, creatinine, protein, electrolytes and glucose are almost completely reabsorbed by the tubules when their concentrations in the plasma are within the normal level but appear in the urine when their plasma level exceeds and due to defect in renal tubules as a result of nephrotoxicity.

The simulation studies shows an excellent interaction with HIV (-1212.97) (Figure:7) and Influenza (-895.40)(Figure:8). The area of contact is higher for HIV, but of less difference with Influenza. This amoxicillin can be a suitable target molecule in preparing drugs for HIV and Influenza. Simulation studies shows Amoxicillin as an excellent target molecule, but it has to be used in minimal and safe manner so that the side effects can be avoided.

SUMMARY

Antibiotic is a chemical substance produced by microorganism having property of inhibiting the growth or destroying other microorganism in high dilution Amoxicillin (300 mg) injection. It is semi synthetic broad spectrum penicillin, which is metabolized in kidney. A single dose of Amoxicillin injection (300 mg) is administered to the experimental rat. Blood samples were voided 1st day, 5th day, 10th day and 15th day after the dose is over in control and test rat were subjected to biochemical analysis. The serum samples were used for quantitative determination of total protein, urea, uric acid, creatinine, calcium, sodium and potassium.In the experimental animal the body weight seems to be reduced. All these biochemical analysis shows significant effect of antibiotic Amoxicillin injection (300 mg) on the renal function of the experimental animal. The simulation studies confirms Amoxicillin as a potential target molecule for HIV and Influenza virus treatment. Usage of such antibiotics should be minimal to avoid side effects.

BIBLIOGRAPHY

[1] Bonner,J. (1997) Hooked on drugs. New scientist, 18 January 1997, 24.

[2] Coghlan, A. (1996). Animal antibodies theates hospitals epidemics, New scientist, 27 July, 7.

[3] Cohen, M.L. Epidemiology of drug resistance implications for a postantimicrobial era, Science 257, 1050-1055, 1992.

[4] Sungpyo,K.,and Eichhorn,P., and Jensen, J., and weber, S.A., and Aga, D.S. (2005) Environmental Science and Technology. Removal of Antibiotics in waste water. Effect of Hydraulic and solid Retention Times on the Tetracycline in the Activated slude process.

[5] Tune B.M. (1997), Nephrotoxicity of beta- lactam antibodies: Mechanisms and strategies for prevention. PediatrNephrol. 11.

TABLES AND FIGURES

Table 1: Report for Renal Function Test of Blood Sample

Test Name	Control	1st Day	5th Day	10th Day	15th Day	Units
Blood Sodium	4.8	7.6	6.2	5.7	5.2	mmo/L
Blood potassium	6.8	9.6	7.8	5.5	4.2	mmo/L
Blood Calcium	9.2	10.8	9.2	8.4	6.0	mgs/dl
Blood Urea	20.3	18.3	16.5	14.7	12.6	mgs/dl
Blood Creatinine	0.6	0.8	0.7	0.6	0.5	mgs/dl
Blood Uricacid	6.2	7.6	5.8	5.2	4.9	mgs/dl

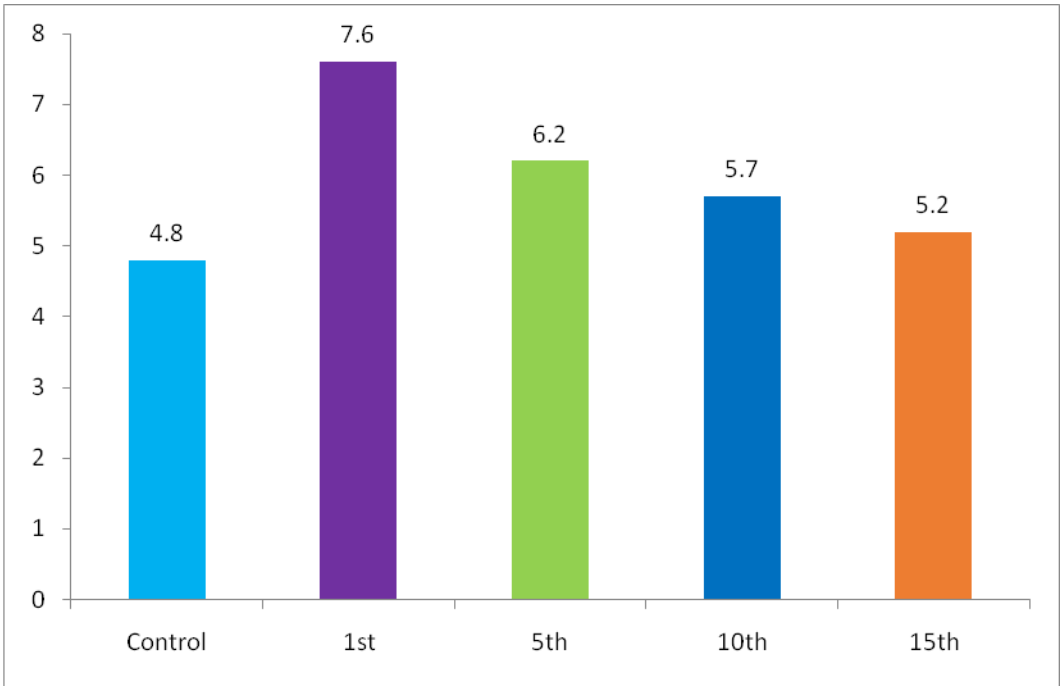


Figure 1: Blood Sodium Levels

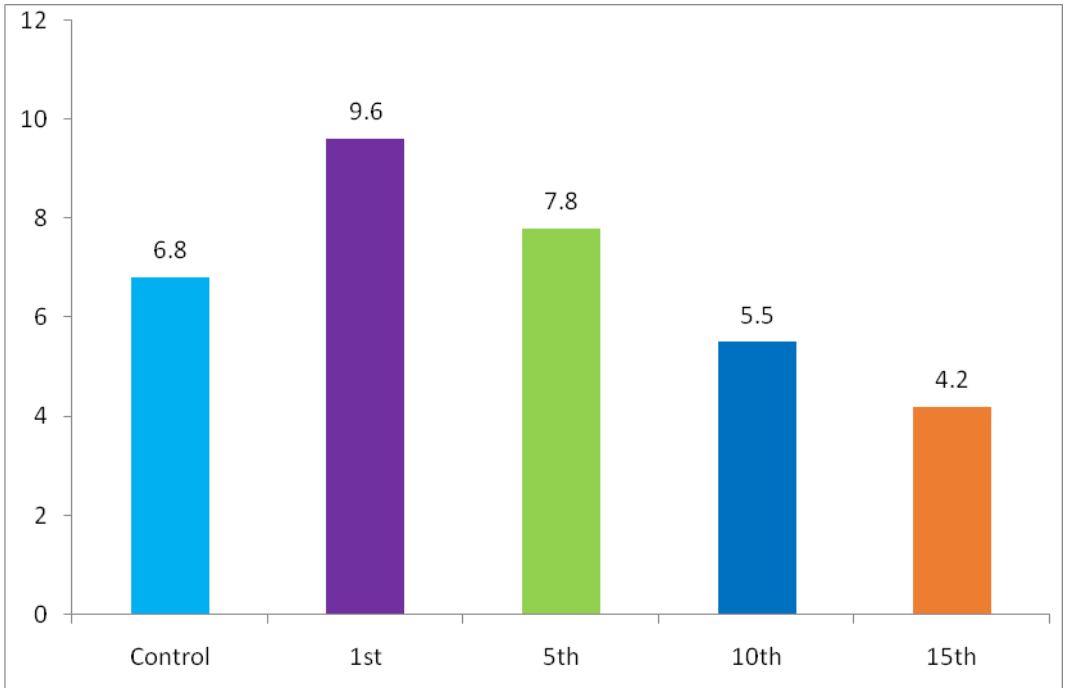


Figure 2: Blood Potassium Levels

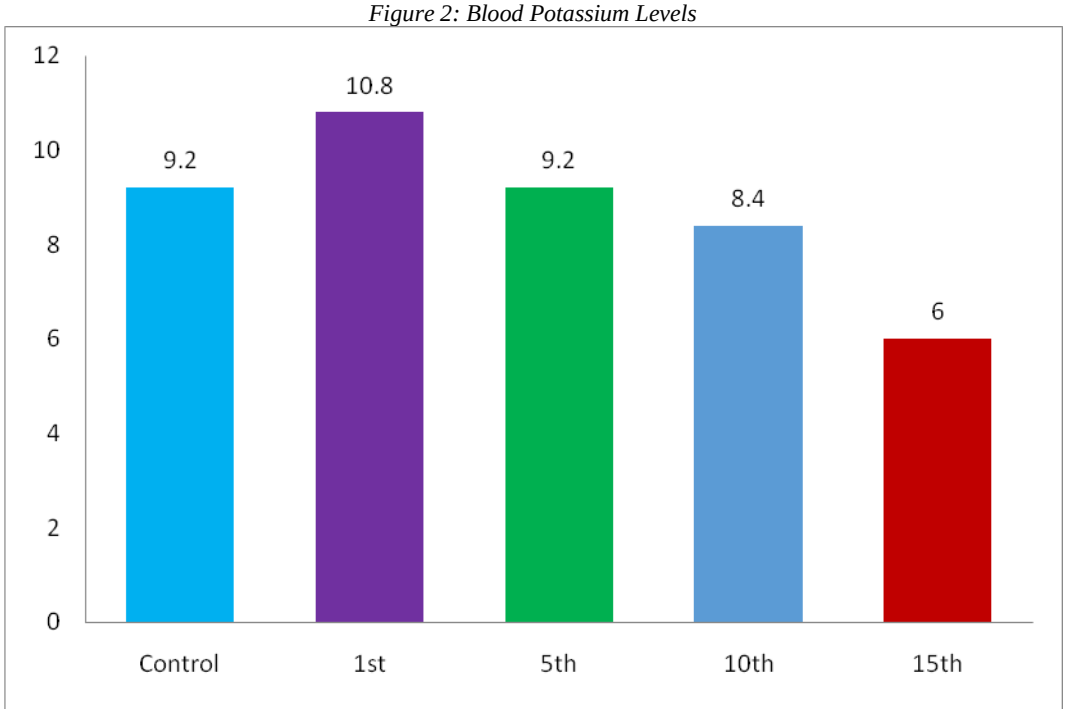


Figure 3: Blood Calcium Levels

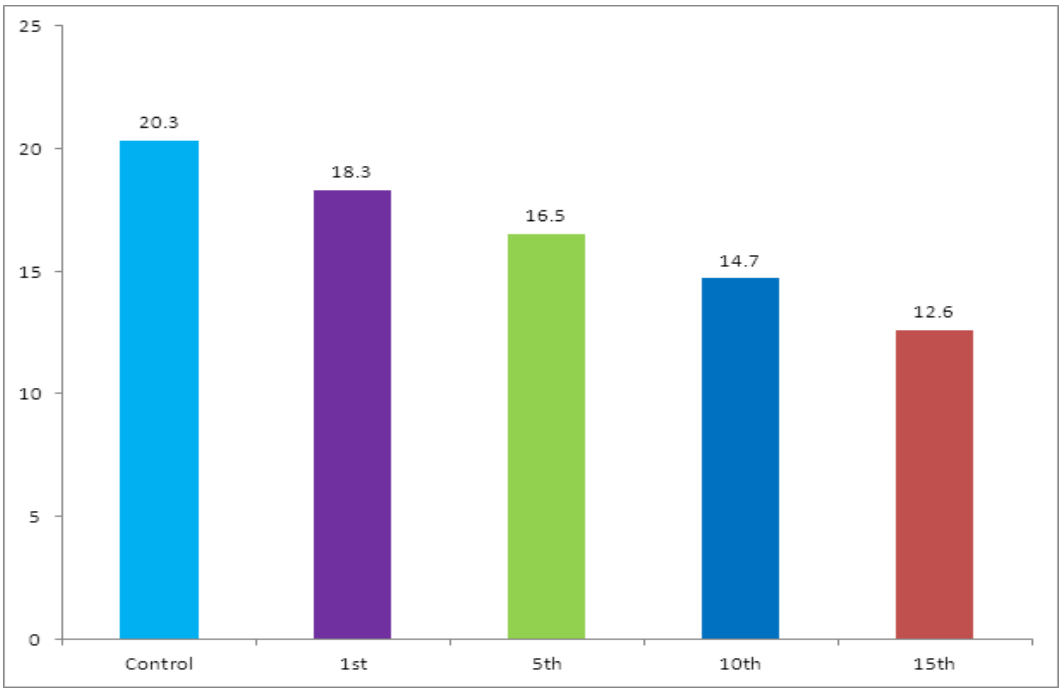


Figure 4: Blood Urea Levels

Figure 5: Blood Creatine Levels

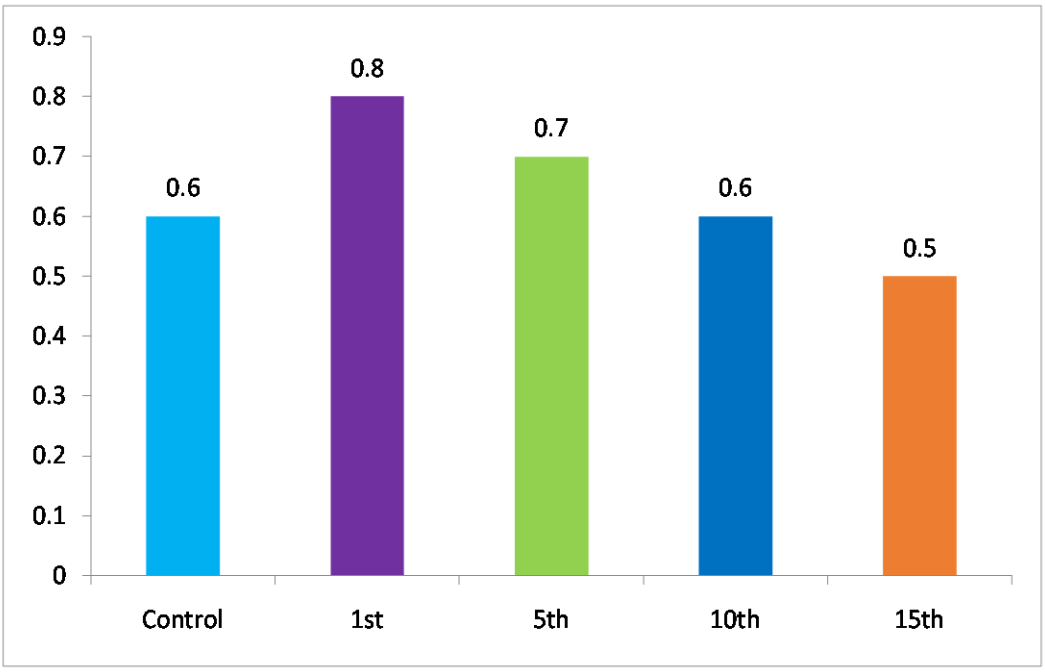
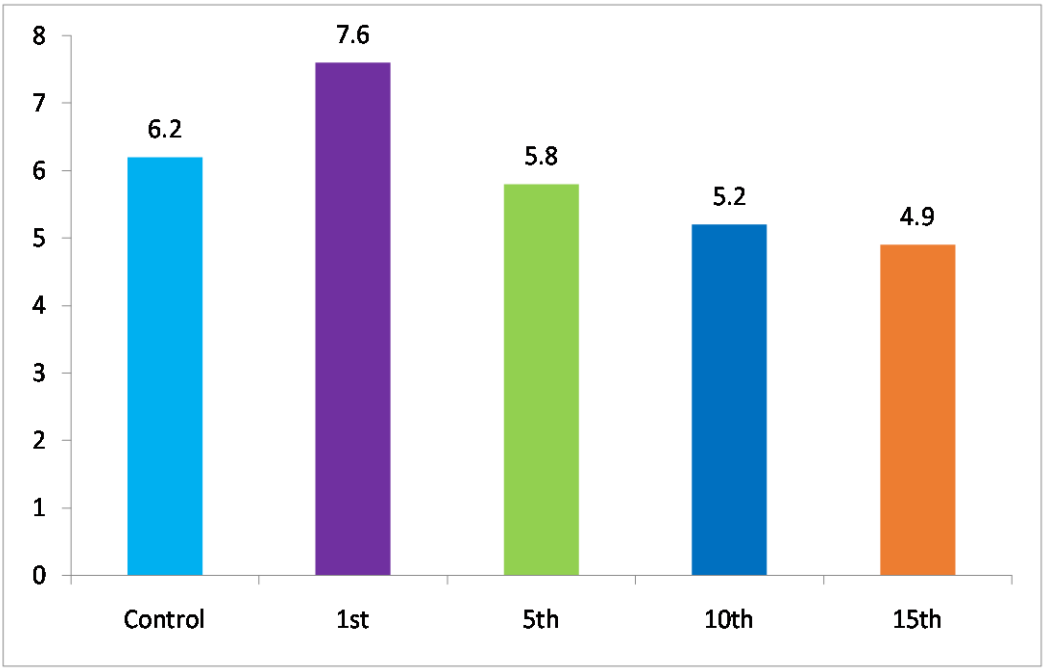


Figure 6: Blood Uric Acid Levels



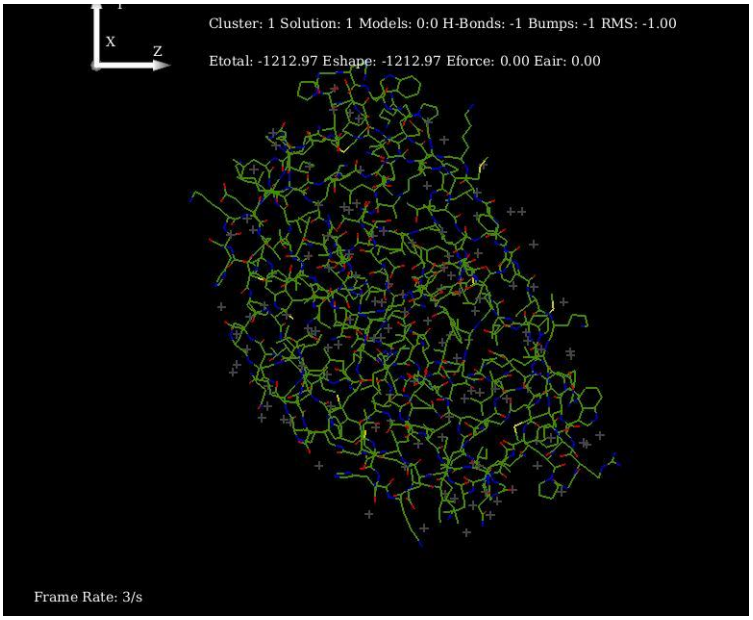


Figure 7: Molecular Docking of Amoxicillin with HIV Virus

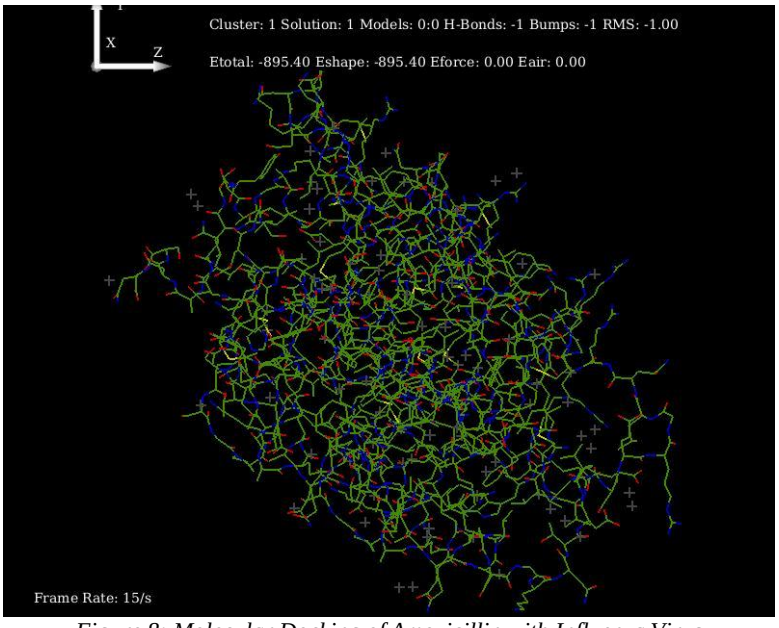


Figure 8: Molecular Docking of Amoxicillin with Influenza Virus